Turkey

Country Report

Prepared for the
3rd World Water Forum
March 2003

Republic of Turkey

This publication has been made possible by funding from the World Water Council

Published by: World Water Council

ISBN: 92-95017-06-4

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About the cover:

Marbled paper, called *ebru* in Turkish, was used extensively in the binding of books and within the calligraphic panels in Turkey. In the Renaissance period, book lovers in Europe prized *ebru*, which came to be known as “Turkish paper”. Early texts such as the *Discourse on Decorating Paper in the Turkish Manner*, published in 1664 by Athanisus Kircher in Rome, helped to disseminate appreciation for this art.

A child's vision of the Southeastern Anatolia Project.
Untitled painting by Alev Akin, Siirt (4th grade)
National First Prize, 1995
GAP Children's Art Competition, Painting Division

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ABBREVIATIONS AND ACRONYMS

CATOM	Multi Purpose Community Center
CC	Civil Code
CEKUL	The Environment and Culture Agencies Cooperation Association
DHKD	The Society for the Protection of Nature
DHS	Demographic Health Surveys
DIE	State Institute of Statistics
DKHD	Turkish Society for the Protection of Nature
DPT	State Planning Organization
DSI	General Directorate of the State Hydraulic Works
EDI	Economic Development Index
EIA	Environmental Impact Assessment
EIEI	Electricity Surveys Administration
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FYDP	Five Year Development Plans
GAP	Southeastern Anatolia Project
GAP-GIDEM	Entrepreneurship Support and Guidance Center
GAP RDA	Southeastern Anatolia Project Regional Development Administration
GDP	Gross Domestic Product
GDRS	General Directorate of Rural Services
GNP	Gross National Product
GOLD	General Organization of Land Development, Syria
GRP	Gross Regional Product
ICOLD	International Commission On Large Dams
ID	Irrigation Districts
IGEME	Records of Turkish Export Promote Center
ILO	International Labour Organisation
IMF	International Monetary Fund
IMO	Irrigation Management Organizations
IPS	Institute of Population Studies
IWMI	International Water Management Institute
JMP	Joint Monitoring Program
MARA	Ministry of Agriculture and Rural Affairs
MICS	Multiple Indicator Cluster Surveys
MOH	Ministry of Health
MOM	Management, Operation and Maintenance
NEAP	National Environmental Action Plan
NGO	Non-Governmental Organization
O&M	Operation and Maintenance
PAPs	Project-Affected Persons
PDoE	The Provincial Directorate of Environment
PHS	Population and Health Survey
RBMWG	River Basin Management Working Group

SHCEK	Social Services and Child Protection Agency
SIS	State Institute of Statistics
SYB	Start Your Own Business”
TCV	The Environment Foundation of Turkey
TEDAS	Turkish Electricity Distribution Authority
TEMA	The Turkish Foundation for Combating Soil Erosion for Reforestation and Protection of Natural Habitats
TKV	Development Foundation of Turkey
TOBB	Chambers of Commerce and Industry
TUBITAK	Turkish Scientific and Technical Research Council
UN	United Nations
UNDP	United Nations Development Program
UNICEF	United Nations Children's Fund
USAID	US Agency for International Development
WCD	Water Supply and Sanitation Decade
WEHAB	Water Energy Health Agriculture Biodiversity
WHO	World Health Organization
WTP	Water Treatment Plants
WWC	World Water Council
WWF	World Wide Fund for Nature
YSE	Road, Water and Electricity Services


LITHUANIA
R.F
GERMANY
POLAND
BELORUSSIA
RUSSIAN
FEDERATION
CZECH REPUBLIC
SLOVAKIA
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HERZEGOVINA
YUGOSLAVIA
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BULGARIA
BLACK SEA
GEORGIA
CASPIAN SEA
ITALY
ALBANIA
MACEDONIA
AZERBAIJAN
TURKMENISTAN
ARMENIA
GREECE
AEGEAN
TURKEY
T.R.N.C.
SYRIA
IRAN
G.A.S.C.
MEDITERRANEAN
LEBANON
IRAQ
ISRAEL
JORDAN
LIBYA
EGYPT
SAUDI ARABIA
PERSIAN


BULGARIA
Black Sea
0 75 150 km
0 75 150 mi
GEORGIA
AZER.
Strait of Istanbul
GREECE
İstanbul
Samsun
Trabzon
Sea of Marmara
Kocacli (İzmit)
ARMENIA
Strait of Çanakkale
Bursa
ANKARA
Sivas
Erzurum
Balıkesir
Eskişehir
Euphrates
Lake Van
AZER.
Manisa
Anatolia
Kayseri
Van
IRAN
İzmir
Konya
Diyarbakır
Tigris
Kahramanmaraş
Şanlı Urfa
Antalya
İçel (Mersin)
Adana
Gaziantep
İskenderun
Aegean Sea
Mediterranean Sea
SYRIA
IRAQ

INTRODUCTION

Water is the engine for economic and social development and for poverty eradication. Yet, it is generally agreed that the growing water shortage may lead to serious water crises in many parts of the world in the decades to come. Already, 1.1 billion people do not have access to safe drinking water, and almost 2.5 billion do not have access to adequate sanitation.

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.

The Third World Water Forum, as a continuation of this process of international cooperation, will convene a wide range of stakeholders, and will be instrumental in proposing plans of action, and in strengthening commitments toward the achievement of these goals.

These goals, in the face of rising populations, urbanization, environmental degradation, and other threats are, to say the least, challenging. To make the water crisis easier to understand, it is helpful to look at individual countries and regions with special geographic and climatic conditions and problems. Every country has its own understanding of these problems, and the challenge of translating global targets into local action. We have prepared this country report in order to contribute to understanding of the diversity and complexity of the issues surrounding water use and management in Turkey.

Contrary to the first impression that Turkey may give to her visitors, Turkey is not a water rich country. Turkey is situated with major bodies of water on three sides, and its interior is dissected by two of the world's most famous rivers, the Tigris and the Euphrates, and yet Turkey still faces the problem of getting enough water where and when it is needed.

The availability of water per capita in Turkey is only about one fifth of that of the countries of North American and Western Europe. Because Turkey's water resources are not as fully developed as these countries, actual consumption is even lower, about one sixth of per capita consumption in

Europe. It is therefore imperative that Turkey should improve per capita water consumption in order to enhance the quality of life of its people.

As Turkey becomes more urbanized, as industry grows, and as the demand for agricultural production increases, this resource must be developed in an efficient way that optimizes water's benefits – more crop per drop – while minimizing negative environmental impacts.

In recent decades Turkey has made great strides in water resource development for irrigation, power generation, flood control, and other purposes. The creation of dams and reservoirs has enabled Turkey to save the water from its brief seasons of rainfall to use throughout the year for irrigation, energy, drinking and sanitation. Multipurpose water infrastructures also enable Turkey to regulate the flow of its rivers and to release sufficient amounts of water to downstream countries even during dry seasons.

Since Turkey does not produce either oil or gas, Turkey's development would have been much costlier without hydropower. Non-polluting hydropower makes up nearly 40% of the total power generated in Turkey. As Turkey's energy consumption is rising at about 5.7% per year, due to rapid urbanization and industrialization, we can expect increases in the demand to develop this energy source further.

Following the Rio Summit, Turkey has taken important steps such as enacting legislation and making policy commitments to conserve biodiversity. The five-year development plans, 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 implementation in Turkey.

Turkey has been 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 and biodiversity. Environmental impact assessments are compulsory for all large scale projects, dams, other water storage facilities and irrigation systems.

One of Turkey's seven major regions has 20% of the country's economically irrigable land, 25% of Turkey's surface water resources, and 10% of Turkey's population, yet until recently contributed only 4% to the nation's GDP. The development of multipurpose water infrastructures has

been the key to unlocking the potential of this region. That is why we have devoted an entire chapter in this report to the Southeastern Anatolia Project (GAP), an integrated, multisectoral and regionally based development program that is built on a foundation of sustainable water resources development. Because the water resources were developed first, it has been possible to support economic growth, social change, and even the "softer" aspects of development like the protection and promotion of cultural heritage (no small task in a land of 28 consecutive civilizations!).

Only about one-third of Turkey's arable land is economically irrigable, and only half of that is currently under irrigation. GAP has provided Turkey with valuable experience in building integrated development upon the management of its water resources; this experience can be transferred to other regions in Turkey with similar needs and potential.

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 the country of Turkey interacts with its natural environment in order to improve the quality of life of its people.

CHAPTER 1: BACKGROUND ON TURKEY

1. Administrative Framework

The Republic of Turkey is a democratic and secular state. The government is headed by the President, elected by the Grand National Assembly of Turkey. Elections for president are held every seven years; most recently in 2000. Elections for members in the Assembly are held every five years, most recently in November 2002. Turkey has a multi-party political system, with a Prime Minister selected from among the members of the Assembly. The Prime Minister in turn selects the remaining cabinet ministers for appointment by the President.

Turkey is divided into 81 administrative provinces. Each province has a governor serving as head of the provincial government, appointed by the Council of Ministers with the approval of the President. As chief executive of the province and principal agent of the central government, each governor supervises other government officials assigned to carry out ministerial functions in his or her province. Government at the provincial level is responsible for implementing national programs for health and social assistance, public works, culture and education, agriculture and animal husbandry, and economic and commercial matters.

EU Accession

At the Helsinki European Council held in December 1999, Turkey was officially recognized as a candidate state for membership in the EU. Thus Turkey, like other candidate states, became eligible for a pre-accession strategy to stimulate and support its reforms. This includes an Accession Partnership, combined with a National Program for the Adoption of the Acquis. Turkey is currently engaged in the task of adopting the EU acquis directives, including those related to the environment, in its national legislation.

Provinces are further divided into districts, headed by district governors responsible to the governor and serving essentially as his or her agent in supervising and inspecting the activities of government officials in the district. Municipal governments, headed by locally elected mayors, exist in each provincial and district capital, and in all other major population centers. Forty-percent of the total population reside in the 53 largest cities of more than 100,000 inhabitants. As of October 2001, there

were 3,228 municipalities in Turkey. Village governments are established for smaller settlements outside the jurisdiction of provincial and district centers and other municipal centers.

2. Population Characteristics

2.1 Population

A general census has been conducted every five years since 1935. As of the most recent census in 2000, the total population of Turkey was approximately 68 million. The population of Turkey has grown steadily since the turn of the century at annual rates ranging from 2.52% to 1.62%. According to the 2000 census, the population growth rate has slowed to an annual rate of 1.62%, and is expected to slow down to 1.27% by 2030.

According to the 1998 PHS, the average household size in Turkey is 4.3 persons. Average urban households have 4 persons, and rural households 4.9 persons. Two of every five households in Turkey have more than 5 members.

Birth and death rates vary throughout the country, due in part to variations in education levels and socio-economic conditions. Although mortality rates have decreased in the last decade, rates are still higher in rural areas and in the eastern regions of the country than in urban areas and the western regions. Presently, the birth rate is 21.4 births per 1,000 people, the death rate is 6.6 deaths per 1,000 people.

2.2 Population Density & Urbanization

The population of Turkey has become increasingly urban since the 1950s, and the urban growth rate is currently slightly over 4% per year. Currently, 65% of the population lives in urban areas. The principal urban areas of Turkey are Istanbul, Ankara, and Izmir. The lowest population densities are in the eastern parts of Anatolia. Similarly, most of the large Turkish cities are concentrated in the western part of the nation, and along the Sea of Marmara.

In recent decades, the three largest cities (Istanbul, Ankara, Izmir) have grown so fast that an imbalance has appeared in the urban network of Turkey. Though some cities (Kayseri, Eskisehir,

Konya, Gaziantep, Erzurum, Samsun) still have high employment capacity, the more agriculturally oriented cities show signs of decline, leading to even more internal migration.

Comparisons over time suggest that inequality between regions may be growing. GDP data at the province level over the period of 1975-95 shows an increase in the differences in productivity levels –and in growth rates– between provinces. Consequently, the richer provinces in the Marmara, Aegean, and Mediterranean Regions are converging, while the remaining provinces continue to fall behind.

3. Education

For the school year 1999-2000, there were 12.7 million students and 484,089 teachers in 59,374 pre-school, primary and secondary educational institutions, both public and private. See Table 1.3 *Education Indicators*, for information on adult literacy and school attendance rates.

Table 1.3 Education indicators

		Total	Male	Female
Adult Literacy Rate (%)	1990	78.4	89.8	67.4
	2000	86.5	94.5	78.4
Net Primary School Enrolment Rate (%)	1990	91.96	95.06	88.70
	2000	90.80	93.62	87.78
Net Secondary Education Enrolment Rate (%)	1990	26.35	31.82	20.59
	2000	38.02	41.33	34.56

Source: DIE

4. Economy

Since World War II, the Turkish economy has shifted steadily toward industry and services, and the agriculture's share of national income has declined. Nevertheless, agriculture is still vitally important to the Turkish economy, and represents more than half of the country's work force. Approximately 39% of the workforce is in the service sector, and another 16% in the industrial sector. The distribution of Turkey's GNP among the four major sectors in 2001 is shown in Table 1.4.

Table 1.4 Gross National Product by sector, 2001

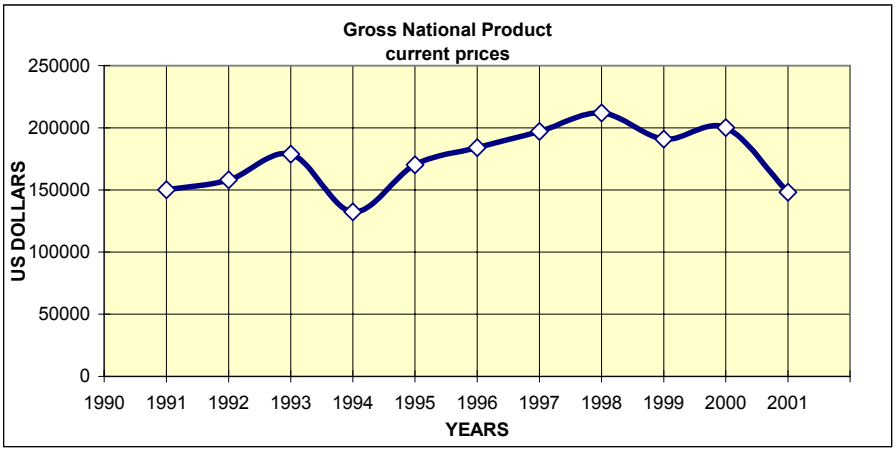
Sector	Sector GNP	Share of total GNP
Services	53,989	51.4
Industry	30,721	29.3
Agriculture	14,711	14.0
Construction	5,550	5.3
Total	104,971	100.0

Source: DIE

Per capita GDP of Eastern and Southeastern Anatolia at fixed prices is far below the country average in both 1995 and 1998 surveys by DPT and DIE.

Because of the currency devaluation following the economic crisis in 2000, per capita GDP with purchasing power parity has considerably decreased to $4,500. However, when calculated at the province level, regional disparities in income are revealed, with the spatial distribution of per capita income generally correlated with areas of high urbanization, mainly in the Marmara Region.

Figure 1.5 Gross National Product, 1991-2001



CHAPTER 2: WATER AND LAND RESOURCES

1. Water Resources

Due to the fact that Turkey's water is not always in the right place at the right time to meet present and anticipated needs, the country experiences a shortage of water. Turkey's territory is divided into 26 drainage basins. The rivers often have irregular regimes and natural flows cannot generally be considered as usable resources. Geographically, there is a large variation in average annual precipitation, evaporation, and surface run-off parameters in the country. The drainage density is relatively higher in the Black Sea Region, while the density is much lower in the regions of Central Anatolia and Southeastern Anatolia.

Though Turkey has a generally semi-arid climate, 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 southeastern part of the country, to over 3,000 mm in the northeastern Black Sea coastal area. This average annual precipitation figure for Turkey corresponds to an average of 501 billion m^3 of water per year. Approximately 70% of the total precipitation falls between October and April, and there is little effective rainfall during the summer months.

Although Turkey has, at present, more water resources than some of its neighbors, it will be unable to meet its own needs in the near future.

Turkey's average annual runoff is approximately 186 billion m^3. The amount of this capacity available for consumption is more than 110 billion m^3, including 12 billion m^3 of groundwater. Taking into consideration Turkey's population of 68 million, the quantity of water per capita is 1,700 m^3. Countries regarded as being rich in water resources have 8-10 thousand m^3 water per capita per year. The available water per capita in Turkey is about one-fifth that of the water-rich countries. The impression that Turkey has excess water derives from the fact that it is at present utilizing only 39.3 billion m^3 of its capacity. This leaves 70.7 billion m^3 of exploitable water for its future needs.

Of the 501 billion m^3 of annual precipitation, 274 billion m^3 evaporates from the surface and transpires through plants. Sixty-nine billion m^3 of precipitation directly recharges the aquifers, whereas 158 billion m^3 forms the precipitation runoff. There is a continuous interaction between surface runoff and groundwater, but it is estimated that a net 28 billion m^3 of groundwater feeds the rivers. The amount of evapo-transpiration is relatively larger, considering the other water budget elements, with the ratio of 55%. The highest amount of rainfall falls in the eastern Black Sea Region with the average value of 1,200 mm.

The average annual surface water potential is 186 billion m^3, with an additional surface runoff of 7 billion m^3 coming from neighboring countries, bringing the total surface runoff within the country to 193 billion m^3. However, not all of the renewable water resources can be utilized because of economic and technical reasons. Exploitable portions of surface runoff include 95.3 billion m^3 including inflow from bordering countries, and 12 billion m^3 from groundwater.

1.1 Climate

Turkey has a subtropical, semi-arid climate with extremes in temperatures. In the east, summers are hot and dry; winters are cold, rainy, and snowy. Along the coastal area, a Mediterranean climate is dominant with long, hot, dry summers, and short, mild, rainy winters. Rainfall shows great differences from one region to another. The average annual rainfall is 643 mm, ranging from 250 mm in the southeast to more than 3,000 mm in the northeast Black Sea area. About 70% of the rain falls in the winter and spring seasons. Autumn marks the start of the rainy season, which continues until the late spring. Although Turkey is situated in a geographical location where climatic conditions are quite temperate, the diverse nature of the landscape, and the existence in particular of the mountains that run parallel to the coasts, results in significant differences in climatic conditions from one region to the other. While the coastal areas enjoy milder climates, the inland Anatolian plateau experiences extremes of hot summers and cold winters with limited rainfall.

Turkey has both maritime and continental weather patterns. The Aegean and Mediterranean Regions are essentially sub-tropical, characterized by hot dry summers and mild, rainy winters. The Black Sea Region receives precipitation throughout the year and has mild summer and winters.

Central Anatolia is a vast high plateau and has a semi-arid continental climate with extremities in temperature.

The average annual temperature varies between 15^0C and 20^0C in the coastal zones, and falls to 4^0C and 18^0C in the inland areas. The mean annual temperature is lowest in the region of Eastern Anatolia, while the Mediterranean Region has the highest mean annual temperature.

The cloud cover index decreases from north to south. The Black Sea Region has the highest index while Marmara, Central Anatolia, and the Southeastern Regions have the lowest cloud cover index.

As for the regional distribution of sunshine duration, the west and middle of the Black Sea Region and also the Marmara Region have the lowest duration of sunshine, while the Southeastern Anatolia and Mediterranean regions have the longest sunshine duration during the year. Similarly, the average humidity values of Turkey are at the highest level in the region of the Black Sea, while being at the lowest level in the region of Southeastern Anatolia.

Turkey has a climate that is characterized by great extremes and wide temperature variations between regions and seasons. The narrow coast land and mountain slopes to the north, west, and south have wetter and milder winters than the interior as well as moderately hot summers. The interior plateau winters are cold with frost, while the summers are hot. Eastern Turkey has bitter cold winters and hot summers.

Due to the variation in topography, four main types of climate are observed in the country, namely Mediterranean, Black Sea, Central Anatolian, and Eastern Anatolian. Air flow coming to Turkey is controlled by Asor Anticyclone, Siberian Anticyclone, Polar Front Depressions, Mediterranean Depressions, and the Basra Low Pressure Center.

Three types of rainfall occur over Turkey. These are: convective rainfall which is observed in Central Anatolia in spring and summer months; frontal rainfall which is observed in all regions, mainly in winter and spring months; and orographic rainfall which is observed on the seaward slopes of the Black Sea and Mediterranean Sea. Due to the country's complex topographical structure, climate conditions vary by the region:

- Black Sea Coast: all seasons are rainy. In the summer, it is quite hot and in the winter, quite mild.
- Mediterranean: these regions experience Mediterranean conditions, with a hot dry summer and a mild winter.
- Anatolian Plateau: substantial differences in both temperature and amount of precipitation are evident in Anatolia's sub-regions. Rains fall in winter, with some summer rains in the north. Summers are humid and warm, while winters are cold.
- Eastern Turkey: a dry mountain climate prevails. The altitude and the topography have a major influence on the climate. The summer is cool, while the winter is extremely cold. Precipitation falls in the winter, mostly in the form of snow.
- The Southeast: this region is exposed to the influence of the Syrian and Arabian Peninsula deserts, resulting in a hot semi-arid climate. The area experiences very hot summers and mild winters.

To conclude, meteorological data shows that in more than 96% of the country, plants get inadequate moisture during their growing periods. Therefore, application of irrigation water is necessary over the whole country to obtain optimum benefit from its land resources.

1.2 Surface Water

There are 26 important hydrological basins in Turkey. The total surface run-off of the country is estimated at 193 billion m^3/year; almost one-fourth comes from the Euphrates and the Tigris Rivers, both of which have their sources in the eastern part of the country.

Turkey, contrary to the prevailing belief, is not a country rich in water resources. Furthermore, it is not the richest country of the region in water resources. This fact can be clearly seen when we consider the diagram in Figure 2.1. This figure shows that the amount of water available per capita per year in Turkey is considerably below the world average. It is estimated that, by 2025, the amount of water available per capita per year will likely be under 1,000 m^3.

Turkey's water requirement is growing. As seen, the largest part of the water requirement is presently in the irrigation sector with about 30 billion m^3. The amount of water volume to be utilized by this sector is expected to increase to the level of 71.5 billion m^3 by the year 2030.

Figure 2.1 Per capita water availability in the world per year

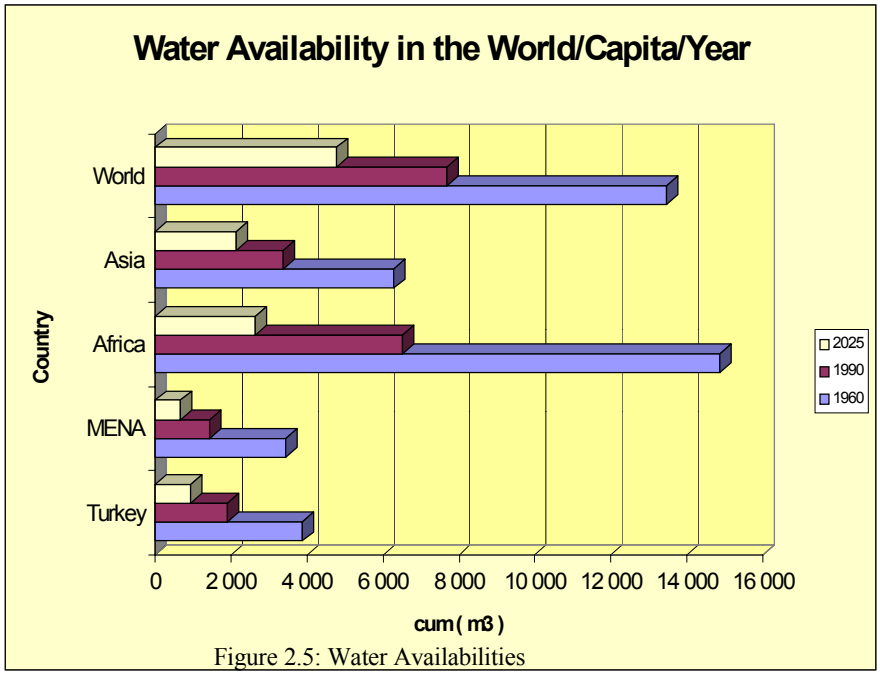
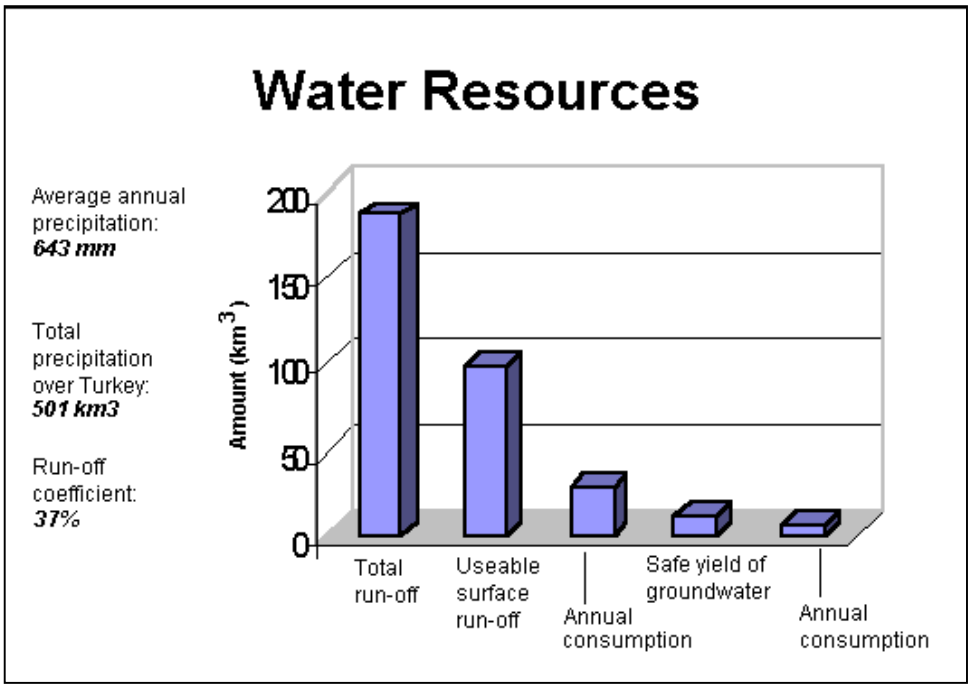


Figure 2.5: Water Availabilities

This figure also shows that most of the water is consumed through irrigation, with an increasing trend from the past to the future. Agricultural use is not only the largest component of water consumption in Turkey, but also the greatest consumer of funds allocated for water resources projects.

Figure 2.2 Safe yield in water potential.



Source: DSI

1.3 Groundwater

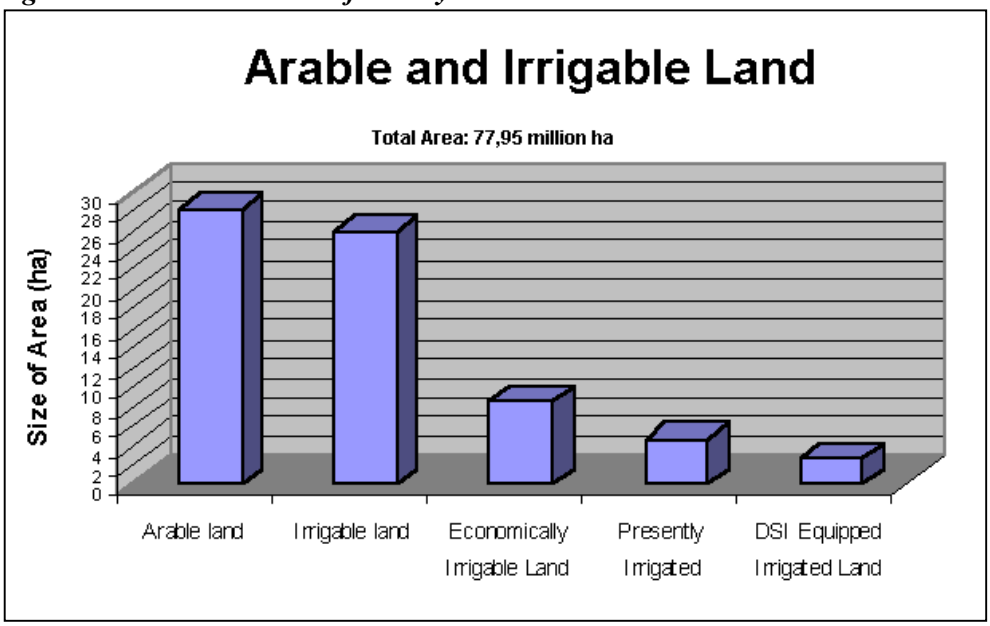
As a result of groundwater studies begun in 1956, to determine the existing groundwater potential of Turkey, DSI has completed 342 reports on various plains of the country. Also, 1/500,000 scale maps covering all of Turkey have been published.

According to these studies, the mean annual total safe yield of these plains is estimated at 12.3 billion m^3/year, excluding the discharge of the springs. Currently, on a yearly basis, 5.84 billion m^3 of the ground-water reserve is allocated for irrigation and 4.83 billion m^3 for domestic and industrial purposes.

