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**Forestry Outlook Study for West and Central Asia
(FOWECA)**

Working paper

**Euphrates and Tigris watershed
Economic, social and institutional aspects of forest in an integrated watershed
management**

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1 INTRODUCTION

Our planet is known as the blue planet, due to its extensive reserves of water. The three fourth of the earth's surface is covered by water. Unfortunately, 98% of this surface water is in the oceans, the remaining two percent accounts for the fresh water supplies of the world. More drastically, 90% of this fresh water supply is either in the poles or remains under the ground. Therefore, we, humans, actually have access to only 0.000006% of the water available on our planet. As fresh water resources they make up only 0.26%, which is available to human consumption.

The importance of scarce fresh water is yet to be understood by many people and nations, despite the fact that most of the developing nations are located in the arid or semi-arid regions of the world, where water is the scarcest. For example, Europe alone contains the half of the running surface water in the world; at the same time in the Middle East, the water scarcity is so severe that nations are threatening each other with war. In 1988 in developing countries, with nearly 40% of world's population, water shortages were a serious constraint on their development. The water scarcity barrier for human consumption is accepted to be a mere 1000 cubic meters per person annually, and many of the Middle Eastern countries fall below this barrier. Besides Turkey, Iran, Syria and Iraq who share the Euphrates-Tigris watershed, almost all of the nations in the Middle East suffer from serious water scarcity.

This research was done in order to find the answers of the following questions:

1. What is the status of forests in this watershed?
2. What are the social, economical and institutional aspects of forests in this watershed?
3. What can we do for these forests in an integrated watershed management?

In chapter 1 of the following report, we collected some important economic, social, environmental and institutional information in watershed and country scale. It could be useful for knowing more about the current situation. Chapter 2 included main issues and problems about three important factors in this watershed: forest, people and water, and also the relations between them. The last chapter included the analysis of the current situation of this watershed, some practical recommendations for conservation these forests from more degradation and also better management of this watershed with an “integrated watershed management”.

2 BACKGROUND

2.1 Watershed Background

The area of Euphrates & Tigris watershed is 765,742 km² and the population density is 57 per km². 1.2 % of this watershed is covered by forests (9188 km²), 25.4% by crop-lands (194,498 km²) and 47.7% by grass-lands (365,258 km²). 90.9% of the watershed is defined as arid area. There are 19 in progress large dams in Euphrates & Tigris watershed and 0.4 percent of the total area is categorized as protected area (See Table 17).

2.1.1 The Euphrates River

This River has its springs in the highlands of Eastern Turkey and its mouth at the Persian Gulf. It is the longest river in south western Asia with 2700 km and its actual annual volume is 35.9 billion cubic meters. The Euphrates River is formed in Turkey by two major tributaries; the Murat and the Karasu. The name of this river comes from Old Persian and it means “good to cross over” (See Map 2).

2.1.2 The Tigris River

This River has its springs in the high lands of Eastern Turkey, but the main contribution to the river comes from the tributaries in Iraq: The Greater Zap, the Lesser Zap, the Adhaim, and the Diyala. This river is the second longest river in Southwest Asia at 1,840 km and it carries more water than the Euphrates River, due to its tributaries from the Zargos Mountains. The name of Tigris comes from Old Persian and it means “the fast one” (See Map 3).

The Euphrates joins the Tigris River near the city of Qurna, and the combined rivers are called the Shatt al-Arab. The Karun River from Iran joins the Shatt at Basra, and they empty into the Persian Gulf altogether.

2.1.3 Hydrology

The regime of the Tigris and Euphrates depends most heavily upon winter rains and spring snowmelt in the Taurus and Zagros mountains. The precipitous flow of its tributaries makes the Tigris more susceptible than the Euphrates to short-term flooding and brings its annual flood period a month earlier. As it reaches the Mesopotamian alluvial plain above Samarra, the Tigris is a bigger, faster, more silt-laden, and more unpredictable river than the Euphrates at the corresponding point, Al-Fallujah. This character is expressed in the Arabic name Dijla, meaning "Arrow." The mean annual discharge of the Tigris is estimated at 43,800 cubic feet (1,240 cubic meters) per second, and the silt load at approximately one ton per second. These estimates are roughly twice those calculated for the Euphrates. In flood time the two rivers together carry as much as three million tons of eroded material from the highlands in a single day.

2.1.4 Climate

The Tigris and Euphrates make one of the habitable and productive harshest environments in the world. The region has a continental subtropical climate, with extremes of heat in summer and cold in winter, as well as great diurnal variations. Rainfall is scanty. In the Mesopotamian plain, the most characteristic climatic feature is the extreme heat of the summer, with daytime temperatures rising as high as 140 F (60 C). Humidity in most areas is as low as 15 percent. Dust storms, which occur throughout the year, are especially frequent in the summer.

2.1.5 Plant Life

Oak, *pistachio*, and *ash* forests covered the mountains and foothills through which the upper Tigris and Euphrates pass. The wildflowers and other plants that appear in spring die off in the heat of May and June. In the driest zones, *camel thorn* and *prosopis* are the dominant shrubs. The Euphrates *poplar* and a species of *willow* grow in small belts beside the rivers and canals; the *poplar* provides strong timber for construction and boat building, as well as handles for tools. The *date palm* is indigenous to the region. Five-stamen *tamarisk* and *mesquite* form thickets along the lower and middle courses of the Tigris and its tributaries, up to an altitude of about 3,300 feet. *Licorice* is sufficiently plentiful to allow exports.

Euphrates & Tigris watershed includes 5 counties: Turkey, Iran, Iraq, Syria, and Saudi Arabia (see map 1). However, Saudi Arabia and Iran are not major riparian in this watershed; Iran is riparian only to the Tigris; Saudi Arabia is riparian only to the Euphrates. Moreover, the Saudi Arabian stretch of the Euphrates dries in summer, and because of unfavourable geographic and climatic conditions, Iran cannot use the waters of the Tigris for agriculture or hydropower. Therefore, these countries have generally been ignored in studies of the watershed. Generally, Saudi Arabia has not any significant role in this watershed; for more information see tables 1, 2, 3, 4 and 5.

Before the end of World War II, Turkey was the only independent riparian country. Therefore, France and the United Kingdom were the signatories of the conventions relating to the basin of the Euphrates concluded during the Mandate era. After World War II, the exploitation of the Euphrates can be divided into two phases. During the first phase, from 1946 to 1960, no far-reaching projects were undertaken, with the notable exception of a project related to the collection of rainfall returns and the acquisition of meteorological information. The second phase, from 1960 until the present day, has on the contrary been marked by a series of projects that have been exemplified by an almost-complete lack of cooperation between the three riparian States.

2.2 Countries Background

2.2.1 Physical Context

Iran covers a total area of about 1.65 million km². About 52 % of the country consists of mountains and deserts and some 16% of the country has an elevation of more than 2000 m above sea level. The total population is about 70,675,000 that of which 32% is rural. The average population density is 41 inhabitants/km and the annual population growth is 1.4%.

The climate of Iran is one of great extremes due to its geographic location and varied topography. The average annual rainfall is 252 mm and approximately 90% of the country is arid or semiarid. Overall, about two-thirds of the country receives less than 250 mm of rainfall per year.

Iraq with a total area of 438,320 km² including 924 km² of inland waters. Topographically Iraq is shaped like a basin, consisting of the Great Mesopotamian alluvial plain of the Tigris and the Euphrates rivers.

The total population is about 26,555,000 that of which 32% is rural. Average population density is estimated at 47 inhabitants/km.

The climate is mainly of the continental, subtropical semi-arid type, with the north and north eastern mountainous regions having a Mediterranean climate. Rainfall is very seasonal and occurs mainly between December and February. Average annual rainfall is estimated at 154 mm.

Syria covers a total area of 185,180 km². The country can be divided into 4 physiographic regions: coastal regions, mountains, plains and deserts. The total population is 18,650,000 that of which 47% is rural. Actual population growth is 3.3%.

Syria's climate is Mediterranean with continental influence. Large parts of Syria are exposed to high variability in daily temperature. The Average annual rainfall in the country is 252 mm.

Turkey covers a total area of 779,450 km². The total population is about 73,302,000 that of which 32% is rural, with an annual demographic growth estimated at 2%.

Turkey has a subtropical, semi-arid climate with extremes in temperatures. Rainfall shows great differences from one region to another. Average annual rainfall is 643 mm.

2.2.2 Historical and political Background

All these countries have had unstable political situation and their history is full of mistruths, conflicts and even wars.

Iran: The Iranian heartland became part of a world empire whose centre was not in Iran. Nevertheless, historians have found striking continuities in Iranian social structure, administration, and culture. Iranians contributed significantly to all aspects of Islamic civilization; in many ways they helped shape the new order. By the ninth century, there was a revival of the Persian language and of a literature that was uniquely Iranian but was enriched by Arabic and Islamic influences. The break up of the Islamic empire led, in Iran as in other parts of the Islamic world, to the establishment of local dynasties. Iran, like the rest of the Middle East, was affected by the rise to power of the Seljuk Turks and then by the absolute destruction wrought first by the Mongols and then by Timur, also called Tamerlane (Timur the Lame).

The Islamic revolution in 1979 brought a sudden end to the rule of the Pahlavi dynasty, which for fifty years had been identified with the attempt to modernize and Westernize Iran. The Revolution replaced the monarchy with an Islamic republic and a secular state with a quasi-theocracy. It brought new elites to power, altered the pattern of Iran's foreign relations, and led to the transfer of substantial wealth from private ownership to state control. As of June 1987, the eight-year-old war with Iraq had evolved through various stages of strategy and tactics; the major events of the war could generally be divided into six overlapping phases: the original Iraqi offensive, Iranian mobilization and resistance, the Iranian counteroffensive, the war of attrition, Iraqi internationalization of the war, and the surge in superpower involvement. In addition, there was the tanker war in the Persian Gulf, which extended over several of these phases.

Iraq: Although the modern state, the Republic of Iraq, is quite young, the history of the land and its people dates back more than 5,000 years. Indeed, Iraq contains the world's richest known archaeological sites. Here, in ancient Mesopotamia, the first civilization—that of Sumer—appeared in the Near East. Despite the millennium separating the two epochs, Iraqi history displays a continuity shaped by adaptation to the ebbing and flowing of the Tigris and Euphrates rivers. Allowed to flow unchecked, the rivers wrought destruction in terrible floods that inundated whole towns. When irrigation dikes and other waterworks controlled the rivers, the land became extremely fertile. The ancient cities of Sumer, Babylon, and Assyria all were located in what is now Iraq. Surplus food production and joint irrigation and flood control efforts facilitated the growth of a powerful and expanding state.

Formerly part of the Ottoman Empire, Iraq was occupied by Britain during the course of World War I; in 1920, it was declared a League of Nations mandate under UK administration. In stages over the next dozen years, Iraq attained its independence as a kingdom in 1932. A "republic" was proclaimed in 1958, but in actuality a series of military strongmen ruled the country, the latest was Saddam Hussein. Following Kuwait's liberation, the UN Security Council (UNSC) required Iraq to scrap all weapons of mass destruction and long-range missiles and to allow UN verification inspections. Continued Iraqi non-compliance with UNSC resolutions over a period of 12 years resulted in the US-led invasion of Iraq in March 2003 and the ouster of the SADDAM Husayn regime. Coalition forces remain in Iraq, helping to restore degraded infrastructure and facilitating the establishment of a freely elected government, while simultaneously dealing with a robust insurgency. The Coalition Provisional Authority transferred sovereignty to the Iraqi Interim Government (IG) in June 2004.

Syria: Present-day Syria constitutes only a small portion of the ancient geographical Syria. Until the twentieth century, when Western powers began to carve out the rough contours of the contemporary states of Syria, Lebanon, Jordan, and Israel, the whole of the settled region at the eastern end of the Mediterranean Sea was called Syria, the name given by the ancient Greeks to the land bridge that links three continents. For this reason, historians and political scientists usually use the term "Greater Syria" to denote the area in the prestate period. Historically, Greater Syria rarely ruled itself, primarily because of its vulnerable position between the Mediterranean Sea and the desert. As a marchland between frequently powerful empires on the north, east, and south, Syria was often a battlefield for the political destinies of dynasties and empires. Unlike other parts of the Middle East, Greater Syria was prized as a fertile cereal-growing oasis. It was even more critical as a source of the lumber needed for building imperial fleets in the pre-industrial period.

The French administered following the break up of the Ottoman Empire during World War I, Syria until independence in 1946. Since 1976, Syrian troops have been stationed in Lebanon, ostensibly in a peacekeeping capacity, despite international pressure calling for their withdrawal.

Turkey is a new country in an old land. The modern Turkish state drew on a national consciousness that had developed only in the late nineteenth century. But the history of nomadic Turkish tribes can be traced with certainty to the sixth century A.D., when they wandered the steppes of central Asia. Asia Minor, which the Turks invaded in the eleventh century, has a recorded history that dates back to the Hittites, who flourished there in the second millennium B.C. Archaeological evidence of far older cultures has been found in the region, however. National hero Mustafa Kemal, who was later, honoured with the title Ataturk, or “Father of the Turks” founded modern Turkey in 1923 from the Anatolian remnants of the defeated Ottoman Empire. Under his authoritarian leadership, the country adopted wide-ranging social, legal, and political reforms. After a period of one-party rule, an experiment with multi-party politics led to the 1950 election victory of the opposition Democratic Party and the peaceful transfer of power. Since then, Turkish political parties have multiplied, but democracy has been fractured by periods of instability and intermittent military coups (1960, 1971, 1980), which in each case eventually resulted in a return of political power to civilians. A separatist insurgency begun in 1984 by the Kurdistan Workers' Party (PKK) - now known as the People's Congress of Kurdistan or Kongra-Gel (KGK) - has dominated the Turkish military's attention and claimed more than 30,000 lives, but after the capture of the group's leader in 1999, the insurgents largely withdrew from Turkey, mainly to northern Iraq. In 2004, KGK announced an end to its ceasefire and attacks attributed to the KGK increased. Turkey joined the UN in 1945 and in 1952 it became a member of NATO. In 1964, Turkey became an associate member of the European Community; over the past decade, it has undertaken many reforms to strengthen its democracy and economy, enabling it to begin accession membership talks with the European Union.

2.2.3 Social Context

Rapid population growth, high poverty level, high rate for migrating from rural areas to urban areas, and lack of popular services in rural areas such as health and education services are the significant social problems in all these countries.

Iran: Since the 1979 Revolution, Iran has given strong and special emphasis to human development, social protection, and "social justice," with significant progress to-date. As a result of major investments in the social sectors over the last 20 years with universal education and extensive health coverage, and an active government distribution strategy through direct transfers and indirect subsidies, the proportion of the population living below the poverty line has fallen dramatically. In 2000, only 7.3% of the population was living at less than \$2 a day (HDR 2003). Regarding to HDI Iran is ranked 101. Virtually all social indicators have shown improvement to the point where Iran now ranks at or near the top of comparable countries.

The followings are the main social indicators of Iran:

1. Education: Of particular note is the closing of the gender gap in education, where enrolment rates for boys and girls show only small differences, in literacy, and in political representation. However, there are development challenges.
2. Poverty: Iran still has a significant prevalence of poverty and a significant rate of unemployment. Iran has an extensive social safety net and transfer system that reaches a large number of the poor. Half of the poor, about 4.5 million persons or 1.47 million households, benefit from social coverage by government social safety net programmes, charity institutions, and other non-profit organisations
3. Migration: Iran's central position has made it a crossroads for migrants and it has emerged as a major transit area. The population is not homogeneous - although it has a Persian core that includes over half of the people. Azerbaijanis constitute almost a quarter of the population. The country is a major transit route for narcotics coming from neighbouring Afghanistan and Pakistan and destined for Europe, Central Asia and the Persian Gulf region.
4. Health: The percentage of the total population of Iran with access to sanitation facilities is 99 and the percentage of drinking water that is available for everyone is 92. Rate of infant mortality in Iran that is often used as an indicator of the level of health in a country, is 42.86 deaths/1000 live births. Life expectancy at birth is 69.96 years in Iran of total population, both male & female.

Iraq: In 2002, infant mortality was estimated at 57.6 deaths/1,000 live births, with a life expectancy at birth of 67.4 years. Over the last decade, Iraq's urban and rural society has been expanding and undergoing rapid social change. The accelerated process of urbanization throughout the country reflects the concentration of trade, construction, and real estate activities based on oil revenues and has resulted in a dramatic population decrease in rural areas. Prior to the 1991 Gulf War, Iraq enjoyed a high standard of living, with a majority of the population making up a relatively wealthy middle class.

The followings are the main social indicators of Iraq:

1. Health: The country's medical infrastructure is in a very poor state. Many facilities are only partially operational because of inadequate maintenance of buildings and equipment, and a lack of vital spare parts. In the other hand, morbidity rates among children under five are very high, with acute respiratory tract infections and diarrhoeal disease representing over 70% of deaths.
2. Water supply and sanitation: Recent statistics for the north of Iraq have shown a fall in the number of cases of typhoid, cholera and malaria – diseases linked to the absence of clean water supply and adequate sanitation systems. It has been estimated that 5 million people (19% of the total population) are at risk from lack of access to safe water and sanitation.
3. Food supply: As of early 2003, UNICEF reported that close to 60% of Iraqis were fully dependent on the monthly government-distributed food ration. Although the nutritional value of the ration had increased under the oil-for-food programme, it still did not reach the minimum threshold set by the UN Secretary General. Over 18 million people were considered by UNICEF as being 'food insecure' and therefore highly vulnerable during a conflict.

4. **Income, employment and education:** Prior to the outbreak of the conflict in March 2003, at least 50% of the labour force was unemployed or underemployed, GDP had fallen further from a 1995 estimate of US \$715 per capita, and a shortage of basic goods, compounded by drought, had resulted in rampant inflation (120% in 2000). The most recent estimates of literacy rates are for 1997; at that time, 57% of the total adult population was considered literate (males 69.5%, females 42%).

5. **Refugees and internally displaced persons:** There were more than 128,100 refugees and about 700,000 internally displaced persons in Iraq in 2001. An estimated 600,000 internally displaced persons in the Kurdish controlled northern governorates included more than 100,000 people expelled by the Iraqi regime from Kirkuk and surrounding districts. In 2001, an estimated one to two million Iraqis living outside Iraq were believed to be at risk of persecution if they returned, although only about 300,000 had any formal recognition as refugees or asylum seekers.

