DESERTIFICATION IN TURKEY

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1. Introduction

Desertification is a land degradation in areas that are arid, semiarid and areas with low precipitation, resulting from various factors including climatic changes and human activities. 900 million people in 100 countries on earth live in areas with problems of desertification and drought. On the other hand, it has been expressed that the population affected desertification shall be doubled by the year 2025.

30% of the irrigatable agricultural fields (1.5-25 billion ha), 47% of agricultural land dependent of precipitation (3.5-4.0 billion ha) and 73% of pastures (35 billion ha) are affected by desertification at certain levels. These areas have last their productivity totally or partially, due to land degradation. In short, desertification affects approximately 1/6 of the world population and 1/4 of the total world land areas.

Our country feels the severity of desertification less than the regions of the earth that are sensitive in this regard. However, the abuse of our lands irrespective of their capacity, agricultural malpractices, and unhealtly methods of irrigation, over use of lands and overgrazing in pastures, forest removals for opening new agricultural fields and use of valuable agricultural fields for non-agricultural purposes, lead into land degradation that shall threaten out future. Therefore, Turkey has become a country affected by drought, and with risks of desertification, 86% of its land experiencing a low level, up to severe degree erosion problems.

On these grounds, and within the framework of "United Nations Agreement on Fighting against Desertification", "National Action Plan for Land and Water Resources in Turkey" has been drafted with regard to our land and water resources within the scope of the General Directorate of Rural Affairs (KHGM), in order for desertification not to threaten our future.

Problems that have still been intensively experienced in our country and that threaten the land existence causing the loss of land capacity for production such as

erosion, soil pollution, soil abuse and use of land for non-agricultural purposes have been considered in developing this program.

2. Natural Resources and Agricultural Structure

Geographical Location: Turkey having a rectangle-like shape on the World Map is located at the Eastern Mediterranean Basin and on its particular climate zone, is a bridge between Europe and Asia. It's on the sea way connecting the Black Sea to the, Mediterranean Sea via its straits; and is located between 25° 40' and 44° 48' Eastern Longitudes, and 35° 42' and 40° 06'Northern Latitudes. Its total land surface area inclusive of Lakes is 779452 square kilometers, 23764 square kilometers of which is in the Thrace, and 755688 square kilometers of which is in Anatolia.

Climate: (1) Surrounding seas, (2), land masses (3) pressure centers and (4) earth formations are effective in the formation of the climate of Turkey. Because of these, Turkey is located between warm and cold climate zones. Turkey lies in a humid-warm and humid-cold climate zone in the North, and semi-warm Mediterranean climate zone in the south. Coastal regions are rainier, more humid and warmer than inlands due to sea effect. As one goes toward inlands, the sea effect diminishes and characteristics of a continental climate become visible. Cold air masses above. Asia and Europe, along with hot and dry air masses of African and Arabian deserts affect the climate of our country Cold air from Siberia in winter causes severe cold in Central and Eastern Anatolia, similarly, the cold air from the Balkans causes precipitation of snow in the Thrace and Western Anatolia. On the other hand, the dry and hot weather from Northern Africa and Arabian Peninsula leads into high temperatures in Anatolia.

According to surveys on climatic elements in Turkey, four main climate zones are identified: (1) climate zones of central region, (2) Eastern Anatolian climate zones of High region; (3) Mediterranean climate zones, and Black Sea climate zones. These main climate zones are divided into sub-climate types depending on climatic elements such as average yearly and monthly temperatures, precipitation, sun exposure, fog, frost, humidity, evaporation and drought, as well as natural flora of Turkey.

Physical Geography: Turkey is along the Alp-Himalayan Mountain Folds. Young mountain folds progressing from Europe towards East stretch towards Asia. Our country is an elevated section of this range restricted by faults during a recent

geological period. The physiography of our country indicates differences according to geographical regions (Black Sea, Marmara, Aegean, Mediterranean, Southeastern Anatolia, Eastern Anatolia and Central Anatolia.

Geology: Turkey is within the Alp Fold Range. Therefore, each section of the earth crust metamorphosed through plate movements in each geological period. Areas elevated by mountain forming movements have been eroded continuously by rivers and materials moved from these areas have been accumulated in glens lakes and seas. During the geological period when the accumulation occurred, fields belonging to this geological period were formed.