2. Land Resources

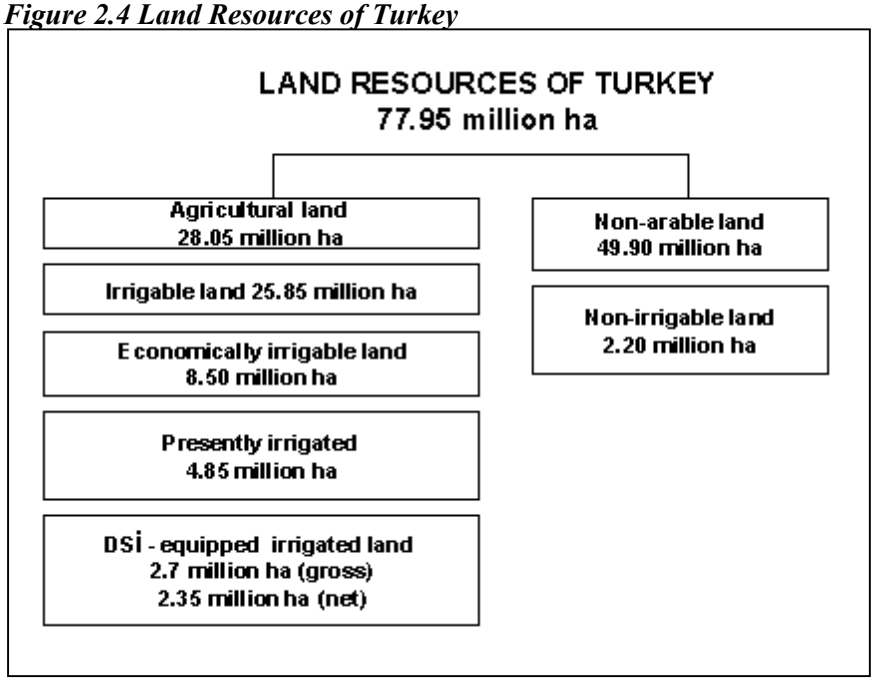
The total land resources of Turkey is 77.95 million ha (Figure 2.3) However, of this total, 49.90 million ha is considered as non-arable land resource which includes 2.20 million ha of non-irrigable land.

Figure 2.3 Land Resources of Turkey



Source: DSI

Figure 2.4 Land Resources of Turkey



When we consider the total agricultural land in the country, 36% of the total land resources, or 28.05 million ha, can be classified as cultivable (agricultural) land. According to recent comprehensive studies, an estimated 8.5 million ha is economically irrigable with the available technology, while the total amount of irrigable land is estimated at 25.85 million ha.

This amount would likely be at the lower level when we consider the availability of water and economic viability. Presently, about 3.85 million ha (net area) of irrigation infrastructure has been developed by the public sector and supplementary water for about 1.0 million ha is provided by small scale privately owned irrigation schemes. The total area under irrigation is about 4.85 million ha which includes private and public irrigation schemes operated by DSI and GDRS (Figure 2.3).

Between the years of 1980 and 2002, the size of fallow area has considerably decreased from 8 million ha to its existing level of 6 million ha, showing an absolute development in agricultural technology. Meanwhile, cultivated areas and vegetable gardens have increased slightly.

CHAPTER 3: WATER MANAGEMENT AND ALLOCATION

1. Legal Framework

1.1 Water Resources According to the Constitution of the Republic

Turkey adheres to certain principles relating to the use of water resources within the framework of its public law. In the modern Republican era, Turkish constitutions abandoned the individualistic and private law-based approach of the *Mecelle* (Ottoman CC) towards water resources. The country now views water in terms of public benefit.

These same principles are also reflected in the Turkish Constitution of 1982. According to Article No.168 on the "Exploration and Management of Natural Wealth and Resources," natural properties and resources are under the disposal of the State. The authority to explore and manage such wealth and resources is vested in the State. The State may, however, delegate its rights to legal and real persons for some period of time. It is stated explicitly in law which natural properties and resources are to be explored and managed by legal or private persons either alone or in cooperation with the State. Conditions that legal and real persons must satisfy as well as supervision and sanctions to be applied by the State are to be specified by law. The Turkish CC considers water in two distinct categories:

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, are under the proprietorship of private persons. Rights of ownership and use of such waters are arranged for in the CC and such rights are subject to title deed registration (CC, A 674).

Public Water Resources

These are water resources out of the domain of private proprietorship and under the rule and disposal of the State. Thus, their management and utilization are to be provided for by public law.

However, since public waters would have natural and inherent relationship with farmlands under private proprietorship, there should be a water registration parallel to title deed registration. At first, the CC included only surface waters (streams and lakes) in the category of public waters and considered groundwater resources as springs and therefore subject to private domain. Since this arrangement led to legal and economic problems, amendments were made (CC Law No.138, Article 679) which transferred groundwater resources from private to public domain. Afterwards, Law No.167 made provisions relating to the use and management of water resources within the framework of public law. Later, Law No. 3202 instituted the GDRS and Law No. 2560 on Istanbul Water and Sewage Administration also began to operate within the domain of Law No. 167.

Article 641 states that benefit of public waters remain in the domain of State ownership and disposal and waters originating from mountains, rocky areas and hills where farming is not possible cannot be under private ownership. The article further stipulates that the management and use of natural properties such as rivers and riverbeds, which are of public utility, are subject to special provisions.

Article 679 states that any surface water source, in an inherent part of an area under private property, is also considered as private property. Groundwater resources, however, are of public nature and owning a piece of land does not bring along the ownership of water under that land.

1.2. Principal Laws in the Water Sector in Turkey

Water resource management is affected by several key elements of Turkish legislation:

The Bank of Provinces Law, 1945

The Bank of Provinces was established with a mandate to assist all municipalities, irrespective of size, in the financing and construction of their infrastructure works including water supply (drinking water) and sewerage, under the Ministry of Public works and Resettlement.

Establishment of DSI, 1954.

The law defines duties and authorities of DSI and determines its organizations. Water resources management and nation-wide responsibility for water sector planning is centralized within

DSI, under the Ministry of Energy. DSI acts to some extent as a means of water sector integration, although this is not systematically established in the legislation.

Groundwater Law, 1968

According to this law, groundwater is the sole property of the State, and DSI is the only legal authority responsible for the investigation, use, and allocation of ground waters.

Drinking Water Supply Law, 1968

This law authorized DSI to provide drinking water to cities having a population of more than 100,000 provided that the government authorizes DSI and the concerned city council approves.

Rural Area Water Supply Law

Responsibility for supplying drinking water to villages was originally assigned to DSI, but later was transferred to GDRS.

The Law of Environment, 1983

Based on the principle of "polluter pays," this law deals with the issue of environment in a very broad scope. The aim of the law, which considers the environment as a whole, is not only to prevent and eliminate environmental pollution, but also to allow for the management of natural and historical values and land in such a way as to utilize and preserve such richness with concern for future generations as well.

Although there are separate enactments dealing respectively with matters such as rural and urban water supply, groundwater, irrigation and hydropower, DSI coordinates water use at the national level. Any agency with either need for a potential development project or is itself investing in a water-sector related activity has to cooperate with DSI and must obtain prior approval from DSI concerning the source and volume of water to be used for each project.

Though DSI is the main executive agency for the government for overall water resources planning, execution, and operation, at the user level, distribution of drinking water supply and distribution of hydropower through inter-connected systems are undertaken by municipal water administrations and TEDAS respectively.

2. Institutional Framework

Studies for the development of water resources in Turkey began in the 1930s. They were initiated especially for the development of small-scale irrigation projects, the size and scope of these studies expanding in a relatively short period of time. But, it was not until the late 1940s that basin-wide hydrologic assessment and master plan studies were started. Activities in this respect gained a momentum and accelerated with the establishment of a number of institutions. These studies served as a blueprint and constituted a solid foundation at each stage of the basin-wide development efforts throughout Turkey. Master plan and individual studies were followed by intensive design and construction work which has so far contributed to the realization of many large and small dams.

2.1 National Policies

The major systematic aspect of water related activities in Turkey is central planning. At the national level, Five Year Development Plans (FYDP) are aimed at ensuring the optimum distribution of all kinds of resources among various sectors of the economy.

Every five years, DPT, with experts from all sectors prepares the Development Plan. In the seventh FYDP (1996-2000), the main principles, policies, and objectives with regard to proper management of water resources were as follows:

- Institution of a new structure for the management of water resources with an emphasis on harmony in the construction of municipal water, sewerage, and treatment facilities,
- Ensuring the participation of the users in the planning, implementation, and management of infrastructure investments which are placed within the context of land and water resource development.
- Drawing up of a special law which includes institutional reorganization concerning planning, management, and conservation of groundwater and surface water resources for the purpose of rational utilization in different sectors and elimination of disorganization in the existing legislation,
- Drawing up necessary legislation for the planning and implementation of the required environmental impact assessment Studies and resettlement projects.

Under the eighth FYDP (2001-2005), the most important policy was to increase the ratio of population in terms of accessibility to the basic infrastructure facilities in accordance with sustainable development together with regional development goals. Once again, an integrated planning approach

and harmonization among involved institutions have been strongly emphasized during the construction of municipal water, sewerage, and treatment facilities. Other relevant policies are stated as follows:

- to encourage effective use of natural resources;
- to establish an effective operation and management system for infrastructure services;
- to encourage private sector involvement;
- to enable the participation of the public and private actors in the decision making process;
- to prevent water wastage ;
- to emphasize the reuse of waste water for agricultural and industrial purposes;
- to encourage the privatization of the water and sewage authorities or bodies at the municipalities;
- to adopt the EU standards for water, waste water, and solid waste management in Turkey.

The State Planning Organization also allocates resources for public investment. Since the third FYDP (1973-1977), these plans include environmental management. The sixth FYDP adopted the concept of sustainable development. As part of the seventh FYDP (1996-2000), the institution coordinated and supervised the preparation of the NEAP in cooperation with the Ministry of Environment. At the present time, the eighth FYDP (2001-2005) has gone into effect.

The institutional framework has three levels:

- **Decision making level:** prime ministry, DPT, and ministries.
- **Executive level:** Governmental organizations under the ministries.
- **User level:** Both governmental and non-governmental organizations concerned with the operation and maintenance of the projects.

2.2 Technical Insttitutions

In Turkey, there are a number of central and local organizations and agencies active in the water sector:

DSI is attached to the Ministry of Energy and Natural Resources: DSI's main responsibilities cover the issues of observation, field investigation, master plan, pre-feasibility, feasibility, design,

construction and management for irrigation, hydraulic energy generation, domestic water supply (for cities with a population of more than 100,000), flood control. Development, management and conservation of groundwater resources are also exclusively under the responsibility of DSI.

Bank of Provinces: Financing, insuring, and supporting of water projects

EIEI, attached to the Ministry of Energy and Natural Resources: conducts studies and surveys for producing energy from water resources, conducts planning work, feasibility studies, and final project design in relation to dams and hydraulic power plants on rivers.

General Directorate of Rural Services (KHGM) attached to the Ministry of Agriculture and Rural Affairs

Urban water and sewage administrations in metropolitan municipalities are in charge of such works as constructing, operating, and maintaining water supply and treatment facilities, and are responsible for networks of industrial establishments within the boundaries of metropolitan municipalities.

DSI's total and investment budgets for 2000 fiscal year amounted to USD 1.6 and 1.1 billion which constitute almost 2.4% of the National Consolidated Budget and over 30% of the National Investment Budget in 2000 respectively. By the end of 2002, DSI completed the construction of 203 large dams and over 368 small dams and developed 2.7 million hectares of irrigation schemes.

Optimal planning and rational management of water resources calls, first of all, for adequate and reliable data concerning, among others, quantity and quality of water depending on time and space as well as other meteorological variables that are of significant impact on both water supply and demand. In parallel with the effectual and practical procedures of water resource development projects and operation of facilities built in this respect, DSI carries out, and is responsible for, the tasks associated with the observation and measurement of wide range of hydrometeorological and hydrological variables. The data are observed, measured and processed by DSI including primarily water levels of lakes and groundwater, stream-flow rates, sediment loads.

General Directorate of Bank of Provinces. This bank was first founded in 1933 under the name of "Bank of Municipalities" to render public work services to municipalities. The original idea

was to secure the funds that municipalities needed for their services. This institution was restructured in 1945 and renamed as "Bank of Provinces" with the following duties:

- To extend loans or allocate funds to local governments, upon their request, for the construction of water supply, sewage networks, and treatment facilities.
- To extend services to local governments in the form of maps, plans, projects, surveys, and Studies related to the above stated facilities, and to assign other parties to construct infrastructure and other facilities for local governments.
- To exercise control over and supervise those works carried out with funds extended by the bank.
- To sell or lease materials, supplies and equipment to local governments.
- To get insurances for materials, supplies, goods, moveable property and real estate owned by local governments.
- To conduct banking operations related to all above stated services.

Following the completion of work, the Bank transfers the facility concerned to the Municipality, which is then responsible for its operation and maintenance. Since 1983, the Bank has extended its services to all local governments irrespective of their population as long as it is authorized by these governments. This is valid for sewage services as well. Currently, it is in agenda of concerned circles to include solid waste management in the domain of the Bank.

EIEI is a legal public entity established in 1935 under the provisions of Private Law and managed in the context of commercial procedures. According to Law No. 2819, the duties of the administration include the following: To survey water resources in the country to identify those that are promising for energy production purposes; to conduct hydraulic and geo-technical studies and surveys relating to these resources; to undertake studies and engineering services in relation to dams and power plants at the stages of reconnaissance, master plan, feasibility, and final project outlay; and to carry out nationalization and control services as assigned by the Ministry of Energy and Natural Resources. As a developing country, Turkey's energy needs increase steadily. In this context, engineering services related to the planned energy facilities, which are in the domain of the EIEI, bear great importance. The EIEI has to keep a project stock in advance to ensure, when needs arise, rapid phasing in of that part of the country's hydraulic energy potential.

General Directorate of Rural Services (KHGM) The KHGM was established in 1985 with the reorganization of YSE (Road, Water and Electricity Services) and the General Directorate of Land, Water and Settlement Affairs. According to Law No. 3202, tasks related to the water sector are as follows:

1) To ensure the protection, efficient utilization and development of land and water resources in line with principles and policies described in development plans and programs, and to extend services to farmers in this context.
2) To identify main principles and rules and carry out work in relation to the construction, repair, maintenance and operation of roads as well as water, electricity, and sanitation facilities of villages and settlements attached to villages.
3) To provide drinking and domestic water to villages, their attached settlements, and military garrisons.
4) To supply irrigation water to farms either from the existing water reservoirs constructed by the state or from other available sources.
5) To construct, improve, expand and operate irrigation facilities for areas whose irrigation water need does not exceed 500 liters per second.

Ministry of Forestry protects mountainous and upper basins as the origin of streams, and the development of projects to protect such areas (i.e. utilization and protection of in-forest streams, lakes and reservoirs; afforestation; rangeland rehabilitation; erosion control, etc.).

The Ministry conducts studies and surveys on problematic basins and areas as identified by DSI and other organizations and identifies relevant measures to control erosion. Projects that emerge as a result of these studies and surveys are then conveyed to other organizations and agencies that are legally authorized to introduce land and water protection measures.

Turkey has 20.2 million hectares of forested land and 52,000 hectares of this total consists of in-forest streams, lakes, and water reservoirs. At present, there are 4,223 such water basins or catchments in forests. It is among the duties of the Ministry of Forestry to protect and develop such places, use them for tourism and sports purposes, promote water products and hatching, establish necessary facilities and premises; to reforest areas surrounding water resources and rehabilitate rangelands adjacent to these resources and to support the social-economic development of forest villagers.

Issues related to land and soil conservation in farmlands within forests fall in the domain of the GDRS. It is the duty of the DSI to take measures to prevent gully erosion and ensure stabilization in this respect.

In case periodic assessments made in active dams reveal a level of sedimentation beyond what was initially envisaged, efforts are made, in cooperation with other related organizations and agencies, to asses the level of erosion in the surroundings of the facility concerned and measures are taken to prevent it.

2.3 Monitoring-Supervising Organizations

There are a number of monitoring-supervising organizations performing under various legislative arrangements. Among them, the most important ones include MOE, which is directly related to activities in the water sector, the MOH, and DPT in charge of guiding investments at the macro level.

Ministry of Environment, 1991 The Ministry undertakes the basic tasks of protecting and rehabilitating the environment. It is among these tasks to introduce appropriate arrangements to prevent pollution in water resources and exercise control over related issues. Other duties of the Ministry include ensuring sanitation in receiving environments and discharging according to the Regulation on Controlling Water Pollution issued in 1988 under the Environmental Law No. 2872, implementing the Regulation on EIA and carrying out required coordination with regard to these issues.

Ministry of Health, 1936 Under Law No. 3017, the duty of ensuring sanitation in drinking water is given to the MOH. Moreover, Law No.1593 on General Hygiene assigns the Ministry the mandate to ensure public health. In 1984, the service domain of the Directorate of Environmental Health functioning under the Ministry was expanded. Water quality controls; physical, chemical and micro-biological analyses of water; assessment of chlorine; issuing licenses and permits for water use are all in the domain of this Directorate.

Ministry of Agriculture and Rural Affairs According to Law No. 1380 on Water Products, this Ministry has the authority to control water resources where water products are produced along with discharges made to such waters. More specifically, the General Directorate for Protection and Control under the Ministry is in charge of conducting relevant controls in this area.

2.4 Local Governments

The Municipal Law of 1930 assigns 76 specific powers and duties to municipalities. This can be divided into service provision and regulatory powers. According to this law; a municipal administration can be established in localities of more than 2,000 inhabitants with a referendum. The major services which municipalities provide are:

- Water Supply & Sanitation
- Sewerage System & Maintenance
- Refuse Collection & Disposal
- Fire Protection
- Construction of Social Housing
- Social Facilities
- Rural Health Centers
- Road and Public Square

The regulatory duties of the municipalities are:

- Urban/Town planning and development
- Environmental Health and Pollution control
- Traffic Management
- Conservation of natural areas and historical sites

In spite of the municipalities having an extensive duties stated by law, in practice the duties to which they give priority are mainly:

- Providing water supplies and sanitation
- Opening new roads which are urgently needed
- Building and maintaining sewerage systems

Due to rapid growth since 1960, many municipalities in Turkey are negatively affected by the growth of illegal housing areas, insufficiency in land market and infrastructure services such as water supply, sewage system, solid waste, and essential services including road and parks.

2.5 Non Governmental Organizations

Environmental protection activities and public consciousness about the scarcity of water resources mostly seen in the last decade have led to the development of many NGOs operating at the national and regional level in the field of the environment in Turkey. The main national NGOs are actively involved in many water and environmental problems in order to create public awareness and to encourage public participation. They propose efficient solutions and act as pressure groups in the decision-making process.

The 1996 UN Habitat II Conference started the main Turkish NGO movement and it was a turning point for civil society initiatives in Turkey. Fifteen thousand people from 165 countries attended. It was the first civil society initiative in Turkey that convened NGOs, the business community, and community-based organizations on the same platform. The devastating earthquakes of August 17, 1999 and November 12, 1999 in Turkey also reinforced the consciousness of civil society and changed the understanding of civil initiatives. The citizens who united in the rebuilding after the earthquakes have maintained their cooperative and constructive civic spirit. In recent years, there has been an increase in the number of NGOs such as foundations, associations, and citizens' initiatives engaged in subjects such as science, technology, research, democracy, environmental protection, etc. The main national NGOs of Turkey representing civil society in the environmental and water resources field are described below:

The Society for the Protection of Nature (DHKD), was founded in 1975. The society works for the conservation of biological diversity and natural resources, encourages sustainable use of natural resources, increases public awareness of nature conservation, carries out projects aimed at protecting significant and threatened ecosystems and lobbies official institutions and agencies in support of these goals. It has 12,000 supporting members. The Society is an associate member of the World Wide Fund for Nature (WWF), Bird Life Partner of Turkey.

The Environment and Culture Agencies Cooperation Association (CEKUL) aims to create a society that cooperates with associations that are sensitive to the environment and culture and have an understanding of ethics and an ideal of living in a clean environment. In addition, it aims at restoring the social and ecological balance that has been disrupted by natural disasters and accidents.

The Environment Foundation of Turkey (TCV) was established in 1978. The Foundation promotes the environment through research, publication of books, newsletters, brochures and other information media, and creates public awareness. The TCV has been a member of the UNEP National Committee since May 1992.

The Turkish Foundation for Combating Soil Erosion for Reforestation and Protection of Natural Habitats (TEMA) was founded in 1992. The chief aim of the foundation is to raise public awareness of several environmental issues posing great danger to Turkey's future. Land erosion, deforestation, loss of farmland productivity, and threats to biodiversity are their main concerns. TEMA develops and carries out model projects in rural development, rangeland rehabilitation, and reforestation. TEMA currently has 50,000 members and 288 volunteer representatives throughout the country.

3. Domestic Water Use

Turkey has a population over 68 million and an annual growth rate over 2%. While 51% of the population was living in cities and towns as urban areas in 1990; this ratio reached approximately 60% in 2000. This population growth rate together with huge internal migration from rural to urban areas over the last 30 years and economic development as well as increasing agricultural production have created enormous infrastructure problems for cities. Water supply; sewerage systems and wastewater treatment have become top priority for both central and local governments in Turkey. Hence, economic developments along with increased irrigation for agricultural production and high population growth rates have increased the industrial and domestic demand for water in Turkey.

With the projects developed by the institutions responsible for water resources development, actual water consumption in Turkey as of 2002 reached 39.3 billion m^3, which corresponds to only 36% of the economically exploitable water resources, of which 29.3 billion m^3 (75%) has been for irrigation, 5.8 billion m^3 (15%) for domestic uses, and 4.2 billion m^3 (10%) for industrial uses.

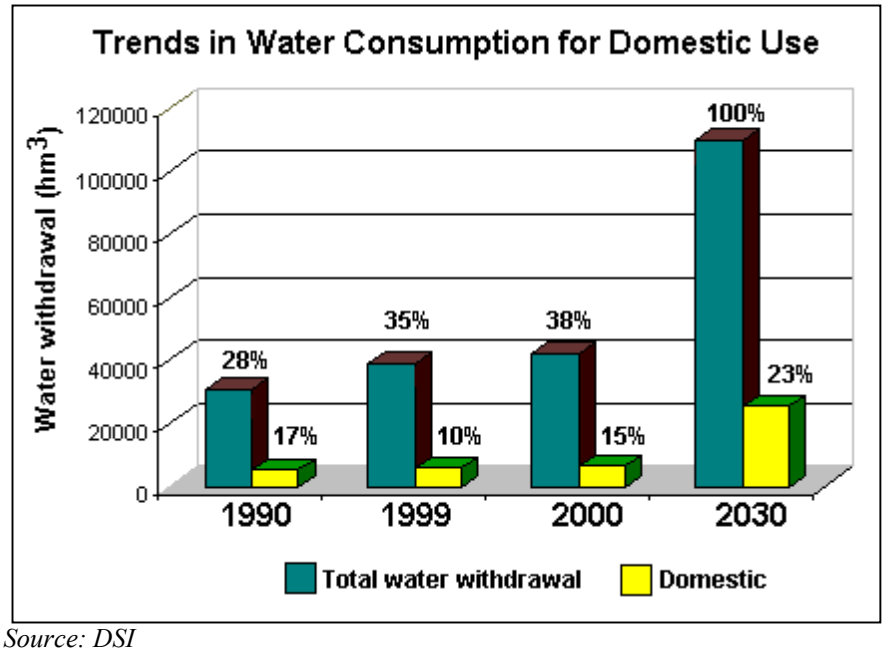
Table 3.1 Actual water consumption figures in Turkey between 1990 and 2000

	1990	34%	1994	36%	1998	41%	2000	46%
	km³	%	km³	%	km³	%	km³	%
Irrigation	22.0	72	23.7	73	28.1	75	31.5	75
Domestic	5.1	17	5.2	16	5.7	15	6.4	15
Industry	3.4	11	3.6	11	3.7	10	4.1	10

As seen in the table above, most of the water is consumed by irrigation (75%) which is not only the largest component of water consumption in Turkey, but also the greatest consumer of funds allocated for water resources projects.

3.1 Domestic Water Supply Projects

Figure 3.1 Actual and Projected Water Consumption



Source: DSI

According to the Law No.1053, DSI must develop domestic water supply projects for cities, having a population of more than 100,000. So far in Turkey, domestic water of 2,026 billion m^3 per year was supplied to 15 cities. With the completion of new projects, domestic water will be provided to 27 cities. These projects will provide 0.759 billion m^3 water per year to the cities. At full development, the domestic water supply will reach 2,875 billion m^3 per year.

Actual and projected water consumption figures in Turkey between 1990 and 2030 are given in Table 3.2 and Figure 3.2.

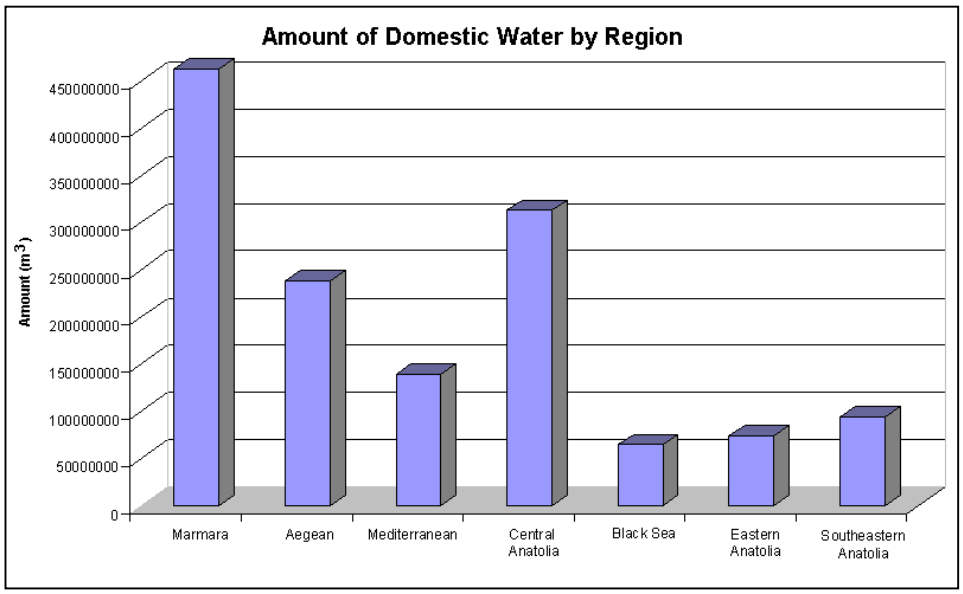
Table 3.2 Development of water consumption in Turkey

Year	Total Withdrawal		Domestic Withdrawal	
	Million m^3	%	Million m^3	%
1990	30,600	28	5,141	17
1999	38,900	35	5,700	10
2002	39,300	36	5,800	15
2030	110,000	100	25,300	23

The amount of domestic water uses is at the highest level in the basins of Marmara which includes the most populated cities of Bursa, Istanbul and Izmit.

The amounts of domestic water use by regions are given in Figure 3.2. As seen in this figure, the geographical regions of Marmara and Central Anatolia which are highly urbanized and industrialized use domestic water at the higher levels.

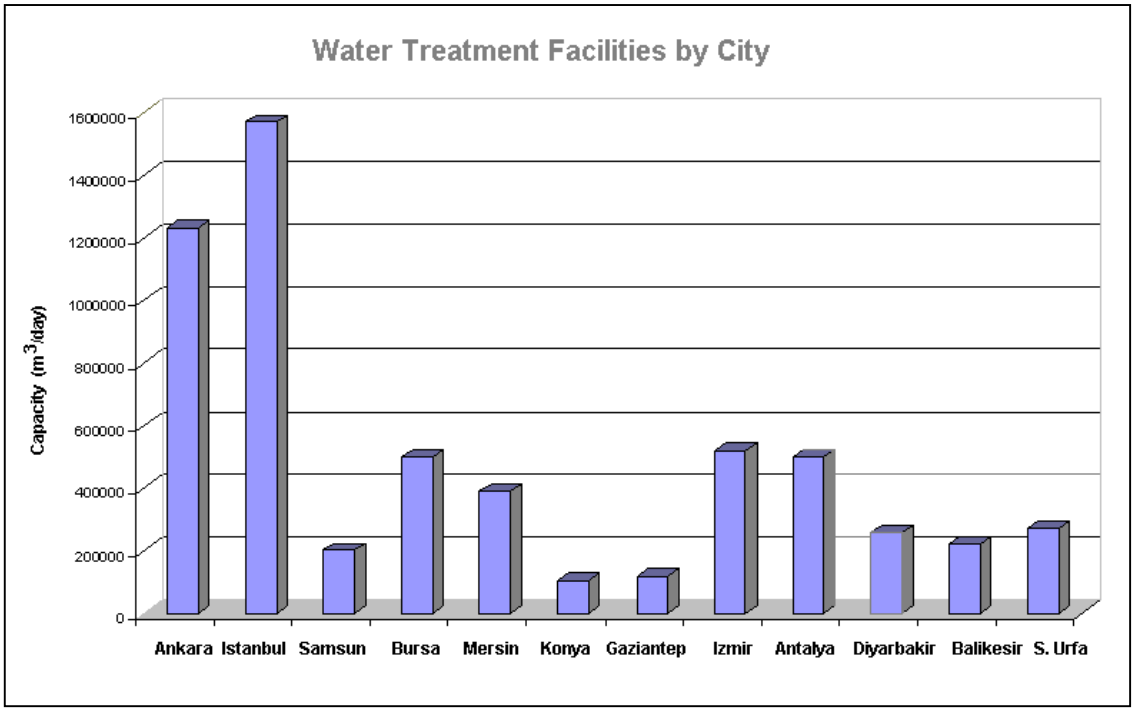
Figure 3.2 Amount of Domestic Water by Region.



Source: DSI

The capacities of treatment facilities constructed by DSI change between 1,600,000 m^3/day and 50,000 m^3/day depending on the population of the cities. This potential can be comparatively seen in Figure 3.3

Figure 3.3 Capacity of Waste Water Treatment Facilities, by City.



Source: DSI

3.2 Urban Water Management

Water Pricing

Water tariffs for domestic and industrial use together with other sector uses in metropolitan municipalities are undertaken by the decision of the Metropolitan Municipality Council according to the 'Tariffs Regulations" defined by the Council of each metropolitan municipality. In the identification of the drinking water and waste water tariffs; the O&M, amortization, rehabilitation and expanding costs are generally considered. Another factor is the profit rate of not less than 10% of all expenditures. This indicates that the water in Turkey is being priced not as a basic need but as an economic good. The commercialization of water supply services and profit-oriented approaches to the provision of water are becoming common even in other than metropolitan municipalities in Turkey. Another indicator is that while the rate of value added tax is 8% in basic goods, it is 18% in water. Thus, in Turkey, water is no more regarded as a basic need. Eventually, water supply and sewage as a

public provision is rendered in a commercialized manner, under the principle of “user pays” principle, in which water can be used only by those who can afford it.