Syria: Regarding to HDI Syria is ranked 106. The followings are the main social indicators were determined by the government of Syria.

1. **Education:** The ratio of illiteracy in Damascus was reduced during the last seventy years from 53.4 to 14.2 in the year 2002. In spite of this general reduction in illiteracy, it is not satisfactory especially in the rural areas.

2. **Health:** Because of the low health services in rural areas and the differences between their life style and the cities, the wide gap between urban and rural areas has remained.

3. **Human Settlement:** In Syria, 46% of human settlements are in the rural areas and 54% are in the cities. The average numbers of rooms in a house in the cities are 3.42 with 1.83 persons in per room; but in rural areas there are 3.06 rooms in every house, although the number of people in every room is 2.3.

4. **Nutrition:** In Syria, the number of people who are not received this amount of energy, are high especially in rural areas. Also the food quality in rural areas is lower than the cities and the rate of malnutrition diseases are higher than it.

Turkey: Regarding to HDI Turkey is ranked 88. The 1996 Human Development Report for Turkey explores key problems of national and local development in Turkey with special focus on urban management and on the eradication of poverty. The main social indicators of Turkey are:

1. **Education:** Education attainments in Turkey have been remarkable as reflected in the steady upward trend in literacy rates and greatly enlarged school enrolments in keeping with the expanding growth of the school-age population. In 1993, there were 12.2 million children and students (ages 6 - 23) in school.

2. **Poverty:** In Turkey, there is no official poverty line, although the State Planning Organization (SPO) has estimated that a per capita income of \$27.30 per month (at 1987 prices in the most recent processed survey of income distribution and expenditures), is needed to escape poverty. But in 1987, 14.2% of the Turkish population was classified as poor.

3. Health: In the area of health, the main trends seen in Turkey have been a dramatic fall in child mortality as indexed by a reduction in the child mortality rate from 152 per 1000 in the 1960's to 53 per 1,000 in 1991, although it is considered that this is still unacceptably high since countries with a GNP equivalent to that of Turkey on the whole had much lower mortality rates.

4. Human settlement: The rapid urban growth in Turkey, fuelled by continual high levels of internal migration and natural births, and aggravated by regional differences and discrepancies and more recently by security questions, has also placed extra strain on the provision of housing as well as on all services and public utilities. About half of the housing premises in large cities of Turkey are unlicensed or illegal squatter constructions. The supply of housing, has clearly fallen far short of demand for a wide variety of reasons, be it bureaucratic, financial, technical, legal, etc., and for which a comprehensive urban renewal and reform programme is called for.

2.2.4 Economic Situation

These countries, more or less, have the same economic problems such as high unemployment rate and low GDP growth. In fact the transition from developing stage to developed stage is very clear in these countries. Being an important source for producing oil has brought new problems for these countries especially for Iran and Iraq; having an unstable economical situation is one of these results.

Iran's economy is marked by a bloated, inefficient state sector, over reliance on the oil sector, and statistic policies that create major distortions throughout. Most economic activity is controlled by the state. Private sector activity is typically small-scale such as workshops, farming, and services. Relatively high oil prices in recent years have enabled Iran to amass some \$30 billion in foreign exchange reserves, but have not eased economic hardships such as high unemployment and inflation. The proportion of the economy devoted to the development of weapons of mass destruction remains a contentious issue with leading Western nations (see table 6).

Agriculture is the most important non-oil commodity sector in Iran. In addition, to meeting about 80 percent of the food requirements, it contributes to about one-fourth of GDP and constitutes one-third of the non-oil exports. In general, main national accounts on Gross Domestic Products (GDP) of Iran are oil, non-oil, agriculture, industry, services and mine.

Iraq's economy is dominated by the oil sector, which has traditionally provided about 95% of foreign exchange earnings. Although government policies supporting large military and internal security forces and allocating resources to key supporters of the regime hurt the economy, implementation of the UN's oil-for-food program beginning in December 1996 helped improve conditions for the average Iraqi citizen. In December 1999, the UN Security Council authorized Iraq to export under the program as much oil as required to meet humanitarian needs. The drop in GDP in 2001-02 was largely the result of the global economic slowdown and lower oil prices. The high percentage gain estimated for GDP in 2004 is the result of starting from a low base. Although the agriculture sector contributed relatively little to the economy before the Gulf War, it has played an increasingly important role in recent years. Given serious import supply constraints, the government has implemented a number of measures aimed at achieving greater self-sufficiency in food.

However, economic sanctions have limited access to foreign investment and imported supplies, including spare parts for farm machinery as well as fertilizers, pesticides and herbicides (see tables 7, 8 and 9).

In **Syria**, real GDP growth rose to 2.3 percent in 2004, a slight increase from 2003 when the predominantly statistic economy suffered from disruptions caused by the war in Iraq and other developments in the region. The Government of Syria has implemented modest economic reforms in the last few years, including cutting interest rates, opening private banks, consolidating some of the multiple exchange rates, and raising prices on some subsidized foodstuffs. Nevertheless, the economy remains highly controlled by the government. Long run economic constraints include declining oil production and exports and pressure on water supplies caused by rapid population growth, industrial expansion, and increased water pollution (see table 10).

Turkey's dynamic economy is a complex mix of modern industry and commerce along with a traditional agriculture sector that in 2004 still accounted for more than 35% of employment. It has a strong and rapidly growing private sector, yet the state still plays a major role in basic industry, banking, transport, and communication. The largest industrial sector is textiles and clothing, which accounts for one-third of industrial employment; it faces stiff competition in international markets with the end of the global quota system. In recent years the economic situation has been marked by erratic economic growth and serious imbalances. The public sector fiscal deficit exceeds 6% of GDP - due in large part to the huge burden of interest payments, which accounted for more than 40% of central government spending in 2004, and to populist spending. Foreign Direct Investment (FDI) in Turkey remains low - averaging less than \$1 billion annually, but further economic and judicial reforms and prospective EU membership are expected to boost FDI. A major political and economic issue over the next decade is whether or not Turkey will become a member of the EU (see table 11).

2.2.5 Environmental Aspects

Industrial centres development in big cities without paying enough attention to environment is one result of being a developing country that it is very clear in this watershed. Water, air and soil pollutions are the important subjects of this result in all these countries.

Iran is faced with a litany of environmental problems, many of which the country is only beginning to tackle as the problems reach a crisis point. Iranian environmental protection efforts in the 1970s focused on conservation, with the establishment of a number of national parks, national monuments, and wildlife refuges throughout the country. However, 8 years of war with Iraq, international political isolation, and economic sanctions kept environmental goals on the back burner in Iran, and conservation measures predominated in Iran's environmental policies.

Iran's failure to move beyond conservation policies towards a more sustainable development has manifested itself in a range of problems today. In addition to deforestation and desertification issues across much of Iran's arid territory, over fishing in lakes and rivers has caused a drop in fishing levels; industrial and urban waste water runoff has contaminated a

number of rivers and coastal waters and threatened drinking water supplies; wetlands and reservoirs are increasingly being destroyed under the pretext of creating industrial and agricultural lands; and oil and chemical spills in the Persian Gulf and Caspian Sea continue to pollute the seas and harm aquatic life. The Caspian Sea region is faced with a number of environmental problems in the international rush to develop the Caspian's oil and gas.

Iraq: Three wars and a 12-year embargo have cumulatively damaged Iraq's land, air, water, and health infrastructure. War damage to Iraq's health status and public health infrastructure began with the eight-year conflict with Iran in the 1980s. Toxicants from chemical weapons used in the 1980s still contaminate soils in some northern areas. The 1991 Gulf War further stressed the country, as did the United Nations embargo. And the latest war in 2003 added to the environmental contamination. The most immediate effects of war on environmental health stem from air pollution such as burning oil wells, factories, and vehicles. Poor water quality is another serious problem. Sewage treatment plants all around the country are not working as the result of war damage, looting, and loss of fuel supply. A million cubic meters of untreated sewage enter the Tigris River in Baghdad every day.

In the other hand, the destruction of the Mesopotamian marshlands, and the consequent displacement of its indigenous Marsh Arab population, is one of the major humanitarian and environmental challenges facing Iraq, requiring both an immediate and long-term planning response. At the same time, the marshlands' central role in discussions on the sharing of trans-boundary water resources and oil development has placed the future of the marshland region among the priorities in Iraq's reconstruction agenda.

Syria: Environment is a valuable commodity in Syria and environmental vandalism entails a fiscal bill, besides affecting the quality of life. A recent World Bank study shows that the losses caused by environmental deterioration in Syria are over US\$ 700 million per year. This is caused by four main factors: US\$ 310 million due to the deterioration of soil productivity due to unsound agricultural practices, including irrigation systems, fertilizers, pesticides and overgrazing; US\$ 290 million due to contaminated water and the depletion of water resources, most of which is used to treat health complications; US\$ 60 million resulting from health problems caused by air pollution; US\$ 40 million due to random urbanization. These figures show that unless environmental management is included as a main ingredient in development equations, the losses resulting from environmental destruction would be enough to eliminate any gains generated by development. However, the solution is not that simple, as money needed for prevention measures should be available beforehand, to be used in long-term environmental measures, which might hinder other necessary development projects having the potential of generating faster results. Again, compromises are needed between development plans and environmental requirements.

Turkey's high rate of economic growth experienced during much of the 1990s, besides resulting in booming industrial production, also led to higher levels of energy consumption, imports, air and water pollution, and greater risks to the country's environment. In addition, increased oil exports from the Caspian Sea region to Russian and Georgian ports and across the Black Sea has led to increased oil tanker traffic (and risks of an accident) through the narrow, winding Turkish Straits (including the Dardanelles, Marmora Sea, and Bosphorus Straits).

As Turkey resumes economic growth in coming years and attempts to meet EU membership criteria, it will increasingly need to take environmental considerations into account. Improved energy efficiency is a key to this strategy; with reduction of state energy subsidies allowing energy prices to more accurately reflect true costs. Overall, Turkey's energy demand is expected to increase by 2.9% annually through 2020, while carbon emissions grow by a somewhat slower 2.2% yearly rate, as natural gas and renewable (which emit no carbon) consumption grows faster than coal usage.

To the extent that natural gas and renewable replace more carbon-intensive fuels, the country's increased use of natural gas will further diversify the Turkish energy supply and contribute to the mitigation of urban pollution and CO₂ emissions. By setting differentiated taxes to promote the use of cleaner fuels (and, in particular, to promote the use of low-sulphur heavy fuel oil), Turkey can significantly stem the rising tide of carbon emissions and other pollutants.

2.2.6 Land Use

Reducing the forest cover, destructing the rangelands, over grazing, developing the agricultural lands and in general having no land use pattern are the same problems in these countries.

Iran: Situated in arid and semi- arid region, Iran has poor vegetation cover and is observed as Low Forest Cover Country. The main land uses in Iran and their percentages are as follows: arable land 9%; grass land 27%; wooded area 11%; arid land and desert 50%. Percentage of urban population in the greatest city is 28% and the rate of urbanisation growth is about 5%.

Iraq is far from being completely a desert. It is surprisingly diverse ecologically, with habitats as varied as dry Montana forest in the north-eastern Kurdish area and the alluvial Mesopotamian marshes of southern Iraq. Even the desert areas, which cover about 60% of Iraq, vary considerably between different parts of the country in vegetation, rainfall, and elevation. The main land uses and their percentages in Iraq are as follows: arable land 12%; grass land 9%; wooded area 4%; arid land and desert 70%. Percentage of urban population in the greatest city is 55% and the rate of urbanisation growth is about 5%.

Syria: About 55% of Syria is a dry steppe or semi-desert, which is only suitable for grazing sheep and goats. Dry farming of cereals, food and feed legumes is the backbone of agriculture in Syria. Irrigated land is about 16% of arable land, which are about 6% of the total area of the country. The main land uses in Syria are as follows: arable land 28%; forest and wood land 3%; permanent pastures 43%; permanent crops 4% and others 22%.

Turkey: In the 1970s, the government conducted land-use studies and found that more than one-fifth of the land should have been used differently to achieve optimum long-term production. Misuse was greatest in rain-fed cropped fields, but some grazing land and wasteland were found better suited to other uses such as cropping and forestry. The government also was considering a broad land-use policy. However, reform proved difficult because of government inefficiency and the lack of alternative crops in areas cut off from markets, where farmers had little choice but to use their land to grow grain to feed their families. The main land uses in Turkey are as follows: arable lands 30%; forest and wood land 26%; meadows and pastures 12%; permanent crops 4% and others 28%.

2.2.7 Forests

Iran: Some of Iran's forest resources were nationalized under Mohammad Reza Shah's development plans, beginning in 1963. Since then, the state has gradually gained control over forest use. Of an estimated 18 million hectares of forest lands, only about 3.2 million hectares near the Caspian Sea can be regarded as commercially productive. The total forest cover in Iran is estimated about 4.5% (12,400,000 ha).

Iraq: Only 1.8% of Iraq is covered by forests (799,000 ha). But the natural forests of Iraq are confined almost entirely to the northeast region of the country, in mountains occupied by Kurdish tribes. Outside the mountain areas, forests exist only as small patches of riverbank scrub along the Euphrates and Tigris and their main tributaries. The remainder of the country is treeless. The mountain forests have not yet been surveyed or delimited, so that their exact area is unknown. It is estimated that their area is around 20,000 km², which is roughly two-thirds of the total mountain area in the Northeast region. About 50 percent of the mountain forests are of good stock and may be regarded as productive forests; the remainder represents degraded scrub with a sparse stock of bushes, or cutover forests not likely to become exploitable within the present generation.

Syria: Forests cover about 5,210 sq. km or 2.8% of the total area. The presence of remnants of forests in several sanctuaries and holy shrines in Syria is indicative of past widespread forest cover over most parts of the Mediterranean basin. But the mild climate in the country has encouraged the rapid increase in the numbers of population and the establishment of the flourishing in grained civilization that gave rise to heavy exploitation of the forests as sources of wood for energy and land for food production and pasture. Increase in population, urban and rural expansion and increasing environmental pollution, resulted in the degradation and denudation of the natural forests to about 233,000 hectares or less than 2% of the country's land area.

Turkey is a country with a landmass of 76.96 million hectares, of which 20.749 million hectares is forested. About 12 million hectares of forested land are subjected to forest fires. Most fires occur where the Mediterranean climate is characterized by high temperatures and low to non-existent precipitation.

2.2.8 Range Lands:

Iran: The area of rangelands is estimated about 90 million ha, covering nearly 54% of the total land area of the country. From centuries ago, the rangelands were exploited by animal holders and so rangelands productive capacity has decreased because of excessive number of animal units; the rate of dried foliage production in the rangelands are estimated 10.7 million tones each year. The amount is used to feed 37 million animal units for 7 months of a year, while at present 83 million animal units are grazing the rangelands.

Iraq: Raising livestock is another economic activity related to land use in Iraq. 10 % of Iraq's land area is suitable for livestock grazing. The livestock population in 2000 included 19 million poultry, 6.1 million sheep, 1.3 million goats and 1.1 million cattle.

Syria: Rangelands cover about 82.329 sq. km or 44.7% of the total area. The Badia once provided the major feed requirements for five million sheep, and now it only provides 20-25% of their feed. The Badia produces two thirds of all red meat production in Syria and one third of all milk. However, despite the efforts and programs of the Ministry of Agriculture and Agrarian Reform- such as forage banks, storage facilities, surface dams, plus planting shrubs over millions of hectares- the plant cover of the Badia continues to deteriorate. Over 40 million shrubs are pulled out annually for firewood and other uses.

Turkey: After the end of the World War 1, there were 440 000 km² of natural grazing occupying 58 percent of the country. At the same time there were about 20 million livestock units grazing on this vast area. After the Second World War animal numbers remained almost the same, while grazing areas were reduced to 430 000 km². Since then there has been a sharp increase in animal numbers and decrease in pasture area. Decrease in the pasture area has been due to mechanization of agriculture and ploughing of pasture to gain cropland. The same trend continued until the present time. Nowadays the number of animals grazing on Turkey's pastures is 3-4 times more than their carrying capacity.

2.2.9 Agricultural lands

Iran's land surface covers 165 million hectares, more than half of which is uncultivable. A total of 11.5 million hectares is under cultivation at any time, of which 3.5 million hectares were irrigated in 1987, and the rest watered by rain. Only 10 percent of the country receives adequate rainfall for agriculture; most of this area is in western Iran. Agricultural imports, including raw materials and intermediate and capital goods constitute only about 6 percent of total imports. Crops provide about 60 percent of the value added in agriculture.

Iraq: The land under cultivation in Iraq, which is predominantly an agricultural country, is about 12%. Most of this land is in the region of the Tigris and Euphrates rivers. According to statistics, agricultural production in 2000 included 226,000 metric tons of barley, 384,000 metric tons of wheat and 130,000 metric tons of rice. Before the UN sanctions imposed on Iraq following the Gulf War in 1991, the country's exports of dates accounted for a major share of world trade in this product.

Syria: Agricultural lands cover about 59.860 sq. km or 32.2% of the total area. The total agricultural crop production figures for 1997 are: 4.318 million tons of grain, 2.249 million tons of agricultural raw products for industry, 2.118 million tons of fruits, 1.920 million tons of vegetables, 183 thousand tons of pulses. These statistics represent a four-fold increase in agricultural products within a period of two decades.

Turkey: During the twentieth century, population pressure resulted in the expansion of farmland. The cultivated area increased from about 8 million hectares in the 1920s to nearly 19 million hectares in 1952 and to almost 28 million hectares by 1991.

2.2.10 Water Resources

Water scarcity is a same problem in these countries. Over using of all water resources during last decades, has made serious problems, more than before, for them. In the other hand, unequal distribution of water, building several dams without economical assessments as enough and high rate of water withdrawal especially for agricultural uses are other problems in these countries.