Natural Flora: There are more than 10.000 varieties of plants in Turkey, made up of trees, bushes, shrubs, grasses and mosses. With quite a rich composition of its flora, the coniferous trees of the Alps, Northern Europe and Siberia, alpine meadows, as well as plants of Arabian and African origins inhabit our country. This variety is a result of the climate and climate changes, surface formations, soil and main materials as well human factors.

Soil: A general view at soils of Turkey indicates Podzolic soils along the coastal regions with high precipitation rate (Black Sea); Mediterranean soils along coastal regions where Mediterranean climate is dominant; forest soils and Rendzinas along mountains and hilly ranges with sufficient humidity; Brown and Reddish Brown soils in arid areas; Incalcareous Brown, Chestnut Brown and Reddish Chestnut Brown soils along more humid areas; Alluvial and Colluvial soils and Vertisoles along the adjacent foothills; and soils of volcanic origin along the old volcanic areas.

Soil Depth: The distribution of soils along groups of soil depth accepted in Turkey is as follows: 15% deep and very deep, 13% medium deep, 32% shallow and 40% very shallow.

Soil Inclination: The distribution of soils in Turkey according to groups of inclination is as follows: 12.5% flat – close to flat, 11% slightly inclined, 14.5% medium-inclined, 16% straight and 46% very straight, steep or very steep.

Soil Structure: According to physical examination of soil profiles cut during the survey of soil map of Turkey. Scaly/filmy, prismatic, columnar, block-like and granular structures were determined, in the upper soil.

Soil Construction: According to the results of the analysis of soil profiles cut during the survey of soil map of Turkey, the soils of Turkey show a variety of differences with respect to their construction. The most common upper soil construction of agricultural soils of Turkey is tenacious soil by 50.5%. Following this are tenacious clay by 41.4%; clay by 4.7; sandy soil by 3.3% and heavy clay by 0.05%.

Soil Reaction and Calcareousness: Soils in Turkey have commonly neutral, very slightly alkaline or slightly alkaline reactions, and they are commonly rich in lime. 62% of agricultural soils have slightly alkaline; 0.8% strongly alkaline, 29.9%, neutral; 5.4% slightly acidic; 1.7% medium-acidic and 0.4% strongly acidic reactions in the upper soil. 25.1% of these soils are calcareous; 23.1% slightly calcareous; 18.3 very slightly calcareous; 16.8%. Very strongly calcareous and 16.7% are strongly calcareous.

Stoniness and Rockiness: The provinces with the highest rate of stoniness and rockiness in the soils of Turkey are Siirt, Muğla, Ordu, Mardin, Erzurum and Erzincan Provinces with the least rate of stoniness and rockiness are Tekirdağ, İstanbul, Trabzon, Rize, Kırklareli and Kocaeli. Among the large soil groups, Basaltic soils show the most stoniness.

Soil Productivity: The organic material in soils of Turkey is generally in low amounts. In fact, 43.8% of agricultural soils have low amounts of organic material; 22.6% have medium amounts; 21.5% have every low amounts, 7.6% have a good amount; and 4.6% have high amounts of organic material. The Potash (K_2O) content in soils of Turkey is high in 87.4%, sufficient in 5.8%, medium in 4.2% and low in 2.6%. The Phosphors (P_2O_5) content of agricultural soils in Turkey is very low in 29.5%, low in 28.5%, medium in 17%, very high in 15.7% and high in 9.3%.

Drainage: 2.750.000 ha (3.5%) of the lands in our country are affected at various levels by the drainage problem. Some of these lands, generally those in coastal regions, need pumping for restoration. The province with the highest drainage problem is Konya (including Karaman) with 387000 ha (8%). Following this is Niğde (Including Aksaray) with 181800 ha (13.6%) and Adana (including Osmaniye) with 16500 ha (9%). In fact, the province with lands with highest rate of drainage problem is Sakarya (16.4%). However, there have been and are various restoration works in these provinces. The provinces with least or no problem of drainage, are Artvin, Bingöl, Diyarbakır, Elazığ, Malatya, Mardin, Şanlıurfa and Tunceli.

Salinity and Alkalinity: This problem may be encountered in Alluvial, Hydromorphic, Alluvial and Organic soils, as well as through less often in Vertisoles in our country.