Drinking water and waste water tariffs regarding domestic use and industrial use by public institutions within the boundaries of each metropolitan municipality are calculated for each month of the year by considering the Wholesale Price Indices defined by DIE together with the Metropolitan Municipality Council decision. The subscribers (households) for domestic water are classified under three groups defined by the water consumption value as m^3/day criteria.

In the identification of water consumption ratios for each household and industry, the consumption figures of the previous year; estimations about rainfall in following years, drought conditions, and seasonal fluctuations in the past and future are considered.

Apart from the Metropolitan Municipality Act; the water tariffs for other municipalities having a population of over 2,000 which are managed by the body of the municipality responsible for the basic urban services are established by the decision of the Municipality Council according to the Municipalities Law No. 1580.

In Turkey, legal procedure as determined by the Municipality Councils is to read water meters of subscribers in intervals of 30-40 days and to bill subscribers accordingly. By applying increasing block schedule, municipalities seek to charge differently for different groups of subscribers and to ensure water saving by this price differentiation. Recently, as a result of liberal policies, Ankara Metropolitan Municipality introduced the system of "pre-paid metering". In this system, only those who pay in advance can have access to services. This is a commercial practice which ties access to services to ability to pay. This practice also conceals the real number of out-of-system subscribers who face the problem of "water deprivation". Low income groups, especially in the metropolitan areas, are affected by the "user pays" principle and the policy since 1980 of reflecting cost recovery (including operation, maintenance, repair, investment, and profit) of service delivery in urban infrastructure in the bills paid by users.

The drinking water projects of the municipalities with a population of over 2,000 is carried out by the Bank of Provinces or by private contractors. For these projects, each municipality should take into account required water amounts for domestic and industrial uses according to Regulation

No. 18733, namely 'The Regulation about the Preparation of the City and Towns' Drinking Water Projects' (1085 Urban Act, Law No. 3194). The same regulation states that the industrial water need of the municipality would be considered separately from the drinking water project. Therefore, under the same regulation, the water quality is identified through physical, chemical, and bacteriological analyses which should be periodically made every three months. For these analyses; the standards of the *"Hifzisihha Kanunu (Sanitation Act)"* and the World Bank should be considered.

3.3 Participation Shares of Expenditures of Urban Services

In Turkey, participation shares of the construction of the water and sewage systems have been arranged under the Municipality Revenue Law (MRL) No. 2464. The basic aim is to enable citizens to participate in the expenditures of various urban services ensured by municipalities. There are three types of participation shares:

- Road Expenditures
- Water Plant Expenditures
- Sewage Plant Expenditures.

The participation shares of water and sewage plant expenditures by MRL were the expenditures made for urban services which are calculated in accordance with the market price and unit price established by the Bank of Provinces and Ministry of Reconstruction and Settlement Works. It was stated that participation shares were no longer more than 2% of the real estates (building and land tax value). These shares will be repaid in equal installments over a period of four years. Under the participation shares of water plants; the construction of new drinking water networks and rehabilitation of the current water network are included. The real estates located on both sides of the roads participate in these expenditures according to the length of the water network belonging to the road to which their water system is connected. Law No. 3239 of 1985, regulates participation shares in urban services.

- If the participation share of the expenditures is made as a "down-payment"; the participation share is discounted 25%.

The Council of Ministries has been authorized:

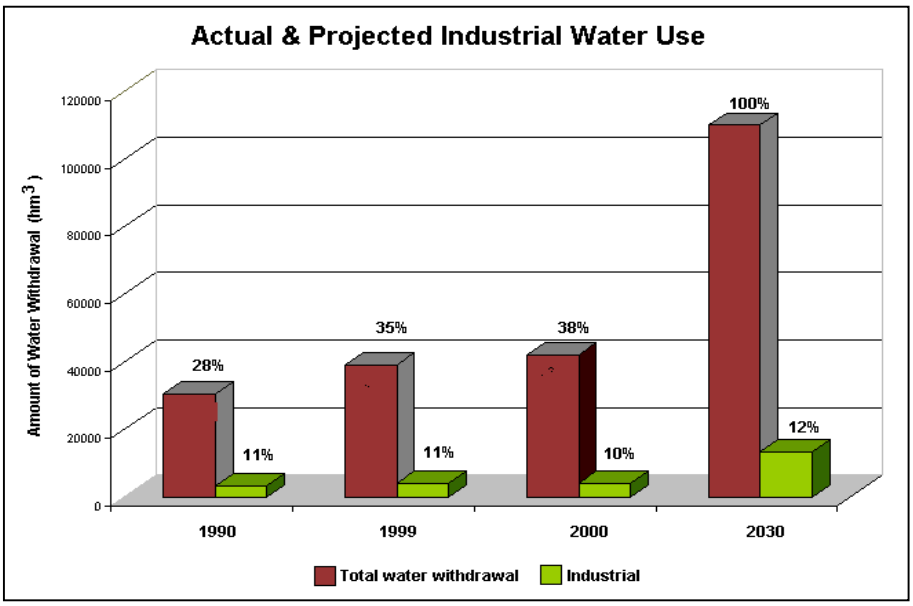
- To lower the cost of participation shares by 50% (one-third in the case of a "down-payment"),
- To differentiate the types of shares by taking into account both the population census specified by the Ministry of Interior and Municipalities' choice.
- To extend the repayment periods up to 5 years. In this situation, municipalities by the Municipal Council Decision may take a definite interest rate for this extended period.

3.4 Industrial Water Use

In general, industrial water use includes water used for processing, washing, and cooling in manufacturing facilities. Major water-using industries in Turkey include steel, chemical, and paper manufacturing, and petroleum refining.

Surface water supplies 52% of industrial water, while groundwater supplies 48%. The actual and projected amounts and percentages of water use for industrial purposes are given in Figure 3.4. As seen in this figure, the percentages of industrial water in the total water withdrawal does not change considerably, being slightly over 10%.

Figure 3.4 Actual and projected industrial water use.



Source: DSI

As of the year 2000, the greatest industrial withdrawals were in the Marmara region, highly industrialized as well as urbanized which account for 18% of the total industrial withdrawals (Table

3.3). Accordingly, this region, (where the biggest metropolitan cities such as Istanbul, Bursa, and İzmit are located) represents the largest users of freshwater for industrial purposes.

Table 3.3 Industrial Water Withdrawal

	TOTAL WITHDRAWAL		INDUSTRIAL WITHDRAWAL	
	Million m^3	%	Million m^3	%
1990	30,600	28	3,443	11
1999	38,900	35	4,000	11
2002	39,300	36	4,200	11
2030	110,000	100	13,200	12

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.

4. Agricultural Water Use and Irrigation

4.1 Land resources and the agriculture sector in Turkey

Turkey has 78 million hectares of mostly rugged land at the eastern end of the Mediterranean Sea. Its exposure to both maritime and continental weather patterns combines with highly varied topography to produce several distinct climate zones. The Mediterranean region is essentially sub-tropical, characterized by hot dry summers and mild, rainy winters; citrus fruits, vegetables and rice and cotton are predominant crops. The Black Sea region, which receives rain throughout the year and enjoys both mild summers and mild winters, is where most of the country's tea, hazelnuts and maize are grown. In the Aegean Region (western Turkey) the mountains run roughly east west (perpendicular to the cost) and is interspersed with grassy flood plains; these plains are among the most fertile in the country. This region produces olives, cotton, tobacco, and a diversity of horticultural crops. Central Anatolia is a vast, high plateau (average altitude of 1,000 meters above sea level) with a semi-arid continental climate. A great part of Turkey's wheat, wine grapes, and sugar beet are grown in this region

Climate and topography also have an important bearing on the location and type of animal husbandry carried out in Turkey. Eastern Turkey's high mountain meadows and even some of the

lower-altitude pastures are snow-covered during much of the year, making grazing possible only from May through September. Cattle production is the predominant agricultural activity. Southeastern Turkey, which is warmer and drier, has vast areas of grassland suitable for sheep rearing. Intensive animal husbandry is carried out in the regions of western Anatolia and Thrace, near the major ports and population centers. Milk production is spread throughout the country, though the largest dairies are concentrated in the west and north. Recent development achievements in southeastern Turkey attract investors and very large dairy and meat enterprises have been established by private companies, as well as small and medium enterprises in southeastern Turkey.

Turkey has 29 million hectares of arable land. Total cultivated land is 22 million hectares, of which 68.77% is field crops area, 16.91% fallow, 11.67% orchards, and 2.65% vegetable and flower gardens.

4.2 Agriculture sector in Turkish economy

The agriculture sector has been the largest single sector in Turkey in terms of employment, and a major contributor to the country's gross national product (GNP), exports and industrial growth. However, with a rapid growth in other sectors, notably manufacturing, trade and services, agriculture's significance in the economy has declined in relative terms over time. Although the share of agriculture in the Turkish economy has been falling, it still accounts for a relatively larger share of total output and employment than in many other countries. The GNP share of the agriculture sector declined from 35% in 1970 to 22% in 1980, to 14% in 1998, to 11.8% in 1999 and to 11.5% in 2000. The main components of the agricultural GNP are crops (55%) and livestock (34%) and the rest are forestry and aquaculture.

4.2.1 External Trade

Crop production is mainly made up of cereals, pulses, industrial plants, perishables and fodder crops. Turkey is a major producer of pulses and dominates the world trade in particularly chickpea and lentil. During the last five years, over 60 countries have imported pulses from Turkey. Wheat, barley, oats, rye, maize, millet and rice are the main cereal crops grown in Turkey, of which wheat is the most predominant. Although the production of wheat became stagnant in the early 1980s,

it has recently begun to rise because of increased use of fertilizer and irrigation. Turkey is the most important producer of oriental tobacco in the world. Tobacco is among the main industrial crops produced in the country and is a traditional export crop. The country also has strong vegetable and fruit markets comprised of up to 80 different types of fresh fruits and vegetables. This has been made possible by the diverse ecological conditions, which allow the cultivation of temperate and tropical crops. Out of the 80 types of fresh fruits and vegetables grown, 30 kinds of vegetables and 20 of fruits are exported. The fresh fruit sector comprises grape-like fruits, pome fruits, stone fruits and citrus fruits, while the fruit-bearing vegetables constitute 60% of total vegetable production. Tomato is the most important vegetable crop, with an annual output of 6.5 million tons. Others of importance include potato, watermelon, melon, onion, and cucumber.

The principal objectives of the Turkish agricultural policy are set out in successive five-year development plans. These are aimed at 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 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. Since the introduction of reform measures in the early 1980's, Turkey has made significant progress in opening its borders to imports and reducing controls on exports. There have been moves to harmonize the country’s trade policies with those of the European Union (EU). The country has also entered into new regional trading arrangements with the European Free Trade Association.

Turkey entered into a Customs Union with the EU on 1 January 1996, and since then all custom duties and charges on imports of industrial products from the EU have been withdrawn. The Custom Union initially covered only processed agricultural products including cereals, sugar, and milk, as well as industrial products. Free movement of traditional agricultural products between Turkey and the EU will become possible to the extent that Turkey will match its agricultural policy to the Common Agricultural Policy of the EU. Turkey is the largest producer and exporter of agricultural products in the Near East and North Africa region. Export of agricultural commodities (excluding

agro-industry) were valued at USD 2.8 billion in 1999 and accounted for 9.75% of Turkey's total export earnings. Total export of agricultural and agro-industrial commodities were valued at USD 4.4 billion and accounted for 16.51% of Turkey's total export value. Table 3.4 shows export trends in selected agricultural and food products.

Table 3.4 Export trends for selected agricultural and food products (US $ million).

Item	1992	1993	1994	1995	1996	1997	1998	1999
Pulses	200	185	167	198	269	255	197	134
Citrus Fruits	112	112	157	153	158	114	158	251
Sultanas	129	134	176	190	188	206	212	203
Hazelnuts	292	413	509	770	608	872	833	669
Wheat	341	76	89	23	2	4	163	191
Other cereals	75	35	63	51	84	74	124	34
Wheat flour	92	75	99	138	167	254	90	40
Tobacco	309	396	404	343	543	531	534	493
Cotton-raw	44	142	31	6	124	57	55	87
Pasta	18	24	37	53	58	70	45	10
Biscuits	44	58	77	164	220	201	123	76
Olive oil	18	12	20	120	75	87	75	170
Frozen fruits & vegetables	34	32	61	43	54	59	62	52
Sugar conf., chocolate products	61	98	191	266	282	280	206	151
Dehydrated vegetables	12	11	15	25	26	19	16	17
Fruit juice & concentrates	36	25	37	67	84	55	63	70
Tomato products	106	90	110	102	136	134	140	131
Total	1,923	1,918	2,243	2,712	3,078	3,272	3,096	2,779
Total export value	**3,425**	**3,537**	**4,056**	**4,354**	**4,921**	**5,430**	**5,006**	**4,391**

Source: Turkish Export Promote Center (IGEME), 2001

4.2.2 Employment trends

Although mechanization in agriculture has been improved, agriculture is still highly labor intensive in Turkey. Employment in agriculture is therefore a key factor of production. The rate of agricultural employment in agriculture was around 75% of the total civilian population in 1950. Between 1979 and 1993, the number employed in agriculture fluctuated between 7.5 million and 9 million, but because of a steady increase in employment in other sectors, agriculture's share in civilian employment dropped from 55% to 42%. Currently, 30% of civilians are employed in agriculture.

4.3 Water for Agriculture

4.3.1 Historic Water Delivery Systems in Turkey

Anatolia, a crossroads of civilization, is like one of the attractive open museums regarding with water structures constructed in the last four thousand years. Since ancient times, Anatolia has been the cradle of different civilizations. Hittites, Phrygians, Persians, Macedonians, Romans, Byzantines, Seljuks, and Ottomans have held important places in Turkey's history and its people's culture. Ancient civilizations in Anatolia and the Ottoman Empire constructed many water structures of which some of them are still operating in good condition. Remnants or ruins of water related structures are spread over Anatolia and stand as impressive engineering techniques of their era. The first modern irrigation and drainage project, the Cumra Irrigation and Drainage Project, was designed and constructed between 1908 and 1914 by the Ottoman Empire. After the establishment of modern Turkey in 1923, there have been great endeavours by the state to develop the country through the utilization of natural resources. In this respect, DSI initiated many water related projects including dams, irrigation schemes, domestic water supply and flood control structures have been built.

4.3.2 Irrigation

Water is a limiting factor for agriculture over much of Turkey. While average annual precipitation is highest in the Black Sea region (1,120 mm), and exceeds 800 mm/year in some of the other coastal areas, Thrace and eastern Anatolia, the remaining 70% of the country receives precipitation averages of less than 500 mm/year. In the vast high land plains of central Anatolia, it averages less than 400 mm. Because of this, irrigation is gradually being extended.

Although 12.5 million hectares area of Turkey's arable land is irrigable, 8.5 million hectares area of that is determined technically and economically irrigable land. The distribution of the irrigable land by water resources is given in Table 3.5

Table 3.5 Economically irrigable areas by water resources

	Potential Irrigable Area	
Water resources	Million hectares	Percent
Surface water	7.9	93
Underground water	0.6	7
Total	8.5	100

Source: DPT

Agriculture consumes 75% of the total water in Turkey. Table 3.6 shows the water consumption for irrigation by years.

Table 3.6 Water consumption for irrigation during 1990-2000

			Irrigation	
Year	Total water consumption (million m^3)	Development (%)	Amount (million m^3)	Share (%)
1990	30,600	28	22,016	72
1992	31,600	29	22,939	73
1998	38,900	35	29,200	75
2000	42,000	38	31,500	75

Source: DPT

Irrigation development in Turkey is carried out by the public sector, represented by DSI under the Ministry of Energy and Natural Resources and GDRS under MARA, and by the private sector (farmers and groups of farmers). DSI is responsible for planning, designing, constructing, operating and maintaining dams, pumping stations and canals for large scale irrigation systems, defined as those with a supply capacity of greater than 500 liters/sec. DSI is also responsible for support activities related to these water projects, including research, expropriation and the construction of buildings, workshops and other facilities, and is one of the largest investing agencies utilizing national budget funds.

GDRS deals with land leveling, land consolidation, sub-surface drainage works, and irrigation network of minor irrigation projects. GDRS also simultaneously working together with DSI in the large irrigation projects and in the small size projects of ground water irrigation projects and in the small size projects of ground water irrigation cooperatives.

The development of irrigation in Turkey since 1990 is shown in Figure 3.7. In 1960, the amount of irrigated areas was only 1 million ha, which was mostly irrigated by farmers. Today it has

increased to about 4.85 million ha. As seen from the figure, after 1984, the speed of development in irrigation area has slowed down slightly.

Table 3.7 Irrigated areas by organizations

	Irrigated Area	
Organization	Hectares	Percent
DSI	2,701.000	56
GDRS	1,147,000	24
Farmers	1,000,000	20
Total projects in operation	4,848,000	100
Projects under construction	700,000	

Source : DPT

By 2030, when all irrigation networks are constructed, 8.5 million hectares of economically irrigable land in Turkey will be opened for irrigation. It is estimated that water consumption in irrigation will be 71.5 billion m^3 and the rate of water consumption in irrigation will decline to 65% through the use of modern irrigation techniques.

4.3.2.1 Surface Water Irrigation

Almost 94% of the total area is irrigated using surface irrigation methods (furrow, basin, border, wild flooding). The remaining part is under sprinkler irrigation (mainly hand-move) and some micro-irrigation, mainly in the Aegean and Mediterranean regions. The conventional (hand-move) sprinkler irrigation is common all over Turkey among the farmers and an estimated 200,000 ha are irrigated using this method. In DSI schemes, 80,000 ha are irrigated by sprinklers, mainly for sugar beet, cereals, beans, alfalfa, cotton, sunflowers, watermelon and vegetables. Micro-irrigation is practiced on 3,900 ha of DSI schemes, mainly for citrus-fruits, vineyards, vegetables, strawberries and watermelons.

4.3.2.2 Groundwater Irrigation

In Turkey, there are two organizations in charge of groundwater management for irrigation. These are the DSI and the GDRS.

According to the 1960 Groundwater Law No. 167, DSI is in charge of activities concerning groundwater resources such as research, usage, protection, appropriation, and official registration. In accordance with the aims indicated in the Groundwater Law, a Groundwater Regulation and

Groundwater Directive were prepared to apply the law efficiently. The purpose of this law is to protect groundwater resources and encourage the public to use groundwater with a maximum benefit. Until now, around 101,210 groundwater licenses have been given for the purposes of individual irrigation, domestic and industrial uses.

Great importance is given to hydro-geological surveys and these are performed in conformity with photo-geological, geophysical, hydro-chemical surveys and exploration drilling and pumping tests. Water well drilling activities are performed for the following three purposes: exploration wells, exploitation wells. and domestic water well drilling. As of 2001, a total of 31,003 wells with a depth of 3,934,736m have been drilled by DSI.

The aim of **groundwater** exploration is to assess the possibility of the development of groundwater resources in plains and basins and determine in location, depth, quality, and quantity. During these investigations, geological, photo-geological, geophysical activities and exploratory drilling are carried out, together with aquifer tests, and hydrological and water chemistry surveys. Irrigation from groundwater is mainly considered in the areas where irrigation from the surface water is not possible or feasible and groundwater is convenient in reserve and quality. In Turkey, there are four types of groundwater management structures:

Irrigation Cooperatives Groundwater activities concerning irrigation cooperatives are jointly carried out by DSI and GDRS. Hydro-geological surveying, preparing feasibility reports, drilling groundwater wells, providing and mounting of motor-pumps, and building electrification systems are the responsibility of DSI. Foundation of cooperatives, construction of irrigation systems, and on-farm development are conducted by GDRS.

The constructions of all schemes, wells, motor-pumps, electrification systems, irrigation systems are financed by the state but all investment costs except for irrigation systems are refunded by the users within 15 years. Irrigation cooperatives are not required to make payments for the first three years. This three-year period is assumed to be a time for development. Cooperatives make payments over 12 years in equal shares without any interest. Operation and maintenance services are performed by cooperatives according to Operation and Maintenance Regulations. In case of high cost of

maintenance-repair services, DSI can pay incurred cost but recovers this amount in a certain period time.

Groundwater Supplied by DSI This type of groundwater irrigation is performed to supply groundwater to irrigation canals where surface water is insufficient, or irrigation is conducted only by groundwater. Operation, maintenance, and repair services are performed by DSI. Because these services lead to financial problems, services are not performed optimally, and system performance is decreased. In order to overcome these problems, operation and maintenance services of groundwater irrigation schemes are transferred to Water User Organizations. The results have been satisfactory in that application. Until 2001, 8,990 pumps were installed in groundwater production wells and electrification systems were constructed for the cooperatives.

Irrigation by Public Institutions To meet the needs of Public Institutions, groundwater wells are drilled and all equipment related to irrigation schemes are provided by DSI on a cost basis. 3.75 billion m^3 of groundwater was allocated for these three types of groundwater irrigation until the end of 2001. Relevant statistics with regard to the first three types of groundwater irrigation are given in Table 3.8. According to this figure, the share of irrigation by public institutions is considerably lower; while the groundwater irrigation by cooperation have gained the largest share in the groundwater irrigation. Irrigated area through groundwater by DSI corresponds to 19% of total irrigated area by DSI.

Table 3.8 Groundwater Irrigation in Turkey

Types	Irrigated area (ha)
Irrigation Cooperatives	441,775
DSI Groundwater Irrigations	6,712
Public Institutions Irrigations	76,058
Total	524,545

Irrigation by Individual Farmers Approximately 80,000 ha are irrigated by farmers in this way. Each farmer who wants to consume groundwater for irrigation requires a drilling license from DSI, according to Turkey's Groundwater Law.

GDRS applies two methods for individual farmer irrigation. First, if a farmer can afford all the investment costs of schemes for constructions and equipment, GDRS makes only an irrigation project. If a farmer cannot afford these, he is financed by Agricultural Bank credits. Groundwater allocated for this purpose until end of 2001 totalled 2.1 billion m^3.

In conclusion, a total of 6 billion m^3 groundwater potential was allocated for irrigation and this amount corresponds to 54.7% of total allocated groundwater resources. Of all the types of irrigation, open canal systems are predominant. Recently, however, with a view to saving water and increasing production of irrigated area, modern irrigation systems such as sprinkler and drip irrigation system have come into use.

4.3.3 Fisheries

While Turkey has a rich potential in living aquatic resources, the actual production is quite low. According to the data in 1998, fishing has declined especially after 1995. About 80% of total fishery production comes from the seas, 10% from inland waters, and another 10% from fisheries. The fisheries production was 636,824 tons in 1999, of which 523,634 tons including shellfish, crustacean and mollusks (13,634 tons) came from marine fisheries, 50,190 tons from freshwater fisheries and 63,000 tons from aquaculture.

4.3.4 Land Consolidation

In Turkey, because of its high population rate and continuous dividing of agricultural properties through the country's Inheritance Law, agricultural projects have developed problems. In order to solve these problems, land consolidation is always considered a primary issue by the government. But due to continuous increase in prices of agricultural lands, the expropriation costs are often as much or more than the agricultural project itself. Among the major benefits of land consolidation are:

- application of modern techniques in land properties,
- construction of networks for irrigation and transportation in agricultural areas,
- lowering of loss due to employment,
- prevention of over-dividing of land areas.

- result in a high amount of decrease in the cost of construction, management and operation;
- the modern irrigation applications in agricultural areas which are developed to the highest standards both technically and economically result in higher production yields, giving a considerable amount of benefit to the farmers and to the country's economy.

5. Roles of Dams and Reservoirs

Even though the freshwater resources are limited and unevenly distributed, demand for water is steadily increasing throughout the world. During the past three centuries, the amount of water withdrawn from fresh water resources has increased by a factor of 35, whereas world population by a factor of 8.

In Turkey, along with the basic perception of water as an integral part of the ecosystem, it is of paramount importance as a social and economic good for the country's socio-economic development. In this context, sustainable water development is assumed to include not only the planning or minimizing of adverse environmental effects, but also satisfying and reconciling water needs for human activities. Water storage facilities are being constructed to benefit from these existing water resources which are not regular in terms of time and place. Seasonal variations and climatic irregularities in flow, with floods and droughts causing problems at catastrophic proportions, impede the efficient use of river runoff.

The building of dams, which provide regular water from reservoirs to be used for increasing demand, is also a vital part of civilization. Dams have played a key role in human development since the third millennium BC when the first great civilizations evolved on major rivers, such as the Tigris-Euphrates, the Nile and the Indus. From these early times, dams were built for flood control, water supply, irrigation and navigation. Dams were also built to produce power and electricity since the industrial revolution.

Although the importance of water is well known around the world, various groups argue that expected economic benefits are not being produced and that major environmental, economic, and social costs are not being taken into account.

A dam is a structure built across a stream, river or estuary to retain water. The purpose of dams are:

- to meet demands for water for human consumption, irrigation, and industry;
- to reduce peak discharge of flood water; to reduce or prevent floods
- to increase available water stored for generating hydroelectric power,
- to increase the depth of water in a river so as to improve navigation.
- to provide recreation and fishing

Dams are considered critical in sustainable management of limited water resources. Water resources are subject to increasingly competitive demands as global population growth exacerbates tensions over the water needed to produce energy and to ensure food security. Dams store water in the reservoir during times of excess flow, so that water can be released from the reservoir during the times that natural flows are inadequate to meet the needs of water users.

In Turkey, the modern era of dam building began in 1954 with the establishment of DSI, whose primary charge was to provide water and power for the development of the country. Subsequent legislation and establishment of regional administrations continued to spur dam development through the second half of the 20th Century. The dam building era reached a peak in the 1980s and subsequently declined, due to a lack of public funds for dam projects. Environmental concerns are another reason for the slowing progress in dam construction activities in the country.

The first dam built in Turkey during the Republic Era was the Cubuk-I Dam, built for the domestic water requirement of the city of Ankara. Until the end of the Second World War, a few low dams were built for irrigation purposes. Since then, however, there has been an increase in construction of dams and hydroelectric power plants.

Studies made by DSI indicate that with the construction of 805 dams and 551 hydroelectric power plants (including the ones under construction, planned and in operation) it will only be possible to regulate our rivers and make maximum use of them. Local communities, municipalities and GDRS with the assistance of DSI constructed more than 600 small upstream irrigation dams since 1960.

An extensive network of over 1149 (203 large and 368 small dams by DSI, 578 small dams by GDRS) dams are maintained in Turkey, including 203 major dams, 15 m or more in height, or with

a normal storage capacity exceeding 3,000,000 m^3. Large dams account for 18% of the total, with an additional 946 small and medium dams accounting for 82% of the total. As understood from the given information, the topographic conditions of Turkey can be considered as appropriate for building large dams.

More than 70% of the dammed surface area is primarily used for energy generation and irrigation. Flood control and water supply for domestic and industrial purposes comprise relatively minor amounts of the total surface area, each accounting for approximately 10% of the total.

Age of Dams

The distribution of the ages of large dams reflects more or less the history of dam construction in Turkey:

- About two-thirds (65%) of all Turkey's dams are 0-20 years old
- About one third (30%) are 21-40 ages old
- 5% are older than 40 years

Other Facts about Turkey's Dams:

The total water surface area of reservoirs already put into operation by DSI is over 380,000 ha. This amount is expected to reach 580,000 ha after completion of reservoirs already planned for construction. Most of the large dams (70% of large dams) are earth filled, while rock-filled dams comprise 30%. If we consider the large dams according to their heights, 44%, are in the range of 30-59 m, while the second largest group, with 36%, is between 15-29 m.

Within the next 10 years, more than 10 existing dams will reach their original expected lifespan of 50 years. In the near future, many of these small dam projects will require significant rehabilitation, replacement, or removal in order to protect human and natural systems. Currently over 10% small dams require rehabilitation.

6. Renewable Energy – Hydropower

Success in sustainable development with its economic, environmental, social, and geopolitical dimensions requires a complex and long process. Energy policies contribute to this process by tailoring its three basic goals that reflect the requirements of sustainable development:

- reliability of supply that seeks to minimize the negative effects and risks to society of possible supply cuts
- competitive energy systems to ensure low-cost energy for both producers and consumers so as to contribute to competition and to other broader social policy goals
- environmental protection that is integrated to energy production and utilization practices so as to maintain ecological and geophysical balances in the nature

In industrialized countries, energy policies focus on achieving larger, cleaner, and more reliable output with lesser amounts of energy. Turkey, despite a growing economy, diversifying industrial activities, and a changing demographic structure, the level of energy consumption is far behind the industrialized countries in terms of per capita use of both primary and electrical energy.

Production and consumption of electrical energy has its significant share in efforts to reach or sustain a specific level of welfare and development. Thus, sources of energy are mostly used for producing electricity.

Starting from the Fifth FYDP, Turkey witnessed substantial structural changes in its energy sector. As a foreign source for our economy, natural gas gradually increased its share and weight in the sector. As a source alternative to oil and coal, it can be said that natural gas will maintain this status in the following planning terms as well.

6.1 Energy and Development

In 1999, Turkey consumed 118.5 billion kWh of energy.

By 2005, electricity consumption will reach 195 billion kWh.

By 2010, consumption will reach 285 billion kWh.

Electrical energy consumption is one of the most important indicators of economic development and social welfare. Electrical energy production and/or consumption per capita statistics are of great importance in terms of reflecting the living standard in a country.

Socio-economic development has been progressing parallel to the fast growing industry of the country which has caused the living standard to rise. This has led to an increase in demand for electrical energy. As a result of rapid increase in the field of electrical energy consumption, the basic input of all kinds of economical activities depend upon continuously developing technology and energy. Electrical energy has become an indispensable component of social life. Moreover, in addition to reliability and continuity provided by interconnected systems throughout the country, the consumption facilities provided which extend even to the smallest settlement units causes electrical energy consumption to increase rapidly.