Iran: Water shortages are compounded by the unequal distribution of water. All streams are seasonable and variable. Spring floods do enormous damage, while there is little water flow in summer when most streams disappear. Scarcity of water and of the means for making use of it has constrained agriculture since ancient times. To make use of the limited amounts of water, the Iranians centuries ago developed man-made underground water channels called Qantas that were still in use in 1987. They usually are located at the foot of a mountain and are limited to land with a slope. There are several large rivers, the only navigable one of which is Karun, the others being too steep and irregular. The Karun River, with a total length of 890 km, flows in the southwest of the country to the Shatt Al-Arab, which is formed by the Euphrates and the Tigris after their confluence.

Iraq has more water than most Middle Eastern nations, which led to the establishment of one of the world's earliest and most advanced civilizations. About one-fifth of Iraq's territory consists of farmland. About half of this total cultivated area is in the northeastern plains and mountain valleys, where sufficient rain falls to sustain agriculture. The remainder of the cultivated land is in the valleys of the Euphrates and Tigris rivers, which receive scant rainfall and rely instead on water from the rivers. The rivers' discharge peaks in March and in May, too late for winter crops and too early for summer crops. The flow of the rivers varies considerably every year. Conversely, years of low flow make irrigation and agriculture difficult.

Syria: Water is a scarce resource in Syria as it is throughout the Middle East. Sufficient rainfall supports cultivation in an arc from the southwest, near the border with Israel and Lebanon, extending northward to the Turkish border and eastward along that border to Iraq. The other main area of cultivation, although dependent on irrigation, is along the Euphrates River and its major tributaries.

Turkey: Getting enough water to crops is a major problem for many Turkish farmers. Rainfall tends to be relatively abundant and regular in the coastal areas because of the mountains behind them. However, the bulk of the agricultural land is on the Anatolian Plateau, which receives less rainfall because it is ringed by mountains. Although rainfall on the plateau varies considerably among regions, it is barely adequate over large areas. In addition, the amount and time of rains vary sharply from year to year, causing sharp fluctuations in harvests.

2.2.11 Surface and ground water resources

Iran: Internal renewable water resources are estimated at 128.5 km³/year. Surface runoff represents a total of 97.3 km³/year, of which 5.4 km³/year comes from drainage of the aquifers, and groundwater recharge is estimated at about 49.3 km³/year, of which 12.7 km³/year is obtained from infiltration in the riverbed. Iran receives 6.7 km³/year of surface water from Pakistan and some water from Afghanistan through the Helmand River. The flow of the Aras River, at the border with Azerbaijan, is estimated at 4.63 km³/year. The surface runoff to the sea and to other countries is estimated at 55.9 km³/year. The total safe yield of groundwater has been estimated at 49.3 km³/year.

Iraq: The average annual flow of the Euphrates as it enters Iraq is estimated at 30 km³. Unlike the Tigris, the Euphrates receives no tributaries during its passage in Iraq. About 10 km³ per year are drained into the Hawr Al-Harnmar. For the Tigris, average annual runoff as it enters Iraq is estimated at 21.2 km³. Good quality subterranean water has been found in the foothills of the mountains in the northeast of the country and in the area along the right bank of the Euphrates: The aquifer in the north-east of the country has an estimated sustainable discharge of between 10 and 40 m³/s. Its salinity increases towards the south-east of the area, where it reaches 1 mg/l. Other aquifers on the right bank of the Euphrates River have an estimated discharge of 13 m³/s and their Salinity varies between 0.3 and 0.5 mg/l. In other areas of the country, groundwater is also found, but always with a salinity level higher than 1 mg/l.

Syria: The natural average surface runoff to Syria from international rivers is estimated at 28.73 km³/year. Total groundwater inflow has been estimated at 1.35 km³/year, of which 1.2 km³ from Turkey and 0.15 km³ from Lebanon. Although not quantified, the amount of groundwater flowing into Jordan may be significant.

Turkey: Of the total surface runoff of the country, estimated at 192.8 km³/year, almost one-fourth comes from the Euphrates and the Tigris rivers. Average annual surface runoff entering Turkey from other countries is estimated at about 1.8 km³ (the Orontes, the Tunca). Another 5.8 km³/year comes from Bulgaria through the Meric River, which forms the border between Turkey and Greece. Average annual surface runoff leaving the country is estimated at 60.4 km³, while almost 8 km³ flows in the interior basins. A figure of 12.2 km³/year for groundwater is given for the year 1994. It probably represents identified development potential, and a figure of 20.0 km³/year for yearly groundwater recharge is probably a more realistic estimate.

2.2.12 Dams

Iran: Dams have always played an important role in harnessing Iran's precious water reserves and the long-term objective of Iran's water resources development plan is based on the control and regulation of water resources through dams. Construction of large reservoir dams since World War II has made a major contribution to water management for both irrigation and industrial purposes. The first of the major dams had a significant impact on the Iranian economy. Completed in 1962, the Mohammad Reza Shah Dam on the Dez River was designed to irrigate the Khuzestan plain and to supply electricity to the province. In 1994, 27 storage dams were in operation with a total regulation capacity of 39.2 km³. At the same time, 24 storage dams were under construction with a design regulation capacity of 11.5 km³.

Iraq: Not until the twentieth century did Iraq make a concerted effort to restore its irrigation and drainage network and to control seasonal flooding. Various regimes constructed several large dams and river control projects, rehabilitated old canals, and built new irrigation systems. Barrages were constructed on both the Tigris and the Euphrates to channel water into natural depressions so that floods could be controlled. Some dams that created large reservoirs were built in the valleys of tributaries of the Tigris, a measure that diminished spring flooding and evened out the supply of water over the cropping season. In 1988 barrages or dam reservoirs existed at Samarra, Dukan, Darband, and Khan on the Tigris and Habbaniyah on the Euphrates. Two new dams on the Tigris at Mosul and Al Hadithah were on the verge of completion in 1988.

Syria: Syrians have long used the Euphrates for irrigation, but, because the major systems were destroyed centuries ago, they make only limited use of the river's flow. In the mid-1980s, the Euphrates River accounted for over 85 percent of the country's surface water resources, but its water was used for only about two-fifths (200,000 hectares) of the land then under irrigated cultivation. In 1984, about 44 percent of irrigated land still used water from wells. Several project studies were conducted after World War II, and, in the 1960s, the Soviet Union agreed to provide financial and technical assistance for the Al-Tabqa Dam, a large hydro-electrical power station, and portions of the major Euphrates irrigation project. Now, there are 141 dams in Syria with a total storage capacity of 15.8 km³.

Turkey: Major projects in Turkey were planned to expand the irrigation system because government surveys had indicated that irrigation of up to 8.7 million hectares was possible. By the end of 1991, the construction of 164 large dams, mostly rock fill or earth fill dams, and 765 small dams had been completed and put into service for water supply, irrigation, hydro power and flood control. Total dam capacity is about 206 km³. The Ataturk Dam on the Euphrates south-eastern part of the country, with a total storage capacity of 48.5 km³, is one of the 10 largest dams in the world.

2.2.13 Water withdrawal

Iran: The total agricultural, domestic and industrial water withdrawal was estimated at about 70 km³ in 1993 (of which 91.6% is used for agricultural purposes, 6.3% for domestic use and 2.1% for industrial use). Although this is equal to 51% of the actual available renewable water resources, current annual abstraction from aquifers (from 49 km³ in 1990 up to 57 km³ in 1993) is already more than the estimated safe yield (46 km³). Further to these 70 km³, another 39 km³ of water is used annually, of which about 20 km³ for electricity production, 11 km³ for flood control, 2 km³ for environmental protection (control of downstream parts of rivers), while the remaining part is considered to be surplus water.

Iraq: Total water withdrawal is estimated at 42.8 km³ in 1990, of which 92% is used for agricultural purposes (3% is used for domestic supplies and 5% for industrial use). According to the most recent estimates, 85 % of river water withdrawal is used for agricultural purposes.

Syria: Total annual water withdrawal in Syria in 1993 was estimated at 14.41 km³/year, of which agricultural use accounted for 94.4% (3.7% is withdrawn for domestic use and 1.9% for industrial use). The assessment of agricultural water use is based on the assumption that the maximum water requirement is about 13,450 m³/ha per year. In Syria, all treated wastewater is reused.

Turkey: It is estimated that 95 km³ of the total surface runoff of 192.8 km³/year could be technically developed for economic use. In 1992, total annual water withdrawal was 31.6 km³, of which agricultural use accounted for 72.5% (16.4% is withdrawn for domestic use and 11.1% for industrial use). The treatment of domestic wastewater is estimated at 0.1 km³/year.

2.2.14 Institutional Arrangement

In all these countries, government is the main responsible for managing the natural resources; it means other managing parts, such as private sectors or non-governmental organizations, have no authority to manage the forests of their countries.

Iran: After Iranian revolution in 1979, the Government of the Islamic Republic of Iran has centrally managed all natural resources as well as trade. In the late 1980s and 1990s there were some economic reforms towards liberalisation and to moderately reduce government intervention, especially in the marketing and pricing of agricultural commodities. One of the main objectives behind this move is to decrease national reliance on revenues from oil and boost exports in other sectors, in particular agriculture. There have also been some moves to decentralise the management of the economy and to involve more civil society elements. As will be noted below, this includes the forestry sector; however the impacts of these changes on the forestry sector (if the current trend continues) are more likely to be indirect.

Iraq: All land in Iraq is owned by the State. For some farming land, rights have been transferred from the State to occupiers to utilize, exploit, rent the land or sell the right itself. Most, if not all, grazing and forest land has been made available to village communities for their communal use.

Syria: The legal standing as regards timber and forests is fairly straightforward. In Syria in accordance with ancient Turkish rights, all forested land belonged to the Sultan. After the dissolution of the Ottoman Empire, ownership devolved on the State. Communal forests, public properties, and religious: properties are rare. The forested land of this country is made up of approximately 72 percent state forests, 23 percent privately owned forest and only 6 percent of communal, public, and religious forests.

The legal position of some forest land in Syria is very confused as the result of innumerable ownership cases contested as much by communities as by individual persons and on which there have never been any rulings. It should be noted that the state forests are neither delimited nor marked and no precise boundary maps exist

Turkey: Forests were nationalised in 1945, the ownership of 99% of Turkish forests is in state hands; 20,000 ha are under private ownership. However the lack of clear ownership boundaries in forest areas have caused ongoing disputes between various stakeholders, as one-fourth of the forest areas have not yet had their boundaries marked. Disputes have been exacerbated by revisions in the legal definition of forests, which have in turn required new cadastral surveys to be undertaken and have led to further tenure disputes.

2.2.15 Institutional Framework

Iran: The Department of Forests and Rangelands -which is part of the Ministry of Jihad Agriculture- is the overall responsible body for managing forests and developing forest policy. Iranian forest policy is currently moving towards a more integrated approach to forestry that includes sustainable forest management as a national objective. At the national level, the forest sector has started to create horizontal linkages with other departments (such as environment, industry, energy, agriculture and animal husbandry). The Department has also started to decentralise some of its management activities and involve the private sector; Local communities in forest areas and NGOs have also recently been involved in preparing forestry plans.

Iraq: Iraqi government is the sole owner of the pure state lands of Iraq and no one has any legal rights upon these lands; the State can sell, hire, donate and exploit these lands without any restriction. The Ministry of Finance runs these lands as the representative of the State. In the other hand, abandoned lands belong to the State and have been allocated to public utilities or for the benefit of village people. They include: Mountains, Natural range and forests, Rivers and their branches, Public Gardens and Parks etc. Management of range and forest is entrusted to Departments of Agriculture within each Governorate; these local authority agencies recognize National legislation as the current authority for control and management of range and forest areas.

Syria: The Forest Directorate of Syria is responsible for the forests through their protective role and their contribution in the development of agriculture. The Forest Directorate and its departments in Syria, operate in accordance with legal frameworks and executive instructions embodied in the Forest Law number 7 of 1994 and the Forest Regulations (and whatever related instructions and explanations). For this purpose, the forest unit within the structure of the Ministry of Agriculture and Agricultural Reform abides by the legal implications, maintaining administrative and organizational links with other directorates concerned with forest protection and law enforcement within and outside the ministry. The forest plans and forest law is dependant upon a basic point, which is that the Syrian forests are owned, managed and financed by the state. The citizens' rights of ownership on their forests are guaranteed, but those rights should be enjoyed under supervision and in accordance with forest laws, which control the private and state forestry practices. There is also co-operation and co-ordination with the other ministries in the upkeep of the forested regions and the sustainable use of the forest resources. In addition, there are two main forest education institutions in Syria.

Turkey: The Ministry of Forests of Turkey is the overall responsible body for managing forests and developing forest policy; this Ministry and its public bodies derive a significant income from wood production as well as being charged with the protection and management of forests. Turkey also has a significant private sector involved in a variety of forest related activities.

2.2.16 Livelihood Assets

Iran: An FAO study in 2002 estimated that five million people in Iran rely on forests and services related to forests. The direct benefits that people derive from forests through either from subsistence consumption, employment, trade or processing are more difficult to estimate. The FAO 2002 study estimated that there were 7,453 and 12,831 temporary jobs in the forestry sector. Apart from these direct benefits the rural poor get indirect benefits from forests and rangelands through the conversion of forest land to agriculture, the extraction of fodder and livestock grazing.

In the other hand, nomadic pastoralists have been the main users of rangelands in Iran. They had been able to achieve some sort of "balance" between their environment and their economy through a long-time co-adaptation. But this has changed over the recent decades, as nomads are now being held liable for the significant degradation of the rangelands, over which they migrate with their livestock. Efforts to improve the natural resource status of rangelands have traditionally been attempted through the use of technology transfer and centralized top-down planning. Poverty and low levels of social welfare among the nomadic peoples are causes for significant concern to government agencies committed to matters of equity and social justice. But while a large proportion of the nomadic population now wish to improve their own welfare through settlement, the government does not enthusiastically support such a strategy for a number of different reasons including those above. Low levels of productivity characterize the utilization of the rangelands by nomadic pastoralists. Although they represent only a small proportion of the population, even in rural areas, the nomads are the main breeders of indigenous species of livestock in Iran. They provide the breeding stock for the rest of the livestock industry in the country, including large-scale commercial livestock enterprises.

Iraq: In most villages, all forest and rangeland is available for communal grazing where traditional rights to graze the rangeland are still recognized (89% of villages surveyed). In a small percentage of villages (6 %) the headman has a separate area for grazing from the other livestock owners. Over half the surveyed villages reported that local rules were applied to control the use of range and forest within the village. About 75% of villages in the mountainous areas and only 40% of villages in the lowland areas recognized some rules controlling their use of forest and range. Most villages recognised local authority rules against cutting down green forest trees, but there was no control over sheaving practices (cutting of green tree foliage for fodder). About There were no rules regulating numbers of animals or grazing pressure. In general, if there was feed available then it could be grazed. Control of grazing in distant rangeland or alpine pastures is determined solely by availability of feed and local weather conditions.

Syria: In the steppe the majority of people are tribally organized and dependent on a migratory pastoral or agro-pastoral economy where mobility and natural resource management are facilitated by extensive customary systems. The people have been using the forests for millennia, with traditional use managed through agreements between tribes. The central Syrian Desert has experienced serious degradation over the last 15-20 years, with loss of many species. Traditional activities of the herders have become unsustainable and have surpassed the capacity of these semi-arid systems. The traditional way of using resources was replaced 30-40 years ago by the Syrian government with a destructive system of open access. Also, awareness of conservation among local communities is very low.

There are a lot of misunderstandings about nomads in Syria, such as that they are degraders of the steppe. The most important action to take to rehabilitate and save the forests and rangelands of Syria is to reform the land use laws, to either go back to the traditional system or find some compromise with the new system that limits destruction. Training of larger numbers of both local people and government officials, both formal and informal, is also important.

Turkey: The 15 percent of the Turkish population who live in forests or forest neighbouring villages are far poorer than the national average. Landholdings in forest villages are also lower than the national average and unemployment can be as high as 60%. Most of these villages are remote and few initiatives have so far been successful in improving their livelihoods through approaches using forest resources. Indeed many poor people in forest villages do not make their livelihoods directly from forestry; their incomes depend in greater part on alternative land uses that compete with forestry such as agriculture and livestock grazing. The main pressure on forests comes from fuel wood collection and livestock grazing as well illicit timber extraction.

3 CHAPTER 2 - ISSUES

3.1 Main Forest Issues

3.1.1 What are the Impacts of Deforestation in this Watershed?

Forests cover only 1.2 Percent of Euphrates and Tigris Watershed. Therefore, forests have not a significant weight in terms of land uses. Forest vegetation in this watershed has been very dense but with time has become very poor due to years of degradation activities. The land of these forests lies along historic east-west travel routes and has a long history of human settlement. Thus, although it is mountainous and characterized by the high plateaus and rugged landscape, much of the forest has been destroyed by long periods of human use. Human impact has resulted in a decline in the habitat as well as plant diversity. Nearly 50 percent of the forests have been heavily destroyed; an open canopy, well-developed grass layer and a patchy distribution resulting from human exploitation characterize these forests. Forests are present at the edge of plains in tectonic depression. Dry forests are found at high elevation, being sparse and poor due to aridity as well as heavy biotic pressures. Nearly 50 species have been recorded to be under a threat of extinction. In particular endemics are facing a greater threat. This area shows an endemic ratio of 20-25%.

Generally, in this watershed deforestation can be accompanied by some degree of desiccation, the gradual reduction of water resources in this deforested region; desertification is an extreme result. The effect of deforestation is more fundamental than its mere utilitarian factor. Shrinking forest cover lessens the landscape's capacity to intercept and retain precipitation. Instead of trapping precipitation, which then percolates into the soil, deforested areas become sources of surface water runoff, increasing potential for flooding. Deforestation also contributes to decreased evapotranspiration, which lessens atmospheric moisture and precipitation levels, and affects precipitation levels downwind from the deforested area, as water is not recycled to downwind forests, but is lost in runoff and returns directly to the oceans. Forests are also important stores of organic carbon, and forests can extract carbon dioxide and pollutants from the air. Forests are also valued as a thing of aesthetic beauty and as a cultural resource. Deforestation results in the loss of these benefits.

Overgrazing is one of the problems here, and forests have been cut extensively for fodder, construction materials and fuel wood. Large-scale reforestation schemes intended to produce wood for fuel and other purposes completely alter or destroy natural vegetation communities. In addition, dam construction and large-scale irrigation schemes along the Tigris and Euphrates rivers pose significant threats to the native plant species either by flooding their habitat or altering the water regimes to which they are adapted.