This problem is common in the Central Anatolian Region and alluvial coastal plains in Turkey. According to the surveys, more than half of the lands with drainage problems, that is approximately 2% of the total land area or approximately 1.5 million hectares have been affected by salinity and/or alkalinity.

Erosion: Approximately 7% of the lands in Turkey are slightly affected by water erosion; 20% of the lands are affected at medium level, 36%, severely and 22% are affected very severely. In approximately 500000 hectares or less than 1% of the lands, and most commonly in the provinces of Konya, Niğde, Kayseri, Kars, İçel and Sakarya, wind erosion has been found.

Groups of Land Use Capacity: 6.5 % of the lands in Turkey are classified in Group I; 8.7% in Group II; 9,4 % in Group III; 9.5 % in Group IV; 0.2 in Group V; 13.9 in Group VI; 47.3 % in Group VII; and 4.3 % of the lands in Turkey are classified in Group VIII.

Land Use: According to the data obtained from land surveys implemented by TOPRAKSU between 1982-1984 and being evaluated by KHGM, total agricultural land area, is 28054000 hectares. Precipitation dependent (dry) agriculture is practiced on 21255000 hectares (75,8 %). Total land area where water-based (irrigated) agriculture is practiced, is 4354000 ha (15.5 %); vineyard-grove lands are 1129000 ha (4 %); lands for specialty produce (pistachios, tea, olive, hazelnut, chestnut, bananas, citrus, pine nuts, figs, mulberry) are 1314000 hectares (4.7 %).

Total land area of pastures and meadows is 21505000 hectares. A large section of this area, 20858000 ha, is used as pastures. The remaining 647000 hectares is meadows. Pastures and meadows are 27.6 % of the total and area of Turkey. 26.8 % of this is pastures and 0.8 % is meadows. Total forest and heathland area in Turkey is 23228000 hectares. 15185000 hectares of this is forest and 8043000 hectares is heathland. Out of the total land area of Turkey covered with forest and heathland which is 29.8 %, 19.5 % is forest and 10.3 % is heathland and shrubbery.

Water Potential: The mean of annual average of precipitation in Turkey is 642.6 millimeters. Average annual precipitation in our country is 501.0 km^3, and annual flow

is 186.05 km^3; and annual flow/precipitation rate is 0.37. Annual amount of disposable water is 95.0 km^3 and actual annual consumption is 35.5 km^3. Turkey is divided into 26 basins with respect to drainage areas, in order to survey extensively the problems related to development of water resources. Turkey is rich in number with regard to lakes, however, they do not cover a large surface area. Total land surface area of lakes and marshes in our country is approximately 10000 square kilometers. The underground water potential in Turkey, as a result of calculations regarding reserves as of 1996, is 9.4 % km^3/year of useful water reserves in the plains, and this amount goes up to 12.3 km^3/year including those found in isolated sections.

Agricultural Structure: Agriculture in our country is structured in two ways-The most common of these is the traditional agricultural businesses including small village businesses. The other is the commercial (modern) agricultural businesses comprised of large companies. While the traditional agricultural businesses produced at subsistence levels in order to sustain their existence, the commercial (modern) businesses produce for the market. The production of agricultural sector in our country is largely dependent on the conditions of nature. Therefore, the risk and uncertainty is rather big. In addition, low rate of return on funds (capital) in agriculture, insufficient capital accumulation and, low investments in turn, makes it necessary for support and incentives in this sector.

It shall be possible for our country to prove its existence and maintain it in an international competitive environment, when resources are utilized reasonably and in a planned manner in our country which has a great potential with regard to the size and variety in agricultural production due to its geographical structure and ecological factors.

While, according to the results of the General Agricultural Census of 1980, there were 3650910 agricultural businesses in Turkey, this number has gone up to 40684432 in the General Agricultural Census of 1991. When the size of business is considered, it has been observed that the agricultural businesses in Turkey are small businesses to a great extent. As the number of businesses increase, the size of business decreases in time. While the size of business in Turkey was 7.7 hectares in 1980, this has decreased to 5.7 hectares according to the General Agricultural Census of 1991. On the one hand the majority of the agricultural businesses are owned by small businesses with small

lands, on the other hand, the lands that are owned by small businesses are made up of plots that are in patches, irregular and scattered. The number of plots in 43 % of the businesses is 1-3 %; in 23% 4-5; in 19% 6-9; and in 15 % 10 or more.