The sustainable energy approach refers to policies, technologies, and practices that allow the guaranteed supply of required energy with minimum level of financial resources as well as environmental and social costs.

Sustainability in the field of energy is based upon three main principles:

- Efficient utilization of energy and energy saving,
- Minimization of the adverse environmental impacts and pollution caused by energy production and use and development of environment-friendly energy strategies,
- Enlarging the share of renewable sources of energy and improving the technology further in this area.

6.2 Turkey's Energy Policy

The basic target of Turkish national policy on energy is the provision of cheap electrical energy in sufficient amount and on time, under qualified, reliable and competitive conditions of energy market. In this regard, the energy policy determined by the current is as follows:

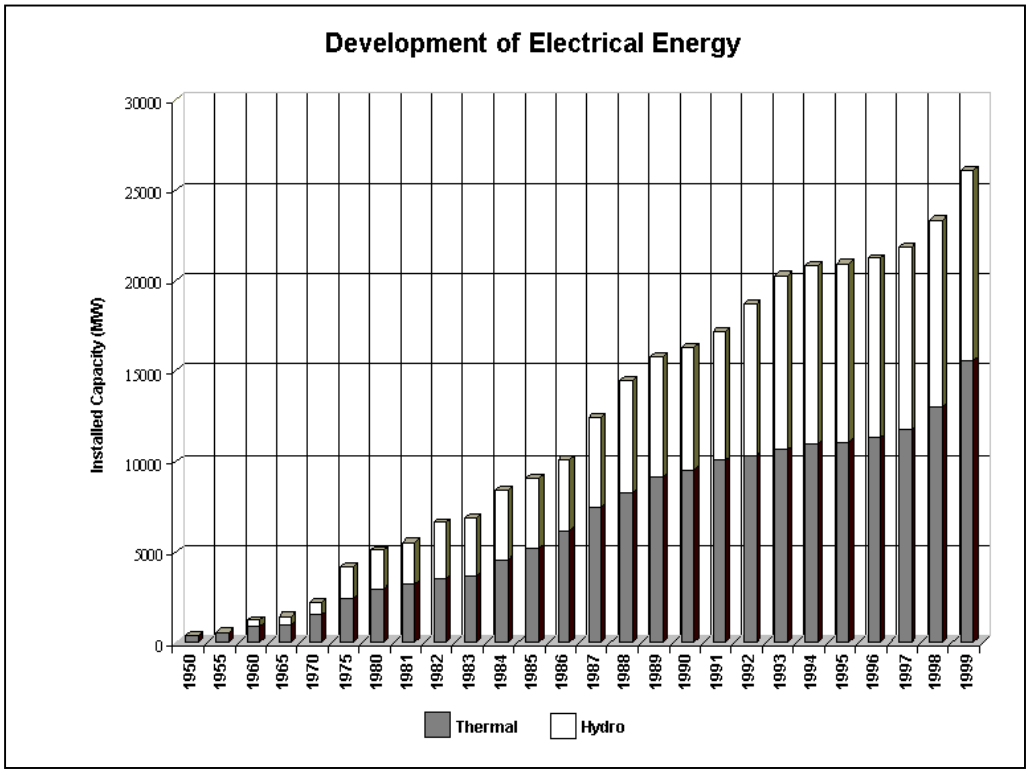
- Provision of qualified, reliable and cheap energy for sustainability in socio- economic development,
- Provision of safety in energy supply,
- Encouraging private sector investment and expediting privatization activities in the power sector.
- Adding new and renewable sources as soon as possible to the energy supply cycle.

In the early years of the Republic (1920s), the per capita electric energy consumption was around 7 kWh. As of 2002, per capita primary electric energy consumption reached 1,805 kWh.

However, these figures are still lower than Europe's per capita electricity consumption of 5,000 kWh and the world per capita average, which is 2,500 kWh. It is quite clear that Turkey should invest more in electricity in order not to be exposed to a serious energy crisis in the future.

The critical importance of electricity is well known in the energy sector. Parallel to the annual average growth rate of 7.3%, the installed capacity being 16,315 MW in 1990 has reached 27,265 MW by the year 2000 corresponding to energy generation from 58 billion kWh in 1990 to 125 billion kWh in 2000. Since the growth in electricity was below the demand in recent years, after 1997, Turkey became an importer of electricity. The share of thermal resources in total installed capacity increased due to rapid increase in gas-fired power plants, while the share of hydropower plants decreasing from 47.8% in 1993 to 41% in 2000 (Figure 3.5)

Figure 3.5 Development of Electrical Energy in Turkey



6.3 Institutional and Legal Framework

Before the Electricity Market Law of 2001, The Ministry of Energy and Natural Resources (MENR) was the main body of the energy sector which directly reports to the Prime Minister, being

responsible for the preparation and implementation of energy policies, plans, and programs in coordination with the affiliated and related organizations and other public and private entities. DPT evaluates Turkish energy needs, including production and imports, makes investment decisions after consultation with the relevant State Economic Enterprises.

The General Directorate of Energy Affairs which reports to MENR is the body responsible for the operation of the power sector as a whole evaluate the private sector applications on the basis of Built-Operate-Transfer (BOT) and Built-Operate (BO) models under the Law numbered 3096 and also finalize and contract both hydro and thermal plants. Additionally, energy pricing system, pollution problems and conservation of energy activities are carried out by this organization.

DSI, which also reports to MENR, is in the charge of preparing feasibility and final design Studies and construction of water projects, such as hydro power, irrigation, flood control, potable and industrial water supply and drainage facilities. After the commissioning of the hydro power plants, responsibility of operation is transferred to the EUAS. EIEI supplements DSI by taking over the research and design of hydro power plants.

The government has focused its efforts on improvement and restructuring the power sector, generation, transmission and wholesale sale-purchase functions. The Turkish Electricity Generation and Transmission Corporation (TEAT) were separated into three entities in 2001. EUAS is responsible for the operation of existing power plants owned by public. The Turkish Electricity Transmission Company (TEIAS) carries out transmission and load dispatch activities and the Turkish Electricity Trading and Contracting Company (TETTAS) carries out electricity wholesale and purchases. An independent regulatory body will provide for the transparent and non-discriminatory functioning of the electricity market through the Electricity Market Law.

The main objectives of the Electricity Market Law to be achieved are; to create a more transparent structure for the electricity sector, to establish an independent regulatory body for the electricity sector, to establish a financially strong and competitive electricity market and to provide reliable, high quality and low-cost electricity to the consumers.

Following the enacting of “Electricity Market Law” no 4628 published in the Official Gazette dated March 3, 2001, the Energy Market Regulatory Authority (EMRA) was established in order to

liberalize the electricity market activities to provide a fair and transparent market regulation in terms of generation, transmission and distribution, wholesale, retail companies, export-import, unbundling and tariffs. Additionally, the "Natural Gas Market Law" No. 4646 was enacted in 2001 for the liberalization of the natural gas market. Therefore, the Electricity Market Law is an important step in harmonizing Turkish legislation with the EU Acquis.

With this new law, generation will by realized by the Electricity Generation Company, private sector generation companies, auto-producers and auto-producer groups. The right of generating and selling electricity will be obtained by generation licenses. Transmission will be accomplished exclusively by the Turkish Electricity Transmission Company while there are certain rules of eligibility for distribution companies. However, no treasury guaranties will be issued as in the case of the Law No 3096. Companies having retail licenses will have permission to operate in all areas and there will not be any monopoly factor.

As a consequence of the Electricity Market Law, the autonomous Energy Market Regulatory Authority Board was charged being responsible for the achievement of a competitive electricity market by means of establishing the legal framework of the restructuring, regarding to enforce the provisions of the law and to issue regulations. The main goal of the new law is to put into forward an eligible consumer concept ensuring freedom for consumers to choose their suppliers within the new legislation framework of restructuring regulations.

After the completion of the regulatory legislation, the new market model will be operated by means of primarily two regulations, namely the Electricity Market Licensing Regulation and Electricity Market Tariffs Regulation.

6.3.1 Present Status in the Field of Energy Developments

Installed Capacity And Production Installed capacity in Turkey reached 26,116.8 MW at the end of 1999. Respective shares of plants in this total are as follows: 59.6% by thermal plants with 15,555.9; 40.3% by hydraulic plants with 10,537.2 MW; and 0.1% by geothermal and wind with 23.7 MW. The development of installed capacity over years and by types of fuel used is given in Table 3.9.

Table 3.9 Development of Installed Capacity, 1965-1999 (MW)

Year	Thermal	Hydraulic	Geothermal & Wind	TOTAL
1965	985.4	505.1		1,490.5
1970	1,509.5	725.4		2,234.9
1975	2,407.0	1,779.6		4,186.6
1980	2,987.9	2,130.8		5,118.7
1985	5,229.3	3,874.8	15.0	9,119.1
1990	9,535.8	6,764.3	15.0	16,315.1
1995	11,074.0	9,862.8	15.0	20,951.8
1999	15,555.9	10,537.2	23.7	26,116.8

Source: TEDAS, APK, 1999

Legislative arrangements introduced in 1984 and after aimed at enhancing the private sector's participation in energy production. As of 1999, enterprises active in the sector of electrical energy production include the public corporation (TEAT), the private sector (firms and auto-producers), firms on concession agreements (CEAT and KEPEZ), and Mobile Stations from which services are taken on the basis of leasing agreements. Table 3.10 below gives the distribution of installed capacity by these actors.

Table 3.10 Distribution of Installed Capacity by Primary Energy Source, 1999 (MW)

Source of Energy	TOTAL	%
Thermal	15,555.9	59.6
Hydraulic	10,537.2	40.3
Geo-thermal	15.0	<0.01
Wind	8.7	<0.01
Total	26,116.8	100.0
%	100.0	

Source: TEDAS, 1999

As of 1999, 24.3% of total installed capacity in Turkey is represented by power plants that use **lignite** as fuel**.** Leading ones among these plants include Aftin-Elbistan (1,360 MW) consisting of 4 units each with a capacity of 340 MW, Soma (1,034 MW), Seyitomer (600 MW), Yatagan (630 MW), Yenikoy (420 MW) and Kemerkoy (630 MW).

The second largest share in total installed capacity belongs to plants that use **natural gas** (23.5%). Ambarlı (1,350.9), Hamitabat (1,200 MW) and Bursa (1,432) natural gas and combined transformation plants are the largest ones among such plants. Following lignite and natural gas, the share of plants that use such liquid fuels as fuel oil, diesel fuel, LPG and naphtha.

The first interconnected wind energy plant in Turkey is an auto-producer of 1 MW established in Cesme. There is a second one established on the "build-operate-transfer" (BOT) model again in Cesme (7.2 MW). These two plants jointly produced 20.5 million kWh of electricity in 1999. Denizli – Kızıldere Geothermal Plant (15 MW) has been in operation since 1984.

In Turkey, plants using solid wastes and biogas have also been started. These initiatives use the BOT model.

Preliminary work on nuclear plants is presently in progress.

6.4 Investment and Financing Needs in Energy Sector

Looking at the trend for investments in the energy sector, we observe that the total investment was USD 1.8 billion and this figure reached its highest value in 1990 with USD 2.3 billion. Investments in the sector displayed a falling trend after this peak value in 1990 until they started rising again in 1997 and 1998.

Table 3.11 Public Sector Energy Investments

Years	SECTOR TOTALS	
	Programmed	Realized
1986	1,366	1,855
1987	1,782	2,154
1988	1,965	1,803
1989	1,984	2,164
1990	2,231	2,286
1991	1,926	1,873
1992	1,963	1,703
1993	1,714	1,548
1994	899	715
1995	1,041	715
1996	1,121	796
1997	1,130	1,093
1998	1,502	1,483
1999	1,709	1,274
2000	2,098	-

Source: DPT

6.5 Hydroelectric Energy Generation

The natural energy resources in the country are limited. National energy resources are comprised of l25 billion kWh from hydraulic, l05 billion kWh from lignite, and l6 billion kWh from hard coal, with a total annual average of 246 billion kWh.

The gross hydroelectric potential and technically utilizable potential of Turkey are estimated as 433 billion kWh and 2l6 billion kWh, respectively. The economically utilizable installed capacity and the annual average energy generation have been determined approximately as 35,483 MW and l25,828 billion kWh, respectively.

Although Turkey is not affluent in terms of hydroelectric potential, it is ranked in the first quartile within the European countries. In terms of developing water resources in Turkey, hydraulic energy generation takes a considerable portion. So far in Turkey, for the purpose of hydroelectric energy generation, 551 Hydro-Electric Power Plants (HEPP) have been developed at the various levels. As of 2002, 129 HEPP have been put into operation, 33 HEPP are under construction, and the other 389 HEPP are considered at the various project stages.

As of 2002, 129 hydropower plants with the installed capacity of 12,177 MW have been put into operation. By means of these plants 44,034 GWh energy is being generated annually. By means

of 33 hydropower plants under construction and 389 hydropower plants at different project stages, 9,932 GWh/year and 79,862 GWh/year energy will be generated, respectively.

So far, only 35% of the exploitable hydroelectric energy has been developed The annual average and firm energy is at the highest level in the Euphrates basin. The second highest potential is in the Tigris basin.

According to the International Journal on Hydropower & Dams 1997 World Atlas, the gross hydroelectric potential of Turkey is considered at the level of 1% of the world's total hydroelectric potential. This amount also corresponds to 14% of the economically utilizable potential of Europe.

In Turkey, only a small portion of all major dams is exclusively used for hydropower generation. Most of the hydroelectric dams are located throughout Büyük Menderes in the Aegean Region, and along the Euphrates River in the Southeastern The largest amount of hydroelectric power generation is found in Euphrates and Tigris River basins.

Trends in demand for electric power suggest that an energy shortage is imminent. For this reason, it is considered that hydro-electric energy should be given priority due to the fact that it poses much less of a threat for the environment compared to other types of energy sources.

According to the Long-Term Energy Generation Plan Studies prepared by Turkish Electricity Generation and Transmission Company, the installed capacity in our country will increase to 58,651 MW in 20l0, and to 116,240 MW in 2020. For the same period, the installed capacity of hydraulic is anticipated to increase to 18,843 MW in 20l0 and to 33,092 MW in 2020 approximately. Therefore, in order to reach the planned hydraulic capacity which is currently 12,177 MW, should be 33,092 MW in 2020, an installed capacity of around l,000 MW should be added to the system annually over a period of 20 years, seeking support for the development of all its economic potential by the year 2023 which is the 100^{th} anniversary of the foundation of the Turkish Republic.

When the classification is made for the hydroelectric power plants to be constructed in future in Turkey according to their installed capacities, it is planned that most of the hydroelectric power plants will be in the range of 10-50 MW, while the second largest group will be in the range of 50-100 MW

7. Integrated Water Resources Management

IWRM has become a concept and strategy for policy change in the water sector, taking over from the traditional understanding and practice of water resources development mainly directed at policy and institutional changes on a national and sub-national level. IWRM requires a new holistic approach and an unprecedented level of political cooperation. Environmental fundamentals such as the hydrological logic of the river basin and economic fundamentals relating to the value of water are central to the concept of IWRM. Prioritizing water allocation with an eye on the economy and prioritizing investment to reduce environmental impacts conflict with the interests of current water using practice.

This paradigm is bringing forward approaches, which include:

- Participation, consultation and inclusive political institutions to enable the mediation of the conflicting interests of water users and the agencies, which manage water. IWRM incorporates the principle that the river basin is an appropriate unit: Close relationship exists in a catchment area between the upstream and downstream environment. The upstream-downstream dependence does exist in a river basin, at all levels of the ecosystem. Therefore there should be a natural solidarity between all the water users within one single river basin. The basic idea is, within those natural geographic boundaries of the river basin which seem most appropriate
- to put forward an integrated water resources policy in order to prevent natural hazards
- to rationally satisfy the various uses
- to meet the requirements of sustainable development
- to protect the aquatic environment.

Isolated treatment of any component of the water resource system results in sub-optimal, if not unsatisfactory, solutions.

Problems with water resources management are basically related to the fact that occurrence and magnitude of water resources do not match the distribution of water demand. Furthermore, we know from experience that extreme mismatches, floods and droughts tend to cause damage to both water-related structures and activities. To alleviate the danger of these types of damages and improve the availability of water resources, water resources management activities are fundamentally concerned with the problem of water storage.

Water resources assessment is of critical importance for sustainability because of the predictable impacts of increasing population and the heightened severity of extreme water-related events such as droughts and floods. It would not be exaggeration to state that water resource assessment is a prerequisite for all aspects of water resources development and management.

Though it is highly desirable to accurately assess the water resources locally, regionally, and globally, a variety of challenges exist:

- Increasing need for integration and coordination between institutions
- heightened stress on water and the need for more precise information
- the effects of human activity and climate change
- transboundary aspects of water resources
- insufficient number of component personnel
- limited financial resources.

Natural water resource systems consist of the hydrologic cycle with its components of precipitation, evaporation, transpiration, infiltration, and surface runoff. The activities of people are affected by the natural water resources system. Finally, water resource management system is composed of the activities and relationships in the public and private sectors concerned with harmonizing the supply and demand sides so as to achieve the objective of the society. Recognition of each of these components and detailed analysis of the interaction between them would undoubtedly yield better results in the management of water resources.

Turkey, through its major water development and management agency, DSI strives to adopt Integrated Water Resources Management in water management. The following projects are examples of integrated river basin management:

Porsuk Basin Water Management Plan was completed in 2001. Since 1954, DSI has carried out basin-wide Studies in different sectors. To overcome increasing water quality and water deficiency problems in the basins. The main river in the Porsuk Basin (located in northwestern Turkey) is heavily polluted by industrialization and increasing population. The following issues have been evaluated:

- The demand-source balance was established by considering all the needs in the context of the projects developed in the basin
- Flood problems and solutions worked out in the basin. Domestic water requirement in long term conditions and related complementary recommendation were achieved.
- Water pollution problem of the main stream of the basin and the necessary measurements to be taken on this issue were all determined in the protection plan. The pollution points in the basin, short and long term pollution status of Porsuk river and Porsuk dam were all determined by using mathematical models.

As a result of the study, it was determined that, a good cooperation has to be provided between institutions for precise inspection and regulations in order to overcome the problems related to quality and quantity in the basin.

8. Finance

Water resources development projects are mainly financed by the public sector. The budget allocated for these projects has always been far from adequate to cover the expenses. Because of the heavy investment cost of water resource projects, it is necessary to move from today's heavy dependence on public financing to private sector involvement. For these reasons, the construction or O&M of water resources projects shall be gradually transferred from public sector to private in order to improve system performances and efficiency, and foster economic growth in water and other sectors.

In this context, private sector participation has gained great importance. Turkey is at a good level of privatization of irrigation scheme operation. Since 1993, the policy shifted from transferring only small and isolated schemes to an accelerated approach of transferring large schemes. At the beginning, selected pilot irrigation schemes, with high irrigation rate, high farmers' willingness, and cash crop production, had priority in transferring process. The program is also considered as a part of privatization policy. Between 1993-2002, except small- scale projects, 1.88 million hectares corresponding to 86% of the total irrigated large projects area has been transferred to the users.

The Build-Operate-Transfer (BOT) Model and the 100% Foreign Credit Turn-Key Model came into force and the private sector has made significant improvements in the realization of hydro-electric projects.

In the energy sector, the basic policy of Turkey is the provision of cheap electrical energy on time and also in sufficient amount under qualified, reliable and competing conditions of the energy market. In addition, the private sector aims to improve hydraulic energy in the shortest period possible to realize the continuity of sustainability in socio-economic development, and the creation of additional financial resources for the public budget. These efforts are needed to avoid an electrical "energy bottleneck" in the coming years.

With respect to the issues related to the energy sector, priority should be given to the construction and operation of HEPP. This hydroelectric potential is the most important renewable national energy resource. Because of its low operational costs relating to not having any fuel expense, HEPP can easily fit load demand, has a long economic life, and has low environmental impacts compared to alternative energy resources. Additionally, the multipurpose profitability of the hydro-power plants are because of:

- having large reservoirs for flood protection
- storing water for domestic water supply purposes, industry, and irrigation
- fisheries
- navigation
- building access roads, thus exposing originally inaccessible and remote areas to economic development.

To maintain competition in the power sector, to increase productivity, and to provide transparency is another important piece of the applied policy. In order to ensure this, the restructuring Studies of the power sector and establishing organizations, to determine the necessary rules and regulate the sector through the promulgation of the Electricity Market Law, are still underway. Through this law, the following objectives will be accomplished:

- Creation of a more transparent structure for the energy sector.
- Establishing of an independent regulatory body for electricity sector.
- Establishing of a financially strong and competitive electricity market.
- Provision of reliable, high quality and low-cost electricity to the consumers.

9. Investment Models for Hydraulic Plants

9.1 Externally Funded Projects

The shortage of domestic public funds to finance the energy sector in Turkey made it necessary to resort to models based on external loans. These models can be summarized as follows:

- Competitive bidding based on loans secured from such international finance institutions as the World Bank, EBRD, OECF, EIB and ADB,
- Competitive bidding based on funding proposals,
- Securing of external funds through the BOT model,
- Funding through intergovernmental cooperation schemes whereby financing is by contractors via their respective governments.

Table 3.12 Projects under Bilateral Cooperation Presently in Operation

HPP	Established Capacity (MW)	Average Annual Production (MW)	Location			Protocol	Operation date
			Province	District	Basin		
KARKAMIŢ	189	652	Ţ.URFA	BİRECİK	FIRAT	Austria Turkey	1999

Table 3.13 Projects Under Bilateral Cooperation Presently Under Construction

Name of the HPP	Established Capacity (MW)	Average Annual Production (MW)	Location			Protocol	Estimated completion date
			Province	District	Water Basin		
DERİNER	670	2 ,118	ARTVİN	Center	Çoruh	Russia Turkey	2005
BORÇKA	300	1,039	ARTVİN	Center	Çoruh	Austria Turkey	2005
MURATLI	115	444	ARTVİN	Center	Çoruh	Austria Turkey	2005
TOTAL	1 085	3 601					

Build-Operate-Transfer Model

The introduction of the BOT model in energy sectors derives from the need to channel the limited funds of the public to other sectors by attracting private funds to this sector. The BOT model was introduced also for such considerations as encouraging the entry of foreign capital, transfer of technology, and quicker completion of facilities.

As of 1999, this model resulted in 8 HEPP (151.5 MW in total) already in operation and Birecik HEPP of 672 MW presently under construction.

The Birecik Dam on the Euphrates was constructed by an international consortium on the BOT model. The dam was completed in the fall of 2000. It is one of the 22 dams envisaged by the Southeastern Anatolia Project (GAP) with an installed capacity of 672 MW, the HEPP produces 2.5 billion kWh a year and the dam irrigates an area of 92,700 hectares.

10. Valuing Water

10.1 Water Pricing in Turkey

The use of pricing to counter resource misallocation is considered one of the major public policy measures by the economists. Theoretically and empirically, the pricing has proved to be an efficient instrument, better than other alternative, quantitative regulations. The Dublin Principle of 1992 allied to the UNCED process in the same year also acknowledged that water has an economic value in all its competing uses and should be required as an economic good. The role of economic instrument in water management continues to be increasingly recognized as a legitimate tool.

Theoretically, water pricing may serve following purposes:

- **Financial:** To cover capital investment and operation and maintenance (O&M) costs of water services.
- **Efficiency:** To inculcate upon the users the consciousness of intrinsic value of resources and delivery systems and to discourage water wastage, strengthen institutional capacities and improve quality of services.

- **Equity:** To reduce income distribution gaps and thereby achieves social justice.

Depending upon the situation and the context of reforms, there are certain enabling principles that can be used in structuring public policy for water pricing. These include:

- marginal cost pricing
- ability to pay principle
- net-benefit principle
- full cost pricing.

These broad principles are put into practice through a variety of pricing methods (such as volumetric pricing, two-part tariff, crop/area/time based pricing, water wholesaling, etc.) which may differ from country to country, depending on the socio-economic and technological development levels a country has achieved.

Based on the type of irrigation management, the issue of water pricing has to be approached differently for schemes operated by Government and those operated by Irrigation Districts (Water User Associations).

10.1.1 Determining Operation and Maintenance Charges and Preparing Water Tariffs for DSI Managed Irrigation Schemes

The legal legitimacy of water pricing for the schemes operated and maintained by DSI is grounded in Article 26 of DSI Law which states:

> "All expenditures done to operate the schemes are paid by the beneficiaries themselves (except the flood protection facilities, reclamation facilities and the facilities which make navigation convenient)".

Here, the water pricing means recovering the costs of services from the users. Therefore, DSI does not sell the water to users with a price determined by full cost calculations, but recovers the costs of water transmission from the source to the field. That ıs why the main terminology used is "*operation and maintenance charges*" instead of "*price of water*" or "*pricing water*".

The two main inputs in the preparation of water tariffs for irrigation management by General Directorate of DSI are:

- O&M expenditures

- Estimated irrigable areas

Operation and Maintenance expenditures are those that have to be incurred for operating the schemes and keeping them ready for the service (providing sustainability). These expenditures consist of operation costs and maintenance costs. Operation Costs include personnel (the total wages paid for permanent and temporary personnel working at operational services in a fiscal year), vehicles (the total cost of vehicles used for operation activities), and energy-oil expenditures (consumed in pumping units which are constructed and used for irrigation and drainage) that are made mostly in an irrigation season. Other expenditures include the expenditures for operating the scheme such as telephone, electricity, water, heating, and rent. Maintenance Costs are the annual or periodical expenditures made for sustaining expected services from the schemes before any problem arises, repairing the damages, and performing weed-control.

The estimated potentially irrigable areas, (based on crops) are determined both for gravity and pumping irrigation schemes in the preparation of water tariffs. A "Water User Information Form", which is given to users before the irrigation season, including the type of the crop which users would plant and irrigate; hectare; information related to irrigation; and other information such as farmers' tendencies, past applications, marketing opportunities, and product supply and demands. In this way, estimated areas (including first and second crop areas) can be irrigated by the scheme in each season.

O & M water tariffs are prepared according to the principles in Article 28 of DSI Law. In Paragraph C of Article 28, it is stated that O & M charge "is obtained by dividing the total expenditure of the last year by irrigated area". DSI-constructed and developed irrigation areas are irrigated by gravity irrigation (using natural slopes of the land) and pumping irrigation (elevation of water by pumping stations for the high altitude areas). In the areas where the surface water is not adequate, ground water pumps are installed for using ground water in irrigation.

Since the pumping irrigation is more expensive and difficult than gravity irrigation, the schemes in water tariffs are divided into two main groups:

- Gravity irrigation,
- Pumped irrigation.

The schemes, which are divided into two main groups according to the water supply method, are subdivided based on criteria given below in Table 3.14:

Table 3.14 Criteria for Water Tariff

Social Criteria	Location of the scheme Irrigation development conditions
Economic Criteria	Crop type Crop prices Yield Market conditions Farmers' ability to pay
Ecological Criteria	Precipitation Temperature

Source: DSI

10.1.2 Irrigation water pricing by Water User Associations (Irrigation Districts)

Water pricing activities of Irrigation Districts are parallel to that of DSI since the authorization of these organizations on that matter are limited to the authorization transferred by DSI, that is given to DSI by Law No: 6200. In other words, the way that would be followed by water user organizations on water pricing, as stated in DSI Law, is limited to recovering maintenance expenditures for keeping the scheme ready for service and operation expenditures for transmitting water from the source to the farm.

Although DSI and water user organizations have parallel methods on water charges, due to their different laws, there exist different practices in determination of expenditures, application of tariff, and collection of charges. These differences can be gathered under the following topics:

1. The expenditures of that year to be determined by an estimated budget before the irrigation season.
2. The application of the tariff according to defined conditions to be based on qualifications of the scheme (under the responsibility of each organization) and region.
3. Making the collection in the same year and deterrence of applied penalties to recover charges, which can not be collected.

Water user organizations have to work with a balanced budget from the standpoint of revenues and expenditures. Therefore they have to determine expenditures of that year for the scheme under their responsibility and form a budget to recover these expenditures. Each association determines its own expenditure budget, which includes all kinds of expenditures necessary for

maintenance of schemes and for irrigation management at the beginning of the fiscal year. In this budget, investments for irrigation schemes (machinery, equipment, and construction of new schemes, renewing of schemes) are also included. However, the capital investment cost is not included in O & M charges. Each association determines its would-be irrigable area and crop types using water user information forms and many other methods.

Tariff studies prepared using estimated budget and potential irrigation figures, show differences among the water users organizations. Each association uses different methods depending on qualifications of its own scheme and region. These methods can be cited as follows:

Area based

a) Crop based (TL/da)
b) Fixed charge (TL/da)
c) Crop based depending on irrigation times (TL/da)
d) Fixed charge depending on irrigation times (TL/da)

Volumetric

a) Based on water amount consumed (TL/m3)
b) Based on water consumed hourly (TL/m3)

Water Users Organizations use mostly the "area and crop based" tariff method. This type is used mostly in gravity irrigation schemes. In pumped irrigation schemes, the volumetric method is used.

Factors which are taken into account when water user organizations choose a tariff method are:

- method should be easy and practical
- lack of data for calculations
- water charge per unit area is intended to be low.

10.1.3 Benefits of Water in Irrigation Sector

Irrigation contributes to Turkey's socio-economic development to a great extent. The increase in yield of agricultural crops under irrigated conditions is three times more than under dry conditions and it contributes significantly to the food security of the country. The Gross Value Added (GVA) of one cubic meter water supplied to irrigation corresponds to USD 0.21. So, the total water amount of 29.3 billion m^3, supplied to irrigation in the year 2000, provided the GVA of USD 6.15 billion for the economy. It also has the maximum share in employment. Irrigation provides a great number of direct

and/or indirect job opportunities. Roughly one third of the total population of the country still lives in rural areas. Agriculture, and specifically irrigated agriculture, are the only employment options for these people. Irrigated agriculture also accelerates industry based on agricultural production. While the share of the agriculture in the GDP is about 14%, it has the maximum share in employment.