3.1.2 What is the Forest Supplying to the People in this Watershed?

The settlements of people living in forest villages of this watershed consist of population ranging from a few households to a few hundreds of people. Their life is deeply interlinked with ecosystem-based elements such as forest-tree, grazing, snow, avalanche, hazards, wildlife, nature etc. In the other hand, forests are source of a lot of wood and non-wood forest products for this people. For example, on an average every year timber in Turkey is harvested at a rate of around 7 million m³ and Euphrates and Tigris basin has a major contribution in it. The firewood production lies around 35 million m³ in Turkey, most of which is used in this watershed.

Industrial wood consumption in Euphrates and Tigris watershed includes firewood, log, chip wood, pulp wood, mining and packing. The consumption of good results of animal breeding in the forests accounts for one of the significant parts of non-wood forest products. Animal breeding in these forests is popular. It is a source of income for the local poor rural population. The main breeding animals include sheep, goats, caws, etc. They are source of meet, milk, wool and related products of high nutrition quality. Thus they observe another technological chain of primary and secondary products of these forest areas, which constitutes serious part of local consumption. The primary animal breeding results in secondary goods all of them part of the local consumption.

In Euphrates and Tigris watershed, there are unique NWFPs that they obtain from medicinal, culinary and aromatic plants of forests and rangelands such as medical shrubs, mushrooms, grass and herbs, and also various crops obtained from leaves, flowers, stems, seeds, roots and gum resins. But, unfortunately, the real values of NWFPs of this watershed are still unclear because of no recognized standard classification, incomplete national/regional coverage, problems of comparability, and problems to estimate production/consumption trends. Gums resins are important marketable NWFPs in this watershed with high economic values that they are so profitable for national and international investments.

3.1.3 What is the Evaluation of Desertification in this Watershed?

One of the critical environmental problems facing the Euphrates and Tigris watershed is the progressive desertification of agricultural land. In a region already far from being self-sufficient in food and with a growing population, desertification poses a very real threat to food security.

Rapid population growth in the last half of the twentieth century greatly increased demand for food, and to meet this demand, large areas of pastoral land and some previously unused land were put under cultivation. The growth of cities, generally situated a top of the regions most productive agricultural land, pushed cultivation onto areas which had previously been primarily pasture. This in turn displaced herders onto land which was unsuitable for permanent agricultural operations. Concurrently, the use of previously unexploited lands for pasturing increased dramatically in the 1980s as the region expanded its wool markets overseas, supporting the demand for wool with large commercial herding operations.

The stress placed on the land by these changes was compounded by changes in land tenure systems. Until recently, most pastoralists travelled as nomadic and semi-nomadic tribes. Constant movement prevented the overgrazing of the fragile vegetative cover that is characteristic of much of this watershed. Beginning in the mid twentieth century, however, the privatization of land resources led to the creation of fenced enclosures and fixed settlements. Fixing the location of herds placed unsustainable stress on the grazing land, and left much of it barren and vulnerable to erosion.

Overgrazing robs the soil of its ability to hold water and at the same time removes much of the cover that serves as a shield against erosion. The consequence is that much of the topsoil in affected regions of this watershed simply dries up and blows away. In a process called desertification, this dry, sterile soil forms drifts, which swallow and kill other plant life. While overgrazing should be seen as the primary cause of desertification in Euphrates and Tigris watershed, unsustainable forestry practices, including the gathering of fuel wood for cooking and heating and the commercial harvesting of trees have also contributed.

3.1.4 Conclusions:

To achieve effective integrated forest and watershed management, the following potential future direction and activities should be given high priority in this watershed:

- Assessing and mapping existing forest and tree resources through out this watershed and adopt the eco-regional and ecosystem approaches
- Developing and implementing policies that incorporate forest management into international, national and regional strategies, plans and programmes related to integrated river watershed, watershed and groundwater management
- Enhancing the role of planted forests, trees outside forests in land restoration, environmental protection;
- Give more attention to forests and tree planting through formulation and implementation of national forest programmes that are well integrated into national development plans
- Working with relevant international and national organizations, institutions and other stakeholders to increase understanding of the hydrological and environmental services of forests
- Encourage afforestation and reforestation in order to supply the wooden needs of local people especially for fuel wood
- Put more strong limitations for grazing in forest lands and stop over-grazing in these lands
- Preparing land use maps and also determining Carrying Capacity of forests in order to stop land use changes especially from forest lands to other land uses
- Making some new practical policies in order to stop extent degradation in these forests and also strong laws with penalties
- Calculating the real values of NWFPs and making investment opportunities for these products
- Assessing the eco-tourism situations of this watershed

3.2 Main Water Issues

3.2.1 How is the Water Quality in this Watershed?

In all the water management projects, which have been planned to date for the Tigris and Euphrates watershed, the emphasis has been on water volumes, with relatively little consideration being given to water quality. In general, the natural water quality of the Tigris and Euphrates watershed is high, especially during the spring/early summer snowmelt period. Within the next decade or so it is possible that water quality along the mainstreams of the Tigris and the Euphrates might change significantly for the worse. The main problem is that, with most of the diverted water being used for irrigation in this watershed, there is a potentially serious problem with regard to the quality of the irrigation return waters.

This water will carry with it a wide range of dissolved chemicals including pesticides, herbicides and petroleum products, which are associated with modern agricultural practices. What is difficult here, however, is to be able to predict just how severe an effect will be generated, as this depends so much on local environmental conditions and the actual agricultural practices, which are being utilised. On the Euphrates it is possible to identify two rivers, which will carry most of the return waters from the Turkish irrigation projects. These are the Rivers Balikh and Khabur. Just what the impact of these waters will be on the quality of the mainstream of the Euphrates is unknown, but it might well be considerable during the low summer flow period.

Given the political standing of Saddam Hussein in the West, it is not surprising that many Western commentators have placed all the blame on Iraq for the potential disruption of the ecology of the marshes of the Shatt Al-Arab. This is, however, a rather extreme view of the situation as the major new irrigation works in the upper part of the basin has already threatened the future of the marshes. In reality, the Iraqi actions have merely exacerbated what was already a critical situation. It also has to be recognized that attitudes to the draining of wetlands have changed markedly in the relatively recent past.

Growing demands for irrigation by both Syria and Turkey ultimately affect the amount and quality of water Iraq receives from the Tigris and Euphrates rivers. Higher sedimentation rates and river salinity have reduced flow rates and necessitate major changes in water use policies.

3.2.2 How is the Water Distribution between the Countries in this Watershed?

The anticipated and declared demands of the riparian countries of Euphrates and Tigris watershed are greater than the total water volume of the two rivers. There is a need to devise an arrangement for using the waters of the Euphrates–Tigris watershed in a rational, equitable and sustainable way.

The important problem of water resources unequal distribution and existing misconceptions is because of Turkey's power and position in this watershed. Also numerous studies that have been published over the past decade cite Turkey as the water-rich country of the Middle East¹.

¹ For the real water-rich countries of northern Europe and Canada, the water availability is around 10,000 m³/person per year or more.

However, this is so only in relative terms. However, this is so only in relative terms. All three countries will by 2020 face more or less the same conditions in terms of water supply. The misconception that Turkey is often thought of as having a water surplus is partly due to the fact that Turkey, so far, has only developed one-third of its total water potential and has a huge unused resource, which Turkey's economy will need in the future.

3.2.3 What are the Social, Environmental and Economic Impacts of GAP “South-eastern Anatolia Project” on this Watershed?

Economic impacts

Eight economic plans have been put in place for the GAP project. However, these goals have not been reached yet. The unemployment rate remains very high. Land reform, which was aimed at abolishing the feudal structures in Southeast Anatolia and distributing income more equally, has not been realized. This issue had already been a matter of grave concern in Ataturk's time. Still land lordship prevails. The GAP project was scheduled for completion in 2010, but the deadline has now been postponed until 2047 due to financial problems. To complete the GAP by 2010, 900 million US\$/year would have to be invested. In 1999, however, only 450 million US\$ were invested. So this is likely to cause a 15 year delay in implementation for energy, 37 years for agriculture and 25 years for the region's infrastructure.

A law to encourage investments in 11 cities was extended to 22 cities. Investments, however, focused more on the larger cities and often did not reach the cities where real necessities are present. The main objective of the law was to enhance the situation in cities where economic and social indicators are very low, if the government had provided the same possibilities for every region, the economic gain in these regions would have been much greater. Investment in hydropower energy was completed successfully but the plan for agricultural investment is still unfinished.

Environmental impacts

Erosion, sedimentation, and salinization: The total GAP region is 7.4 million hectares; moderate to very intensive water erosion affects 5.5 million hectares of these. This area is volcanic and steep and erosion has been significant enough to expose underlying sub-soils and rock structures. An area of 4 million hectares now has a problem with this increased bedrock exposure. Farmers, however, still attempt to cultivate their land by removing the stones. Because of improper and excessive irrigation there has also been an increase in salinization.

Erosion has also resulted in sedimentation, 10% of the volume of the Ataturk Reservoir has been filled with sediment. However, complete sedimentation will take 500 years in this reservoir because of the Keban and Karakaya dams which are located above the Ataturk dam. This differs from the sedimentation rate of other dams in Turkey, many of which only have a 50-year lifespan. Soil erosion, due to insufficient forests and vegetation cover, is also a problem in the GAP region. Together these reasons explain why 72.3% of the region is facing intensive soil erosion.

Wastewater treatment: Wastewater from the surrounding areas flows directly into the Ataturk dam reservoir, which is used as a drinking water source. However, there is not enough data to evaluate the situation.

Archaeological impacts

There are some settlements of historical importance in the region that will be submerged by the construction of dams. For example, the Birecik Dam would flood Zeugma, Apamea, Urima and Halfeti. The planners indicate that only 2/5 of Halfeti will be under water. It was also decided that water from this dam would be used as drinking water, not only for irrigation and energy. Because of this, the rest of the settlement cannot survive because of the laws about the protection of drinking water sources. So people from this area would have to relocate.

Social Impacts

Unequal distribution of land: The most distinguishing feature of the GAP region is the large-holding landowners in a country characterized by small family farms. This is because land was given to tribal leaders for political support during the Ottoman Empire. These land holdings have since been passed on down the family line. There are many villages in which one or relatively few families own all the cultivated land, with the land of some families extending beyond a single village boundary. Approximately 32% of all large holdings in Turkey are located in the southeast where 30% of the households own no land.

The position of the women: Women in this region have a marginal position and are not permitted to inherit land or property and therefore they do not receive individual compensation during resettlement. There is a general cultural belief that land should be passed down to sons and not daughters even though the Turkish Civil Code states that land should be shared and inherited equally by both men and women.

Not enough information and education: In the GAP irrigation canals, 100 people have been drowned in about 5 years. People, especially children, entered the canals of the Euphrates to refresh themselves or they fell into the canals accidentally. Families who lost their children and farmers using the canals began to argue over this issue. The families wanted to stop the water in the canals temporarily in order to search for their children, while the farmers were against this.

Resettlement Problems: The majority of people who have chosen compensation under the various resettlement programs have faced many problems in the urban areas where they are newly settled. Moving from a village environment where there is strong social support is both psychologically as well as culturally disruptive. To deal with cash was exciting for poor farmers. But many of them had never had cash in their hands before and they also had no experience about financial management.

Unemployment in urban areas is also a serious problem. Most settlers in the cities suffer from economic problems and rural settlers have problems of adapting to their new situation (unsuitable locations, housing that is not suited to rural life, lack of good quality fertile land and few employment opportunities).

3.2.4 What is the Status of bilateral Treaties between Turkey, Syria and Iraq due to Shared Water Resources in this watershed?

Since only a minimal part of the GAP irrigation project has been realised, tensions are likely to increase as more water is used by these projects. In this watershed three factors are important in assessing the conflict potential of these international rivers (For a visualisation of international relations in relation to shared water resources (See Table 15) :

- 1- The degree to which cooperative frameworks and agreements have been realised
- 2- The perception of water scarcity and inequitable distribution
- 3- The power balance and degree of interdependence between these countries

Turkey's position:

1. Turkey (as well as Syria) would like the Euphrates and the Tigris to be considered as one watershed, two branches of the same river. This would mean that one could agree separately with Syria on the Euphrates and with Iraq on the Tigris, because this would be an easy way of sharing the "one" river watershed.
2. Turkey considers the rivers as “transboundary” and not “international”. This means that Turkey has more freedom on how to use the waters. As the rivers have their source in Turkey, it maintains that it has rights over them. If the rivers were considered as international, a trilateral agreement would have had to be signed before GAP could have been implemented. Conceding 500 m³/s (15.8 km³/yr.) to Iraq and Syria is seen as an act of good neighbourliness, not a legal obligation.
3. Turkey nevertheless respects certain aspects of international law: not causing appreciable harm to "prior rights" of utilization; in other words Turkey will not cause too much harm to users who have already been using the water. This avoids, or at least postpones, open conflicts. What does "appreciable harm" or "too much" mean, however?
4. Turkey proposes the principle of "comparative advantage". Thus, in agreement with others and based on technical considerations, water should be developed for the maximum benefit of all; in other words this means a sectoral specialization. Turkey uses the water to develop irrigation, thus covering the nutritional needs of the countries of this watershed as well as supplying them with hydroelectric power; on the other hand Iraq could supply Turkey with oil, a vital resource for Turkey's economy.

Syria's position:

1. The rivers should be considered as an “international” river, historic rights of usage are to be protected. No water development projects should be undertaken without the prior consent of the other riparian countries. Supply increase due to water development projects should be shared on an equitable basis. Although Syria takes a strong stand regarding these principles when it comes to negotiations with Turkey, she is more flexible in applying them in relation to the downstream, Iraq. This is largely due to the conflict-rich relationship between the two opposing Ba`th-parties in power in these two countries.
2. The rivers should be considered as one watershed. Syria has the total downstream rights on the Euphrates, Iraq on the Tigris.

Iraq's position:

1. The rivers should be considered as “independent”; each river should be shared equitably and independently of each other. This would ensure that Iraq has rights over the Euphrates equal to the other riparian countries. Utilization of the Tigris is linked to numerous problems:
 - a) The river traverses the North of Iraq, which is Kurdish territory. Should this area become more independent, it would mean that Baghdad would lose control over its water resources.
 - b) The Tigris River has a higher salt content than the Euphrates; this means that it is difficult to use this water without mixing it with less salty water from the Euphrates – especially for soils that are already naturally salty.
 - c) The majority of Iraqi irrigation schemes, as well as many villages, are situated along the Euphrates. The probable outcome in the long run will be for Iraq to transfer water from the Tigris to the Euphrates watershed within her borders.
2. Concerning the legal status, Iraq has a similar position to Syria.

In sum, Turkey’s water security is clearly driven by not only economics, but also political motivations, regardless of proud claims to irrigate 1.7 million hectares by GAP. The technical stance taken by Turkey regarding water allocations is helpful, but any successful cooperative arrangement to share Euphrates or Tigris waters from Turkey will have to go further to address mutual regional security agreements first, followed by strengthening economic interdependencies. Interestingly, social and environmental concerns seem to take low priority in Turkey’s development agenda. Concerns from downstream riparian focus on Turkey’s projected use (withholding) of water and water pollution, threatening Syria and Iraq’s water security.

3.2.5 Conclusions:

As soon as the first parts of the GAP were realized, new problems arose due to the large size of the project; Thus:

1. An assessment of the economic, ecological, political and social advantages and drawbacks of the project are needed. This would provide the basis for a more appropriate decision making process
2. An improvement in the information policy towards the local people and the outside world would help public participation
3. Negotiations and a binding agreement over shared water resources with Iraq and Syria are needed. If the international implications of a certain project (e.g. Ilisu) are based on the implementation of the project, then the conditionality of this implementation should be agreed upon with the countries concerned (e.g. Iraq). As a country such as Switzerland is economically involved in a project that has political implications, it should also become politically active and support efforts at securing an international agreement between the countries concerned. By being involved in the Ilisu project, Switzerland becomes co-responsible for any conflicts between Turkey and Iraq related to this project.
4. An Export Risk Guarantee is an important tool in export economies, but the lack of binding agreements with strict social, political and environmental stipulations prevents the promotion of sustainable projects. Export Risk Guarantees should only be granted when such agreements have been met and their implementation guaranteed.
5. The losses due to bad electricity distribution infrastructure should be reduced, the potential of demand-side management should be looked into and wind or photo voltaic-power plants should be built.

3.3 Main People Issues

3.3.1 What are the Linkages between Population Growth and Poverty in this Watershed?

Poverty in Euphrates and Tigris watershed is a complex phenomenon and its incidence is determined by many factors, including the level of per capita income, distribution of assets and income, quality of governance, policies and institutions related to education, health and other aspects of human development. However, high population pressure in this watershed leading to low per capita income is considered one of the major causes of poverty here. With a fixed amount of land and other natural resources, it becomes difficult to provide even a minimal standard of living to a large and rapidly growing population. Even though birth rates have been declining in this watershed, the population growth momentum is such that net absolute additions to population numbers each year is higher than in the previous year. Such demographic dynamics lead to what has been called the “population poverty trap”.

Another linkage between high population growth and poverty in this watershed is manifested in large family size among the poor, signifying the relatively higher population growth rate of this group. Therefore, large family size as a result of a higher population growth rate is considered one of the principal factors keeping such families poor. However, here it can be argued that the high population growth rate is not only a cause but a result of poverty. The poor tend to have more children because of a greater need for income from child labour. In both rural and urban areas, the children of the poor start to help their parents to earn a livelihood at an early age and they are the only security the poor have for their old age. Although the earnings of the very young are usually meagre, the need for their labour prevents them from attending school. The lack of education of poor children, in turn, helps to transfer poverty from one generation to the next.

Labour force and employment: Employment and poverty in this watershed are closely associated: the lack of the former is the most important reason for the perpetuation of the latter. Demographic changes have a direct impact on labour force supply and thus employment. In general, this watershed with high labour force growth has relatively high unemployment rates. In Euphrates and Tigris watershed, the rate of female labour force participation tends to be lower than that for men. However, there was a rapid increase in the share of the female labour force in the total labour force. The rapid decline in fertility rates gave more time for women to participate in economic activities.