Demographics: The population of Turkey has shown a variety of rates of growth since the first census in 1927, and has increased from 13.6 million up to 62.8 million people; thus it has increased by 4.6 times the population in the first census. The rate of population growth has remained above 2 % up to 1997 census. Average rate of growth is 2.51%, and highest rate is 2.85 and the lowest rate is 1.53 %. Two factors seem to be effective, as one considers the population growth with respect to regions. The first factor is migration and the other is a high rate of birth. The population of the western, central and southern provinces of the country such as İstanbul, Bursa, Kocaeli, Tekirdağ, İzmir, Ankara, Eskişehir, Antalya, İçel and Adana has increased naturally as well as due to migration. The provinces in the Black Sea region, Western Central Anatolia, Central and Upper Kızılırmak and the section of Erzurum-Kars have been the ones which out migration took place.

The parallelism of high birth and growth rates in the Southeastern Anatolian region has been quite significant, in spite of out migration. While the total birth rate of the country was 2.7 in 1990, in Şanlıurfa and Hakkari provinces of this region, the rates has reached to the levels of 4.4 and 7.4 respectively.

The population of coastal regions is denser than that of central regions. Aside from the natural fact of convenience of living, economic and industrial development, agriculture, trade and such elements affect the population distribution. The total change in population is different for rural and urban sections. While there is a decrease in the rural sections, urban population increased. The urban population in 1950 was 5.2 million while the rural population was 15.7 million; hence, the proportion of urban population in the total population was 25%, while that of rural population pas 75%. However, the urban population is 40.6 millions and rural populations 22.1 million in 1997. According to these figures, 64.7 % of the total population (62.8 million, in 1997) live in urban areas and 35.3% live in rural areas. Despite the fact that the population in agricultural areas have decreased from 75 % to 35 %, this rate is fairly low in the developed countries.

It has been found that one out of four people live in places other than their birth place due to migration in Turkey. As the provinces of İstanbul, Ankara, İzmir, Adana, Antalya, Aydın, Bursa, İçel, Kocaeli and Manisa are considered, it has been found that 7 out of 10 people who live outside their birth place have resided in these provinces. According to the net migration rate in 1990 census, the provinces of Kars, Tunceli, Siirt, Gümüşhane, Bayburt, Erzurum, Sivas, Muş, Artvin and Ağrı constitute the top ten provinces where out migration took place, most of the out migration provinces are eastern provinces. According to the results of this census, there are 53 out-migrating and 19 in-migrating provinces in Turkey.

The majority of the working section of the active population earn their living from primary activities (Sector I) such as agriculture, animal husbandry, fishing, etc; the second section from industrial (secondary) activities (Sector II); and the third section from tertiary sectors (Sector III) such as trade, transporting, financial and administrative services. The share of agricultural sector of the active population was 77.5% in 1955, whereas this share has decreased to 53.7 % in 1990. Although it has not been finalized, it has been estimated that the rate of population working in this sector has decreased to 44%. The case has been reverse for the industrial and service sectors. The rate of 8 % in 1955 in the industrial sector has increased to 17.3 % in 1990. The same case is observed in the service sector. 14.5% rate of this sector in 1955 has increased to 28.8 % in 1990. In short, the proportion of people working in the agricultural sector to the active population has decreased, while that of industry and service sectors has increased. As the proportion of people working in primary activities (agriculture, animal husbandry, fishing, etc.) to the total active population is examined, more than 80% of the active population living in the provinces of Yozgat and Muş work in the agricultural sector. Where as in the provinces where industrial and service activities increase (İstanbul, Kocaeli, Bursa, İzmir, Eskişehir, Ankara, Kayseri and Adana, etc.), the rate of active population working in agriculture has decreased lower than 50%. For instance, the rate of active population working in the industrial sector in İstanbul is 42%, which is ten times higher than that of Muş.