10.1.4 Benefits of Water in Hydraulic Energy Generation

In Turkey, there are many streams flowing in 26 hydraulic basins and their total potential is 193 billion m^3 of surface water. This corresponds to gross theoretical electrical energy potential of 433 billion kWh/year.

As of 1999, technical and economical feasibility studies indicated that 123 billion kWh out of this theoretical figure corresponded to the actual hydraulic energy generation of Turkey. This means that technical and economic feasibilities correspond, respectively, to only 28.4% and 57% of the gross potential. What is considered as technically and economically feasible, in its turn, reflects a total of 483 hydraulic power projects at various stages (i.e. preliminary study, master plan, feasibility study, definitive project, construction and operation), which corresponds to an installed capacity of 592 MW.

Table 3.16 Hydraulic Energy Potential in Turkey and Development Status as of 1999

Status of Hydraulic Power Plants Projects	HES (number)	Total Capacity MW	Average Annual Production GWh/Year	Percentage Rate	Successive Rate (%)	Average Load Factor
In operation as of the end of 1999	114	10,537	39,145	32	32	42
Under construction	37	4,057	13,368	11	43	36
Not at the stage of construction yet	332	19,715	69,619	57	100	40
Total Potential	483	34,592(*)	122,322	100	-	40

(*) 3.5 MW as the total of not operating small plants is included
Source: DSI

Total installed capacity in Turkey is 26,117 MW as of the end of 1999 and the share of hydraulic power plants in this total is 10,537 MW. The total electricity output in Turkey came out as 116,440 GWh in 1999 in which the respective shares of thermal and hydraulic plants are 70% (81,661 GWh) and 30% (34,678 GWh).

In parallel with rapid economic development and industrialization, a considerable rise is observed in the use of electricity. Use of electrical energy rose from 23,275 GWh in 1980 to 123,392

GWh in 2001, indicating an annual increase of 530% in 21 years time. Despite this increase, per capita electricity consumption is 1,850 kWh, which is far less than the average consumption of 5000 kWh for the developed countries. On the other hand, it is seen that the share of hydroelectric energy in total energy projects fell from 49% in 1980 to 33% in 1998.

According to the evaluations of water resources in Turkey, hydroelectric energy generation takes an important part beside the energy generation from other resources. So far in Turkey, for the purpose of hydro-electric energy generation 551 projects have been developed. As of the end of 2002, 129 power plants have been constructed, 33 power plants are under construction and the other 389 power plants are at various project stages. As of 2002, hydro-electric energy production corresponds to 35% of total electrical energy production in Turkey.

The **Economic Valuation of Hydropower** Hydropower has several important benefits:

- absolute flexibility which permits it to adapt itself in a continuous form to the variations of the demand
- assuring frequency and power at the same time that it provides the rolling load necessary to make good the defects that could be produced in other power stations of the system.

This is taken into account in the wholesale market by way of the retribution of these complementary services. The average production of hydraulic energy is about 44,034 GWh per year.

It is estimated that the energy benefit per kWh is about 0.065. In total, a direct production has been obtained of 2,862 million $/year. If we also consider flexibility and continuity of the production and its compensations as 0.04 $/kWh and others complements as 0.015 $/kWh, the valuation of the productivity of the water in hydropower increases to a USD 0.12 per kWh. In this case, the total production of water in hydropower becomes about USD 5,284 million per year.

10.1.5 Benefits of Water in Domestic and Industrial Uses

The contribution provided by hydroelectric energy production to Turkey's GDP is US $5,284 million. This value corresponds to 3.6% of the GDP of Turkey.

According to today's conditions in domestic and industrial sectors, 10 billion m^3 water is being consumed per year in Turkey. In relation to the water supply for domestic uses, the actual demand is about 5,800 million m^3/year. This value includes

the municipal services and the supply to small industries that are connected to the municipal networks, which can reach values of up to 15% of the total demand.

According to law, DSI must develop domestic water supply projects for cities having a population of more than 100,000 for the long term. So far in Turkey, projects developed by DSI provide 2,026 billion m^3 per year of domestic water supplied to 15 cities. With the projects under construction, domestic water will be provided to 27 cities. At full development, domestic water supply will reach 2,785 billion m^3 per year.

Out of the total domestic water requirement of 5,800 million m^3/year, approximately 35% comes from ground water. The mean prices of water have increased during recent years, due to the inclusion in the value of the water of all the costs of the production, and the costs of wastewater treatments. The unit price of water is oscillating between 0.50 to 1.25 for different parts of the country and in some of the large cities. So, it can be estimated that the price for the water supply is US\$0.75/m^3 for the 5,800 million m^3/year, that is to say some US \$4,350 million per year.

The actual demands of water supply in industrial uses are 4.2 billion m^3/year. Values of the productivity of the water in several sectors oscillate between US \$1.00 to 3.00/m^3. It can be estimated that the unit price for industrial water is \$1.50/m^3, that is to say some US \$6,300 million per year for industrial uses. When 70% of this benefit is taken as GVA, the contribution provided from domestic water production is \$4,410 million. This value is 1.3 percent of the GDP of the country.

11. International Activities

Turkey has been building close relations with some water-related international organizations such as WMO, UNEP, UNDP, UNESCO, IAHS, WWC, etc. In this context, DSI is serving as a focal point for various international projects or programs such as the International Hydrological Program (IHP), Hydrological Operational Multipurpose System (HOMS), International Association of Hydrological Sciences (IAHS), Mediterranean Hydrological Cycle Observing System (MED-HYCOS), and the Black Sea Hydrological Cycle Observing Systems (Black-Sea HYCOS).

Turkey is in a position to strengthen its existing representative responsibilities at various water related organizations. Moreover, Turkey is actively engaged in coordinating the activities of all

hydrology-related organizations including the private sector, newly emerging institutions, and universities. In this connection, an office to deal with the international hydrological activities of UNESCO, WMO and like has been recently established under the auspices of DSI. The following water-related projects are being coordinated by DSI:

IHP: Being the focal point for the International Hydrology Program of UNESCO, DSI is coordinating all scientific and technical matters relating to water resources of Turkey. Its research and development activities include mainly hydrology, water resources, and river engineering. The activities of the Turkish National Committee are under the leadership of DSI. A staff member in the Investigation and Planning Department of DSI chairs the committee.

MED-HYCOS: This project includes all Mediterranean and Black Sea basin countries. Turkey has been participating in the MED-HYCOS project since 1994. This project is supported by the World Bank and conducted by the World Meteorological Organization (WMO) and the European Union (EU). The regional center of project is IRD, the scientific research institute of France.

HOMS: HOMS was established by WMO for the transfer of technology in operational hydrology. This technology is usually in the form of descriptions of hydrological instruments, technical manuals or computer programs, materials which have been made available for inclusion in HOMS by the Hydrological Services of member countries. Turkey established its national center in 1997.

With regard to regional cooperation, a protocol can be given as an example, which has been recently signed between DSI and the National Institute of Meteorology & Hydrology (NIMH) of Bulgaria. This protocol is related to the implementation of a hydrologic telemetric station on the Maritza (Meric) River at Svilengrad. The installation, operation, and maintenance of this hydrologic telemetric was used for better monitoring of hydrometeorological data in period of floods caused by the river which flows through the Bulgarian territory (near Svilengrad) and downstream near the city of Edirne,Turkey.

In order to achieve technological improvements in water sector, certain projects have been initiated in Turkey. Turkey Earthquake and Flood Emergency Recovery Project (TEFER) can be given as an example of these activities. The TEFER project is financed by the World Bank, hydromet

network review and design, automatic real time meteorological monitoring, automatic real time hydrometric monitoring, receiving stations installation, utilization of the data base, flood forecasting and warning studies will be carried out. However, in order to take steps in these technical issues, research and design consultancy is needed in the fields of "Hydrometric Network Review and Design" and "Automated Weather and Hydrometric System Design".

During 1993-1998, significant improvements have been achieved regarding the hydrometeorological observing stations in Turkey. Hydrometric observing stations, the electronic limnigraphs have been installed. These activities improved the station conditions, removed the observation errors and failures. Additionally, the measurements are conducted in a more sensitive way and the observed data are transferred by modern telemetry technology. Using the modem facilities, it is now possible to read, evaluate and store the real time data at the office.

Seasonal snowmelt runoff estimates are extremely important in mountainous regions with semiarid climatic conditions, like eastern part of Turkey. Knowing the seasonal discharge volume in advance increases the flexibility in planning and operational of water resources systems as well as various water management decisions. The optimum operation of Keban, Karakaya and Ataturk dams, which are located in the Euphrates river basin depends on the estimated seasonal discharge volumes resulting from snowmelt during spring time.

The nation-wide meteorological observation network is not dense enough to provide the detail of information required especially in rugged regions, and common problems of inaccessibility in the snow covered regions combine to ensure that the exact aerial distribution of snow is not well-known. Therefore there exists an essential need to apply remote sensing to snow monitoring in Turkey. For most operational requirements microscale characteristics are not the focus of operational interests since water yields at this scale are small compared with those at the larger scales. It is at the local and regional scales that information about snow accumulation is needed, scales at which traditional point measurements are inaccurate and cannot meet the necessary data requirements. Satellite remote sensing is potential solution to this problem because broad area observation systems are capable of monitoring macro scale atmospheric and terrestrial features at varying spatial and temporal

resolutions. Spatial and temporal requirements are important factors governing choice of satellite retrieval method.

Application of remote sensing techniques in snow monitoring was initiated in 1996, by the NATO SfS fund support in the east part of Turkey. In that study, areal snow cover, its depth and water equivalent were derived from satellite imagery and ground measurements as well as hydrologic models for eastern Turkey. Remotely sensed snow cover data obtained by the satellite system were used to estimate the runoff from snowmelt in the Karasu River which joins the Euphrates River at Keban Dam. Snowmelt from mid March to June contributes 65-70% of the total annual runoff.

11.1 Remote Sensing and GIS Applications

In the information age, it is very important to access information and utilize it in effective manner in order to reach the well defined goals of a water management organization. Being the primary authority in the planning, construction, supervision and operation and the maintenance of water resources projects, DSI has decided to modernize existing system of planning and management of water resources with the introduction of Geographic Information Systems (GIS).

In order to establish an effective and efficient GIS infrastructure within DSI, a GIS Feasibility Study was carried out in late 1999. Based on the feasibility study, GIS applications and remote sensing studies are in progress. Two satellite receiving stations (Meteosat and NOAA) are installed in DSI. In the scope of these studies, the project for estimation of snow-water equivalent potential of the Karasu basin has been started with supervision of TUBITAK-Bilten. NOAA images of the region are obtained, processed, and combined with GIS in order to monitor time and spatial distribution of snow-covered areas. Real time snow depths are measured and received regularly from the field using six snow measuring stations using the Inmarsat MiniM systems. Within the Investigation and Planning Department of DSI, relevant information using satellites and other related systems are stored and analyzed.

12. Transboundary Water issues

12.1 The Euphrates and Tigris Rivers

The Euphrates and the Tigris are two of the most famous rivers in the world. The combined water potential of the two rivers is almost equal to that of the Nile river. Both rise in the high mountains of north-eastern Anatolia and flow down through Turkey, Syria, and Iraq and eventually join to form the Shatt-al-Arab 200 km before they flow into the Gulf.

They account for about one third of Turkey's water potential. Both rivers cross south-eastern Anatolia region which receives less precipitation compared to the other regions of Turkey. Therefore, during the 1960's Turkey launched projects to utilize the rich water potential of these rivers both for energy production and irrigation.

Turkey contributes 31 billion cubic meters or about 89 per cent of the annual flow of 35 billion cubic meters of the Euphrates. The remaining 11 per cent comes from Syria. Iraq makes no contribution to the flow.

As to the Tigris, the picture is entirely different. Fifty-two per percent of the total average flow of 49 billion cubic meters comes from Turkey. Iraq contributes all the rest. No Syrian waters drain into the Tigris.

12.2 Turkey's Water Management in a Transboundary Context

Turkey's policy regarding the use of transboundary rivers namely the Euphrates and the Tigris is based on the generally accepted international principles. The following principles should be mentioned in this context.

- Water is a basic human need and right.
- Each riparian state in a transboundary river has the sovereign right to make use of the water in its territory.
- Riparian states must make sure that their utilisation of such waters do not give "significant harm" to others.
- Transboundary rivers 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 riparian states.

Manavgat Water Supply Project

In order to supply fresh water to the cities along the Mediterranean coast of Turkey and to the countries in the region facing water scarcity, Turkey developed the Manavgat Water Supply Project on the Manavgat River, a national river of Turkey flowing into the Mediterranean Sea.

The installation of on-shore components for the treatment and storage of water and off-shore components for loading water onto tankers was completed in 1997 at a cost of 147 million USD. The daily water treatment capacity of the Manavgat Water Supply Project is 500,000 m^3. It should be noted that the Manavgat River has an annual water potential of 3.6 billion m^3. If needed, more water could be extracted from the river by increasing the capacity of the installations.

Desalinization may be an alternative for supplying fresh water to water stressed countries in the region. However, the water quality of the Manavgat River is far superior to desalinated water and the desalination process is not environmentally friendly.

Water is one of the key factors in the Middle East Peace Process. In order to make a positive contribution to this ongoing process, Turkey has offered to supply fresh water from the Manavgat River to interested parties. So far, Israel has expressed an interest in purchasing 50 million m^3 of treated water. In this respect, negotiations between Turkey and Israel have been ongoing since June of 2000. For the transfer of water from the Manavgat River to Israel, it was concluded that the most convenient means of transportation for such a long distance was via super-tanker. However, new water tankers would need to be built or large oil tankers would need to undergo a special conversion process in order to maintain the quality of the water being transported. If it is realized, this transfer of water from Turkey to Israel will be the first such undertaking in the world.

With respect to the utilisation of the waters of the Euphrates and the Tigris rivers, Turkey has consistently abided by these principles and continued to release maximum amount of water from both rivers even during the driest summers thanks to the completed dams and the reservoirs in South-eastern Anatolia. For example, 1988 and 1989 were the driest years of the last half century. The natural flow of the Euphrates was around 50 cubic meters a second. Yet Turkey was able to release a monthly average of minimum 500 cubic meters per second to Syria in comformity with the Article 6 of the Protocol signed by Turkey and Syria in 1987. Article 6 reads as follows:

> "During the filling up period of the Atatürk Dam reservoir and until the final allocation of waters of Euphrates among the three riparian countries, the Turkish side undertakes the release a yearly average of more than 500 cubic meters per second at the Turkish-Syrian border and in cases where the monthly flow falls below the level

of 500 cubic meters per second, the Turkish side agrees to make up the difference during the following month."

Turkey's water use is also compatible with the Implementation Plan of the Johannesburg Summit (World Summit on Sustainable Development, 26 August-4 September 2002). According to the plan, member states agreed to "substantially increase the global share of renewable energy sources with the objective of increasing its contribution to total energy supply". The use of hydro-energy was particularly highlighted in this context.

12.3 The UN Convention on the Non-Navigational Uses of International Watercourses

The UN Convention on the Non-Navigational Uses of International Watercourses was adopted by 103 votes in favour to 3 against (Turkey, China, Burundi) with 27 abstentions on May 21st, 1997 in New York. The Convention almost lost its credibility and it is not expected to enter into force in the near future as only 12 countries ratified it so far.

The 37-article Watercourses Convention and its 14-article annex govern measures for protection, preservation and management of transboundary watercourses. Originally foreseen as a framework Convention, it addresses also issues such as flood control, water quality, erosion, sedimentation, salt water intrusion and living resources. It shall enter into force following the deposition of 35th instrument of ratification.

Nevertheless, a number of States who abstained or voted against the text drew attention to a lack of consensus on several of its key provisions, such as those governing dispute settlement, as well as the lack of balance in its provisions between the rights and obligations of the upstream and downstream riparian States. Concern was also expressed that the text had deviated from the aim of being a framework Convention. Turkey voted against the Convention for the following reasons:

- As a framework convention, the text should have set forth general principles. Instead, the Convention goes beyond the scope of a framework and establishes a compulsory mechanism for planned projects and dispute settlement. Such a practice has no basis in international law. The mechanism creates an obvious inequality between States. It is not appropriate for a framework convention to foresee any compulsory rules regarding settlement of disputes, a matter which should be left to the discretion of States concerned.

- The Convention does not refer to the sovereignty of the watercourse States over the parts of international watercourses located in their territory.

- The Convention should have established the primacy of the principle of equitable and reasonable utilization over the obligation not to cause “significant harm”. As Turkey has not signed the Convention, it will not be a legal instrument for Turkey.

ILISU DAM

The Ilisu Dam is part of the GAP Project and is currently the largest hydropower project in Turkey. It is located on the Tigris river and will create a reservoir with a maximum volume of 10.4 billion cubic meters and a surface area of 313 square kilometers. The Ilisu power station will have a capacity of 1,200 MW and is expected to produce 3,800 GWh of power per year.

There has been controversy around the building this dam both socially and environmentally. Certain NGOs and pressure groups have taken issue with some of the aspects. However, the facts are somewhat different.

- The Ilisu dam is not designed for irrigation, only for power generation: The water passing through the turbines has to flow back into the riverbed.
- River water flowing into Iraq and Syria will not be polluted because the use of water for hydropower is non-polluting. Ilisu does not involve irrigation.
- As a result of Ilisu, new sewage treatment facilities will be built in the towns upstream, thus improving water quality.
- Ilisu will act as a regulator holding back water during the winter floods and releasing it during the summer droughts.
- Claims that 15 towns and 52 villages will be flooded are misleading.
- Hasankeyf, a small town, is the only one affected, but only the lower parts of Hasankeyf will be flooded. The citadel will stay above the water. Archaeologists and scholars from Turkey and several other countries are at work on a project to excavate, record, and preserve as much as possible. It should also be stated that almost every town in Turkey is a major archaeological site.
- A comprehensive program of resettlement and compensation is planned. The total number of people who will have to be resettled is around 15,000. This mean about two thousand families. They will be given the choice of whether they prefer an agricultural or an urban settlement. I should like to point out that all hydro-power plants involve resettlement everywhere.
- Contrary to allegations by certain NGOs, there are people of different ethnic origins in the region. Resettlement and compensation will be applied to all Turkish citizens on an equal basis. Irrespective of their origin, those who may not be satisfied with compensation will have the right to refer the matter to the courts for further compensation. The dam will not operate for at least 7-8 years and the resettlement and compensation issues will be resolved by then.
- Ilisu will have major environmental benefits. It will avoid the emission of millions of tons of greenhouse gases from alternative thermal power plants.

Finally, obstructing development project means that economic growth cannot go ahead. In the case of Southeastern Turkey, construction and additional electricity will bring higher income levels and new opportunities to an area which badly needs them. In a wider international context, economic development and the spreading of prosperity to all people in the region will be the best ways to resolve disputes between nations and create a climate of peace and good neighbourly relations.

CHAPTER 4: WATER AND SUSTAINABLE DEVELOPMENT

1. Sustainable Development

It is reported that worldwide around 850 million people live on land threatened by desertification. Another 500 million reside on terrain too steep to cultivate. Most of the world's rural poor live in the latitudinal band that will be most vulnerable to the effects of global warming. To make matters worse, 90% of the urban sewage in the developing world is discharged into rivers, lakes and coastal waterways without any treatment. It is also widely quoted that perhaps one billion people lack safe drinking water, and three billion lack adequate sanitation. These conditions result in the deaths of more than two million children each year due to water-related diseases. Ironically, these figures come after five decades of "development" under the leadership of the industrialized countries.

As industrialized countries have progressed in the last century, their ideas about using natural resources have changed, and they have projected their own concerns and values onto the less developed countries. For example, while less developed countries are still building dams, the industrialized countries stopped building dams long ago, and have even begun to decommission dams. To cite the World Water Vision, about 70% of industrialized countries' potential for hydroelectric power has already been developed, and there is little incentive to increase agricultural areas via irrigation in these countries, but the less developed countries are still far behind in energy production, water supply, and other basic infrastructure required for economic growth. According to the IWMI, by 2025 almost a third of the world's population will face water shortages and will have to divert water from irrigation and food production to household consumption, implying further underdevelopment. The solutions that we have relied on so far are inadequate for the challenge.

Recently, much discussion has emphasized capacity building and strengthening local institutions as requisites to success in sustainable development. These are clearly needed, as we cannot accomplish gender equity or reduce environmental degradation simply by making policy statements, if people in authority continue to make decisions based on traditional patterns.

However it is not enough to look at capacity building only at the level of the individual or of the institution. The fragmentation of efforts among agencies, sectors and regions hampers development. Coordination across conventional boundaries is essential in order to ensure ongoing sustainable development where information and know-how are shared in a complementary fashion for optimal effectiveness.

Even the best practices in participatory development could be more responsive, transparent and inclusive. Projects in Turkey targeting sustainable development, which include local water users, neighborhood women, and other intended beneficiaries in decision making roles, have had their challenges. New ideas about gender equality and participatory development go against traditional ideas about gender roles and social hierarchies. At the same time, however, traditional institutions can provide ready-made networks for communicating with stakeholders and learning about the environment.

Improving local participation also means improving the capacity of public sector agencies, at both individual and institutional levels, to respond to the changing social, economic and environmental landscape. Public institutions need to find ways to create new linkages between local constituents and centralized policy makers. In the context of these challenges, some cases are presented below to demonstrate efforts made toward sustainable development in Turkey in relation to water resources development.

2. Provision of Safe Drinking Water and Sanitation

Demand for water is steadily increasing throughout the world, although the fresh water resources are limited and unevenly distributed; during the past three centuries, the amount of water withdrawn from freshwater resources has increased by a factor of 35, where world population has increased by a factor of 8.

According to the ICOLD (1999) definition, by 1949 about 5000 large dams had been constructed worldwide, three quarters of them in industrialized countries. By the end of the 20th century, there were 45,000 large dams in over 150 countries.

Worldwide, 50% of the large dams were built mainly for irrigation. Dams contribute to 12-16% of world food production. Hydropower currently provides 19% of the world's total electricity supply and is used in over 150 countries. Globally, 12% of large dams are designated *as domestic water supply dams.* Of the same classification, there are 625 large dams in Turkey.

Owing to considerable variation observed in the runoff in terms of seasons, years and regions, it is absolutely necessary to have water storage on the major rivers in Turkey. This ensures access to water when it is necessary. Turkey's dam construction program is necessary 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; significant progress was made in the construction of dams in the 47 years since the establishment of DSI. Now, more than one third of the total population is receiving fresh, clean water from dams constructed in Turkey.

Thanks to the recommendations brought about by the International Drinking Water Supply and Sanitation Decade (1981-1990) as a major outcome of the UN Water Conference held in Mar del Plata, Argentina, 1997, the routine monitoring of water supply and sanitation was requested from WHO. At the end of the Decade, WHO and UNICEF decided to combine their experiences and resources in a "Joint Monitoring Program for Water Supply and Sanitation (JMP)" intended for capacity building in information systems at the country level. Under the JMP; by using the final population-based data on access to water supply and sanitation, particularly national census reports, Demographic Health Surveys (DHS) were conducted by the USAID and UNICEF's Multiple Indicator Cluster Surveys (MICS). The DHS and MICS are national cluster sample surveys, covering several thousand household in each country. Household survey results were collected and reviewed including DHS and MICS results. They therefore provide an important step forward in obtaining more accurate information for the sector.

At the international level, by considering the figures on water supply in Turkey, the water supply ratios in rural areas (76%) are lower than ones in urban areas (82%) (Water Technology Net). According to the DHS carried out in 1993 and 1998 by USAID, the estimates for access to improved

drinking water sources in Turkey reveal similar figures. Access to urban drinking water was 83%; in 1990 and 81% in 2000; access to rural drinking water was 72% in 1990 and 86% in 2000.

These figures show that the policy has been oriented towards increasing accessibility to drinking water in rural areas, which have a serious lack of infrastructure. These achievements in Turkey have shown some similarities with world achievements. In general, if we accept the water supply ratio in Turkey as around 80%, this ratio should be seen as a successful improvement on the worldwide level.

The surveys carried out in 1990 and 2000 show differences in accessibility to drinking water sources in urban and rural areas of Turkey. In 1990, the rural accessibility ratio to improved (safe) water referring to household connection, public standpipe, borehole or rainwater collection, was 72%. This lagged behind the urban areas, at 83%. However, in 2000, the picture was reversed. While the ratio of accessibility to safe water in urban areas was 81%, the rural areas ratio reached 86%. In general, rapid urbanization and the huge financial burden for providing infrastructures in the urban areas have played a crucial role in creating the imbalances between urban and rural areas in Turkey.

According to results of the JMP; the sanitation ratios for 1990 and 2000 have stayed the same for both urban and rural areas; 97% and 70% respectively. However; according to the Sanitation League Table, which classifies the countries by the defined rankings mean, including some countries of sub-Saharan Africa; Middle East & North Africa; Central Asia; South Asia and America regions in the world; Turkey has taken the second rank which accepts 50-74% accessibility ratio for sanitation. This means in general 50 or 73% of the population of Turkey has access to improved sanitation, including the households at least having connection to public sewer, septic system or simple pit latrine.

Table 4.2. Access to Improved Drinking Water Sources and Improved Sanitation in Turkey

	DHS 1993			MICS 1995			DHS 1998		
	Urban	Rural	Total	Urban	Rural	Total	Urban	Rural	Total
Piped Water Into residence	74.5	42	62.9	62	27.7	49	65.9	32.7	55.3
Public tap	3.8	16.3	8.2	0.6	0.6	1	0.8	1.3	1
Rainwater	0	0.3	0.2	0	0.2	0	0	0.1	0
50% Well Water	3.2	17.6	8.3	3.8	34.3	15.5	3	14	7

Source: UNICEF-WHO

According to surveys undertaken under the JMP; the figures related to the piped water into residence were in 62.95% in 1993, 49% in 1995 and 55.3% in 1998.

We see a similar picture in urban and rural sanitation figures in Turkey. Sanitation conditions in the urban areas are better than in the rural areas. In general, as of 1993, the accessibility ratio to improved drinking water in Turkey has fluctuated, from 80% in 1993; to 75% in 1995 to 81% in 1998.

Seventeen potable water supply projects (17 dams, 15 water treatment plants, 72 water reservoirs) have been completed by DSI. Of the qualified drinking water, about 2 billion m^3 per year in total, served 20 million people in 15 cities. Twenty-five more schemes are in the construction stage to supply an additional 759 million m^3 water per year. The population growth rate is 2% at present but it is forecasted at less than 2% in 2030. Therefore, the estimated population for 2030 will be 110 million inhabitants. In the case of utilization of all water sources, minimum consumption will reach 1 000 m^3 per inhabitant per year.

By the end of 2002, 15 drinking water treatment plants (WTP) constructed by DSI were in operation and six of them started to provide water to the cities in 2000-2002. All drinking water plants constructed by DSI are the conventional type and the quality of the water treated by these plants is equivalent to the standards of the EEC or the WHO.

In 1996, total water consumption was 34 billion cubic meters[3]. DIE calculated that 95.2% of the municipal population (2113 municipalities) was served by a drinking water network; 2.45% (312

municipalities) by supply water from wells, 1.67% (333 municipalities) by water from public fountains and 0.65% (232 municipalities) by water from natural springs.

Water consumption increased eight percent between 1980 and 1997. Among rural residents, 62% have access to safe drinking water and nearly 70% of the urban population is connected to safe drinking water. It is significant that 50% of the total drinking water potential is lost in the supply networks.

There are currently 3215 municipalities with over 2000 people in Turkey. The 2255 municipalities having a water supply network have served 90.26% of the population of all municipalities in Turkey. The 135 municipalities with drinking water treatment facilities in Turkey is 36.02% of the total number of municipalities.

Total water withdrawal of the municipalities through the water supply network equals 4.04 billion m³. According to the water sources, the amounts of the water provided from wells, dams, spring waters, rivers, and lakes are respectively 37.25%; 28.13%; 22.76%; 3.32%; and 6.73%. The remaining was supplied by other resources such as drainage or ponds and small lake (Table 4.4). Out of 1.5 billion m³ withdrawn from surface waters, 2.5 billion m³ was provided from ground water resources. Regarding water treatment; 78.5 % of the 135 municipalities with treatment facilities have physically treated water; 21.49 % of them have chemically treated water.

Table 4.4 General statistics on water

Total municipalities	3215
Municipalities connected to drinking water network	2255
Population with access to drinking water network	90.26%
Amount of supplied drinking water	4 billion m^3
Number of municipalities with water treatment facility	135
Proportion of population served by treatment facilities	36.02%
Drinking water treatment capacity (m³)	1.25 billion

Source: DIE, 1998

Currently, about 55% of the population is connected to the sewage system in municipalities having a population of more than 3,000, whereas only 11% has a wastewater treatment system. These are usually in greater (metropolitan) municipalities. The other municipalities lack a treatment system,

have only primary (physical) treatment, or they lack the capacity to operate the established sewage treatment plants.

Wastes in Turkey are controlled by the regulations on Control of Solid Wastes, Control of Medical Wastes, and Hazardous Waste Control Management with the aim of assessing any adverse impacts. The responsible authorities for solid waste management in Turkey are the Ministries of Environment, Industry and Trade, Interior Affairs, Public Works and Settlement; municipalities; the Chambers of Trade and Industry; and the Turkish Standards Institute.

One way of measuring a country's level of development is to look at data such as access to safe water, which indicates the percentage of people who can lead healthier lives. Safe water includes treated surface water, as well as untreated but uncontaminated water from sources such as natural springs and sanitary wells. On average, a person needs about 20 liters of safe water per day to meet his or her metabolic, hygienic, and domestic needs.

Water supply and sanitation sustainability involves: ensuring the continuous availability of safe water by adequate institutional frameworks; applying sound management practices, appropriate technologies, and full-cost accounting, and maintaining facilities and equipment effectively. However, management of water supply and sanitation systems is often poor, resulting in interruptions in the provision of services and sometimes in the complete collapse of systems. When the latter happens, users may be obliged to resort to traditional water sources, which may be contaminated.