Agriculture is still the major source of employment in Euphrates and Tigris watershed. As a result of heavy pressure on the rural agricultural sector and the lack of other non-farm employment opportunities, there has been a rapid migration of the labour force from rural to urban areas as people search for a livelihood. In urban areas, these new migrants, who are often uneducated and unskilled, usually end up in low paying informal sector work owing to the limited job opportunities in the formal sector, thus exacerbating urban poverty.

Education: Education itself is one of the dimensions of non-income poverty in Euphrates and Tigris watershed. The labour force in this watershed has lower educational levels. A rapidly increasing school-age population also makes it difficult to improve the quality of education in this watershed. Also, it has direct bearing on income generation and hence income poverty through labour productivity. With an increase in fertility, the population of children of school-going age also increases with some time lag.

Health: The importance of health as a contributor to non-income poverty as well as its direct impact on labour productivity cannot be over-exaggerated. Demographic dynamics of this watershed affect the demand for health services in at least two ways. As the size of the population grows, the demand for health services rises. Therefore, this watershed with a high population growth rate faces the dual challenge of improving health services for the existing population as well as meeting the demand of the growing population.

Changes in age composition of the population in Euphrates and Tigris watershed as a result of changes in fertility and mortality rates have implications for health services also. In this watershed with high fertility rate, a large proportion of the population will consist of infants and young children with particular health needs. At the same time, there is a larger demand for reproductive health services for women.

Poor people usually do not have sufficient income to pay for health services. In public hospitals where medical services are subsidized or are free of cost, facilities are often woefully inadequate and there are usually long queues. In rural areas of this watershed, people have to travel long distances to benefit from health services because public health facilities are situated mostly in urban areas. Thus, high opportunity costs deter effective utilization of health services by the poor.

3.3.2 What are the Main Effects of Population Growth in this Watershed?

The spread of technology and culture together with a rapid growth of human population in Euphrates and Tigris watershed has spread the desertification process to every continent. Here, degradation is a problem with ancient roots related to population growth; cutting of forests, overgrazing, and salt accumulation in irrigated lands led to desertification in Mesopotamia.

Industrialisation and demographic explosion have been important driving forces in the heavy urbanisation of Euphrates and Tigris watershed. This watershed experienced greatest constructional activities during the last decade losing 16,000 ha of prime quality land. The first recorded civilisation of the Sumerians was thriving in the southern Tigris-Euphrates Valley by the 4th millennium B.C. Over the course of years, Sumerian irrigation practices destroyed the pedosphere in such a way that this civilisation collapsed. However even today vast areas of Iraq look like snow covered fields. Latest trend in this watershed has been use of best quality arable lands for urbanisation districts such as highway construction, tourist establishments, sports complexes, universities, airports and other activities.

Biological degradation of this watershed is the reduction in the quantity of organic matter and living organisms in particular plant cover decomposition, whereas chemical degradation includes salinity, alkalinity, or acidity. A high concentration of salts in soil of Euphrates and Tigris watershed gives rise to saline or alkaline soils. This is often the result of irrigation without adequate drainage. Soil and salinity problems are more widespread and acute in arid than in temperate areas.

The man-made share of these salinity problems arises principally from raising of the water table through continuous passage of large amounts of H₂O through unsuitable canals, thus converting large productive areas from a renewable resource to a non-renewable one. In the fertile crescent of Tigris and Euphrates Rivers salted up 5-2 millennia ago and resulting in the collapse of the civilisation. Even today flooding and over irrigation have started creating serious problems of soil salinization in Syria and Iraq. A similar situation is observed in this area in Turkey as well. The Euphrates and Tigris watershed is presenting an alarming situation with over 75 000 ha facing salinity-alkalinity problems.

3.3.3 What is the Participation Status in Institutional Arrangement of this Watershed?

Before, the efforts made in Euphrates and Tigris watershed such as rural works and rural employment programmes did not improve the plight of the poor on a sustained basis. After growing awareness of participation, International agencies, governments and non-governmental agencies of this watershed realized more and more that the main reason of many unsuccessful development projects was (and still is) the lack of active, effective and lasting participation of the intended beneficiaries.

Constraints: The main constraint of genuine participation in this watershed is the political has to promote this in a project area. This basic problem can be overcome by means of various strategies at international, national and local levels. The strategies should all aim at informing, sensitizing and motivating various categories of key persons in one way or another involved with rural development efforts. The practical outcome of the strategies must be that politicians, officials, experts and elites become motivated to accept, support or at least tolerate effective forms of participation of the disadvantaged rural people in development.

Sensitizing Governments: Politicians, top decision-makers and planners of the countries in this watershed are not completely aware of the necessity to incorporate participation in rural development policies, plans and programmes and they need to be convinced.

Promoting policy dialogues: Because of the conflicts between Iraq, Syria and Turkey, there are no significant policy dialogues between key officials, planners and decision-makers of national and international development agencies. These dialogues are necessary for obtaining rural poor-oriented economic and social policies and institutional arrangements that are required for participatory projects. In the other hand, in this watershed there is not woman participation in development as enough. Decentralization of decision-making; rural poor-oriented input supply, extension, credit and marketing; non-agricultural income-generating activities such as fiscal and pricing systems are not satisfactory here.

Systematic sensitization: The sensitization of the traditional, administrative and other influential leaders in this watershed is not high; it means the supports of village leaders are not enough for participatory projects.

3.3.4 Conclusions:

1. *Improving Social Conditions (Country Scale)*: In Euphrates and Tigris watershed, there is clearly a need for adopting population-related policies to minimize the adverse impacts of demographic changes on economic and social development, including poverty reduction. Countries of this watershed suffering from population pressure and having relatively high fertility rates need to increase their efforts to stabilize their populations. Both the development process and reproductive health programmes have played major roles in reducing fertility. With increases in income, more widespread education and improved availability of health services, people tend to desire fewer children and their demand for contraceptives increases. The wide availability access to contraceptives helps them in keeping families small. All population-related policies and programmes require financial resources. These can be generated more easily in a growing economy. Therefore, it is essential that policies promoting broad-based economic growth should be pursued vigorously.

2. *Alleviating poverty*: in this watershed the proportion of people who are poor has fallen significantly but with population growth, the absolute number of poor people has not. A sustainable livelihood framework could be useful in this watershed; it can focus on two components of well-being: having a secure livelihood to meet one's basic needs and realising and expanding one's capabilities in order to achieve fulfilment. Under the livelihoods approach, alleviating poverty focuses on building poor people's capital assets, which include natural capital, physical capital, social capital, human capital and financial capital. It is difficult to measure and attribute the effects of research on poverty, as many poor are simultaneously producers, wage earners and consumers, so technological change has complex and often offsetting effects on their real income.
3. *Improving Rural People Participation and Using Participatory Projects*: The common essential elements in the specific objectives in this watershed are:
 - 1) To help identify, plan and implement employment – and income-generating and other group activities for small farmers, tenants, fishermen and/or labourers
 - 2) To assist the beneficiaries to organize themselves into self-run groups and organizations (or to use existing ones) in such ways that firstly they have (increased) access to programmes of training, credit, inputs, marketing and processing as well as education, health and sanitation and, secondly, they can more and more satisfy their economic and social needs and become eventually self-reliant
 - 3) To assist line departments and other agencies including banks and NGOs to increase their effectiveness to better serve the rural weak, to develop innovative farm and also off-farm income-raising activities, and to encourage self-development efforts
 - 4) To develop a strategy for expanding the successful features of the project in this watershed

Increasing support of donors and development agencies and banks for participatory projects is necessary in Euphrates and Tigris watershed. For these wide scopes donors as well as international development agencies and banks should participate in, initiate and/or organize several of the earlier proposed promotional actions such as policy dialogues, seminars, field workshops and visits to participatory projects. It will be crucial to show the actions and results of participatory projects also by means of good monitoring and evaluation systems. Moreover, case studies on the benefits and cost effectiveness of participatory projects as well as promotional materials will be quite helpful.

3.4 *Main Forest & Water Issues:*

3.4.1 **What are the Linkages between Water and Forest in this Watershed?**

Forests and trees in Euphrates and Tigris watershed -in spite of small area covered by them- play critical role in development of the watershed. In fact, these trees have the potential to restore degraded land and ecosystem; protect landscape, water resources and dams against siltation and pollution. This watershed is very important freshwater-yielding area in terms of both quantity and quality. In fact, the loss of these forest and tree covers and conversion to other land uses can affect freshwater supplies and compound human disasters resulting from hydro-meteorological extremes.

Euphrates and Tigris forested watershed is exceptionally a stable hydrological system. Regarding the high potential of these forests, they would play more significant roles in contrast to other land uses:

- Influence the quantity of water yielded from this watershed
- Discharge better quality of water
- Discharge lower storm flow peaks and volumes for a given input of rainfall in this watershed
- Moderate variation in stream flow between the high and low flows during a year
- Provide more soil stability and lower levels of soil mass movement, gully erosion and surface erosion
- Export lower levels of sediment downstream

That is good to know that lack of relating studies is why there are not clear roles for forests related to water resources in spite of the importance of this object.

Forest and Water Quality: Providing cold and clear waters of high quality for aquatic organisms and human use, is probably the proper focus for managing water in forests of Euphrates and Tigris watershed. There is relatively little management can do to increase total water yield; but forest management in this watershed can have some effects on water quality such as affecting temperature, nutrient loadings, sediment yields, and toxic contaminants. Management can also affect the storage capacity of soils and alluvial deposits, marginally affecting magnitude of peak stream flow and the duration of dry-season stream flows.

Water quality changes have affected aquatic habitats, downstream water management facilities, recreation opportunities, and water treatment costs in this watershed. Land management, here, can cause increases in flood peaks and reduced channel stability, and impact the ability of downstream water users to benefit from the stream flow. The values of change in the quality or timing of stream flows have received less attention by economists than has total quantity in Euphrates and Tigris watershed; partly because quality and timing are more difficult to monitor. The economic value of careful forest management-management that protects soils and water quality and takes full advantage of the watershed's ability to temporarily store water and ameliorate downstream flood damage -calls for additional study in this watershed.

In summary, forests and grasslands of Euphrates and Tigris watershed produce better quality water. Other forms of land use, here, have been found to degrade water quality to varying degrees. The most significant water quality problems found on these forests are typically sediment (turbidity and bed load), nutrients, temperature, and hazardous chemicals.

Forest and Water Quantity: A wide range of human activities in this watershed, including forest management, roads, reservoir and dam operation, development and urbanization of floodplains and other flood-prone areas, and stream canalizing have been implicated as factors increasing the destructive potential of floods.

Although forest practices in this watershed may increase peak flows and sediment transport from upland streams to downstream. Downstream effects may be minimized where reservoir operation reduces flood peaks and sediment accumulates in reservoirs. On the other hand, sustained high-flow releases from dams of this watershed may contribute to higher sediment and turbidity problems downstream compared to shorter but higher natural peak flows.

Although water-yield increases, here, can result from forest management activities; the increases produced by normal silvicultural methods applied in the context of multiple uses in this watershed are modest.

3.4.2 Conclusions:

1. *Preparing a Source Protection Plan:* Concerns about how forest is used within the source protection area should focus on activities, which are potential sources of contamination, such as septic systems and fuel tanks. Source Protection Plan (SPP) provides land use management tools, which reduces the threats of contamination and foster drinking water protection by mapping the recharge area of a water source, recommending measures to control potential sources of contamination, and identifying alternative drinking water sources in the event of contamination.

For more permanent drinking water protection, the nature of forest and land ownership needs to be taken into account. Purchase of the source protection area can be a viable approach for protecting drinking water. Although acquisition is a more costly approach for protecting a drinking water supply, taking advantage of the Euphrates and Tigris Drinking Water Revolving Fund can reduce the expense. Source protection funds can provide low-interest loans to municipalities for purchasing land or development rights. Funding is provided on a priority basis, and water systems must have a delineated source protection area and source protection plan to be eligible.

Sustaining safe drinking water is an expensive proposition but may save money in the long-term. Knowledge of forest, geology, and the hydrologic features of a watershed or aquifer provide the scientific basis needed to protect drinking water supplies effectively. With sound information, water suppliers of this watershed can continue to deliver high-quality drinking water.

2. *Conserving Remaining Old Growth Forests:* Remaining old growth forests of Euphrates and Tigris watershed are sometimes reserved in National Parks but have not been reserved, to date, for their water production values. There will be an increasing reliance on the secure flow of water from this watershed as both resident populations and tourist numbers increase.

Water quality problems and restrictions are already experienced throughout this watershed, which could, in the near future, further hamper economic development. With the cost of relocating water supplies and building new dams being measured in tens of millions of dollars, the very future of some towns and their associated industries may be in question.

As water is becoming an increasingly valuable and scarce resource in this watershed, it would be economically prudent to 'buy' the remaining old growth forests from the sawmill industry or pastoralists, with money from income generated selling water to domestic and other users.

The sawmill industry will run out of remaining old growth forest timber in the next years. Declines in the industry over the last years reflect this loss of resource. A substantial injection of funding through the acquisition of remaining old growth forest could provide the industry an opportunity to retool to younger forests, plantation timbers and a shift to higher value added sawn timber products.

It is vital that the amount of water required for this watershed in the future be mapped against the amount of water the watershed will provide. Then the economic value and management of the remaining old growth forests can be urgently re-evaluated for this watershed.

3.5 Main Forest & People Issues

3.5.1 Which Linkages are there between Forest and Poverty in this Watershed?

In Euphrates and Tigris watershed, forests play role in the livelihood strategies of rural poor. Whilst they are one of the sources of rural livelihoods, the benefits the poor derive from grazing, fodder, NWFPs and illicit, legal and subsidised timber and fuel wood are considerable. These forests contribute to increased income at the household level as well as a certain amount of food security and decreased vulnerability. However despite their obvious benefits, forest management and production in this watershed, are not part of household livelihood strategies; partly this is because benefits of these forests are secondary to the main production strategies which remain focused on livestock, agriculture and migration. Partly it is because the policies and institutions of Euphrates and Tigris watershed that mediate access to forests do not provide an adequate incentive and planning framework.

The followings are the main linkages between forest and poverty in this watershed:

1. Wood production and related employment: One of the main linkages between forests and villagers live in these forests is fuel wood and timber, both through legal and illicit means. Additionally this linkage cause to employ some villagers in this part. Fuel wood consumption has seen a general decrease due to out-migration from forest villages.

2. Utilization from non-wood forest products: The forest villagers of this watershed derive some benefits from non-wood forest products both from home consumption and sale. However in general these activities are not well developed and vary widely between different regions. The current exploitation of non-wood forest products, here, is far from its potential due to a lack of information and investment in production, processing and marketing. With a fair management, NWFP can make more employment opportunities for local poor people of Euphrates and Tigris watershed.

3. Grazing in forest lands and fodder utilization: Unregulated grazing and fodder crop production is common in these forest ranges and often constitute the main benefit that forest villagers derive from these forests. Livestock production is a critical component of the livelihood strategies of the poor of this watershed and is one of the main factors preventing even more rapid out migration from the area. However grazing in this watershed is also one of the main causes of forest degradation because of insufficient attention to the development of strategies for sustainable grazing.

4. Forest water resources: Forest villages benefit from water resources and fisheries in forest ranges near Euphrates and Tigris Rivers and their tributaries. Selling fishes in local markets helps local people to earn money. In fact it can reduce poverty in these regions.

5. Employment in forest works: Local forest villagers of this watershed have the right to priority employment in forest related work such as forest management (thinning, laying fire-lines, marking etc), timber harvesting and afforestation. Recently there has been a trend towards selling timber in stands and letting the contractors themselves arrange for timber felling. This has had a negative effect on the employment opportunities available to local villagers of this watershed as the contractors tend to find the cheapest possible labour and are not bound to give forest villagers priority employment.

6. Private afforestation activities: Forest villagers of Euphrates and Tigris watershed have some rights to carry out afforestation activities in degraded forest areas and to manage them for their own benefit. In recent years, local interest in afforestation in Euphrates and Tigris watershed has grown as a liberalisation in the legislation for private forestry has created opportunities for profit not only from timber but also from non-wood forest products.

3.5.2 What are the Main Factors affecting Forest- Poverty Linkages?

The following are the most significant contextual factors affecting forest-poverty linkages in this watershed:

1. Forest asset base: The available forest assets and the scale and type of demands on forests of Euphrates and Tigris watershed are probably the main factors affecting forest-poverty linkages. On the whole, this watershed is very sparsely forested and scarce forest resources are mostly linked to mountain ranges and rivers. However despite the limited forest cover there is a high diversity of different forest types and plantations of local and introduced species. Forests in this watershed are an important source of fuel wood on which a majority of the population in rural areas still relies. Another key aspect of forest use is the importance of grazing and fodder collection and indeed the important link between forest use and broader land use issues.

2. Economic and Market Influences: The degree of internal / external market exposure, and the role which forests of Euphrates and Tigris watershed are expected to play in local livelihoods and national income generation for each country in this watershed are highly significant. But it will be important to ensure that privatisation introduces pro-poor capacity for forest management and does not become a licence for asset stripping.

3. Institutional Framework and Policies: Policies, institutions and processes have been shown to be a key factor mediating forest-poverty linkages in this watershed. Many of the issues, such as the move towards trade liberalisation, structural reform, growing role of the private sector and changing relations between the state and civil society, can be generalised for Euphrates and Tigris watershed. However there are big differences in the scale and scope of the changes taking place in the different contexts. The particular relationship between forest stakeholders and the strength of state-civil society relations is very significant for determining what kinds of participation are possible in the policy process of this watershed. In Euphrates and Tigris watershed, civil societies are still nascent and are unlikely to play an active role in policy formulation. The broader institutional framework will also affect the policy instruments that can feasibly be used to establish positive poverty-forestry linkages.