3. Protection of land and water resources and factors delimiting sustainability (reasons for desertification)

Social development and economic welfare are dependent on activities exploiting the world resources and destroying the ecology. Human activities have always been the source of waste and pollution. Although this destructive practice has not yet gone beyond the great replenishing capacity of our planet, it has reached its limit. There fore, we need to adapt our economic and social activities today, to the extent that the earth is able to cope with. Turkey's natural resources that make up the ecological basis for most of the agricultural and economic activities in rural areas, are challenged by land degradation and environmental pollution that are generally accepted throughout the world as well. Our lands have been degraded temporarily or permanently in an unrecyclable manner, through most various degrading factors such as accelerated erosion and desertification, compression and crusting, acidification, decrease of organic material and bio-diversity of the soil and exhaustion of soil productivity. Upon this fact, the main factor delimiting the sustainable use and protection of land and water resources in our country is temporary or permanent land degradation. The factors causing land degradation are as follows.

Climate Factor: The climate is an effective factor in soil formation. Similarly, all elements in climate formation are directly or indirectly effective in land degradation. Climatic elements are effective as on their own as well as a few of them together. The effects of first-degree factors of precipitation, wind and aridity index in land degradation have been considered in our country.

Precipitation: The most significant climatic element that affect water erosion is precipitation. Dependent on the factors of its kinetic energy and maximum density within 30 minutes, precipitation causes erosion. Erosive potentials and their monthly distribution calculated on the basis of these two values have been determined for over all Turkey. As a result of these analyses, precipitation erosion indices, their monthly distribution and their annual marginal values based on the data for 25 years from 60 observation stations have been found. The analysis for observation stations fulfilling their 25 year observation periods has still been in process. The erosive potential of precipitation based on the results of long-term observation that have been obtained from more centers of Turkey shall be found as a result of values obtained from surveys to be carried out.

Wind: While, the wind has an influence on the characteristics of a climate, it also causes land degradation through wind erosion. The winds cause erosion through their speed and seasonal distribution. However, land aggregate stability, roughness of land surface, type of vegetation and growing techniques increase or decrease the destructive effect of wind erosion. Aside from this destruction caused in the friction by wind erosion, accumulative destruction to be caused due to its being unable to move the material, or its leaving the material in a place when it is obstructed, are also important. In fact, the vegetation in the place of accumulation is destroyed, and human and animal health are challenged.

The wind erosion is especially effective during the end of an arid spring, in summer and in fall. During such arid seasons, the vegetation growth becomes weak, and thus the effect of wind erosion intensifies. Especially Central and Eastern Anatolian Regions are sensitive to wind erosion.

Aridity Index: A map of annual aridity in Turkey has been prepared according to the Erinç's formula: Im=P/Tam. According to this study, eastern part of the central sub-provinces of Şanlıurfa and parts close to the Syrian border in the Southeastern Anatolian Region; and areas close to the Armenian border and Yusufeli district in Çoruh Valley in the province of Iğdır are classified as arid. A large section of Central Anatolia and Şanlıurfa, Mardin and Diyarbakır in the Southeastern Anatolia; eastern sections of the central subprovinces of Kars, Ağrı and Van in Eastern Anatolia; west sections of Erzincan, Elazığ and Malatya and east of the province of Sivas in the region of Central Anatolia – Eastern Anatolia pass; certain sections of the provinces of Tokat, Amasya, Çorum and Çankırı in the region of Black Sea pass; and northwestern sections of the Region of the Lakes are classified as semi-arid.

The criterion of "aridity index" in the Contract has been the basis for the survey carried out by Türkeş in order to identify the arid lands with desertification tendencies, and to find out the changes in arid climatic conditions in Turkey. As a result of this survey, and according to the criterion of "aridity index" arid / semi-moist lands are commonly found in large sections of Central and Southeastern Anatolia Regions; in a part of Central and Eastern Mediterranean Region; and in western and eastern parts of Eastern Anatolia. Semi-arid climatic conditions prevail especially in Konya and Iğdır regions where total annual average of precipitation is less than 400 millimeters.

The continental central and eastern region of Turkey and Southeastern Anatolian Region are considered as arid lands with a tendency towards desertification. Considering the human element, certain sections of the Mediterranean and Aegean regions can be thought as semi-moist areas affected by desertification processes.

As can be seen in the Aridity Index spatial distribution maps based on the findings from these two surveys, the spatial distributions found out separately from the two above-mentioned methods almost coincide; and a large section of Turkey is categorized as semi-arid and semi-moist.