Contamination of distribution pipelines due to intermittent supply, low water pressure in the distribution network, inadequate wastewater collection systems and leaking pipes are also common problems besides those arising from protection of water resources. If contaminated water penetrates into distribution mains, water that has already been treated and disinfected may become re-contaminated.

Adequate supply of safe water often involves a complex mixture of social, economic, and environmental issues. So, it is important for people, industries, farmers and government to begin to acknowledge that water is an economic good, not a "free" unlimited resource. And as an economic good, there is a wide range in the quality and level of water delivery and sanitation services that people want and that they are willing to pay for. Experience shows that when people, even the

poorest, have a choice in the quality of their water supply and sanitation services, they often are willing to pay a higher price for higher quality. In the end, when members of a community--households, factories, farmers, and businesses, together with scientists and policy makers--all participate in deciding on the most feasible water and sanitation systems, everyone tends to be more satisfied with the quality and price of these services.

3. Water for Food, Poverty Alleviation and Rural Development

World per capita supplies of food for direct human consumption are today 18% above what they were 30 years ago. The majority of the developing countries has participated in this progress and improved nutrition. However, impressive as this progress has been, it has bypassed a large number of countries and population groups. Many countries continue to have very low per capita food supplies and have hardly made any progress. Indeed, sub-Saharan Africa is today worse off nutritionally than 30 years ago. And, continuous population growth has meant that the declines in the percentage of chronically undernourished people did not indicate commensurate declines in the absolute numbers affected. The latter have fallen only modestly and remain stubbornly high at some 800 million people.

It is now well recognized that failure to alleviate poverty is a main reason that undernutrition persists. This realization, together with the evidence that the world as a whole faced no major constraints in increasing food production by as much as required to meet the growth of demand, contributed to focusing attention on ways and means of alleviating poverty and improving the "food entitlements" of the poor, while downplaying the role of increasing per capita food supplies. However, the two aspects cannot be separated in the quest for policy responses to the problem of undernutrition. Over one million people in the developing countries are poor, with a substantial majority of them living in rural areas. In the majority of developing countries, increasing food production is among the principal means for combating poverty. This follows from the fact that the majority of the poor depend on agriculture for employment and income. So long as this dependence continues to be high, the growth of food production and of agricultural productivity in the countries with high concentrations of rural poverty will continue to be among the principal means for alleviating poverty and improving nutrition.

Agriculture also contributes indirectly to alleviating rural poverty because it influences the non-farm rural economy. It can also 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.

As the arable land has been used almost to the maximum level, increasing agricultural productivity is mainly dependent on modern production technologies and the right amount of input using which needs integrated management. Extending irrigated areas and using appropriate irrigation techniques are important tools for increasing agricultural yields. The supply and management of water resources plays a pivotal role in food production and security, and many countries, including Turkey, have therefore devoted much attention to improving and expanding their irrigation systems. A total of 75% of the funds allocated for agricultural investments is directed towards irrigation projects.

As mentioned, Turkey has about 8.5 million hectares of land that is economically and physically irrigable. Half of this area has already been equipped with irrigation infrastructure. The rapid expansion of irrigated lands helps to create rural employment and to alleviate migration from rural to urban areas. The average yield of irrigated land is 7.6 times that of dry farming land, and the average value-added per irrigated hectare is 2.6 times that of one rainfed hectare. Irrigated land, although constituting 17% of total arable land, contributes 34% to the agricultural GDP derived from crops.

4. Participatory Irrigation Management

Irrigated agriculture is deemed to be the foundation for sustainable development in Turkey. If it fails to perform up to expectations, this would seriously weaken the economic base of the region and threaten the sustainability of the rapid development that has been taking place. Hence, for the existing and proposed irrigation developments to be sustainable, the present levels of cost recovery must increase and, in line with world-wide trends, encouragement must be given to greater devolution of management responsibility to water users. Turkey has developed its present base of irrigated agriculture very rapidly over the past fifty years, and in so doing, has established a valuable source of technical expertise. The role of irrigation management transfer in improving water use

efficiency and equity through farmers' involvement as well as reducing the financial burden on government has been recognized by the Turkish government since the early 1990s. Hence, DSİ, the central water agency, has managed to transfer the management, operation and maintenance of the irrigation systems at secondary and tertiary levels to the local administrations or to irrigation districts.

DSİ has the primary responsibility of management and operation of the irrigation systems, including the collection of water fees and water delivery to farmers. However, by the Establishment Law Code (1954), DSİ is entitled to transfer the operation and maintenance of irrigation systems to irrigation management organisations (IMO) such as village administrations, municipalities, cooperatives, and irrigation districts (ID). Thus, since the early 1960s, DSI has had a program to transfer O&M responsibility for secondary and tertiary canals to IMO. However, by 1993, DSI was only able to transfer O&M irrigation systems of some 70,000 ha to various types of IMO. This process gained momentum since 1993 and within the past ten years nearly 1.8 million ha irrigation schemes have been transferred to local administrations or to ID: the innovative form of transfer used where the irrigation scheme covers more than one local administrative unit such as villages or municipalities.1 By the end of 2002, the total irrigation area constructed by DSI, GDRS and public irrigation (informal) reached 4,848,000 ha. This area corresponds to 58 % of 8,5 million ha which are economically irrigable under available technology. From the irrigation area in operation, 3,848,000 ha (gross) can be irrigated by technically and economically feasible projects. Of this, DSI has developed 2,657,812 ha gross area (2,296,350 ha net area) mainly under large schemes, GDRS has developed 0.97 million ha as minor schemes, DSI and GDRS have jointly developed 0.34 million ha served from groundwater supply, and farmers individually have developed 1 million ha. As of end of 2001, DSI has transferred about 1,884,000 ha area, which corresponds to 84% of the total area developed by itself.

Efforts to increase the amount of area surface water schemes transferred to ID have been spurred by the poor performance--in terms of cost recovery, equity, efficiency in O&M and repair of the expanding systems--of many large irrigation schemes by government agencies. Background

conditions leading to the irrigation management transfer include: a national budgetary crisis that led to severe limitations on financial allocations to DSI in general and to the O&M Department in particular, and progressive deterioration of the irrigation infrastructure due to deferred maintenance. Notwithstanding these negative aspects, a World Bank supervision mission which to DSI in 1992 facilitated the transfer process. World Bank staff emphasised that if DSI transfers responsibilities to IDs, in particular fee collections, the overall cost recovery system would function properly.

In the event, the older and various types of participatory IMO, such as indigenous management practices, cooperatives and irrigation groups enabled DSİ Regional Directorates to utilise this experience in different ways in developing ID. The irrigation districts in Turkey have been established through the existing local government structures. ID is not a product of any grass-roots movement or organisation. The DSI staff was the major initiator and executor of the transfer program. There were intensive negotiations between the agency (DSI) and the local communities, including representatives from the local governments, concerning the terms of transfer.

Hence, there are presently three main types of organisations involved in the management, operation and maintenance of the irrigation schemes, extending from the primary water source down to the farm level, namely:

(i) DSI managing the bulk water supplies and the main supply canals and controlling the distribution of water to the ID,

(ii) Irrigation Districts managing the secondary systems and controlling the distribution water in the heads of the tertiary hydraulic units,

(iii) Informally organised groups of irrigators controlling water distribution to individual farmers within the tertiary hydraulic units.

Thus there are three forms of transfer:

Full Transfer: All the operational and maintenance activities on irrigation projects developed by DSI are taken over by the water user groups. The responsibility of operation and management is transferred to the water user groups by agreement. This agreement is signed by the water user groups and DSI, then the Ministry approves it, DSI keeps on monitoring and evaluating the operation and management performance of irrigation schemes.

Participation Through Joint Management: This type of transfer has been used in some irrigation projects developed and operated by DSI. Limited responsibility of operation and management services is taken over by water users, named Water User Groups, with an agreement signed by DSI and the water user groups.

Informal Transfer: All the operational and maintenance activities of irrigation projects developed by GDRS, which are small scale and generally serve one village, are managed by farmers. There is no agreement signed between Water Users and GDRS.

Full transfer mentioned above has taken place on a voluntary basis by the water user groups. DSİ O&M staff both at the General Directorate office and at the Regional Directorate offices have provided the technical, administrative and to some extent financial assistance, that are required for the long-term viability of ID. They use existing local government structures to facilitate a framework for sustainable ID. Thus, in the Turkish case, state assistance and regulation is regarded as a continuing activity, even when an ID takes on a greater role in irrigation management. Hence, there is a continuing role played by the bureaucracy in the administration of irrigation resources. The overall success of the Turkish case can be attributed to the fact that there is a collaborative working relationship between DSI staff and the ID, which, in turn, strengthens the management transfer program.

5. Public Participation 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, for every new activity an EIA report has to be prepared and approved by the Ministry of Environment. 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. This could also happen for the water resources development projects. But, up to now,

all the EIA reports of water resources development projects have been approved by the Ministry of Environment.

6. Water and Health

Water supply has direct and indirect impacts on the daily life of communities and their development capacity. The availability and quality of water, sanitation facilities, and hygiene practices are intricately linked to the wellbeing of children. The interaction of these sectors is not solely water supply, sanitation, and hygiene issues benefiting the other areas, as improvements in these areas also improve the effectiveness of service delivery and utilization for water supply and sanitation.

A UNICEF report from 1998 states that, although access to water and sanitary facilities has improved in Turkey, the occurrence of water borne diseases is increasing. During the last two decades, access to water supply in both rural and urban areas has dramatically improved. Data from 1995 shows that 97% of the urban population, and 80% of the rural population, had access to water supply, and these figures continue to improve. However, when it comes to 'safety' and 'convenience' of water supply, regional disparities persist: only 28% of rural households secure safe and convenient water, while in the urban areas the percentage rises to 71%.

Access to sanitation in rural areas was 99% in 1995, improved from 89% in 1985. In urban areas, the level of access to sanitary excreta disposal was estimated at 99% in 1995. However, statistical access to latrines does not give an adequate picture of their appropriateness or their sanitary conditions: available data on accessibility to 'appropriate' and 'convenient' sanitation indicate that only 33% of rural households actually have such accessibility, compared to 86% of urban households.

Additionally, UNICEF indicated that although the water supply and sanitation infrastructure is continuing to develop, there continues to be a need for better education on general hygiene. Environmental health risks due to poor management of wastewater and excreta, unsafe food handling practices, need to be addressed to complement infrastructure improvements, in order to effectively reduce the incidence of water-borne disease.

The Turkish Demographic and Health Survey (DHS) of 1993 included a survey of the incidence of diarrhoea among children under five. Twenty-five % of children under the age of five had experienced diarrhoea within 15 days prior to the survey. Incidence was found to be higher among rural children, children in the eastern regions, and children of mothers with limited or no education. The Ministry of Health's Control of Diarrhoeal Disease Program, begun in 1986, responds to this need by free distribution of oral rehydration therapy (ORT), education programs for mothers, and public awareness campaigns. Consequently, ORT usage increased from 44% in 1988 to 57% in 1993, but as seen by the 1993 DHS report, the need for education programs and hygiene awareness continue. Please see Chapter 8 "GAP Case Study" for case studies of projects addressing water borne diseases in the Southeastern Anatolia Region.

7. Resettlement

The resettlement of families adversely affected by infrastructure projects in Turkey is regulated by the Resettlement Law, which provides for state-assisted resettlement in both rural and urban areas. In order to implement resettlement successfully, a commission has been established under the State Planning Organisation and all necessary coordination between various related organisations is being carried out by the commission. 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.

In Turkey, while expropriation compensation payments are granted to all individuals holding immovable 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. Compensation to affected families includes the provision of a home or plot of land sufficient to meet the needs determined by the size of the household; provision of credit to artisans and tradesmen in order to establish new workshops; and the provision to farmers of sufficient farmland, livestock, farm equipment, seeds, storage units, and other inputs. The current resettlement law extends eligibility for resettlement to the following categories of residents:

- Families whose assets have been expropriated for large public infrastructure projects (dams, airports, highways, harbours, etc.), nomadic or transient populations who are considered beneficiaries of this law under special provisions.

- Households in a project area with no immovable property to be expropriated can also be eligible for government sponsored resettlement, although they do not receive expropriation compensation.

- Rural resettlement: Families engaged in agriculture may choose government-assisted rural resettlement. Eligible households receive housing, farm buildings, farmland, credits for animal husbandry activity and initial agricultural production, equipment and inputs for crop production such as fertilizers and agro-chemicals. The resettlement package is intended to enable the resettled household to earn at least the market equivalent of 13,500 kg wheat. The size of the parcel allocated is dependent on the size of the household.

Farmers also receive free counseling services on how to optimize land use, new agricultural methods, and other relevant activities, through MARA and other institutions. All rural resettlements include a post office as well as a health center staffed by a doctor, a nurse, and midwife. The government also conducts routine health controls and arranges informative meetings at resettlement sites. Various social activities are also supported with the aim of helping to integrate resettled families into the local host population.

Urban resettlement: Housing settlements are provided in the city centres, towns and the countryside in accordance with zoning and construction plans where land is available for development. All these settlement projects encourage local participation to achieve a return on investment. GDRS also undertakes the consolidation of unsustainable distant and scattered settlements as well as the establishment of village development centres.

In both rural and urban resettlement, the value of the expropriated property of a family may exceed the cost of resettlement. In such cases, after final calculations have been made, the difference is paid back to the owner. Conversely, if the value of the resettlement package exceeds the of the expropriated property, the owner is granted a five-year moratorium on the debt, followed by a 20 year interest-free repayment period.

Standard Implementation Sequence

After the decision to expropriate lands is made, GDRS is responsible for informing affected settlements, in writing, of the pending action. Each unit targeted for expropriation is visited by

resettlement teams. All applicants are contacted and asked to fill out documents of commitment. GDRS investigates the availability of public lands near the project area. If suitable nearby public lands are not available, destination sites are obtained through purchase or expropriation. Arrival site should not be far from the departure area. Resettlement policy in Turkey emphasises the importance of nearby relocation in order to mitigate negative effects.

Resettlement housing is designed appropriate to the climatic and socio-economic requirements of the project area.

Detailed soil analyses are performed at the destination site while an agricultural redevelopment package is prepared to ensure that households will be able to maintain or, if possible, improve their standard of living.

CHAPTER 5: WATER AND ENVIRONMENT

1. Existing Legal Structure

A new legal structure of environmental protection and water management has emerged over the past two decades in Turkey, driven by an increased emphasis in domestic law; the expansion of activity in terms of bilateral and multilateral international agreements; and the nation's efforts to meet EU criteria toward accession to full membership. The combined result of these three approaches is to raise both the visibility of water and the environmental issues in Turkey and to enhance the ability of the government to act effectively in protecting what its Constitution refers to as its "national wealth".

1.1 Domestic Legislative Action

The foundation of modern water management in Turkey was established in the Turkish Constitution of 1982, which defined water resources as the wealth of the nation, under the authority of the State, to be used for the benefit of the public. Consistent with this principle, recent environmental legislation stressed this theme, a legal notion of "the Commons." The responsibility of the State is to protect the Commons against individual interests that may lead to environmental degradation. This is clearly seen in enactment of the Environmental Law of 1983, introducing into Turkish regulations the approach that environmental protection and pollution prevention can be enhanced with a "polluter pays" principle. That is, a legal distinction is made between the public interest and private interests. In effect, the law provides for a social contract between the State and Turkish citizens concerning how the environment is to be managed and also links the prevention and elimination of pollution with the protection of the environment and sustainable resource management. This law defined the legal approach to the environment and natural resources that has continued to the present.

Later legislation further elaborated this framework, notably the Water Pollution Control Regulation of 1988. This legislation, focusing principally on land use regulation and control of water discharge practices, provided for the regulation and treatment of water resources in terms of an overall ecosystem, as opposed to their being viewed simply as one commodity among many others. Further,

it upgraded the conservation and treatment of water to the status of a national priority. As the Water Pollution Control Regulation deals primarily with surface water, supplementary additional legislation was later developed under the Groundwater Law, the responsibility for which was assigned to DSI.

More recent reform in environmental management introduced other new concepts into Turkish law, such as the EIA regulation of 1993, subsequently revised in 1997 and 2002. Newly planned industrial concerns are required to prepare EIA reports and are subject to review by both governmental agencies and non-governmental organizations in terms of their efforts to minimize negative environmental impacts. Additionally, the Ministry of Environment was established in 1991 to more clearly designate authority for environmental management as well as to emphasize symbolically the growing priority for environmental protection in Turkey.

In general terms, Turkish law in water resources and environmental protection areas has been developed in four key areas:

- Constitutional Mandates
- Regulatory Law
- Natural Resource Utilization Regulations
- Public Health Law

Although legislation in this area has been a matter of Parliamentary interest since the formation of the Grand National Assembly in the 1920's, some of the most important and far-reaching reform in water resources and environmental protection has taken place within the past twenty years. Indeed, Turkey's recent Constitution is one of the few examples in the world in which a foundational legal document explicitly mentions water resources. Much of Turkey's recent progress stems from the priority that Turkish law has placed on this area and it continues to be a highly active and visible issue.

1.2 International Agreements on Water and the Environment Ratified by Turkey

Turkey is a signatory of a number of international agreements to protect water resources and the environment. Recent multilateral treaties include:

- Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean, Barcelona Convention , 1976 (ratified by Turkey in 1981)

- Protocol for the Protection of the Mediterranean Sea against Pollution from Land-Based Sources and Activities, 1996 (ratified by Turkey in 2002)
- Protocol Concerning Mediterranean Specially Protected Areas and Biological Diversity, 1995 (ratified by Turkey in 2002)

- Convention on the Conservation of European Wildlife and Natural Habitats, Bern Convention, 1979 (ratified by Turkey in 1984)
- Convention on the Protection of the Black Sea against Pollution, Bucharest Convention, 1992 (ratified by Turkey in 1994)
  - Protocol on the Protection of the Black Sea Marine Environment Against Pollution from Land Based Sources, 1992 (ratified by Turkey in 1997)
- Convention on Biological Diversity, 1992 (ratified by Turkey in 1997)
- Convention on Long-Range Trans-boundary Air Pollution, 1979 (ratified by Turkey in 1983)
- United Nations Convention to Combat Desertification in Those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa, 1994 (ratified by Turkey in 1998)
- Convention on Wetlands of International Importance Especially as Waterfowl Habitat, Ramsar Convention, 1971 (ratified by Turkey in 1994)

Turkey has also been a signatory on more than 25 water and environmentally related international declarations and documents since 1972.

1.3 Regulatory Changes Carried Out Under EU Harmonization Criteria

In December, 1999, the European Council meeting in Helsinki, Finland, confirmed that Turkey was a candidate country destined to join the EU. Accordingly, as part of its preaccession process, Turkey is currently engaged in aligning its national laws, rules, and procedures with the EU Acquis, including those in the field of environment. This Accession Process, initiated in Turkey in 2000 and as coordinated in this sector by MOE include:

- Harmonization of Turkish legislation with related EU directives on water protection and management.
- Improvement of regulatory structure in environmental sector.
- Establishment of monitoring and data-collection network.
- Integration of principles of sustainable development into all sector policies and regulations.
- Implementation and enforcement of Turkey's EIA directive

- Determination of the necessary legal, technical, and administrative infrastructures for EU compatibility
- Alignment of existing waste legislation to align with EU standards
- Initiation of a needs assessment to reach EU water quality standards
- Alignment of regulations concerning the control of dangerous chemical substances with EU standards

In 2001 as well, the Ministries the Environment of Turkey and the Netherlands signed a Memorandum of Understanding in which they agreed to begin a project aimed at assisting Turkey in implementing the EU Water Framework Directive. Under the scope of a mutual agreement established between Turkey and the Netherlands concerning the MATRA and PSO programmes involving technical assistance for EU candidates.

The broad goal of the project is to assist Turkey with its compliance efforts in relation to the *Acquis Communautaire* and, thus, facilitate the country's accession into the EU. However, the more immediate purpose of the project is to support Turkey with the implementation of the Water Framework Directive on a national and regional level. Specifically, the project is designed to foster collaboration and co-operation between institutions and organizations responsibile for water management and to aim for a participatory and integrated approach in water management planning in Turkey. The project will develop in three stages:

Stage One- Relevant legislation harmonisation studies will be carried out in Turkey under the 2000/60/EEC Water Framework Directive. The Directive requires its implementation on the basis of river basin management plans. For each river basin, the Directive requires:

- Assessment of the characteristics of the basin;
- Establishment of a program of measures to achieve the objectives of the Directive
- Summarising of the above in a river basin management plan
- Public consultation of the plan

Stage Two-River catchments management studies will be carried out

Stage Three-Implementation studies will be carried out in the Büyük Menderes River Catchment area which was selected to serve as a project pilot. The results of the pilot will provide

information as to the structure for proper implementation of the balance of the requirements of the directive.

While these initiatives proceed, the motivation for EU membership is likely to continue to further stimulate environmental progress in other areas. Significant benefits may be expected as a consequence of both its progress in legislation apart from EU accession, as well as its additional efforts to harmonize with the water resources and environmental standards of Europe.

2. Water Pollution

Globally, the increase in population has a direct effect on demands for fresh water resources, doubling it every twenty years. Further, economic growth and environmental degradation in other areas has exacerbated this burden, increasingly threatening current water resources less usable due to pollution. This is particularly problematic for developing countries experiencing rapid institutional change.

River Basin Management (for Büyük Menderes River Basin)

For the Büyük Menderes River Basin pilot study, the Province of Aydin was selected as the project center. In July, 2002, the project team made its first visit to the area. During this mission, the project team met with community stakeholders and introduced the project, getting their ideas as to how the project should be implemented. The Aydin PDoE was determined as the regional coordinator of the project and a project office has been opened in the PDoE headquarters. The Regional Directorate of DSI (XXI Region) in Aydin is the main supporter of the PDoE and the project.

The pilot study officially started on September 3, 2002, with the first regional workshop, which was held with the participation of all related (government/non-government) organizations in the basin. During the first part of the workshop the general scope of the project and the results of the stakeholder analysis performed earlier were introduced. The second part of the workshop focused on problem identification and possible solutions. At the end of the workshop the **River Basin Management Working Group** (RBMWG) was determined.

The RBMWG first met on September 5, 2002. During this meeting tasks and responsibilities of the group were defined and a draft protocol was introduced. The group has now started to implement their work with a regular weekly meeting schedule. The first task of the group will be the preparation of a *data inventory* for the basin. This task will be completed shortly as the group needs those data for the preparation of integrated river basin management plan. During February, 2003, these works were scheduled to be compiled by the RBMWG with assistance of Dutch and Turkish experts.

Turkey demonstrates the same pattern of challenges exhibited elsewhere. The rapid growth of population and its redistribution to urban areas as well as growth in manufacturing, agriculture, and tourism have intensified the pressure on the physical environment, most especially water. In particular, demands for fresh water have been exacerbated due to the increasing requirements of irrigation to provide for growing requirements in agricultural commodities for domestic consumption and greater economic opportunities in export markets. In addition, threats of pollution to existing supplies and a diminishing availability of easily exploitable new water resources have escalated the problem. This indicates that more funds will be required for water development at the same time as costs are increasing for water treatment. Failure to establish sufficient substructure and treatment plants for disposal of domestic and industrial wastes create serious environmental threats, particularly on Turkey's surface water resources and seas.

2.1 Surface Water Conditions

In 1996, total water consumption was 34 billion cubic meters. Over 95% of the municipal population (2,113 municipalities) were served by a drinking water network, 2.45% (312 municipalities) by supply water from wells, 1.67% (333 municipalities) by water from public fountains, and 0.65% (232 municipalities) by water from natural springs.

Annual consumption of drinking water supplies capita was about 74 cubic meters in Turkey, compared to the EU average of 100 cubic meters. While this is obviously lower than the target standard, per capita water consumption increased 8% between 1980 and 1997. Among rural residents, 62% have access to safe drinking water supplies, compared to 70% of the urban population. It is significant that 50% of the total drinking water potential is lost in the supply networks. Based on the data, this is a relatively greater problem for the urban population, but the rapid growth of the cities indicates a pressing need to address this issue.

With regard to water treatment, 71.8% of the municipal population was connected to sewage systems, 13.8% connected to wastewater plants. Of those municipalities having a population over 3,000, about 55% are connected to sewage systems, 11% to wastewater treatment plants. The other municipalities have no treatment facilities other than primary (physical) treatment or they do not have the capacity to operate established sewage treatment plants. Seventy-five percent of Turkey's industrial wastewater is discharged without any treatment, primarily into seas and rivers, 20% receives adequate treatment, and 5% receives only primary treatment. Further, approximately half of the 190,000 industrial enterprises in Turkey work in pollution-creating industries.

Clearly, many steps need to be taken to improve sustainable management of water resources in Turkey. Action needs to be taken to increase the share of the population connected to sewage treatment. Further, the price structure of water should be revised to better reflect the investment and maintenance costs and to ensure its rational use. At present, financing for construction of urban water, sewage, and treatment plants is provided largely by the central government through the Municipalities Fund of the Bank of the Provinces. These funds typically fall short of the infrastructural requirement, particularly for the growing urban areas. However, seeking external funds shifts the burden to foreign debt, a matter of current concern in Turkey's efforts to restructure

its financial framework through its engagement with the IMF. Therefore, finance for investments in water supply, sanitation, sewage treatment, and solid waste disposal is still a burden for the central government and Turkish municipalities. Provision for greater financial autonomy for the municipalities is planned for the revised "Law for Local Authorities", currently under review. However, passing on the authority from the central government to the municipalities for water resources decisions without adequate funds to respond to the emergent needs will not by itself significantly reduce the gap Turkey faces. Priority should be given to the development of public-private cooperation for finance, a direction currently suggested by the growing body of law in the area.

2.2 Conditions of the Marine and Coastal Ecosystems

Turkey is encircled on three sides by the sea: the Black Sea on the north; the Marmara on the northwest; the Aegean on the west; and the Mediterranean on the south, a total coastline of 8,333 km, excluding islands. Each coastal region has its own ecosystem and its own set of environmental challenges.

2.2.1 The Black Sea Region

The Black Sea is the largest anoxic sea in the world, and the one most isolated from oceans. It is currently under threat from loss of habitats, over-fishing, and by pollution caused by discharges from sea transportation and land discharges. Extreme concentrations of pollutants, such as PCB and DDT, are found in harbor areas. Land-based pollutants flow mostly from the Danube River Basin and cause eutrophication and seasonal hypoxia. Each year, 111,000 tons of oil and oil composites flow into the Black Sea, 48% from the Danube River Basin alone. About 50,000 vessels per year enter the Black Sea, polluting the seawater with wastewater and oil spillages.

2.2.2 The Sea of Marmara

Due to the special biological, geographic, meteorological, and hydrological characteristics, the Turkish Straits and the Sea of Marmara form a special ecosystem. As the most heavily trafficked waterway in the world, the Marmara and the Straits bear 50,000 vessels per year, about 6,000 of

which are tankers. The short visibility and strong currents lead to a disproportionate number of accidents and attendant environmental risks. It also is the point of introduction of a number of new species that threaten seabed ecosystems. While protected by international treaties since 1994 and increasingly strong enforcement have protected the human and environmental safety of the sea, the fundamental conditions of the area make it highly fragile and sensitive to the ongoing threats of pollution.

2.2.3 The Aegean and Mediterranean Seas

The Aegean Sea, essentially a part of the Mediterranean and connecting it to the Black Sea, has a critical location in terms of the biodiversity of both Europe and Anatolia. The plant and animal life of the Aegean is under threat of oil spillages and habitat destruction. Settlements located in the coastal regions of the sea do not have adequate infrastructures, making urban and industrial wastes a very serious threat to coastal ecosystems. Further, its place on the route between the Mediterranean and Black Sea make it particularly vulnerable to oil tanker accidents. The ecosystems of the Aegean are also threatened by increased human settlements on the islands, coastal tourism, developments that ignore environmental requirements, and by the construction of harbors and highways. While some of the Mediterranean region is still untouched, the impacts of environmental degradation elsewhere in the region are threatening these pristine ecosystems and their fragile plant and animal species.

3. Protection of Special Bodies of Water

3.1 Environmental Threats to the Wetlands

The loss and degradation of wetlands in many countries all over the world, including the Mediterranean region, is continuing at an alarming rate. In Turkey, the total area of wetlands drained exceeded 90,000 hectares by 1986 as a result of drainage activities related to malaria control and the increased need for farmland. Consequently, decreases, in both the bird populations and the number and variety of species of nesting birds, have been observed in Anatolia. By 1991, 61 wetlands of international importance had been identified in Turkey, 55 of which have no protected status. Even those having such status are not sufficiently protected, however, to prevent all degradation. Among those few, Sultan Sazligi, which is host to over 251 bird species, has received protection only since the 1980's. Since then, hunting has been prohibited, although some animal poaching still exists. In

Wetlands Protection (Lake Uluabat)

Lake Uluabat is located south of the Marmara Sea, in the Karacabey and Mustafakemalpa'a districts of Bursa Province, northwestern Turkey. Uluabat is a large freshwater lake, is one of Turkey's richest wetlands in terms of aquatic plants. The plants and the richness in plankton and small aquatic fauna make Uluabat a very important feeding area for various species of wildlife.

Lake Uluabat is currently under active consideration for protection measures. It currently has none and some evidence shows a process of degradation taking place. Lake Uluabat has its only outlet is in the northwest, where it drains into the Kocaçay River. When water levels drop too much, the river starts feeding the lake instead of draining it. The entire west side of the lake, and several kilometres of the Mustafakemalpasa River, are now embanked. Incoming silt has formed an inland delta, which is largely under due to agricultural use. Lake water is used to irrigate surrounding fields. The area is one of the most productive agricultural areas of Turkey. There are arable lands, fruit plantations and stockbreeding. Industry is limited, and mostly based on agriculture and the area is of archaeological importance.

