



**UNITED NATIONS  
CONVENTION TO COMBAT DESERTIFICATION  
(UNCCD)**

**TURKEY'S NATIONAL ACTION PROGRAM  
ON  
COMBATING DESERTIFICATION**

**ANKARA 2006**

**Turkey's National Action Program on Combating Desertification**  
**Jointly prepared by the representatives of the following institutions:**

Ministry of Environment and Forestry (MEF)

- Afforestation and Erosion Control General Directorate
- UNCCD National Focal Point
- Research Planning and Coordination Board (APK)
- General Directorate of Forestry
- Foreign Relation and EC Department,
- General Directorate of State Meteorological Services
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Ministry of Foreign Affairs

- Energy, Water and Environment Deputy General Directorate

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## PREFACE

As the consequence of internationally increased concern on global land degradation, it was finally recognized that desertification is an important problem all around the world, particularly in African countries, in terms of economical, social and environmental aspects. To prevent this process which threatens the welfare and the future of humanity, some measures were taken by the United Nations. The first Conference on Environment, in Stockholm in 1972, was the turning point on this matter and was followed by the Conference on Desertification held in 1977. The “Action Plan to Combat Desertification” approved by the Conference was a pioneering and one of the most leading international initiatives on combating desertification and drought.

The Intergovernmental Negotiation Committee was established by the United Nations Environment and Development Conference (UNCED) in 1992 to prepare the Convention. The United Nations Convention to Combat Desertification was adopted on 17 June 1994. 17 June was therefore declared as the Day of Combating Desertification. The Convention was empowered on the 26<sup>th</sup> of December 1996 with 191 countries as parties of the Convention as of June 2004.

The preparation and implementation of the National and Regional Action Programmes is the most crucial international responsibility of the parties. The main purposes of the National and Regional Action Programmes are in particular: determining priorities of the countries related to desertification and drought; contributing to regional efforts; promoting cooperation among stakeholders; increasing public interest on desertification; integrating development plans and strategies at all levels; promoting participation of all related institutions, civil society organizations and local people; allocating financial resources for implementing activities etc.

The geographical location, topography and climatic conditions as well as the long standing history of the country is the cause of the high magnitude sensitivity exerted on the issue of desertification and drought. Turkey signed the Convention on 15 October 1994 in Paris. It has been approved in 1998 with the law numbered 4340, published in the official gazette on 16 May 1998. Turkey is in the North Mediterranean Regional Implementation Annex (Annex IV) and participates to regional activities such as subject-specific projects and/or regional work programs.

The National level Convention related services and international communication and coordination are being provided by the Ministry of the Environment and Forestry. For this reason, as well as for monitoring international activities and achievements, the Ministry has established a special unit, the “Directorate of Combating Desertification” at its central organization, under the Afforestation and Erosion Control General Directorate.

As a result of the efforts carried out by all related institutions under the leadership of the Turkish Soil Science Society and by the coordination of the Ministry of Environment and Forestry, the Turkish National Action Programme (NAP-TR) to Combat Desertification was completed in 2003.

Thanks to the people who worked for the preparation of this Programme, I believe that all related institutions and individuals are aware of the importance of the subject matter and will give sufficient attention to follow up the strategies in order to achieve the targets of the Programme.

I hope the Turkish National Action Programme to Combat Desertification will reach its targets so that the next generations will only be concerned on the remedies stated in this program and also pursue the tasks of monitoring the environment.

Osman Pepe

Minister of Environment and Forestry

**MINISTRIAL DECREE**

*From the Ministry of Environment and Forestry;*

***Ministerial Circular Notice on National Action Programme to Combat Desertification***

***Number (2005/2)***

*“The United Nations Convention to Combat Desertification in Countries Experiencing Serious Drought and/or Desertification, particularly in Africa” was signed by Turkey on 15 October 1994 in Paris and was approved on 11 February 1998 with the law numbered 4340, published in the official gazette numbered 23344 and entered into force on 16 May 1998.*

*Several articles, particularly the articles 5, 9 and 10 of the Convention are about preparation and implementation of long-term policies and Action Programmes which set out strategies and priorities, in the framework of sustainable development plan and/or policies, for reducing the effects of drought and combat with desertification. In the framework of the Convention to Combat Desertification, the Turkish National Action Programme has been prepared by the Ministry of Environment and Forestry acting as national coordinator, with contributions of the National Coordination Unit, related institutions, universities, civil society organizations and other interested institutions.*