Topographical Factor: As it is the case for the whole world; the inclination degrees, inclination lengths and directions of land, affect significantly erosion; hence the degradation of land in Turkey. However, there is not a comprehensive study on this subject available in our Country. Those which are available, are not sufficient to make a general evaluation. So, it can be said that a number of comprehensive studies / surveys should be carried out on this subject matter.

Land Factor: The degree of sensitivity of the land to erosion (the "K" factor) varies of the physical and chemical properties of soil. The "K" factor, which indicates the sensitivity of a type of soil to erosion and its carrying away, are determined for large land groups by the KHGM Research Institutes' 11-22 year studies / surveys which were carried out on the universal Equation land plots. Also, by applying the findings which have been obtained from the analyses carried out on 3560 soil samples taken from various large land groups throughout the Country to the abacuses developed for this purpose, the said "K" factors for the large land groups have been determined. The "K" factors, which are determined from the analyses performed on the samples taken from the upper 0-15 cm layers of the 22 large soil groups have been evaluated according to the specified criteria. Hence it has been found that soils of Turkey fall within the "middle" or "excessive" classes as for as the "erodability" is concerned. In fact, out of the 22 large soil groups, 9 have the mid-level erodability characteristics whereas 13 have the excessive erodability.

In connection with the soil factor, the most significant reasons which limit the protection of water and land sources and sustainable utilization of them are erosions caused by water and wind. Furthermore; reasons such as deterioration of drainage, moisture –salinity- alkaline levels, deterioration of the physical and chemical properties

of the soil, burning of plant wastes, excessive use of agricultural chemicals and pollution; limit the sustainable utilization of land/soil. However, these are not sufficient studies and statistical data available in Turkey for some of these matters. Those which have been performed in limited areas are not suitable to make generalizations on the matters in hand.

Flora and Fauna Factors : Natural plant resources of Turkey have been depleted continuously by industrialization and construction, by exportation of the plants without controls, by opening up agricultural spaces, by forest fines, by excessive grazing, by pesticides; all of which are results of population increase, and economic development. This dangerous depletion specially affects negatively on the endemic plant species. All these factors cause recession of vegetation, decrease of bio-diversities and also recession of the existence of valuable species (by causing crossing of them).

Turkey is one of the Countries situated in the temperate zone and shows a significant biological diversity. Turkey's flora consists of the wild relatives of such important domestic plants as wheat, barley, chic pea, lentil, cherry, pear, apricot, chest nut and pistachio nut. Cherries, almond, figs and almonds were originated in Turkey. In Turkey, there are approximately 120.000 invertebrate species, 472 fish species (out of which 192 live in fresh waters), 426 bird species 8 Turtle, 49 reptile, 36 snake, 20 frog and 120 mammalian species. However, regression of the existence of the valuable species has being continued, and such plants as orchids, snowdrops and a specific type of tulip; and animals as olters, caretta carettas and special germs of ibis (in Turkish = "Kelaynak") have become endangered species.

Human Factors: Our land which forms a major part of our natural resources, serves at the same time as a production means for a significant part of our population. As a result of pressures caused by population increase and technological development, our land has been suffering from a number of problems. One of the most significant factors which creates these problems is the "human" factor, utilizing the land. When the history of our Country is reviewed, it can be seen that its exploitation has been continued since ancient times. Unfortunately not utilizing the land appropriately according to its properties caused and is causing its degradation.

Anatolian soil has been in the service and exploitation of its inhabitants for thousands of year. Our land/soil which has been under continuous utilization and

exploited with wrong implementations and usage continued to degrade due to non-application of any conservation measures. Besides causing rapid erosion. Excess moisture and salinity, disturbing the physical and chemical characteristics of soil; people also tun their backs to changing of the usage of agricultural land, destruction of forest areas and disturbing of meadows.

When the agricultural lands which were allocated for construction between 1985-1997 are examined, it can be seen that in 1997 the loss of agricultural land reached to its peak level. Within the 13-year period between 1985-1997 the average of the land for which construction permits were issued were for 13.316.278 decares, out of which 2.500.456 decares are good quality arable land and 75.00 decares are irrigated land respectively. In conclusion, it should be stressed here that Turkey does not have a limitless amount of arable land; so this trend should be stopped.