4. Social-Cultural Influences and Conflicts: In this watershed it was argued that societies are linked to forests mainly through intermediary livelihood strategies such as agriculture and pastoralism. Whilst these forests may have a social and cultural role - present in songs and customs for instance - community forest management is not an integral part of local social structures. Even if community forest management had in the past been important in isolated pockets, there is little evidence that these still constitute credible systems for modern resource management. What Euphrates and Tigris watershed therefore has in common, is the need to establish new institutional forms of local resource management, whether or not this is community based. Within this commonality, there are however a lot of differences in the social and cultural norms for local organisations. One clear difference relates to gender; the role of women and the gender division of labour differ greatly between the countries involved in this watershed.

5. Scope and Scale of Change: One of the most important factors in this watershed is what room there is to make decisions about how to deal with change, and whether participating institutions stress incremental change or are able to set new institutional precedents. The policy context may be characterised by the accumulation of small negotiations or by decisive changes in asset ownership and allocation in Euphrates and Tigris watershed; in forestry there are frequently tensions between the long time horizons needed for good forestry and the short time horizons experienced by poor people. In the countries involved in this watershed, there are unlikely to be rapid changes in the distribution of assets and ownership of forests.

In sum, in Euphrates and Tigris watershed the potential of creating positive forest-poverty linkages is heavily influenced by contextual factors; in fact policy statements in this watershed that recognise the poverty reducing potential of forests, have to be seen in the context of market and political forces.

3.5.3 Conclusions:

Within this watershed, the tendency has been to grant local communities the responsibility for protecting forest resources, without granting the rights to use them in a major way. Where local use is permitted, it is usually highly circumscribed and generally limited to minor or non-wood forest products. A related problem, here, is the decentralization of responsibility without devolution of the power to make independent decisions or to take action outside narrow parameters set by forest authorities.

Should forests of this watershed be given over to communities for management? There is much disagreement as to whether forest resources should be handed over to communities at all. The main argument in favour of devolution is essentially pragmatic: conventional forest management (i.e. through forest departments) has not worked well in much of Euphrates and Tigris watershed.

One of the key arguments against devolution is based on the belief embraced by some foresters of this watershed that communities do not have the ability to manage forests. This concern may be legitimate in particular cases and may indicate a need for some controls (and for capacity building at the community level), but it is not valid as an argument against community control of forests. This viewpoint indicates an obvious lack of trust and confidence in communities. Another variant is the argument that some communities do not have the will or interest to manage forests. According to this view, commercialisation and mercerisation have transformed the rural economy to such an extent that traditional resource use patterns have been replaced with newer livelihood strategies that include commercial exploitation.

Meaningful devolution requires both that local managers (be they local government units or local communities) have the capacity to manage forests and that those with current authority to make management decisions are prepared to transfer that authority. A major prerequisite for meaningful decentralization and devolution, therefore, is to build levels of trust in local management. However, decentralization and devolution approaches should not simply allow forest departments to set and police the rules, and judge community performance. Forest departments of Euphrates and Tigris watershed must also be answerable to the communities' special tribunals or other mechanisms.

The importance of monitoring the performance of community-level forest managers is often noted. It is important for at least two reasons. First, it provides checks and balances. Second, monitoring can help identify successful community-level managers and contribute, through the provision of good examples, to the building of trust and confidence.

Testing a community's capacity to implement a management plan designed by someone else is not a valid measure of the community's management capacity. In other words, it is difficult to assess community management capacity meaningfully if there is no real community input into decision-making. Monitoring the success of community-based forest management can only be meaningful when there is genuine devolution of authority.

It is also unfair to apply tougher tests to community-based activities than to conventional forest management. **In this context, it is important to remember the high annual deforestation rates that prevail under the current management system.** Otherwise, decentralization and devolution will contribute relatively little to sustainable forest management and human development in Euphrates and Tigris watershed.

3.6 Main Water & People Issues:

3.6.1 Why is Water such a Contentious Issue in this Watershed?

The combination of increasing population and fixed water supply in Euphrates and Tigris watershed results in decreasing water available per capita. The countries involved in this watershed have to adapt to an increasingly challenging set of preconditions and development constraints. Often their economies are failing to adapt to these rapid changes. Generally, water conflicts are occurring in many places: India and Bangladesh, Slovakia and Hungary, Israel and its neighbours (including Syria again), Egypt and Ethiopia, the US and Mexico, and others. In fact, water shortages are replacing oil as the source of conflicts. But what is different about Euphrates and Tigris watershed? Why is water such a contentious issue here?

First, water is not a plentiful resource in Middle East, the arid Middle East that is. There is a huge disparity between the water scarce arid countries and water rich Turkey, Iraq, Iran and Syria, although with exception of Iraq, the three have large populations. Why is there conflict between such water 'rich' countries in a water scarce region?

Second, many of populations of this watershed depend on these rivers that transverse an international boundary before reaching them. Some people have no rivers and depend on diminishing wells or expensive desalinated water from the sea.

Third, unchecked population growth in this watershed is high.

Fourth, water use in Euphrates and Tigris watershed is characterized by over-use, wasteful practises and polluted groundwater and aquifers. Over irrigation and flooding of fields have raised water tables polluting soils with salinised water, even impinging into the root zone causing crop failures. Massive dependence on agriculture and a heavy dependence on irrigation, fertilizers and chemicals, combined with largely sandy and gypsiferous soils, have caused massive leaching of chemicals into the groundwater. Subsequent over pumping of wells has exacerbated the problem. Major development and hasty irrigation projects have sent polluted and highly saline return flows into water of these rivers, as is the case in the Euphrates River upstream from Syria and Iraq.

Finally, history in this watershed has told a story long threaded with mistrust, suspicion, zero-sum diplomacy and conflict. Euphrates and Tigris economics directly relate to Euphrates and Tigris politics, ethnic conflicts and social inequalities. Relatively 'new' states have vehemently defended their borders, played hardball politics and stood on the premise that 'water for one means less for the other.' Zero-sum foreign policies have translated into overzealous self-sufficient policies, many resulting in failure at the expense of neighbouring countries.

3.6.2 What are the Impacts of Population Growth on Water Resources in this Watershed?

All the populations of these three countries do not all dwell within the basins of the Tigris-Euphrates; there can be no doubt that the impact of this growth will be felt there. The population growth rates experienced by all three countries during this century have been remarkable. Besides population increases, there are also increases in the standards of living of the populations. In turn this means that water usage in an urban/industrial context is likely to go up also. Although the increases are high in percentage terms, the actual water volumes remain low when compared with the predicted irrigation demands. Even so, obtaining sufficient water for some of the rapidly growing cities may begin to cause problems.

This leads us to the question of whether water in the twenty-first century can continue to be used for irrigation purposes in this watershed. The issues are water availability and maximum economic productivity. There is no doubt that because water is available at zero cost in this watershed, local farmers for irrigation purposes will use it. This is, indeed, the basis of traditional agriculture throughout this watershed and it is often the only way available for the people of this area to farm. In the future, however, with continued increases of pressure on available water resources, governments of Euphrates and Tigris watershed will be forced to cut back the volumes of water allocated to irrigated agriculture in an attempt to ensure that the urban/industrial regions receive all the water they need for continued growth. It is important to realize that this urban/industrial demand is relatively small when compared with irrigation needs and should be able to be easily met from available resources.

With continued population growth in this watershed, increasing attention will be focused on the feasibility of using irrigation water to produce food crops. It is certainly possible that during the early decades of the twenty-first century there might well be a decrease in irrigated agriculture throughout the watershed as increasing volumes of water are transferred to economically more productive uses in urban/industrial environments.

In effect, the twentieth century has seen a restructuring of water use in the watershed of the Tigris-Euphrates. Although the main elements of the new management strategy are already in place, in terms of the major dams and reservoirs, the full impact of these changes will not be realized for at least another decade. Inevitably the restructuring of water usage will have economic and social impacts as well, which will be painful for the local inhabitants. In the lower part of this watershed, rural areas will not be able to sustain the same high level of population that has been the case in the past. This might suggest that rural depopulation will increase, putting further pressures on the already crowded urban centres. By contrast, both rural and urban populations seem bound to increase in the upper part of this watershed in Turkey, as economic opportunities grow hand in hand with the expansion of irrigated areas which have previously not been cultivated in any widespread manner.

3.6.3 Are there any Balances between Water Resources and Demand Management in this Watershed?

The demand for water in this watershed can be thought of in two principal ways: first, a demand which can be satisfied because water is available, and second a demand which cannot be met owing to water scarcity. Until the 1960s the water demands of all three countries in this watershed could be satisfied with water to spare. Since then, as water demands in the upper part of the watershed have increased, the situation has changed and will continue to do so for the next two decades until all the planned irrigation projects are fully commissioned.

Several scholars have addressed the problem of demand for water over the years and all have reached the same conclusion, namely, that there is not sufficient water in the Euphrates River to meet the needs of the three countries with interests in the watershed. On the Tigris, the situation is less serious, but even here the most optimistic scenarios only register a flow into the Shatt Al-Arab of about 9,500 to 10,500 MCM when all the irrigation schemes are in operation.

On the Euphrates, a maximum water demand in Turkey of around 21,500 MCM each year when all the irrigation projects are commissioned (Table 13). This seems a very high figure when it is remembered that the planned irrigation area on the Euphrates only amounts to 1,083,000 ha. With the water volume quoted this would seem to imply a water usage rate of 19,853 m³ per hectare or a much larger area under irrigation. A more realistic calculation would seem to be a figure of about 10,000 m³/ha, giving a total water demand figure of 10,830 MCM. Even if irrigation tariff of 12,000 m³/ha was used, a maximum demand of only 12,996 MCM is reached. On top of this there are, of course, evaporation losses from the major dams along the Euphrates, which amount to 1083 MCM. This gives a total of between 11,913 and 14,079 MCM, which is reasonably close to the figure quoted by Altinbile.

For Syria, Kolars quotes a water demand of 11,995 MCM and Kliot, 13,400 MCM, while Altinbilek gives a total of only 5,500 MCM. Here the situation is much more difficult to assess, because everything depends on the size of the irrigated area which is eventually developed by Syria. It would seem that the total figure would be between 475,000 and 1,000,000 ha when all projects are completed. However, at the moment, it is difficult to be any more precise than this as the Syrian government has been extremely slow to begin the schemes, which were planned more than 20 years ago. Annual water demands for these irrigated regions would be 4,750 MCM (for the lower value of 10,000 m³/ha) to 12,000 MCM (for the higher value of 12,000 m³/ha). On top of this evaporation from the reservoirs along the Euphrates is 630 MCM each year (Table 13).

The question of water demand in Iraq becomes something of a theoretical concept. If Turkey and Syria extract the maximum expected volumes of water from the Euphrates, the discharge into Iraq will be reduced to around 5,000 MCM each year. Evidence suggests that even in the 1960s Iraq was extracting 16,368 MCM between Hit and Hindiyah to irrigate around 1,230,000 ha. It is also known that considerable irrigation was taking place downstream from Hindiyah at this time, though exact amounts are unknown. In 1970 only 400,000 ha were being irrigated along the Euphrates and 800,000 ha along the Tigris. However, these figures would seem to be incorrect. The irrigated area in Iraq in 1970 was 3,680,000 ha. The vast majority of this would be located in the Tigris-Euphrates basin.

Kliot quotes figures from the late 1980s and early 1990s which estimate the actual irrigated area along the Euphrates River in Iraq as 1.0 to 1.29 million ha. It is, however, acknowledged that at this time the irrigated area had been reduced as a result of the Iran-Iraq war of the 1980s. The total area on the Euphrates, which can be irrigated, is thought to be 1,833,000 ha. If this is a realistic figure it means that total water demand at some time in the future could rise to 24,379 MCM/y with an irrigation rate of 13,300 cubic metre/ hectare. For a rate of 15,000 m³ per hectare the total demand would rise to 27,495 MCM (Table 13). Table 13 clearly shows that the potential water deficit on the Euphrates River after the year 2020 might be as high as from 10,500 to 23,000 MCM each year. Since there will be enough water in the river to satisfy the full needs of both Turkey and Syria, it will be Iraq which will be least able to satisfy its potential needs.

On the Tigris the overall situation is similar. There is general agreement that water demand for Turkey will be between 6,700 and 8,000 MCM each year (Table 12). The calculations of the present author suggest that the likely water demand for the planned irrigation of 558,000 ha will be between 5,580 and 6,696 MCM/y (Table 12). Evaporation from a total of nine proposed reservoirs, with a total surface area of 693 km² is likely to add a further 624 MCM to the demand. This is based on an evaporation rate in these upland valleys of 900 mm/y.

Syria's use of water from the Tigris remains something of an enigma. It would be possible to divert water from the Tigris and pump it into the upper Khabur. However, without the active support of Turkey it would only be possible to obtain significant quantities of water during the high flow period. What is certain, though, is that Syria's demand for water to be used within the catchments of the Tigris River itself will be small, as it does not have access to suitable land.

Potential water demand in Iraq is high with estimates from 29,200 to 40,000 MCM/y (Table 14). As with the Euphrates, it is exceedingly difficult to obtain accurate statistics as to the area of irrigated land. Kliot quotes a figure of 2 million ha being irrigated in the Tigris basin in the late 1980s and a total irrigable area of between 2.8 and 4 million ha. If these figures are correct, potential water demand could rise to values of between 37,240 and 60,000 MCM/y based on water tariff figures of 13,300 to 15,000 m³/ha (Table 16). Prediction of maximum evaporation losses for all the reservoirs in Iraq is difficult to calculate owing to the lack of data, but will be at least 1,000 MCM/y. Taking these figures for the Tigris as a whole suggests a surplus of around 8,000 MCM/y for the lowest figures, but a deficit of over 15,500 MCM/y if the higher values are utilized (Table 16).

If the newly calculated water demand data for the Euphrates and Tigris Rivers are summed, they provide an estimate of the overall balance for the basin in the period after 2020 (Tables 13 and 16). The minimum data estimates point to a possible water deficit of 2,233 MCM/y. However, the maximum values reveal a huge potential deficit of 38,641 MCM. This, it will be noted, is greater than the average flow of the Euphrates River.

3.6.4 Conclusions:

Each country in the Euphrates–Tigris watershed is generally inclined to formulate its plans by considering its national possibilities, resources and objectives, with least regard for the needs of others. Some of the areas of possible co-operation are listed below:

- The optimum plan for the basin as a whole can be formulated and implemented.
- Seemingly conflicting demands can be harmonized within a broad master plan that may incorporate many water-supply-augmenting and efficiency-improving measures.
- The waters of the Euphrates and Tigris can be utilized equitably and effectively, taking into account seasonal and yearly variations in flow due to floods and droughts.
- Technical co-operation can extend to water transfers between rivers and between the reservoirs of the same river.
- Conjunctive use of interconnected water and energy systems can be realized.
- Basin-wide management using remote sensing, geographical information systems (GIS) and optimisation technologies can promote optimal use and water savings.
- Joint regional research institutes, training centres and pilot farms can be developed to exchange not only engineers and technicians but also farmers.
- Water-augmenting techniques such as water harvesting, conjunctive use of surface and groundwater sources reuse of return water and, if necessary, cloud seeding, can be studied, encouraged and practised.
- The Turkish experience of water user associations, which was supported by the World Bank, can be shared and exchanged with other riparian countries to increase water use efficiency and the water revenue collection rate and to save water.
- Demand management plans can be developed for municipal and irrigation water supplies, especially for possible drought periods.
- Co-operative action may facilitate the achievement of environmental sustainability.
- Financing of joint and national projects from various international sources may be easier and more attractive.

Water-supply-enhancing and demand-management technologies must be part of a comprehensive solution in this watershed. The overall objective of water agreement in this watershed is to provide sustainable utilization of the region's land and water resources for the welfare of people. The most important role in achieving hydro-co-operation in the region, rather than hydro-conflict, lies with the responsibility of democratically elected governments of riparian countries

4 CHAPTER 3 - CONCLUSIONS AND RECOMMENDATIONS

Euphrates and Tigris watershed in some aspects is almost unique in the world: having more than 6000-years history; creating one of the greatest civilizations in the world; living people with different religions and races together; several times looted - in some cases exertion - by foreign countries; wars between people with religious and ethnic differences or between these countries and foreign countries, ...; but what changed this watershed to such an unsecured region with unstable economic situation?

We do not want to answer this question. What is important for us is to what extent these instabilities and insecurities have been -or will be- effective on the situation of this watershed and its forest. Destroying deep and friendly relation between people and nature has been one of these avoidable effects; infact thinking about the nature and the beauty needs to be free but in this unfavourite condition of life, people missed their interest and motivation to think about the beautiful objects around them even about forest that their livelihood -directly or indirectly- depends on it.

In order to have a *sustainable management* in this watershed, preparing an “*Integrated watershed management plan*” is necessary. With this plan, managing *people, forest and water* together, without sacrificing the other factors, and with a sustainable development pattern would be possible. Regarding this management, all efforts must be done in the framework of this plan that it needs close collaboration between local people and policy-makers and also between experts, state organizations and private sectors related to water, people and forest in national and international scale; infact this *integrated management plan* is an *intersectoral management* with the central pivot of *people*.

Additionally, because water is such a contentious issue in this watershed, as we discussed in chapter 2 main water and people issues, it is so necessary to make an official agreement between these countries related to equitable distribution of water by mediating of United Nation.

But what can we do, as a forester, for a *sustainable forestry* in an integrated watershed management in Euphrates and Tigris watershed? Because of involving countries with different forest policies and management plans in this watershed, choosing an international authority is necessary; *Forestry Department of FAO* is a suitable choice for this responsibility; preparing FOWECA² by this department, is the first step to make a *same outlook* for forestry in this watershed. In national scale also establishing an independent forest service in each country is necessary. That is good to know that people of Euphrates and Tigris watershed, like some other watersheds, deal largely with the forest like their agricultural land; having an *independent forest service* without depending to agriculture, is useful for promoting the culture of dealing with forest. Also Forestry Department of FAO, as an international responsible, should help to this promoting process.