As a step in the process of protecting this valuable wetland, the Ministry of Environment commissioned a research project to investigate the ecological and biological value of Lake Uluabat in 1997. Several other conservation actions have been carried out by the Ministry, such as regular inspections of the lake by the Provincial Office staff of the MOE. In 1998, a project to establish a management plan for the site was proposed, with the support of the Ministry.

another case, a project exists for the integrated management of the Göksu Delta in Southern Turkey, with support from an NGO (DHKD), the Dutch government, Tour du Valat Research Station in France, and the Turkish NGO DHKD. The Kizilirmak Delta is another example of environmental management which has a high degree of ornithological importance, having 250 species of birds, and is classified as a Class A wetland according to international criteria. Despite these examples, the lack of wetlands protection has been much more generally the case in Turkey over the years.

Still, the value of wetlands has recently been recognized and, thanks to international efforts, steps are being to conserve them and reduce their over-exploitation and loss. The three international actions for the conservation of wetlands are the Ramsar Convention, the Grado Declaration and the Mediterranean Wetlands Forum (Med-Wet). The most important of these is the "Convention on Wetlands of International Importance especially as Waterfowl Habitat" (Ramsar) In this convention, wetlands are defined as "areas of marsh, fen, peat land or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters". By the Ramsar definition, dam lakes and some other water resources development structures can also be considered as wetlands. An example for such an artificial wetland is the Yedikır Dam Lake in Turkey, constructed by DSI on a dry valley in Amasya by collecting the water of Tersakan River, which has been developed as a bird sanctuary.

3.2 Environmental Threats to Lakes

Lakes also have their share of similar problems, such as irrigation, drainage, pollution, over-fishing, hunting pressure, housing etc. An environmental impact assessment was carried out on Lake Beysehir by an interdisciplinary team, including the author, for an irrigation project and management. It is estimated that if the amount of water to be taken from the lake is doubled (300 x $106m^3$ to 600 x $106m^3$) the area of the lake will be reduced by one third, and the water level will be lowered by 6-10 m. This will have a considerable effect on the ecosystem. The theory of Island Biogeography states that the number of species in a given area is directly related to the size of the area. Therefore the larger the area, the larger the species-diversity. Accordingly, in Lake Beysehir the number of naturally

occurring fish species is likely to decrease from 8 to 7, phytoplankton species from 52 to 45 etc., as a result of reduction in size alone.

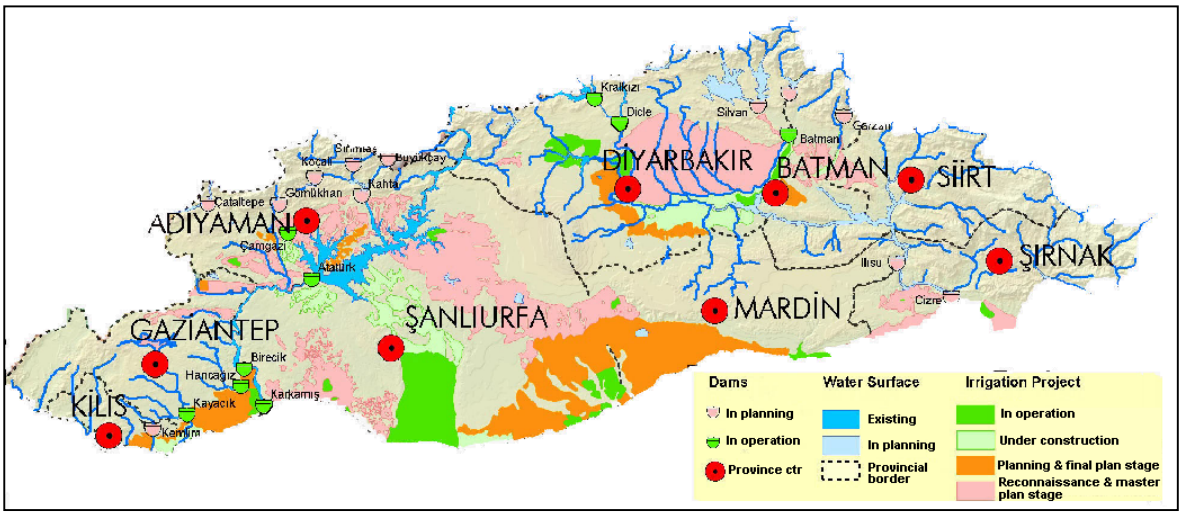
Some argue that it is already too late to save many of the developed world's wetlands. They have already been lost to intensified agriculture, urban development, industrial growth, and pollution. As previously discussed, Turkey needs significant supplies of water to meet the needs of its growing population and to encourage future economic development. However, these resources and their potential for economic development must be managed in such a way that to avoid irreversible damage to ecosystems. In the absence of such environmental protection, any gains made in either water supplies or economic benefits will be impossible to sustain. Since the value of wetlands is obvious, and vital, not only for bio-diversity but also for the survival of human populations, they must be protected.

CHAPTER 6: GAP: A CASE STUDY ON WATER-BASED DEVELOPMENT

1. Introduction

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. 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, 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. All of the institutions, mentioned in Chapter 3, that are responsible for water resources management and development related activities in Turkey have responsibilities for the sectors of a grandiose project like GAP. In 1989, with the transformation of GAP to a multi-sectoral 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 for 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 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 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). The Project includes 22 dams, 19 hydropower plants, and irrigation networks, on the Euphrates and Tigris river basins, to irrigate 1.7 million hectares of land. The total cost of the project is estimated as USD 32 billion, 16 billions of which have already been invested. The total installed capacity of power plants is 7476 MW and projected annual energy production reaches 27 billion kWh.

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. In this chapter, the GAP experience of realising sustainable development in Southeastern Anatolia (GAP) Region of Turkey and the strategy to create human, social and man made capital, while attempting to conserve national environment, to seek public participation in sustainable development process will be described.

2. Challenging Conditions in the GAP Region

Compared with the rest of Turkey, the GAP Region has had higher population growth, fertility and infant mortality rates, and lower life expectancy at birth than the national average.

Tribal structure has been the dominant type of organization for centuries in the Region. Tribal organizations have very deep roots in nomadic life of the people and the formation of the institutions

and state apparatus have been in conformity with the tribal characteristics of the people. Despite transition from simplicity to complexity and from homogeneity to heterogeneity with settled life and urbanization, the tribal organization and culture still have affects on some villages and farmer associations, land ownership, tenure relationships and some state initiated projects.

The Region is well below country averages in terms of the number of schools and of student/teacher and student/class room ratios (one teacher for 31 students in Turkey vs. one for 42 in the Region; one class-room for 42 students in Turkey vs. one for 58 in the Region).

Water for drinking and other purposes is not available in sufficient quantities. It is also not purified or chlorinated in many urban settlements. Around 28% of the village population do not have drinking water, and a 12% have drinking water only in limited quantities. Most of the water distribution systems available cannot be operated in an efficient manner, due to both lack of finance and qualified personnel, and the situation is worsened by the frequent breakdowns in the water networks.

Drainage and water refinement facilities are not sufficient in the GAP Region in general. In some provinces, wastewater is used for irrigation purposes at the vegetable gardens. There are serious problems concerning the human health and environmental safety, in the process of solid waste collecting, accumulating, storing and disposal. Excessive migrations from rural areas to towns contribute to growth of these problems.

The human capital of the Region is largely underemployed or unemployed. The rate of unemployment is still very high in the Region. This situation has been worsened as a result of the Gulf War and the subsequent UN embargo on Iraq.

3. GAP: A Paradigm Shift to Sustainable Development

In spite of these bottlenecks, the Region has potential in terms of water, land and human resources. The majority of the Region lies in the Euphrates and Tigris River basins. The two rivers represent over 28% of the nation's water supply by rivers and economically irrigable areas in the Region make up 20% of those for the whole country. As of 2002, around 10% of Turkey's population

lived in this region. But a distinguishing feature of human resources is the number of young people. Approximately 77% of the population was under the age of 35 in the year 2002.

The Turkish government has placed increasing emphasis on the reduction of inter-regional disparity in the nation's balanced socio-economic development. Development of land and water resources in the Region is still considered the backbone of the Southeastern Anatolia Project.

Starting as an energy and irrigation project to develop the rich land and water resources of the Region, the GAP was transformed into an integrated regional development project with the completion of the GAP Master Plan in 1989. The Master Plan is a guide for plans, programs and projects to be designed in conformity with the overall line and sub-scales that the development of the Region will follow. To achieve the targets, which complement each other and form an integral whole, the GAP Master Plan identified four basic strategies:

- To develop and manage water and land resources both for irrigation and also for urban and industrial use,
- To improve land use by introducing better farm management, agricultural practices and crop patterns,
- To encourage manufacturing industries by giving special weight to agriculture related and local resource based production lines,
- To improve social services and urban infrastructure facilities to better respond to the needs of local people and to attract and keep qualified personnel in the Region.

The basic development scenario envisaged by the Master Plan is to turn region into an agro-based industrial center. Today, GAP is a regional development project carried out within the framework of sustainable human development. In this sense, it targets to create opportunities for the people of the Region to enable them to materialize their economic potential and preferences fully.

Irrigation can be regarded as a powerful tool for transforming the social structure and habits of a rural/semi urban population in addition to bringing about a direct increase in their agricultural productivity. Introduction of large scale irrigation to a region creates a significant changes in the total socio-economic order in addition to providing the obvious water supply infrastructure and allowing intensive agriculture. The ultimate aim of GAP is to ensure sustainable human development in the Region. There is an ongoing collaboration between professionals such as anthropologists and sociologists working at the micro level and economists and irrigation technologists at the macro level

in order to achieve a result which makes optimal use of both physical and social features of the GAP Region. The following sustainability goals have been adapted for the development process:

- Increasing investments to the optimal level which would accelerate the economic conditions
- Enhancing health care and education services so that they reach national levels
- Creating new employment opportunities
- Improving the quality of life of the cities and improving urban and social infrastructure so as to create healthier urban environments
- Completing the rural infrastructure for optimal irrigation development
- Increasing inter- and intra-regional accessibility
- Meeting the infrastructural needs of existing and new industry
- Prioritizing protection of water, soil and air and the associated ecosystems
- Enhancing community participation in decision-making and project implementation.

To reach a definition and priorities of sustainability for GAP such as social, physical, spatial, environmental, economic and agricultural sustainability for GAP, GAP-RDA in collaboration with UNDP, organized a four-day workshop, attended by a large number of stakeholders, NGOs, universities and public institutions. In accordance with the sustainable development approach of GAP, special programs and projects have been initiated to emphasize the human dimension of development through project implementations concerned with basic social services (education, health, housing), gender equity, urban management, irrigation facilities, agricultural and environmental sustainability, institutional and community capacity-building, and public participation. GAP-RDA has implemented a number of social, economic, cultural and environmental projects in consonance with the development of physical, social, human, economic and natural capital, and plan to use them as a springboard into the issues of integration at the local, national and international levels.

4. Physical Capital

The majority of the GAP Region lies in the Euphrates-Tigris basin. The total catchment area of the Euphrates in Turkey, upstream of the Syrian border, is 103 thousand km^2 of which 22% lies within the GAP Region. The upper Euphrates basin is separated from the GAP Region by the

Southeastern Taurus Mountains. The mean annual run off near the Syrian border is estimated to be 31 billion m3. The Tigris River, in the east of the GAP Region, drains a catchment of 38,000 km^2 north of the Syrian border; 30,000 km^2 of this basin lies within the GAP Region. Mean annual discharge in Turkey is estimated to be around 17 billion m3. The water quality of both rivers is good and suitable for irrigation with electrical conductivity values of below 0.6 mhos/cm and SAR of below 0.4. In order to utilize the available water resources, GAP envisages the construction of 22 storage dams and 19 hydro-power plants, of which 12 dams are complete and 6 hydro-power plants are in operation.

GAP-GOLD (Syria) Cooperation

GAP RDA signed a document of cooperation with the General Organization of Land Development (GOLD) of the Irrigation Ministry of Syria for promoting joint irrigated agricultural research projects, exchange programs in management, operation and maintenance of irrigation systems, improvement of soil in levelled lands through use of agricultural residues and bio-fertilizers, and other activities. To cooperate for development, exchange knowledge and experience and improve technical capacity.

The Memorandum of Understanding covers joint projects, study tours, exchange programs, and training programs to (1) improve the technical capacity of Syrian experts through international training courses, custom-made courses and other joint courses offered by the GAP RDA; (2) carry out joint projects with the participation of other organizations from the two countries; (3) realize exchange programs, visits of top executives, experts, and staff and (4) develop cooperation between the GAP Agricultural Research Station in Koruklu in Turkey and the Martyr Basel Al-Assad Research Center in Syria. Also both parties agreed that one of the first projects could be development of twin protection areas, one from each country to be studied, planned, and implemented as a twin development project.

An Implementation Document of the Joint Communiqué was signed 19 June 2002 in Aleppo in order to initiate the Twin Villages Project, the Joint Irrigated Agricultural Research Project, and training programs on participatory irrigation management, integrated water based development, and women and youth in development.

4.1 Impact of Irrigation on Poverty Reduction and Regional Development

4.1.1 Irrigation and Hydro Power

WWC Thematic Center, Ankara

In 2000 the WWC developed the *World Water Vision* to build consensus among professionals and stakeholders to avert further water crises and encourage activities to turn the Vision into Action. To this end, the WWC approved the establishment of its first Thematic Center in Ankara at the Board of Governors meeting in March 2001 in Istanbul. The two leading institutions in water and development issues in Turkey, namely DSI and GAP-RDA, have recognized the necessity of sponsoring such an institution to accelerate multidimensional sustainable water resources development.

The mission of the Thematic Center (www.wwcthematiccenter.org) is to accelerate multidimensional sustainable water resources development through user-driven empirical research and knowledge dissemination on stakeholder participation and intersectoral integration. Since its establishment the Thematic Center has become an active player in the water community through various activities such as holding a series of search conferences' to open up its mission and activities to different stakeholders; drafting two volumes entitled *Water Development and Poverty Reduction* and *Water Resources Management: Crosscutting Issues*; and participating in preparation activities for the Third World Water Forum, namely registering six sessions and collecting a thousand water messages.

Of the total cultivated area of the Region, around 3.9% were irrigated in 1985 After the completion of the GAP Project this is expected to increase to 22.6%. As of June 2002, 215,080 ha had already been brought under irrigation

Turkey produced about 17.6 billion kWh of hydraulic energy in the first six months of 2000. In this total, GAP has a share of 39.7% with its production of 7.8 billion kWh (the energy production target of GAP is 27 billion kWh). In the same period, the share of GAP in the aggregate (thermal and hydraulic) energy production of the country, which is 61.2 billion kWh, is 11.4% (Table 10).

Table 1. GAP-Country Total Comparison in Energy Production, 1995-1999

YEAR	ENERGY OUTPUT OF TURKEY			GAP	GAP/TURKEY	
	Thermal GWh	Hydraulic GWh	Total GWh	Hydraulic GWh	Hydraulic (%)	Total (%)
1995	52,548	31,973	84,521	16,114	50	19
1996	54,448	40,423	94,871	19,314	48	20
1997	63,299	39,764	103,063	19,385	48.7	18.8
1998	68,677	42,224	110,901	20,053	47.5	18
1999	81,800	34,629	116,429	14,781	42.7	12.7

Source: DSI

4.1.2 Agriculture in GAP

The development of agriculture in Southeastern Anatolia is a major part of the GAP Project. Agriculture is the dominant sector in the Region and accounts for nearly 40% of the gross regional product. The Region contributes 9% of value-added agriculture in Turkey. Rural development is vital to GAP, since 35% of the total population lives in rural areas and depend on agriculture for their livelihood (Table 11). The objective in rural development is to achieve sustained growth of the rural economy and improved well-being of the inhabitants. Each member within every household has a role to play, whether this is in farming, trading, wage labor, or other off-farm activities by combining their efforts in producing food and generating income for the household.

Table 2. Main socio-economic indicators of the GAP Region (2000)

Main Indicators	Turkey	GAP Region	GAP Share (%)
Land Area (km^2)	779,452	75,358	9.7
Total Population	67,844,903	6,604,205	9.7
Annual Growth Rate (%)	1.83	2.47	-
Population Density (person/km^2)	87	88	-
Urban Population (%)	65.0	62.9	-
Share of agriculture in GDP (%)	14.4	39.6	11.0
Share of Manufacturing in GDP (%)	23.0	11.7	4.0
Share of Services in GDP (%)	62.6	48.7	5.0
GDP (billion US$ at 1997 prices)	188.77	9.8	5.1
GDP Per capita (US$ at 1997 prices)	3,002	1604	53
Exports (million US$ in 1997)	26,245	619.1	2.36

Source: DIE 2001

The concept of rural development goes beyond that of food production to include environmental concerns and needs. Both agricultural development and environmental protection have economic, social and cultural dimensions, for which planning are very essential. People are at the center of all rural activities, and efforts to improve their standard of living in a sustainable way is the most important objective of rural development. The concept of sustainable human resource development defines the provision of the rural population viable agriculture and income generating activities, as well as clean water, sanitation, adequate education, etc. These efforts are directed through GAP as an integrated and holistic rural development project, which provides a combination of material and technical assistance to over 2 million rural inhabitants in the villages of the Region, in order to help village communities improve their quality of life, both socially and economically. This means the production of more food in order to alleviate hunger, providing clean water to minimize the spread of disease, and creating employment opportunities for income generation. These factors are all interrelated and affect farming as a way of life in the rural areas.

Bordered by Syria in the south and Iraq in the southeast, the GAP Region has a total area of 75,000 km^2, which constitute 9.7% percent of the total area of Turkey. The topography is generally subdivided into uplands and plains. The uplands extend southwards from the Southeastern Taurus Mountains, and consist of high, deeply incised ranges around the perimeter of the GAP Region. The

plains are to the south of the Region and extend towards Syria and Iraq. These mainly lie between 450 -550 m above sea level.

Hot-dry summers, and cold-wet winters characterize the climate of the Region. The mean annual rainfall declines from over 1,200 mm in the North to 311 mm in the South. The mean monthly rainfall is very low during June and September and reaches its peak in December and January, with a wide variation from one year to the other.

4.1.2.1 Population and employment in agriculture

There is evidence of human settlement in what is now the Southeastern Anatolia Region since the Neolithic age between 7000 and 5000 BC, but intense settlement began with the Proto-Hittites during the old Bronze Age between 2500 and 1900 BC. Since then, numerous civilizations existed in the area including the Assyrians, Cimmerians, Persians, Seleucids, Romans, Arabs, Seljuk Turks and Ottomans.

The population of the GAP Region during the 2000 census was 6,604,205 representing 9.7% of the nation's total population of 67,844,903. Although all the nine provinces in the Region are net out-migrating, the average annual population growth was 2.47%, which was much higher than the national average of 1.83%. It is estimated that the Region's population will reach 9.2 million in 2005.

In the Region, 74.35% of the households in rural areas work in agricultural activities. Agriculture is highly labor intensive, since mechanization is weak in the Region. Employment in agriculture is therefore a key factor of production. It is expected that employment in agriculture in the Region will increase by 160% by the end of the project, since agricultural activities will continue to be heavily dependent on labor than on mechanization.

There is also a high rate of urbanization in the Region. The ratio of urban to total population has increased rapidly from 48% in 1985 to 56% in 1990, and to 62.9% in 2000. Table 12 shows urbanization by provinces in 2000.

Table 3. Distribution of rural and urban population in the GAP Region during 2000

	Total	Urban Population		Rural Population	
		Number	%	Number	%
GAP	6,604,205	2,449,647	62.9	4,154,558	37.1
Turkey	67,844,903	44,109,336	65.0	23,735,597	35.0

Source: DIE 2002

4.1.2.2 Agricultural production

Cultivated area of the main agricultural crops and total production are given in Table 12. Wheat is the traditional staple crop in the GAP Region, and it is of great economic significance. Total production of wheat in 2000 was 1,187,092 tons, with Sanliurfa (29%) and Diyarbakir (23%), as the main producing provinces. The GAP Region is the biggest red lentil producer of Turkey. GAP produce more than 95% of the total red lentil production in the country. In 2000, 382,394 hectares of lentil were cultivated in the Region, giving a total production of 272,593 tons. The three leading provinces for lentil production are Diyarbakir (34%), Sanliurfa (25%) and Mardin (15%).

Table 4. Cultivated area and production of selected crops during 2000

Crop	Area sown (hectares)	Production (tons)
Wheat	1,187,092	1,547,614
Barley	607,869	788,086
Lentil	382,394	272,593
Chickpea	75,800	69,934
Cotton	316,819	426,545
Corn	9,619	47,504
Rice	2,303	4,347
Sunflower	6,179	3,840
Sugar beet	1,142	44,969
Tobacco	30,600	30,538
Potato	328	4,833
Dry beans	1,284	2,327
Vegetables	13,256	1,556,665
Onion	6,670	115,060
Garlic	1,071	6,650
Pistachio(number of trees)	35,788,195	65,980

Source: DIE

Around half of Turkey's cotton is being produced here with only partial irrigation coming into force (Figure 2). More than half of that is from the province of Sanliurfa (60%). The other important provinces for cotton production are Diyarbakir (19%), Mardin (6%) and Gaziantep (5%).

Pistachio is one of the main crops of the Region. There were 35,788,195 pistachio trees in the Region in 2000, accounting for 85% of the total number of pistachio trees in Turkey. The Region also accounts for 88% of total pistachio production in country. The main areas of production are Gaziantep (52%) and Sanliurfa (35%). About 15% of total tobacco production in Turkey is from the GAP Region. The important provinces for tobacco production in the GAP Region are Adiyaman (47%), Batman (35%), and Diyarbakır (13%).

Table 5. Production of selected crops in GAP region and Turkey, 2000

Crops	Turkey (t)	GAP (t)	GAP (%)
Lentil	280,000	272,593	97.4
Cotton	879,940	426,545	48.0
Tobacco	200,280	30,538	15.3
Wheat	21,000,000	1,547,614	7.4

Source: DIE

4.1.2.3 Livestock Production

The livestock sector has a significant potential in the GAP Region and should be improved. Animal production is generally based on availability of pasture and productivity of rangelands. Most animals are of local breeds with low productivity. There were 3,902,220 head of sheep in the GAP Region in 2000, which accounted for 14% of the total number of sheep in Turkey. Small ruminant production in the GAP Region is vital for income generation by the landless or families with small-sized farms. Although the Region is rich in rangeland and pasture, overgrazing and erosion limit the amount available for livestock feed. In addition, most farmers do not have enough income to buy feed, thus making the rehabilitation and reseeding of rangelands crucial.

4.1.3 Gross Regional Product

Between 1990 and 1998, the growth rate of the Gross Regional Product (GRP) in Sanliurfa was 9.15%. When the added value created by Atatürk Dam and Hydro-electric Power Plant is deducted from the provincial product value, the annual growth rate is about 6.75%. This rate is same as the growth rate of 6.8% envisaged under the 1989 GAP Master Plan. In the 1990s, not only GRP but also population went up rapidly in Sanliurfa. As the Regional population had an annual rise of

2.5% in 1990–2000, Sanliurfa enjoyed an increase rate of 3.6% per annum. This represents an increase rate which is some 25% higher than the one envisaged by the Master Plan for the Region. The developments in Sanliurfa confirm the hypothesis that water resources development by provision of irrigation is the first and may be the absolute condition to make any major progress in the context of the Regional development.

4.1.4 Economic Development Index

During a study in 1999, an Economic Development Index (EDI) was developed for households in the Harran Plain, where irrigation was begun. The parameters combined to allow analysis of the state of economic development were: quantity of cotton grown, size of land owned, size of land farmed as share-cropper, tractor ownership, number of small and large animals, family size, number of school age children not enrolled in school, house ownership, on farm infrastructures existing in the village, and whether the household migrated for work. These variables were grouped under four factors which make up the income index. These were:

- Land as the basic production factor,
- Labor force which is an important input for cotton production,
- On farm infrastructure facilities as indicators of the transition from dry to irrigated farming, and
- Ownership of small animals.

Households ranked according to EDI values were divided into three major groups with respect to the inflection points of the index. Those that remained in the interval where the EDI has the lowest value form the low income group. It was followed by the middle and high income groups. This grouping placed 39% of landed households in the low, 48% in the middle, and 13% in the high income group (Figure 3). Ninety-one percent of those who farm others' land by sharing 30 percent of the harvest fall into the low, and 8% into the medium income group. It is interesting to note that even most of those who own land can not be placed in the high income group (Figure 3).

As mentioned earlier, income from agricultural production is rising as a result of irrigation and levelling. Cotton and wheat culture and the limited amount of animal husbandry account for a large portion of the derived income. To calculate income in kind, it is necessary to consider the yearly

domestic consumption of crops and animals raised by the household and non-agricultural income which has less than a 5% share.

4.1.5 Changes in Migration Patterns

The trend of migration in the Region has been reversed. Seasonal migration, which involved 70.4% of households prior to irrigation, has now dropped to 11.6%. The irrigation in the Harran Plain has created employment opportunities for landless peasants and for people living in areas where there is no irrigation yet.

4.1.6 Effect on Industrial Development

The increasing prosperity in agricultural income has also stimulated increase in small and medium industrial enterprises. In selected provinces of the Region the number of industrial units grew considerably after part commissioning of GAP. Many of these are agro based industries like cotton processing, spinning, textile, food processing etc.

This development has been accelerated by establishment of Entrepreneurship Support and Guidance Centers (GAP-GIDEMs). GAP RDA, in collaboration with the UNDP, and partnering with Chambers of Commerce and Industry (TOBB), and the Turkish Development Bank, established GAP-GIDEMs to meet the need for information and support services for economic development in the GAP Region. KOSGEB later joined this partnership. GAP-GIDEM offices were established in five major cities in the Region to provide local entrepreneurs with help in market research, finding investors and partners, and selecting technologies. GAP-GIDEM staff also provides information and consulting services to potential investors from other regions in Turkey and from abroad. The Turkish Republic is also establishing industrial zones, small industrial estates, and free zones in the Region, as well as an international airport to support the exportation of local products.

The original idea behind creation of GIDEMs has been to ensure those funds coming as compensations for land expropriation and extra returns from irrigated farming find their ways to productive capital investment rather than being used for speculating. Another aim has been to help

technology and capital transfer from other developed regions of Turkey and also from abroad to the GAP Region.

Various projects in fisheries, clothing, farming equipments, foodstuff processing have been realized with the help of GIDEMs, initiating some industrial activities in a hitherto industrially backward region. But the fact remains that this would not have been possible without initial water resources development.

5. Social Capital

Considering the state of social structure, the conditions of marginalized groups, farmers' backwardness; the focus is on collective capacity enhancement by devising special institution building for Water User groups, by providing platform for participatory regional development planning and by strengthening the grassroots governmental and civil society organizations.

5.1 A Grassroots Model of Irrigation Management: MOM Model

In the literature on irrigation practices two basic principles (or policies) have been identified: *protective* and *productive irrigation*. Systems which yielded a rate of return on invested capital above the interest rate of return plus running costs have been called productive and systems with a lower rate of return termed as protective. Productive irrigation represents a more market-oriented model of water supply, incorporating farmers at every level of the process of water distribution thus sharing with the users to a certain extent not only the costs but also the responsibilities related to management, operation and maintenance of the system. In this approach there is a planned optimization of water availability and demand-oriented water management with varying discharges, the form of production is highly market oriented and the use of wage labor is a significant input. It can be asserted that unless a system is productive, it could hardly be protective. One of the foci of productive irrigation is the interaction between irrigation technology and social relations in an area. Successful arrangements favor not only those who use the water but also bring about the development of the areas as a whole and contribute to the productive capacity of the whole country. Therefore, particular emphasis should be placed on the local level of organization of water distribution by water users' associations, water users' cooperative societies, or whatever name these participatory organizations may be given.

After a survey indicated farmers' positive attitudes on canal maintenance, problem solving and water charges collection, and that their perceived role as one of involvement and participation in water-user organizations; GAP-RDA coordinated a project, namely the GAP Management, Operation and Maintenance Study (MOM) for the training of local farmers and their organization into water user groups with the responsibility for planning among themselves their use of the available water for providing an institutional and organizational framework within which the management model could be replicated with following objectives:

- To maximize net benefits derived from irrigated agriculture
- To ensure the financial and physical sustainability of irrigated agriculture

The crucial work of formulating the MOM model for the project covered many subjects and disciplines such as:

- Environmental problems and the controls to minimize the negative effects on the water and soil resources and human health.
- Water distribution organization and management methods of different water supply systems.
- Regulatory and legal aspects related with water supply management, water use, land ownership and establishing farmers organizations
- Issues such as social and family structures, variety of work, farming applications, cultural preferences and differences, level of irrigated agriculture training needs and character of water uses.
- Technical aspects such as using canal and piped systems, irrigation methods, crop pattern and intensity, soils and topography, drainage needs, evaluation of water resources, operating large drainage and distribution systems.
- Micro economic issues for the irrigation management organizations such as water charge structure and policy, the cost of finance and possible economies of scale and their impact on operation and maintenance costs.

Twenty-four on-farm demonstrations were established to test and demonstrate different irrigation systems and methods to farmers. Due to project activities, 11% of total irrigation water in this district was saved and cropping intensity has been 177.5% in demonstration fields. On - going training courses for technical staff of the Irrigation District and other related organizations are conducted periodically. Water user group formation activities are under way and intensive farmer training is the major activity in that area.

The resulting model is based on bottom-up, participatory approach. It provides a framework for water distribution and water use efficiency leading to sustainable production techniques that ensure the protection of the soil and water resources. It also allows independence in the finances and in the decision making process of the management organization and maximizes the responsibility of the individual. This has contributed to crafting of much needed social capital in a state of transition from very deep-rooted traditional forms of community organization to a new form of social organization of irrigation management. There is lack of experience and uncertainty on the part of the farmers which is quite understandable. The success or failure of major irrigation development in GAP region will ultimately depend upon the farmers, their attitudes and their responses to the opportunity to become more productive and, overall, their positive participation. If they perceive success and can see their way towards increased profitability, it is certain that they will grasp the opportunity for community and self-autonomy. If there is doubt in their minds, they will be cautious and unwilling to spend labor, capital and effort in the process. The central feature of the whole success of the program will be the farmers' and communities' ability to participate wholeheartedly in local organization, management and operation of irrigation at village level, which has been successfully demonstrated by the MOM model.