*Preventing and/or reducing the negative impacts of desertification and drought which threaten the land, soil, water, flora, fauna and other natural resources of our country is important in order to continuously secure the sustainability of our development. Therefore, the National Action Programme to Combat Desertification covers the activity areas of a lot of public institutions, academic and research units, local administrations and civil society organizations referring to the measures which should be taken in these areas.*

*National Action Programme to Combat Desertification, which aims to determine the leading factors to desertification and the necessary measures to be taken to prevent and/or to reduce the negative impacts of desertification and drought were delivered to all related institutions by the Ministry.*

*In order to achieve the expected outcomes set out in the National Action Programme, all stakeholders should provide the following contributions, support and interest;*

- 1) Providing coordination and cooperation with the National Coordination Unit.*
- 2) Taking measures to integrate National Action Programme with their own plans and programmes related to land use, soil, water, infrastructure, natural resources, forest, agriculture etc. which are affected by the desertification and drought processes.*

- 3) *Allocating appropriate resources in their annual work programmes and in their budgets to implement the activities that they are responsible for.*
- 4) *Participating to regional, sub-regional and international works by providing experience and knowledge exchange with other countries for improved cooperation with other countries and organizations at all levels.*
- 5) *Reporting of achievements, results and experiences related to the Programme, to the Secretariat (the Ministry of Environment and Forestry) for information sharing with other countries as well as for preparing periodic country reports.*
- 6) *Participating to subject-related seminars, workshops, panels and similar activities at all levels and building public awareness on desertification and drought.*
- 7) *Promoting public awareness on the International Day of Combat Desertification on 17 June, through activities and informing the society about the negative impacts and the results of desertification and drought, and providing coordination of such activities by the Ministry.*

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## 1. INTRODUCTION

According to the United Nations sources, desertification and drought threaten an area on the earth of more than 4 billion hectares as well as 1, 2 billion people living in 110 different countries. For the future of our world, mankind should combat together and take measures to prevent desertification and drought.

The United Nations Convention to Combat Desertification, which has been in force since 1996, is one of the most important international conventions. The objective of the Convention is to contribute sustainable development over the world, particularly in the highly affected countries through activities which mitigate the negative impacts of desertification and drought. Therefore, it should be emphasized that land rehabilitation, productivity as well as improved life standards should be achieved in order to reach convention targets.

Turkey has been Part of the Convention since 1998 and takes place in the North Mediterranean Regional Implementation Annex (Annex IV) as a country affected from desertification. Turkey has also participated to several regional and cooperative programs and projects connected with this Annex with the other countries in the region namely Greece, Italy, Portugal and Spain.

The geographical location, climate, topography and soil conditions often increase the vulnerability of the country to desertification and drought. Although there is not sufficient scientific data, which proves the sizes and dimensions of degradation factors such as physical, biological etc. which lead to the degradation of the soil, forests and rangelands, as well as the misuse of the agricultural lands, pollution of the soils and increased erosion. All these reflect the potential high risk of desertification the country faces.

Because of the richness of its natural resources, Anatolia has been a multi-cultural civilization since the Neolithic. The overuse of the land without sustainable planning has caused the occurrence of degradation eventually leading, to a reduction in productivity, and even, to the loss of the soil. The degradation of the natural vegetation on the sand dunes of the Eastern Mediterranean in the 1960s has caused the extinction of several endemic plant species. Moreover, agricultural lands and villages were threatened by the movement of the sand dunes. The Ipsala-Edirne flood plain and the Sanliurfa-Harran plain are the best examples for salinity buildup due to excess irrigation and drainage deficiency.

Successful attempts were implemented by related institutions to deal with the threat of sand burial, in the wind erosion prevention area in Konya-Karapınar in Central Anatolia, in the “*Eastern Anatolia Watershed Rehabilitation Project*” area, and in the “*Sand Dune Rehabilitation area in*

*Akyatan-Adana*". Although these efforts have been successful and prevented erosion to some extent, an artificial forestry ecosystem was established by using the inappropriate plants and exotic tree species instead of the indigenous ones.

Institutions, responsible for managing the country's forests, have been quite effective to maintain forest resources sustainable since the 1950s. These institutions were able to achieve successful outcomes, due to the innovative approaches and up-to-date methodologies, which were effectively introduced, and followed by the implementation of forest management programs.