² Forestry Outlook Study for West and Central Asia

The followings are what we suggest, in general, for better forest management in this watershed in addition to detailed conclusions written at the end of each issue of chapter 2:

1. Lack of reliable information about this forest is one of the basic problems in this watershed; that is why we can not suggest clear recommendations for its management; thus the first step is collecting useful and practical information:
 - 1.1. *Related to forest* such as its current situation, the area was covered by forest before, carrying capacity of forested land, the capacity of forested land for reforestation with both endemic and foreign species, endemic species and their ecological characteristics, the lands with capacity for afforestation, the main destructing factors of this forest.
 - 1.2. *Related to water* resource such as its changes within different seasons and years in each country; big floods happened in recent 100-years and their main formative or determinative factors; the relation between these floods and land use changes; the exact effects of forest on water quality and quantity.
 - 1.3. *Related to people* who their livelihood –directly or indirectly- depends on this forest such as their primary needs, the poverty level, their work opportunities, the extent of their dependence to forest, the status of their relations with forest.
 - 1.4. *Related to institutional arrangements* such as national, regional and local institutions and administrations; governmental and private organizations and NGOs; national and regional development plans; policies and legislations related to forest, people and water; local and traditional structures related to natural resources management.
 - 1.5. *Related to other people* such as their opinion about forest and the benefits of forest, their opinion about eco-tourism, their opinion about importance of forest conservation, their assent for substituting wooden products with other materials like iron or aluminium.
2. Choosing a long-term goal and implementing programs related to this goal are the second step:
 - 2.1. Because of the high rate of forest degradation (As we discussed in chapter 2; main forest issues) and the dependence of some people's livelihood to this forest (As we discussed in chapter 2; main people and forest issues) in spite of the small area covered by it, selecting some parts of this forest as the protection area is necessary. Regarding the world standards of forest, 10 percent is appropriate for this protection. In this area, all exploitations should be stopped.

2.2. In the remaining forest depends on the extent of the poverty and the human pressures on the forest (As we discussed in chapter 2; main people issues and main people and forest issues), a suitable long-term goal must be chosen.

2.2.1. Because of the critical conditions of this forest due to extensive degradations and also other destructive factors, for sure wood exploitation is not a suitable goal.

2.2.2. In the forest with high poverty level, Non -Wood Forest Product (NWFP)³ as a commercial commodity is a good choice; but this change in the goal of management -from wood exploitation to NWFP- in such an unstable area, for sure, will encounter with rejections by people and governments. The followings are the recommendable affairs related to people and the governments:

- Changing the consume pattern of these people's life by:
 - Making new work opportunities regarding their life style
 - Making rural societies with real devolution to participate in forest management
 - Substituting black markets of NWFPs by real commercial markets
 - Making real prices for NWFPs
 - Eliminating brokers of NWFP's markets to create more profit for rural people who have rightful more than the others
 - Making participatory forest management projects to attract rural people to their important role in forest management and also to give them more motivations
 - Promoting the culture of forest conservation in order to teach people how dealing with forest
 - Educating people to know how use other energies instead of fuel wood
- Showing other economic benefits of forest instead of wood to the state responsible: Regarding the condition of this forest and its potential, NWFP and eco-tourism are two suitable substitutes for wood; thus what we propose related to the governments in this watershed are:
 - Stimulating governments and the responsible by making new investment opportunities related to NWFPs
 - Helping to Make international and national commercial markets for NWFPs
 - Encouraging the private sectors related to forest in order to invest on NWFPs
 - Helping the governments to substitute the fuel wood by gas, oil, bio-energy or other resources depends on the situation of each country in this watershed
 - Helping to Improve the eco-tourism situation in these countries
 - Advertising about the tourist attractions of each country
 - Creating more facilities for foreign tourists to visit this forest

³ For more information about NWFPs of this watershed see chapter 2; main forest issues

2.2.3. About the forest with low poverty level and less human pressure, our suggestion is "water conservation". As we discussed in chapter 2, main water issues and main water and people issues, water scarcity and unequal distribution of water are important problems in this watershed and the majority of wars between these countries, from past until today and maybe in the future, have been for water. Because of the significant role of forest on water quality and quantity (As we discussed in chapter 2; main forest and water issues), it seems managing this forest regarding water conservation is an appropriate goal.

That is good to know water scarcity, more and less, is a common problem in FOWECA region; for this reason and also because of the similar historical and social background in this region, generalizing the results of this study to the whole region and other similar regions, discreetly, is possible.

POINT: All forest policies should be close to nature and multipurpose. Changing the previous forest policies of this watershed needs to prepare appropriate infrastructures; but because of the high poverty level and unstable situation in this watershed, these changes must be done slowly and step by step.

NOTE: *We should learn from the nature by its own that it never follows the policy of any government, never listens to the politician, never recognises the political boarder and never changes their way because of any religious and political belief. To protect the nature we should think like nature and take action strongly like nature.*

5 ANNEX 1 – What is the Gap?

In accordance with the agreed minutes of the Iraqi-Turkish Joint Economic Committee meeting held in December 1980, a Joint Technical Committee (JTC) was established to negotiate water issues. In the fifth meeting of the JTC on 11 November 1984, Turkey proposed the so-called, Three Staged Plan for Optimum, Equitable and Reasonable Utilization of the Transboundary Water Courses of the Euphrates-Tigris Basin. With regard to the Turkish proposal of studying water transfer possibilities between two rivers, Iraq and the Syrian Arab Republic have argued that the Euphrates and Tigris should be evaluated separately, giving priority to the Euphrates. However, Turkey has launched a gigantic integrated development programme, entitled the Southeast Anatolia Project (Güneydoğu Anadolu Projesi) (GAP) for the Tigris and the Euphrates, without consulting other riparian States at any stage. During the 1960s, the Southeast Anatolia Project (GAP) was contemplated as a project encompassing irrigation and energy.

The South-eastern Anatolia Project, or GAP using its Turkish initials, is the largest development project ever undertaken by Turkey, and one of the largest of its kind in the world. The scheme includes 13 major projects, primarily for irrigation and hydropower generation. GAP is planned by the State Hydraulic Works (DSİ). The project envisages the construction of 22 dams and 19 hydroelectric power plants on the Euphrates and Tigris rivers in the Kurdish part of Turkey. The ultimate plan is that 17,600 km² of land will be irrigated and 27,300 GWh of electricity will be generated annually. By June 1999 about \$ 32 billion² had been spent on the GAP project.

6 ANNEX 2 - Assessment of the Gap Project

- Overall Project: 40% of the overall project has been finished at present. Therefore the original date by which the project was to be finished (2010) has had to be postponed to 2047.
- Irrigation: Only 12% of the expected irrigated area is under irrigation today (1999).
- Electricity: Already 60% of the expected electricity production is achieved today.
- Economic inequalities between the South-east and the West of Turkey:
 - There are still twice as many functionally illiterate people in the GAP area as in the rest of Turkey.
 - The unemployment rate is still very high, especially in urban areas.
 - 3.3% of the people have more than 500 ha each, 40% have none.
 - Investments are focused on big cities; small villages do not get much.
- Erosion, Sedimentation, Salinization, and Wastewater: Serious environmental problems arose during the implementation of the dam projects.
- Archaeological Impacts: Excavations cannot be finished and important cultural heritage will be drowned.
- Displacement of people: So far 200 000 were resettled because of the dams built in the GAP region. About 70% of the resettled people are unhappy with their new life. The main reason for this is low income at their new location.
- Financing problems: As the Turkish government could not afford to finance the whole GAP project by itself, international financing was sought. By undertaking this step the responsibility and the control of the project was partly moved outside Turkey into the hands of foreign investors, private companies and foreign funding agencies.
- Information policy: No transparent information policy has been observed regarding the social and ecological problems.
- International effects: During periods when dams were being filled, Syria and even more so Iraq suffered from lower levels of water flow. There are no legally binding agreements with these downstream countries, thus they are vulnerable to negative impacts of Turkish water development projects.

7 ANNEX 3 - UN Law of Non-Navigational Uses of International Watercourses Convention Application to the Euphrates and Tigris Watershed⁴

The analysis done to determine equitable and reasonable use for each state includes each aspect of water use as outlined in Article 6 (1) from the UN/ILC law. Table 18 shows the relative ranking between uses. As the UN/ILC law states, every use has the same relative priority and consequently has equal weight. In this case, Iraq comes out the favourite, but only by a small and probably insignificant margin, with Syria and Turkey in second and third in term of water needs, respectively. Only one point separates each riparian, thus good judgement would safely determine that each riparian have an equal share of Euphrates water.

This method is limited due to the unrealistic notion of equal ranking between uses. Reality dictates that this is seldom the case, and one use has extreme importance for one country while another may be meaningless. For instance, food security for Syria would far outweigh social needs, as Turkey's energy needs would overcome its need for irrigation.

Country	Turkey	Syria	Iraq
Share in drainage basin	2	3	1
Country's water contribution	1	3	2
Climate	3	2	1
Conservation of water	2	1	3
Environmental policy	2	1	3
Patterns of utilization			
- Past	3	2	1
- Present	1	3	2
Social Indicators			
- Life expectancy	1	2	3
- Infant mortality	1	3	2
Total population (2001)	1	3	2
Population growth (1990-2000)	3	1	2
Energy needs	1	2	3
Economic indicators			
- Per capita income	3	2	1
- Total debt	3	2	1
Cereal imports	3	2	1
Food production per capita	1	3	2
Alternative sources (virtual water)	2	1	3
Total(summation)	35	34	33
Average score	2.06	2.00	1.94

TABLE 18: Equitable use relative ranking for Euphrates and Tigris watershed

A key finding is that water security, or that matter any political component is missing from the above ranking. Table 19 shows differences between use patterns and the corresponding effect if security measures are added.

⁴ Beaumont, YALE F& ES Bulletin

In this case, interestingly, the addition of water security factors based on analysis from the previous work equates the ranking between all three riparians. It is also interesting to note that adding environmental factors to the hydrological category, Turkey loses its superior position due to the potential to pollute Euphrates and Tigris water with return flows from agricultural use. This satisfies Article 7 and the ‘no harm’ principle.

Use	Turkey	Syria	Iraq
Hydrological	10	10	10
Patterns of utilization	6	4	2
Social Indicators	6	9	9
Energy	1	2	3
Economic indicators	12	9	9
Sub-Total	35	34	33
Water Security	1	2	3
Total (incl. security)	36	36	36
Average	2.00	2.00	2.00

TABLE 19: Water security - relative ranking

There is inherent volatility using the UN/ILC equitable and reasonable use principle as a method to allocated and manage an international (or transboundary) watercourse system. The system suffers from the practical uncertainty of ambiguous data. Little or no cooperation over data sharing has succeeded witnessed by the failure of the JTC. Water resource information, as well as economic data is often treated as state secrets. Dispute over data has been a consistent trend over Euphrates-Tigris usage.

Secondly, national priorities dictate preferential use, but political, including security concerns often dominate over economic and social factors. Turkey’s use of the absolute territorial sovereignty moves the analysis from a needs based to a rights-based framework. This categorically removes the interests lesser power groups, such as indigenous Kurds or Marsh Arabs. The framework fails to include aspects of environmental, human and ecological security, leaving out water security.

Finally, the framework is an admirable ideal for a cooperative framework between states, but offers no incentive to Turkey, Syria or Iraq to use it, especially if the upstream riparian, in this case Turkey, will lose out after its application. Even if Turkey accepted the validity of the UN/ILC law, there is no penalty for not meeting it.

8 ANNEX 4 - TABLES

Table 1 Riparian Contributions to the Euphrates-Tigris Rivers Basin

Euphrates & Tigris Rivers	Turkey	Iraq	Syria	Iran	Total
Discharge (%)	78.1	8.1	0.5	13.3	
(Billion m ³ /year)	65.7	6.8	0.5	11.2	84.2
Drainage Area (%)	20.5	46.0	9.0	19.0	
(Km ²)	170,000	469,000	77,000	37,000	819,000
River Length (%)	33.5	51.0	15.5	----	
(Km)	1630	2478	754	----	4862

SOURCE: Macquarie 2004

Table 2 Riparian Contribution to the Euphrates River Basin

Euphrates River	Turkey	Iraq	Syria	Iran	Total
Discharge (%)	98.6	0.0	1.4	----	
(Billion m ³ /year)	32.2	0.0	0.5	----	32.7
Drainage Area (%)	28.0	40.0	17.0	----	
(Km ²)	125,000	177,000	76,000	----	444,000
River Length (%)	41.0	35.5	24.0	----	
(Km)	1230	1060	710	----	3000

SOURCE: Macquarie 2004

Table 3 Riparian Contribution to the Tigris River Basin

Euphrates River	Turkey	Iraq	Syria	Iran	Total
Discharge (%)	65.0	13.2	0.0	21.7	
(Billion m ³ /year)	33.5	6.8	0.0	11.2	51.5
Drainage Area (%)	12.0	54.0	0.2	34.0	
(Km ²)	45,000	292,000	1,000	37,000	375,000
River Length (%)	21.0	77.0	2.0	----	
(Km)	400	1418	44	----	1862

SOURCE: Macquarie 2004

Table 4 Sources and Uses of the Tigris River

			Natural Flow	Uses
Iraq	Entering Removed in	Iraq Iraq	32760	-13000
Syria	Entering Added in Removed in	Syria Syria Syria	30670 +2050	-25511
Turkey	Flow from Removed in	Turkey Turkey	+30670	
Total	Post GAP Project		-21600 <u>32760</u> (Shatt Al-Arab)	<u>-37111</u>

SOURCE: Macquarie 2004

Table 5 Sources and Uses of the Euphrates River

			Natural Flow	Uses
Iraq	Entering	Iraq		
	Added in	Iraq		
	Reservoir evaporation	Iraq		-4900
	Irrigation (to Fatha)	Iraq	11800	-3100
	Irrigation (to Baghdad)	Iraq	+30700	-10400
	Domestic use	Iraq		-1900
	Irrigation	Iraq		-3500
	Irrigation (to Tokuf)	Iraq		-6400
Syria	Entering	Syria	11800	
Turkey	Flow from Removed in	Turkey Turkey	18500	
Total	(Post GAP Project)		-6700 <u>49200</u> (Shat Al-Arab)	<u>-36900</u>

SOURCE: Macquarie 2004

Table 6 Economic Overview of Iran

GDP	\$516.7 billion
GDP - per capita	\$7,700
GDP Growth Rate	6.3 %
Unemployment Rate	11.2 %
Budget	\$43.34 billion
Exports	\$38.79 billion f.o.b.
Imports	\$31.3 billion f.o.b.
Oil - Exports	2.5 million bbl/day

SOURCE: CIA 2004

Table 7 Economic Overview of Iraq

GDP	\$54.4 billion
GDP - per capita	\$2,100
GDP Growth Rate	52.3%
Unemployment Rate	25% to 30%
Budget	Revenues: \$17.1 billion expenditures: \$28.2 billion, including capital expenditures of \$5.6 billion
Exports	\$10.1 billion f.o.b.
Imports	\$9.9 billion f.o.b.
Oil - Exports	1.49 million bbl/day

SOURCE: CIA 2004

Table 8 Nation Wide Unemployment Rate since June 2003

Month	Rate	Month	Rate	Month	Rate
June 2003	50-60 %	February 2004	30 - 45%	October	30-40%
August	50-60 %	April	30 - 45%	December	28-40%
October	40 - 50%	June	30-40%	February 2005	27-40%
December	45-55%	August	30-40%	April	27-40%

SOURCE: UNEP 2005

Table 9 World Estimated of Iraq Reconstruction Needs

	Millions of Category dollars		
	2004	2005-2007	Total
Government Institutions, Civil Society, Rule of Law & Media	99	288	387
Health, Education, Employment Creation	1880	5310	7190
Infrastructure	5836	18368	24204
Agriculture and Water Resources	1230	1797	3027
Private Sector Development	176	601	777
Mine Action	80	154	234
Total	9301	26518	35819

SOURCE: UNEP 2005

Table 10 Economic Overview of Syria

GDP	\$60.44 billion
GDP - per capita	\$3,400
GDP Growth Rate	2.3%
Unemployment Rate	20%
Budget	\$6.58 billion
Exports	\$6.086 billion f.o.b.
Imports	\$5.042 billion f.o.b.
Oil - Exports	285,000 bbl/day

SOURCE: CIA 2004

Table 11 Economic Overview of Turkey

GDP	\$508.7 billion
GDP - per capita	\$7,400
GDP Growth Rate	8.2%
Unemployment Rate	9.3% (plus underemployment of 4.0%)
Budget	Revenues: \$78.53 billion expenditures: \$110.9 billion, including capital expenditures of NA
Exports	\$69.46 billion f.o.b.
Imports	\$94.5 billion f.o.b.
Oil - Exports	46,110 bbl/day (2001)

SOURCE: CIA 2004

Table 12 Revised water demand figures for the Tigris River for the period after the year 2020 in MCM/year

Country	Irrigation Water Use	Evaporation	Total
Turkey	5,600-6,700	630	6,200-7,300
Syria	0	0	0
Iraq	37,200-60,000	1,000	38,200-61,000
Total demand	44,400-68,300		
Available water	52,700		
Balance	+8,200 to -15,700		

SOURCE: Beaumont, YALE F& ES Bulletin

Table 13 Revised water demand estimates for the Euphrates basin for the period after the year 2020 in MCM/y.