5.2 Land Consolidation and Extension Services

The most salient feature of agricultural enterprises in Turkey is their small and fragmented status due to increasing population pressure and also the inheritance law that requires equal sharing.

The GAP Region has been no exception to this. According to a survey 56.6% of the holdings in the Region were below 100 da. Therefore, sustainability in agricultural productivity could be achieved by undertaking land reform measures and on farm development services mutually interlinked with economic and efficient irrigation management by local communities. In Turkey, although comprehensive measures to reorganize the agricultural structure on the basis of enterprises are yet to be taken, a large scale land consolidation project on about 118 thousand hectare land in the GAP Region was undertaken with a view to address irrigation, drainage and land arrangement activities as a whole; for development of a drainage system that would eliminate the adverse effects of

irrigation; for establishment of a more suitable network for inter-village, intra-village and inter-land transportation; for development of land use plans to allocate highly valuable farm lands to most suitable crops; for land levelling and slope removal for utilizing irrigation more efficiently; and for rearrangement of village settlements. A survey in 1999 indicated that the consolidation of dispersed parcels has enhanced the value of the land and now saves time for those working on it, enabling them to conduct efficient work by agricultural machinery and tools. Also, land consolidation has solved some of the problems generated by the traditional gender biased practices which favor males in inheritance, as well as helped the legal rights of females to inheritance become officially recognized. Therefore, consolidation enables females to have access to the ownership of land accorded to them by the existing legal system. Particularly, since land consolidation combines ownership shares, disputes over private land, which were very common earlier are mostly prevented and this has contributed to the establishment of social peace and harmony.

There are also some individuals who have problems with land consolidation and they stated the following reasons for their discontent: negation of their old land, existence of dispersed plots even after consolidation, division of farm land by canals, and receiving less land than expected. Existence of dispersed plots is one of the main reasons for dissatisfaction by the large land owners. The strongest support to land consolidation comes from those who either farm other people's land or those who have medium size holdings. There was also some willingness by the people to participate in planning, monitoring and investing in infrastructural development for drainage, land levelling, in farm roads etc. These efforts in agricultural extension have contributed to the crafting of much needed social capital that would be in high demand when large scale irrigation is fully developed in the Region.

5.3 Participatory Regional Development Plan

The GAP Master Plan, prepared in 1989, outlined the framework of the Regional development and set a time-table for the development of water and soil resources in particular, by taking into account financial and technical capabilities. It had also determined the development and employment to be created by this transformation, as well as the consequent population growth and the

probable distribution of this population on the basis of cities and rural areas, as of the year 2005. It identified the requirements for education and health services and housing and urban infrastructure and set forth the financing requirements by years. Basically it was a public sector dominated plan having the nature of a guide for plans, programs and projects to determine the course that must be taken by the Regional development and that would be implemented at lower scales. It had been prepared using traditional approaches to community consultation and participation like surveys, interviews etc. It was partially a conventional regional investment plan with a multi-sectoral approach. Concepts, such as environmental, economic and social sustainability, gender issues, participatory planning and implementation, and the inclusion of the private sector as an active participant were either missing or not given much importance. During the implementation of this Plan, significant social and economic changes had occurred both in Turkey and in the GAP Region and therefore some of the assumptions underlying the Plan needed to be re-assessed and their validity to be tested. In addition, it was necessary to evaluate the progress and impact of the implementations, as well as the constraints and potentials that had risen since the project's inception. Of equal importance in this review were the phasing of the various existing components and the formulation of additional programs, sub-projects and activities resulting from new concepts and priorities. Besides this since regional development issues were essentially complex, carefully facilitated stakeholder insights could be synergized with expert knowledge and advice to produce a higher and more acceptable level of understanding and a more informed and pragmatic foundation for planning decisions. Stakeholder could be guided through a process of ‘induction’ (rather than conventional deductive orientation) to develop a coherent picture of overall problems being addressed. This would incorporate high degree of transparency and would lead to better community ownership of the outcomes of regional development planning.

Therefore, the vision of new GAP Regional Development Plan 2002 has been to empower individuals and institutions in local communities to understand and improve the environment in which they live and work with the objective of mainstreaming and institutionalizing the participatory approach by developing new partnerships between government, civic society and the private sector. The other aim of the participatory approach has been to help build up quality leadership and to

strengthen capacity of local civil society organizations to make them more effective agents/local actors of change and thereby add to the existing stock of social capital.

5.4 Participatory Resettlement

The GAP RDA, with the support of the UNDP and the Food and Agriculture Organization of the United Nations (FAO) and in partnership with a national NGO, the Sociology Association and the local community, initiated a project entitled "Planning and Implementation Project for Resettlement, Employment and Economic Investments for the Population Affected by the Birecik Dam". The main objectives of this project were to:

- organize the affected populations so that they could express their own views and preferences in terms of selecting the areas where they could be resettled;
- inform them of their entitlements in terms of the various resettlement laws;
- advise them on how best the compensation money received can be used to generate stable and regular income on a long-term basis; and
- support them to generate employment and/or income-generating activities in their new settlements.

The first step of the participatory resettlement process initiated by GAP RDA consisted of establishing communication with the populations affected and to find out their concerns so that the social, economic and spatial preferences of the people affected, could be defined. Surveys in thirteen settlements were carried out over two years, which resulted in responses from 1307 families. Concurrently, open meetings were organized in the different settlements in order to establish a direct dialogue with the populations. This was also a confidence-building measure. During all these meetings, villagers were given appropriate information on both compensation and resettlement practices, their legal rights and obligations, and overview of resettlement experiences from both within and outside the Region.

The populations were specifically informed on the criteria for evaluation of their properties, and on how the valuation committee would price their resources and assets so that the total compensation could be determined. They were advised to point out certain specific characteristics of their assets and resources to the valuation commission, which would ensure that they receive higher, but just levels of compensations. This was a totally new process, since these types of information and

support were not available to project-affected persons (PAPs) in any earlier project in Turkey. This campaign to inform the people of their rights and how valuations would be made, generally resulted in the families receiving higher levels of compensation than otherwise may have been the case.

The people who decided to be resettled in the project area, worked jointly with the concerned governmental institutions to identify the locations of their new villages. In addition, a Multipurpose Community Centre (CATOM) was opened by GAP RDA in the District, with the objective of providing information on a regular basis and establishing regular communication with the settlers. The information provided included an overview of the impacts of the Birecik Dam at the national, regional and local levels; how it would affect the local populations directly and indirectly, expropriation, compensation and resettlement-related issues; preferred locations for their new settlements; types of housing they need or could expect etc.

In terms of compensations, the resettlers had several alternatives to choose from. They could either opt for cash payments and then be responsible for their own resettlement, or request the authorities concerned to use the cash amount to facilitate their resettlement. Generally, however, it appears that the people preferred to resettle as a group in areas near to the original settlements with which they are familiar with. Settlers who requested cash compensations were paid the amounts stipulated by the law, although there were some delays in receiving such payments due to lack of funds. They also received support from the government for the construction of their new villages. Some people preferred not to accept compensation in cash, but requested instead that the authorities construct their houses and infrastructural facilities. Other resettlers decided to accept their compensation amounts in cash and then resettle in urban areas of choice by themselves, while some others requested the support of the government to move into urban areas, and thus forego the cash compensation alternative.

Through participation, information and communication strategies, villagers were made fully aware of their rights and financial entitlements under the Turkish compensation and resettlement laws. The population was given all the relevant information on the criteria by which their land and properties would be assessed for expropriation by the government, and thus the levels of compensation they could expect. GAP RDA staff advised them as to which aspects of their land and

properties should be specifically shown to the assessors so that they received proper compensations. The villagers followed this advice, as a result of which their compensation payments were assessed at the correct levels, which were higher than the initial estimates prepared by the government. The final appropriation cost was thus higher than the initial estimates, which were based on earlier resettlement experiences, when people did not have much information on how their properties would be assessed by the government. Payments of higher compensations were appreciated by local partners and residents, and thus became an important element which directly contributed to confidence building with the local populations. Such results of the awareness-raising aspects of the participatory process can generally be considered to be positive.

The main lesson of this resettlement process is the fact that the populations were consulted, informed and supported before and throughout the resettlement period, which contributed to the building confidence between the populations and the related agencies and of course to the empowerment of affected communities. There were also handicaps, which were mainly due to shortages of funds, delays in execution, and the lack of coordination between the several governmental agencies in charge of the different tasks. A similar exercise is being attempted presently in case of communities to be affected by Iliusu dam.

5.5 Strengthening Capacity to Deal with Water Related Health Issues

5.5.1 Health Status of the GAP Region

In addition to national policies, the Ministry of Health (MOH) has established policies specifically for the GAP Region in order to reduce regional disparities in health indicators and in health services. GAP RDA collaborated with the MOH in creating the GAP Health Sector Implementation Plan in 1991, which included needs assessment, the evaluation of available health services, identification and alleviation of bottlenecks, and the creation of an implementation model that could be replicated in other regions of Turkey. Additional conventions for identifying objectives and strategies were the first and second National Health Congresses in 1992 and 1993, respectively.

Although significant improvements have taken place in health services in the Region as a result of these intensive efforts, health indicators in the GAP Region are still below national averages.

As shown in Tables 14 and Table 15, there are noticeable differences between regional and national figures for maternal and infant health indicators and in the coverage of health services. In addition, it has been found that 50% of households in the GAP Region do not have adequate drinking water, and that 75% of rural water, and 25% of urban water, is unsafe for drinking.

Other socio-economic problems that contribute either directly or indirectly to a higher incidence of health problems in the GAP Region have been found to include:

- Low education levels
- High unemployment
- Seasonal labor migration
- Poor household sanitation, including unsafe food handling
- Marriage between close relatives

5.5.2 Health Projects in the GAP Region

In order to define more precisely the existing and potential public health problems and to plan and implement appropriate interventions, a series of health projects have been carried out. The following paragraphs summarize some of these projects.

5.5.2.1 GAP Region Public Health Project

The objective of this project was to assess public health implications of changing ecological and environmental conditions, and to develop integrated policies, strategies and implementation programs based on these assessments, in order to prevent existing and potential health problems. Problems considered in the project included health services, reproductive health, child health, infectious and parasitic diseases, chronic illnesses, disabilities, and seasonal labor migration. A major outcome of this project was the GAP Region Public Health Action Plan, developed by diverse stakeholder institutions representing regional universities, several government ministries and other agencies under the coordination of the MOH. The project was completed in 2002.

5.5.2.2 Project to Strengthen the National Capabilities of Malaria Units in Turkey

This project was conducted in 1998-99 by WHO and the MOH, in cooperation with UNDP. Local municipal officials, provincial directorates of health, environment and other line ministries were also involved in the implementation of the project. Major accomplishments of this project were:

- A regional strategy and plan of action for malaria control
- Preparation of training materials and the delivery of training programs for malaria control personnel
- Rehabilitation of entomology laboratory facilities
- Rehabilitation of spraying equipment

5.5.2.3 Projects for Community Volunteers in Malaria Control (Roll Back Malaria)

This on-going project provides training to participants in local CATOMs as local health volunteers, and as trainers of volunteers, working to increase community awareness and participation in malaria control efforts.

5.5.2.4 Leishmaniasis Projects

This project to identify local vectors for leishmaniasis was one of the first health related projects carried out under the coordination of GAP RDA in 1995. The project was launched under the lead of Yale University in cooperation with universities in the GAP Region. During the course of the project, the type of parasite and vector were identified, and recommendations were prepared for disease prevention, including personal hygiene and treatment guidelines.

5.6 Water Supply and Sanitation Projects

5.6.1 Water Supply Wells for Small Settlements in the GAP Region.

Government is striving to provide basic water supply infrastructure for the communities in the Region. Agricultural development through irrigation of unexploited lands and the provision of drinking-water to rural areas are often urgent tasks requiring rapid identification of water resources and particularly groundwater. The "Groundwater Exploration For small Settlements Project" in the GAP Region aims at providing safe and sustainable water to small settlements for improvement in

sanitary condition and reduction in waterborne diseases. Securing an adequate supply of good quality water is often a constraint in the development and growth of value-added businesses in rural communities.

A preliminary survey has been conducted to identify the groundwater conditions and, taking these and other conditions into account, a reasonable basis for choice of groundwater development is obtained. Identifying groundwater conditions includes determining the location and physical properties of the aquifer, estimating the quantity and quality, and determining depth to the water table from the surface. The groundwater conditions determine types of wells that are to be constructed.

The first stage of the project involves determination of needs of small settlements and making annual plan in which drilling is done for four months per province. Later, testing the well is crucial to prepare the well for pumping. In addition to this project, the Provincial Governorates and the Rural Services Directorate provided wells to communities as well.

5.6.2 Reuse of Municipal Wastewater in Small and Medium Sized Communities for Irrigation in the GAP Region

This project was financed through in-kind grants by the government of France and implemented by the joint venture between French organization BRL and the Turkish company SU-YAPI with the objective of assessing the feasibility of reuse of wastewater in irrigation and disseminating wastewater reuse technologies to appropriate rural and urban areas in the GAP Region. This pilot project is the first one of its kind undertaken at national level.

The overall objective of the project is to assess the feasibility of reusing municipal wastewater for irrigation purposes and to spread the practices over the other small and medium sized municipalities in the GAP Region along with the sustainable principles. Another objective is to propose the best technical solutions aimed at preserving public health through studying on the applicability of economical solutions for municipal waste water treatment.

The most important outcome of the project is to set up a management structure geared to coordinate the involved public institutions and farmers within the project area. At the first stage of the project which was the site selection; among 6 districts in the Region having inadequate infrastructure and using wastewater without treatment facilities; the Siverek district of Sanliurfa province was

chosen as a pilot site in 2001. Following the feasibility studies; the special characteristics for urban wastewater and necessary treatment facilities were identified. In this context; the importance of the soil, vegetable and especially human health conditions in the Region was emphasized in the reuse of wastewater for the agricultural purposes. In addition; the main measures for wastewater quality and minimizing possible risks were identified. At the end of the feasibility studies; both technical and financial solutions were introduced, yet regarding the implementation stage some basic proposals were brought in.

5.6.3 Solid Waste Management Project in the GAP Region

GAP RDA aims to develop solid waste management in urban centers for improving services so as to meet the requirements of rapid urbanization in the GAP Region and for minimizing the negative impacts on eco-system and public health. Hence, this project has been prepared and contracted out on 29 May 2001 and carried out by GAP RDA, SPO, the Ministry of Environment, the Ministry of Health, GDRS, municipalities, and other institutions.

5.6.4 Construction of Sewerage Systems and Wastewater Treatment Plants of Akcakale, Ceylanpinar and Kahta

The overall objective of the project is to facilitate a healthy environmental and urban development process by forming the basis for future infrastructure in specific areas where urban infrastructure remains inadequate in the face of a rapid urbanization process.

This project will establish the system for sewerage network in order to collect house-discharges and construct the wastewater treatment plant. These projects will help to decrease the pollution of drinking water, irrigation water and groundwater so will serve to the ecosystem and water resources conservation and preserve the public health.

5.6.5 Design of Sewerage Systems and Wastewater Treatment Plants for 28 Settlements in the GAP Region

Serving the same objective of improving and sustaining environmental conditions and reducing health hazard to the local population, this project is undertaken by GAP-RDA. Right along with the benefits of eliminating the risks posed to human health and the environment, also the benefits

of providing the demonstration effect on wastewater treatment to be replicated in the Region, improving the environmental situation, providing health statistics for the area and building knowledge and awareness which will have been achieved at district and provincial level through sharing of the project results with the communities in the Region will be gained by the realization of the effective sewerage systems and wastewater treatment plants. In 1996 20 settlement sewerage systems and wastewater treatment plants, in 1997 7 settlement sewerage systems and a settlement wastewater treatment plant were opened to bid by GAP-RDA and controlled by Bank of Provinces and a project inventory is formed ready to be implemented.

5.6.6 GAP Urban Sanitation and Planning Project

In line with overall objectives of GAP, the projects "Sanliurfa-Harran Plains On-Farm Village Development" and "GAP Urban Sanitation and Planning" have been developed for purposes of improving urban and rural infrastructures in the Region. The World Bank has extended financial assistance for these projects. The preliminary project works included a situation analysis; development of work descriptions and preparation of budgets for project components and preparation of detailed tendering documents and engineering projects for activities to be conducted under specific project components.

In accordance with the norms set by the World Bank, the GAP-RDA carried out a two stage process of preliminary qualification for firms submitting offers to undertake preliminary project works. Consequently; with the consent of the World Bank; the preliminary works of "Sanliurfa-Harran Plains On-Farm Village Development" and "GAP Urban Sanitation and Planning" projects were conducted, respectively, by a series of foreign and national firms. This project aimed to mitigate the adverse environmental impacts of inadequate urban and rural infrastructures which are under the stress of rapid population growth; bringing solutions for the improvement of such infrastructures and enhancing the institutional capacity of local governments to enable them to extend better urban infrastructure services.

The project covers some settlements in the GAP Region, and envisages solid waste management schemes in Diyarabakir, Sanliurfa, Mardin and Siverek; drinking water disinfecting in

56 settlements; the rehabilitation of existing drinking water networks in Viransehir and Kabala; and the establishment of urban planning and geographical information system in Diyarbakir. In relation to these projects which all bear importance in terms of environmental protection and improvement as well as ensuring public health along with the urban planning system, the project seeks support to ensure the best possible organizational structure and financing for relevant project designs, conduct of project activities and operation of facilities to be phased in.

6. Human Capital

This focus is on empowerment of women, youth and children by disseminating functional literacy, self employment generation potential and encouraging vertical social mobility by providing institutional platforms for learning as well as self expression. This is especially important since changes in physical capital generated by transition to irrigated farming in some parts of the Region have to be made sustainable by giving due institutional and organizational support to development of necessary human capital.

6.1 CATOM: Multi Purpose Community Centers

Multi-purpose Community Centers (CATOM) in the GAP Region are one of the results of the search for integrated and participatory alternatives for social change for gender-balanced development, a need which was identified by the survey "Women's Status in the GAP Region and Their Integration into the Process of Development". This survey was conducted by the Development Foundation of Turkey (TKV) for GAP RDA in 1994.

CATOM are community based centers established in poor urban neighborhoods and in rural communities and provide a gathering place for women who otherwise would remain isolated. They use a flexible and modular program that uses social interaction and training to achieve the following short and medium-term objectives:

- Raise the literacy rate of women,
- Promote the awareness and provide information related to health and balanced nutrition,
- Train women in childcare,

Women who participate in income generation programs are encouraged to organize their work together. One outcome of this has been the project "*Improvement of Income Generating Activities and Management Capabilities for Women in Southeastern Anatolia*", with the cooperation of *ILO* in the provinces of Adiyaman and Kilis. Another project, "*Start Your Own Business*" *(SYB)*, aims to instill in women the idea of starting their own businesses, developing their management skills, improving employment and raising income levels.

This project started in 1999 with courses in entrepreneurship, business plans, marketing, legal procedures and insurance, enterprise visits, cost accounting, and the use of resource persons, and capital funds. As a result of this project, 24 of 31 women decided to start their own businesses in fields such as sewing, embroidery, sheep lots, daycare centers, and snack bars. They developed concrete business plans and took steps for starting their business. The first enterprises that followed were "SYB" started by two women in Adiyaman province and embroidery and textile workshop started on credit by two women in Kilis province. Now the present target is to replicate the SYB project in all other CATOMs.

- Improve women's income generating skills,
- Enable women to better express themselves and promote skills and understanding of cooperative work,
- Help women become more aware of problems in their communities,
- Enhance self-confidence, and improve women's access to public services.

One of the most meaningful outcomes of CATOM activities has been that the participants have started functioning as community health volunteers. For example, participants in Batman and Sirnak provinces CATOM were assigned by the Province Directorates of Health under Ministry of Health to take part in their immunization campaigns. It is a point of specific concern to ensure that all CATOM participants are capable of working as health volunteers and encouraging others in their communities to develop awareness of health, sanitation and environmental protection issues. Present trends are promising in the sense that CATOM participants have the potential to act as local community leaders and utilize available health services by others.

CATOM only lay the groundwork and serve as a catalyst for the change process. The basic principle here is to show women what they can do under certain conditions, rather than dictating to them what they should do. It is the women themselves who decide what each local CATOM will become. The direct target group of CATOM is girls and women from ages 14 to 50 who live in poor urban neighborhoods or in rural areas. Activities conducted under CATOM fall under three main categories: social, health and income generation programs. All these activities contribute to an increased sense of cooperation, interaction and solidarity among participants.

6.2 Youth & Children

The population between 0-35 years age group in the Region is over 75%. The main problems in the Region that negatively affect young people are: insufficient educational and vocational training opportunities, high level of unemployment, lack of provision of social and cultural activities and places for recreation. Young people of the Region are in need for tools and mechanism to express them. A driving force is needed towards creation of civil platforms for youth and their participation in the programs in order to overcome these problems. This also necessitates the creation of employment opportunities, expansion of educational and training facilities, organization of social and cultural activities and development of self-initiatives amongst the youth. With international support under the *Youth to Youth Social Development Program Youth Cultural Centers,* have been established to encourage communication networks amongst the youth and a *Youth Association for Habitat and Agenda 21* has been created for providing a participatory platform to youths for discussing their problems and partnerships with local administration are being forged to ensure participation of youths in local decision making mechanisms. This innovative project launched in 2001 to cover the whole region is financed by funds provided by the Swiss Government under the "Program for Sustainable Development in the GAP Region", which is jointly carried out with the UNDP.

Rehabilitation of children working in the streets has also been initiated with the objective of improving the living standards of street children and their families, enhancing local capacities, building awareness on the issue and gradually eliminating child labor. Project activities are carried out jointly by the Diyarbakir Governorate, ILO, GAP RDA and SHCEK, with the technical and financial support of a US based NGO.

The Child and Youth Center established in Diyarbakir serves as a base where relevant activities are carried out. Training on child psychology is one of the project activities. This training mainly covers desired attitudes and treatment towards children and children's relationship with the security. Target groups of this training consist of children at the centre, and security personnel at police departments and Municipality.

The children at the Center also take part in other activities and courses such as table tennis, folk dance, soccer, drama, leadership training, handicrafts and literacy training. Away from the Center, there are family visits and other activities in streets to consolidate ties between children and their families, raise awareness in families and secure public support to street children.

6.3 Income Generating Activities in Areas out of the Coverage of Irrigation

Upon the completion of GAP, 1.7 million hectares of a total 3.1 million hectares of cultivable land in the Region will be brought under irrigation. Dry farming will continue to prevail in the remaining 1.4 million hectares of land. Consequently, GAP RDA started a project to assess the socio-economic status and potentials of those people living in areas out of the scope of irrigation and to identify new or enhanced ways of income generation for these people. The project covers pilot and demonstrative activities being conducted with selected farmers in the Region in cooperation with the Directorate of Agriculture. So far nearly 1500 farmers have been reached through such activities as demonstration orchards, grafting of wild trees, beekeeping, water products, on-contract stock breeding, poultry farming, etc.

7. Natural Capital and Cultural Heritage

The main environmental benefits of the water resources development include the control and use of flood waters mainly for energy and agricultural purposes, availability of a regular supply of high-quality water for human and industrial needs, preservation of the natural flora, increase in the aquatic fauna, creation of recreation areas, etc. On the other hand, some of the potential adverse impacts are considered to be inundation of natural and cultural areas; modification of hydrological patterns; changes in land use; contamination of soil and surface and groundwater; salinity, water logging, sedimentation and erosion; increase in the use of fertilizers and pesticides; increase in the incidence of water-born diseases, etc.

Environmental considerations are being integrated with the physical planning projects of the GAP for the protection of the natural resources of the Region. The existing environmental conditions in the GAP Region, as well as the potential positive and negative impacts which could result from different developmental activities, would have to be carefully analyzed and managed within an integrated and sustainable framework in order to maximize the total benefits and minimize the overall costs that could accrue to the society. With this objective, following are some of the activities to preserve the natural capital in the Region.

Zeugma: A Bridge From Past to Present

Zeugma is a well preserved Greco-Roman city situated on what was a border crossing into the Roman empire on the Euphrates River. In ancient times it was an important crossing point across the river Euphrates for the many people who inhabited the Mesopotamian region. In modern times the extent of Zeugma's rich remains were not clearly understood except by a handful archaeologists and researchers who were committed to finding Zeugma's past under the soil and ash that covered it.

With the completion of the Birecik Dam, one of the key projects being implemented by the GAP, this dormant area was thrust into the lime light in the summer of 2000. GAP RDA formed a multi-national team of archaeologists and other professionals who were dedicated to preserving the archaeological treasures of Zeugma. GAP-RDA obtained cooperation from the Packard Humanities Institute (which graciously funded the project), the Turkish Ministry of Culture and other institutions in the Turkish government. Within a few weeks' time, over 100 archaeologists and conservators from England, Italy, France, and other countries as well as 50 Turkish archeologists and 250 other workers were working around the clock to rescue, record and preserve Zeugma's archeological wealth. Findings included rare mosaics, statues, frescoes and other artifacts which otherwise would never have come to light. Zeugma has been a unique example of cooperation and solidarity for the preservation of cultural heritage in the course of water resources development. (www.zeugma2000.com)

7.1 Afforestation and Erosion Control

Two projects on "Micro-catchment Rehabilitation and Range Land Rehabilitation" and "Erosion Control" involve extensive erosion control activities like terracing, soil stabilization, construction of check dams, revegetation, afforestation fodder crop culture, range improvement etc. There is another project aiming at planting salt resistant re-vegetation in areas prone to salivation.

7.2 GAP Biodiversity Research Project

The objective of this project to conduct an assessment in relation to biological diversity in the GAP Region, identify priority areas in this respect and analyze the impact of the project on these areas; to make proposals for sustainable utilization of natural resources. The Southeastern Anatolia Region is the border zone through which species peculiar to steppe and semi-desert regions enter Turkey and thus hosts environments for species not found in other parts of the country. These environments are the courses of the Euphrates and Tigris Rivers, their flood plains and main tributaries, and the steppe and semi-desert areas in the southern part of the Region.

These two natural environments (wetlands and semi-desert areas) host many endemic species of plants, birds, fish and other animals. An assessment of this rich biological diversity will contribute substantially to the literature on the environment and also give insight as to the possible impacts of the GAP and therefore appropriate measures to be taken so as to preserve this biological diversity.

The project is implemented by Turkish Society for the Protection of Nature (DKHD) in coordination with GAP RDA with the financial support of UNDP. A database is created as a result of the project. This database will be updated regularly according to the needs of the Region and will be open to all those interested parties. Three Progress Reports have been prepared and shared with interested parties. The project will be completed by May 2003.

7.3 Wild Life Project for the GAP Region

While enhancing agricultural development in the Region, GAP may cause the disappearance of natural living environments of many species. This project is, thus, a "rehabilitation/regeneration" project targeting the minimization of negative effects on the natural system. What is desired is to regain natural systems otherwise disrupted by human activities and to introduce a model that can be adopted elsewhere in the country and in the world. The project has been carried out to protect biological diversity in the Region by creating new living environments for settled and migratory species, including those under the threat of extinction, which live particularly along the course of the Euphrates and around other rivers and dam lakes in the GAP Region.

7.4 Studies on the Present and Prospective Climatic Features of the GAP Region

The objective of this project is to analyze changes in climate and hydrology on the basis of regional climate models caused by the projects on the development of water resources; to develop models on the present and future climatic conditions in the Region and to assess the possible effects of climate change on water resources. The project envisages the following for the GAP Region:

- Detailed identification of present climatic conditions and prediction of changes in climate likely to occur in the future;
- Assessment of negative or positive effects that these changes may have on the hydrology, water resources and vegetation in the Region; and introduction of relevant measures against negative effects;

- Search for ways of making maximum use of positive effects; informing all sectors, agriculture in the first place, on possible future climatic conditions; and contributing to the development of pertinent strategies in this regard;

- Regular monitoring of climatic parameters, identification of an implementation plan and corresponding policies; and establishment of a built-in system for monitoring-evaluation.

The project is carried out by the Faculty of Agriculture, Ankara University and it will be realized in three stages. The first stage covering such works as the analysis of climatic data and forming a database for water resources were completed in July 2002.

CONCLUSION

For several years now Turkey has already been implementing the principles of sustainable development based on water resources through activities such as the Southeastern Anatolia Project which involve stakeholders from multiple sectors, including the grassroots, for the purpose of achieving integrated human-focused development.

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 will need to continue to develop its water resources in order for its economic and social development to keep pace with its growing and modernizing population.

Unlike the industrialized countries, Turkey was not able to develop its water resources until a few decades ago. Consequently, water development is urgently needed in order to catch up to existing demands, and to prepare for future demands. Infrastructure such as dams, reservoirs, hydroelectric power plants, irrigation, drinking water and sanitation systems are crucial for satisfying basic human needs, the eradication of poverty, and for economic growth,

Obstructing hydropower projects would result in hindering economic growth. Turkey has learned through integrated water resource development projects how such development can be very successful in raising income levels and improving living standards. Benefits from water development reach far beyond the local people, as increased agricultural production due to water development can contribute to global efforts toward meeting food needs.

Considering the economic and social benefits to be enjoyed from water resources development, and since hydropower is renewable, non-polluting and inexpensive, its wider use should be encouraged in accordance with the implementation plan of the Johannesburg Summit. International organizations should be able to assist in financing such infrastructure in developing countries, and in arid and semi-arid regions in particular.

Economic development and the spreading of prosperity to all people would be the most effective way to resolve disputes between nations, and to create a climate of peace and neighborly

relations. In response to the potential for water shortages in the region, Turkey has developed the Manavgat Water Supply Project as a means to contribute to regional cooperation for helping to alleviate water shortages. Regarding the transboundary rivers, Turkey is of the view that equitable, reasonable and optimum use should be the guiding principle.

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