Water factor: As it is the case for the land resources and human factors, our water resources have some problems as well. There are different governmental bodies for the various utilization types of water resources in Turkey. For example for irrigation water DSI and KHGM; for potable and piped water DSI, Provincial Bank and Municipalities; for power generations DSI, TEDAŞ and TEAŞ are assigned.

There is no determination as yet which have ascertained that water resources of Turkey have becoming scarce due to the drought or other similar reasons. However, due to the material carried by water – erosion causes filling of lakes and dam – pools, hence shortens their utilizable lives (periods)

Irrigation water which consists of the greatest amount of utilization purpose is whether free of charge, or costs very low. For this reason neither water managers nor the users have the notion of using it economically. Hence instead of it should be managed as a limited resource, it is exploited excessively and wastefully. As a result of this trend, excessive amount of water is allocated for irrigation purposes.

Industrial wastes, domestic and industrial sewerage contents –insufficiently or non- treated-, agricultural chemicals, mineral wastes; all cause problems which have been increasing over time. The rivers in Turkey in which pollution is at its highest level are Ergene and Meriç rivers in Meriç Basin; Nilüfer and Simav streams in Susurluk Basin; Gediz river and Nif stream in Gediz Basin; Porsuk and Ankara streams and Cark brook in Sakarya Basin.

The lakes which are under the population risk are Sapanca, Ulubat and Kuş Lakes and Marmara Region; Eber and Karamuk lakes in the Lakes Region; Köyceğiz and Gölcük Lakes in Western Anatolian; Tuz (Salt) Lake in Central Anatolia and Lake Van in Eastern Anatolia Regions.

4. Activities Relating to the Improvement of Land and Water Resources, and to Rural Development Matters

On the subjects of improvement of land and water resources and rural development; besides the General Directorate of Rural Services (KHGM); such governmental / public bodies as Ministry of Forestry (O.B); ministry of Agriculture and Rural Affairs (T.K.B); State Hydraulic Works (D.S.I). General Directorate of Power Studies / Researches (E.I.E); and Environmental Ministry (Ç.B) render their respective services.

Land Surveys: The first land map of Turkey was prepared in 1954 in draft (reconnaissance) level. In 1966, TOPRAKSU carried out surveys for the "Improved Land Map of Turkey" for the whole of the Country. Between 1982-1984 General Directorate of TOPRAKSU (Soil/Land and Water Affairs) also carried out surveys on the Land Potential of Turkey (TTP) in order to determine the changes in land use patterns. In addition to studies) surveys mentioned above, with a study started in 1978 the Yielding Inventory of the Land of Turkey (TOVEP) was taken, and the results were published.

Work of National Information Center for Land and Water Resources: In April 1999, "National Information Center for Land and Water Resources" was established within General Directorate of Rural Services (Department of Research –Planning Coordination Section of Research for Land and Water Resources). With its studies / surveys, this limit completed the digitalization and data base entries of the complete 5560 pieces of 1/25.000 scaled land map sections.

Improvement Services On Land Plots: Works which are necessary to prepare land plots for irrigation and to make them ready for the application of modern agricultural methods in an effective and economical manner, i.e. combination of plots; land contouring. In – plot drainage, plot recovery, breaking of the hardened surfaces, in-plot irrigation canals, water control systems, surface drainage systems, and construction

of in-plot paths one combined under the heading of “on-the –plot improvement service”. General Directorate of Rural Service has rendered the “on-the-plot improvement service” to a total acreage of 944.089 he. with its studies until the end of 1999.

Irrigation Services: Provision of irrigation water and make it flow towards the land to be irrigated are combined under the heading of “irrigation services”. The (old) General Directorate of Soil Conservation and Agricultural Irrigation Affairs (TOPRAKSU) and General Directorate of Rural Services (KHGM), with their works from their foundation years until 2000 provide irrigation services to a total acreage of 1.233.583 h. land; out of which 127.535 ha. irrigated from artificial ponds; 817.580 ha. received surface irrigation; 288.468 ha. received underground irrigation respectively. Hence, up to now irrigation services are provided for a total of 4.256.217 ha. land throughout Turkey. This total is approximately half of the area of 8.500.000 ha. which is evaluated by DSI as economically irrigable by various methods (small –scale, large-scale, surface / underground irrigations).