Country	Irrigation Water Use	Evaporation	Total
Turkey	10,830-13,000	1,100	12,000 -14,000
Syria	4,750-12,500 0	630	5,400 -12,600
Iraq	24,400-27,500	600	25,000 - 28,100
Total demand	42,300 - 54,800		
Available water	31,800		
Balance	-10,500 to 23,000		

SOURCE: Beaumont, YALE F& ES Bulletin

Table 14 Water demand and water availability on the Tigris in the period after 2020. MCM/ annum

Country	Kolars	Kliot	Altinbilek
Turkey	6,700	7,200	8,000
Syria	0	500	0
Iraq	29,200	40,000	31,900
Total demand	38,700	47,700	39,900
Available water	49,200	48,000-52,600	49,570
Balance	10,500	300-4,900	9,670

SOURCE: Beaumont, YALE F& ES Bulletin

Table 15 A chronological summary of the history of conflict and cooperation in the Euphrates and Tigris Watershed

Date	Countries involved	Cooperation/conflict
1946	Turkey & Iraq	<i>Cooperation:</i> Bilateral treaty: art. 5: Prior notification about water development projects
1964	Turkey & Syria	<i>Unsuccessful cooperation:</i> Unsuccessful Turkish proposal to link sharing of Orontes and Euphrates, Syria refuses as she sees this as accepting the Turkish occupation of Sandjak d' Alexandrette
1965, Baghdad	Turkey, Syria & Iraq	<i>Unsuccessful cooperation:</i> Iraq demands 18 BCM/a (Billion Cubic meters per year) of Euphrates, Turkey: 14 BCM/a and Syria: 13 BCM/a (actual total is 32 BCM at Hit, demand = 1.4 x supply)
1966 until today	Syria & Iraq	<i>Conflict:</i> Split in the Ba`th party, opposition between the antagonistic parties (one ruling Syria, the other Iraq). This explains why Syria and Iraq cannot find a common position over the Palestinian question or common water resources
1967	Syria & Iraq	<i>Unsuccessful cooperation:</i> Iraq demands 16 BCM/a (billion cubic meters per year) from Euphrates Syria wants to concede a maximum of 9 BCM/a
1975	Syria & Iraq	<i>Conflict & cooperation:</i> Syria fills the barrage of Tabqa (14.2 BCM), this barrage together with the barrage in Turkey (Kiban, 1973) is said by Iraq to reduce the flow by 9 BCM, from the original of 28 BCM. Arab League and Saudi Arabia offer to mediate. Syria moves armed forces from the Israel front to the Iraqi front. Saudi mediation efforts are finally successful. Pressure from the USSR on both Syria and Iraq helps the process. Declaration of principles is not followed by an official signature, but there seems to be a secret agreement that was signed by the two governments. Besides water, other factors were very important in this crisis: 1) March 1975, Damascus arrested 120 – 200 militant Syrians suspected of being close to the Ba`th party exiled in Iraq. 2) Baghdad rejected Syria's moves of disengagement with Israel. After the war of 1973, Baghdad probably feared that Damascus would follow the steps of Egyptian moves towards peace with Israel.

Date	Countries involved	Cooperation/conflict
1980s	Turkey, Syria & Iraq	<i>Ineffective cooperation:</i> Added tensions between the riparian states due to the civil war of the Kurdish Workers Party (PKK) opposing the Turkish government. Closely linked to this is the GAP in the South East of Turkey where the majority of the population is Kurdish. All three riparian states agreed to a joint technical commission for the exchange of information. Although the commission only met sporadically, it is the closest to a tri-partite cooperative accord
1990	Turkey & Iraq	<i>Negative impacts:</i> During the first phase of the filling of the Ataturk reservoir, the level of the river sank by one meter at the Syrian boarder. It is estimated that Iraq suffered a loss of 15% of its crops due to this
1990	Syria & Iraq	<i>Cooperation:</i> Agreement between Syria and Iraq: 58% of the water measured at the Syrian –Turkish frontier to go to Iraq, 42% to Syria. Syria perceived this agreement as conceding a part of its own water quota to Iraq and threatened to take it back at some point in time.
1990	Turkey & Syria	Syria began the construction of a dam on the Orontes, the only river flowing into the Turkish area of the Alexandrite. Turkey demanded from Syria: 1) control of Kurdish activities 2) giving up the area of the Alexandrite 3) a definitive sharing of the Orontes
1991	2. Gulf war	<i>Conflict:</i> Both Turkey and Syria joined in the ally's opposition against Iraq. It is claimed that Lord Owen urged Turkey to restrict the flow of the Euphrates to Iraq, if this advice was given; it was not heeded by Turkey (Waterbury 1996). According to another source, during the Month of January 1991 Turkey was filling the Ataturk dam (second phase). Syria continued using the water normally, thus the water shortage was carried by Iraq alone – while at the same time being bombed by the allies. This is contrary to the Syro-Iraqi agreement of 1975: 58% of the Euphrates to Iraq, 42% to Syria
1992	Turkey & Syria	<i>Cooperation:</i> Turkey asked that the protocol of 1987 be modified to include a reference to the link between Damascus and the Kurdish PKK. The Turkish minister of interior Ismet Sezgin asked the Syrian President Assad: "When I return to my country, will I be able to say that the Kurdish problem is resolved?" "You will be able to say that there is a true cooperation in order to resolve this problem"
1993	Turkey, Syria & Iraq	<i>Negative impacts:</i> Filling of the Birecik dam, water sinks to 300 m ³ /s. Turkey argues that the agreed on 500 m ³ /s is the annual average, but Syria and Iraq have limited storage capacity, thus the timing is vital (growing season)

SOURCE: Macquarie 2004

Table 16 Average annual water availability per capita (m3)

Country	1990	2000	2010	2020
Turkey	3223	2703	2326	2002
Syria	1636	1177	880	760
Iraq	2352	1848	1435	1062

SOURCE: Bilen 2000

Table 17 Comparing Euphrates and Tigris watershed with the major watersheds of West and Central Asia

				Percent of watershed that is:					
				Cro p- lan d	For est	Gr ass - lan d	Arid area		
Amu Darya	534,739	5	39	22.4	0.1	57.3	72.0	2	0.7
Euphrates & Tigris	765,742	5	57	25.4	1.2	47.7	90.9	19	0.4
Kizilirmak	122,277	1	55	38.0	1.6	52.0	84.9	9	0
Kura & Araz	205,037	5	75	54.0	7.1	30.6	25.4	4	4.3
Lake Balkhash	512,015	2	11	23.2	4.0	61.1	91.6	0	7.2
Ob	2,972,493	4	10	36.9	33.9	16.0	42.5	0	1.9
Syr Darya	782,617	4	28	22.2	2.4	67.4	88.5	4	1.0

SOURCE: World Resources Institute, 2004 (Earth trends)

Amu Darya: Turkmenistan + Uzbekistan + Tajikistan + Afghanistan + Kyrgyzstan

Kizilirmak: Turkey

Kura & Araz: Armenia + Azerbaijan + Georgia + Iran + Turkey

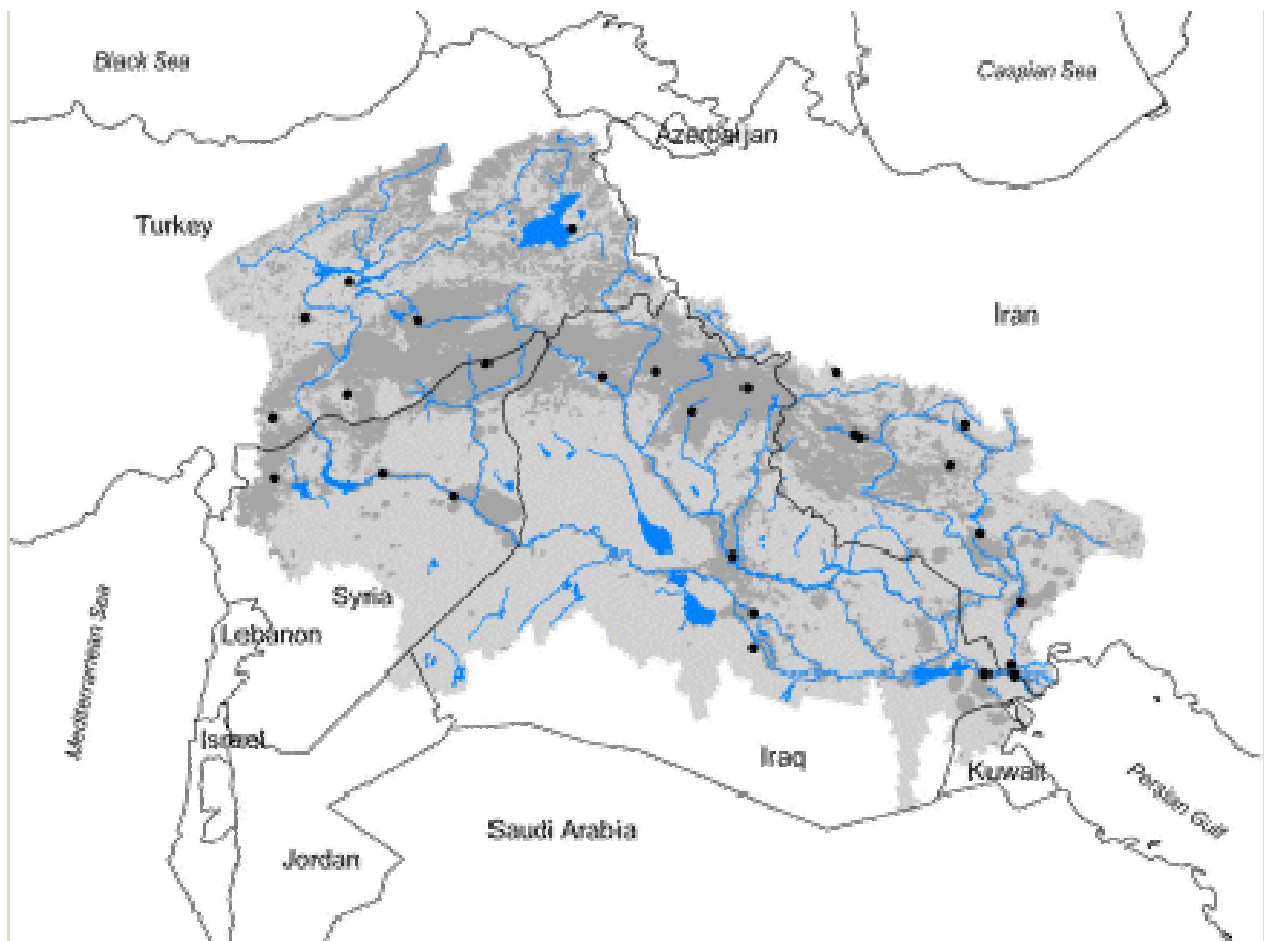
Lake Balkhash: Kazakhstan + China

Ob: Mongolia + Kazakhstan + Russia + China

Syr Darya: Uzbekistan + Kazakhstan + Kyrgyzstan + Tajikistan

Tigris & Euphrates: Turkey + Iran + Iraq + Syria + Saudi Arabia

9 ANNEX 5 - MAPS



Map 1 *Euphrates and Tigris Watershed*

Map 2 Euphrates River Basin



Map 3 Tigris River Basin



REFERENCES

- Al-Farrajii, Fadhil Ali;** Forestry study for Iraq (current situation) 2003, FAO/Rome
- ALTINBILEK, DOGAN;** Development and Management of the Euphrates–Tigris Basin, Water Resources Development, Vol. 20, No. 1, 15–33, March 2004
- Anderson, Jon;** Four Considerations for Decentralized Forest Management: Subsidiarity, Empowerment, Pluralism and Social Capital, FAO
- AQUASAT,** FAO's information system on water and agriculture, Water and Agriculture Division
- Aslantas Dam and related aspects of the Ceyhan River Basin Turkey,** Prepared for the World Commission on Dams (WCD), 2002
- ASSESSMENT OF LEGAL ASPECTS OF THE MANAGEMENT OF SHARED WATER RESOURCES IN THE ESCWA REGION, ECONOMIC AND SOCIAL COMMISSION FOR WESTERN ASIA,** 2001
- Avcioglu, R., E. Acikgöz, H. Soya and A. Tan.** 2000. Forage Crops Production. In: Vth Technical Congress of the Agriculture, 17-21 Jan., 2000. P: 566-585. Chamber of Agricultural Engineers
- Ayers, Alex;** managing global freshwater shortages." Middle East, Student Participant Indianola High School, Iowa
- Banerjee, Ajit K.;** Devolving Forest Management in Asia-Pacific Countries, 2002, FAO
- Baumann, Pari;** improving access to natural resources for the rural poor, a critical analysis of central concepts and emerging trends from a sustainable livelihoods perspective, 2003
- Beaumont, Peter,** Restructuring of Water Usage in the Tigris-Euphrates Basin: The Impact of Modern Water Management Policies, University of Wales, Lampeter, YALE F& ES Bulletin, No. 103
- Beck, Lois;** Use of Land by Nomadic Pastoralists in Iran: 1970–1998, Washington University, St. Louis
- Brooks, David B.;**Keynote Address: Access to water in the Eastern Mediterranean
- CHAPMAN, G. W.;** Forestry in Iraq, FAO
- Country Pasture/Forage Resource Profiles TURKEY** by Dr. Alptekin Karagöz
- DEVELOPMENTAL, HUMAN RIGHTS AND ENVIRONMENTAL IMPACTS OF THE BAKU-TBLISI-CEYHAN OIL PIPELINE, FRIENDS OF THE EARTH (EWNI),** 2002
- Dregne, H. E.;** DESERTIFICATION OF ARID LANDS

Dudley, Nigel; Sue Stolton, Running Pure: The importance of forest protected areas to drinking water, A research report for the World Bank/ WWF Alliance for Forest Conservation and Sustainable Use, 2003

Düzgün, Mevlut; FORESTRY BASED CONTRIBUTIONS TO THE SUSTAINABLE LIVELIHOODS OF FOREST-DEPENDENT MOUNTAIN COMMUNITIES IN TURKEY, Case study from Turkey Sustainable Forest-Dependant Livelihoods, 2002

Ehrlich, Anne H.; Peter Gleick; Ken Conca; RESOURCES AND ENVIRONMENTAL DEGRADATION AS SOURCES OF CONFLICT, 2000

Falkingham, Jane; Welfare in Transition: Trends in Poverty and Well-being in Central Asia

Fé d'Ostiani, Luca; WATERSHED MANAGEMENT, A KEY COMPONENT OF RURAL DEVELOPMENT IN THE MEDITERRANEAN REGION, 2003

Fisher, R.J.; Patrick B. Durst; Thomas Enters and Michael Victor, Overview of Themes and Issues in Devolution and Decentralization of Forest Management in Asia and the Pacific, FAO

Forest related environmental issues in the West and Central Asia: problems and outlook
FORESTRY OUTLOOK STUDY FOR WEST AND CENTRAL ASIA, 2005, FAO, Rome

G. W. CHAPMAN, Forestry in Iraq, FAO corporate document repository

Georgakakos, Aris; A CASEBOOK ON INTEGRATED RIVER BASIN MANAGEMENT

Global Environment Outlook – 3, West Asia, PAST AND PRESENT: 1972 TO 2002

Grazing systems and livestock production in the three northern Governorates of Iraq A report of results of surveys by the FAO range program during 2002 under UN SCR 986, Alexander Holm, Handren Salih, Bayar Ibrahim, Nahla Mohammed Ali, Barzan Ezat, 2003

Holm, Alexander; Grazing systems and livestock production in the three northern Governorates of Iraq, A report of results of surveys by the FAO range program, 2002

Jim, Ryan; Agricultural Research and Poverty Alleviation: Some International Perspectives Visiting Fellow, Economics Division, Research School of Pacific and Asian Studies, Australian National University, Canberra ACT, Australia, 2002

Judith, Yaphe; EPIC II: A Short History of Western Imperialism in Iraq, National Defense University, 2003

Justus, Leicht, 75 years of the Turkish Republic A balance sheet of Kemalism, 1998

Kananian, Mona; Forests of Iran and their potential and constrains to poverty reduction and **KIBAROGLU, AYSEGÜL**; An Institutional Framework for Facilitating Cooperation in the Euphrates-Tigris River Basin, Department of International Relations, Middle East Technical University, Ankara, Turkey, 1991

- Kolars, John;** DEFINING THE POLITICAL/ECOLOGICAL THRESHOLD FOR THE EUPHRATES AND TIGRIS RIVERS, Arab Studies Quarterly, Spring2000, Vol. 22 Issue 2, p101, 12p.
- Koohafkan, Parviz;** Integrated watershed management and sustainable food production, FAO
- Livelihood improvement,** Initial Desk Study, 2005
- McNicoll, Geoffrey;** Special: Population, poverty and environment, Population and Poverty: the Policy Issues, Part 1, and FAO
- Macquarie, Patrick;** Water Security in the Middle East; Growing conflict over development in the Euphrates- Tigris basin; 2004
- Mirabzadeh, Parastu;** Wetlands in Western Asia, the Ramsar Convention on Wetlands
- Mishra, H.R.;** Mountains of the developing world: pockets of poverty or pinnacles for prosperity, FAO
- OKUMUS, KEREM;** Turkey's Environment, A Review and Evaluation of Turkey's Environment and its Stakeholders, 2002
- Ozturk, M., H. Ozcelik, S. Sakcali, A.Guvenen;** Land Degradation Problems in the Euphrates Basin, Turkey; International Society of Environmental Botanists, Enviro News. Vol. 10 No. 3 - July 2004
- Rae, J., Arab, G., Nordblom, T., Jani, K., and Gintzburger, G.,** TRIBES, STATE, AND TECHNOLOGY ADOPTION IN ARID LAND MANAGEMENT, SYRIA, CAPRI WORKING PAPER NO. 15, 2001
- Reed,Christopher;** Paradise Lost? What should--or can--be done about "the environmental crime of the century"?
- Sahan, Emel;** Sustainable Management of International Rivers, Case-Study: Southeastern Anatolia Project in Turkey – GAP, Seminar for Doctoral Students at the ETH Zurich, 2001
- Savenije, Hubert H.G;** HOW DO WE FEED A GROWING WORLD POPULATION IN A SITUATION OF WATER SCARCITY? 1998
- Soffer, Arnon;** NATURAL RESOURCES IN THE MIDDLE EAST, University of Haifa
- SÜLÜŞOĞLU, Melekber;** THE POTENTIAL AND UTILIZATION OF FOREST RESOURCES IN TURKEY AND POVERTY, Initial study, 2003
- Synovitz, Ron;** Syria/Turkey: Common Interests in Iraq Help Rebuild Bilateral Ties
- Tiongson, Virgilio A.;** Experiences and Challenges of Local Government Units in Co-managing Forest Resources: The Case of Lower Magat Forest Reserve, FAO

UÈ NEVER, H. OLCAY; Southeastern Anatolia Project (GAP), Water Resources Development, Vol. 13, No. 4, 453± 483, 1997

Upreti, Bhim Prasad; Balancing Power in Community Forestry: Decentralization and Devolution of Power, FAO

Van Heck, Bernard; Participatory Development: Guidelines on Beneficiary Participation in Agricultural and Rural Development, FAO, 2003

Wiegandt, Ellen; Water Control and Property Rights: An Analysis of the Middle Eastern Situation, 2001

Wimmer, Andreas, Democracy and Ethno-Religious Conflict in Iraq, 2003

Zoomers, Richard; No forests, no water? Surely not!