Soil Conservation: Activities which are carried out in order to ensure sustainable utilization of water and land; to protect the fielding property of soil; to remove rocks and stones from the plots which limit land utilization; and to take measures to prevent water and wind erosions are carried out within the context of soil and water conservation services. On such subject matters; General Directorate of Rural Services (KHGM); Ministry of Forestry. Ministry of Agriculture and rural Affairs (TKB); and State Hydraulic Works (DSI) are rendering their respective services. Out of the total area of Turkey, 66.9 million hectares have been affected from water –caused erosion (from mild to excessive degree); and more than 500.000 hectares from wind – caused erosion respectively; and this trend is continued. As of the end of 1999, KHGM has extended its soil conservation services to 369.632 ha. area.

Studies on Soil and Water Resources: KHGM, published 1860 pieces of reports, etc. up to the present as a result of its studies; surveys and researches towards to ensure development and sustainable utilization of land and water resources; to provide necessary data to the implementing bodies and producers for investment and production processes. The above mentioned studies/surveys and researches cover such areas and fields as hydrology, soil conservation, land-yield, irrigation, drainage, land restoration, agricultural mechanization, agronomy.

Rural Infrastructures Work: As of the beginning of 2000, KHGM has provided 323.288 km roads (with various quality); clean potable water to 65.095 units; and within the scope of settlement services has contracted 9.665 housing units. 5.366 agricultural facilities, 9476 social and economic facilities, and 2.820 sewage works. Furthermore, by its credit funding and technical assistance 10.184 households have built their houses and 5.639 house holds have established their agricultural businesses. Also 2.498 artificial ponds were made to provide water for farm animals.

Legal Framework: Up to the present day, a number of legal and administrative measures were taken to protect and develop water and land sources of the country. The most prominent of the legislation towards this end is the Constitution. The 1982 Constitution states the main principles of the works concerning the soil conservation and restoration works in its several Articles.

Turkey has no specific law aimed directly to land conservation and restoration matters. However, these matters are included in various laws, in a peace-meal manner. Among these, laws are : Environmental Law No:2872; Agricultural Reform Law on Re-arrangement of Land – Plots in Irrigation Areas No:3083; Law on Mobilization for national Re-forestration and Fighting Against Erosion No:4122; Forestry Law no: 6831; Law on Meadows no:4342; Regulation on using Agricultural land for purposes out of Agriculture; decree of Land Combination; TRGM Implementation Regulation; and Regulation on Meadows

5. Measures to be Taken for Fighting Against Desertification:

It is imperative that the natural resources should be transferred to the future generation as we inherited them from our predecessors, and even in a better quality. It is for this very reason that some effective measures should be taken against degradation of our land which forms one of our important national resources. In order to do this, first of all we should determine the properties, characteristics of our land/soil; and their related problems. To achieve this in turn, detailed surveys, starting form agricultural areas, should be performed for out land under a program and by utilizing state of the art techniques. According to the new information to be obtained from such detailed land and soil surveys and researches; relevant techniques and methods should be put into operation to prevent water and wind-caused erosions; to prevent drainage degradation;

excessive moisture – salinity – alkalinization; physical and chemical deterioration; excessive usage of agricultural chemicals; biological deterioration; soil pollution; usage of arable land for purposes other than agriculture; to conserve natural moisture by using the land in accordance with its properties specially in meadow areas (by general land) management methods); alternative production; rotational grazing; appropriate fertilization... etc. When the general land management measures are insufficient in soil and water conservation; then such additional measures as contour plowing; hand-sowing; terracing; diversion channels opening; overflow structures; etc. should be performed.

6. National Action Plan and Priority Implementation Programs Regarding To Prevent Soil and Water Resources and for Their Sustainable Utilization

The land, which is an indispensable element of life, also is a natural resource which cannot be produced and increased.

Therefore, considering social, cultural, ecological, environmental and economic conditions as well as implementations carried out to date, in the planning of its protection and sustainable use, 188 actions have been foreseen to be implemented in the short-term, middle term and the long-term action plans that have been prepared. The implementation of most of these actions have been identified as permanent. 37 of 188 proposed actions are related to political, 88 to technical 33 to social, 9 to institutional, 17 to legal, and 12 to economic arrangements and modifications. 23 public institutions along with other institution, organizations and non-governmental organizations have been involved, in order to actualize these actions.