Moreover, there have been other improvements carried out by several national institutions and local authorities via projects and investments on land rehabilitation and soil-water protection. However, inappropriate urbanization, the pressure of tourism in the coastal areas, the abuse of the natural resources, inappropriate land use practices in both agricultural and non-agricultural lands, have kept the land degradation phenomenon on the agenda. The rapid population growth after the 1950s and the intense development of industrialization after the 1980s have exerted an immense pressure on the natural resources of Turkey. The population pressure has led to unplanned urbanization and industrialization, leading to the irreversible destruction of the efficient land areas and the atmosphere. Acquiring new agricultural and settling areas, deforestation due to forest fires and other reasons, deficiency in land and production planning, topographic and climatic conditions have led to accelerated water erosion, reduction in land quality and finally to desertification.

The most relevant approach to develop strategies and design activities to combat desertification and drought is the preparation of **National Action Programmes**, which take into account specific dynamics of the country and the **Regional Action Programmes**, regarding the similarities between countries in the respective region as well as the cooperative actions.

National and Regional Action Programmes aim at identifying factors which accelerate desertification, identifying priorities, setting out contribution to regional works, increasing public awareness on desertification matters, integrating development plans and strategies of countries, identifying responsible institutions and civil society organizations and allocating financial resources for desertification and drought related works.

**The Turkish National Action Programme to Combat Desertification (NAP-D)** is prepared under the coordination of the Ministry of Environment and Forestry through the guidance of the Turkish Soil Science Foundation. Several institutions and NGOs, interested in desertification related issues, also participated to the preparation works. In order to make the Program acceptable and applicable, it reflects the views and critics of all stakeholders.

In the main text body of the NAP, the major issues directly or indirectly related to desertification and drought, interested sectors and their policies and strategies, natural resources affected from desertification and drought (soil, water, flora etc), negative or positive results of the resource management programs in Turkey were comprehensively outlined and measures to be taken to overcome these negative outcomes are identified in detail.

The most suitable and adoptable proposals for action were given in the Annex of the NAP. Those include the necessary activities related to the proposals and the institutions which were officially responsible to carry out these actions upon their capacities. However, it is clear that an effective monitoring and evaluation system to determine the achievements, results and lessons learnt and methods/techniques used as well as the levels of the activities is crucial. Since the proposals for action are dynamic, they are prepared with the assumption that updating is necessary in accordance with the national and international developments and new techniques and applications.

The NAP was disseminated after approval to be implemented by public institutions, universities, civil society organizations, vocational institutions, local administrations, regional institutions, unions and especially beneficiaries (villagers, farmers). To make the Programme successful, it is essential that all related parties, especially rural communities, should effectively participate to the seminars, meetings, workshops and similar activities. The Turkish National Action Programme to Combat Desertification is a tool to provide sustainability of soil resources which can be degraded easily and can not be renewed.

**It was agreed that The NAP-D should take into consideration the overall planning strategies addressed in the National Development Plans. Therefore, the strategies and actions foreseen under the National Action Programme should be incorporated into the development policies of the related sectors which give legal basis on implementation of the Turkish National Action Programme.**

## **2. DEFINITIONS, PRINCIPLES, APPROACHES AND OBJECTIVE**

### **2.1. DEFINITIONS**

Main definitions used in this report are the same as in the text of the United Nations Convention to Combat Desertification:

- (a) **“desertification”** means land degradation in arid, semi-arid and dry sub-humid areas resulting from various factors, including climatic variations and human activities;

- (b) **”land degradation”** means reduction or loss, in arid, semi-arid and dry sub-humid areas, of the biological or economic productivity and complexity of rainfed cropland, irrigated cropland, or range, pasture, forest and woodlands resulting from land uses or from a process or combination of processes, including processes arising from human activities and habitation patterns, such as:
- (i) soil erosion caused by wind and/or water;
  - (ii) deterioration of the physical, chemical and biological or economic properties of soil; and
  - (iii) long-term loss of natural vegetation;
- (c) **”Combating desertification” includes** activities which are part of the integrated development of land in arid, semi-arid and dry sub-humid areas for sustainable development which are aimed at:
- (i) prevention and/or reduction of land degradation;
  - (ii) rehabilitation of partly degraded land and;
  - (iv) reclamation of desertified land;
- (d) **”arid, semi-arid and dry sub-humid areas”** means areas, other than polar and sub-polar regions, in which the ratio of annual precipitation to potential evapotranspiration falls within the range from 0.05 to 0.65;
- (e) **”drought”** means the naturally occurring phenomenon that exists when precipitation has been significantly below normal recorded levels, causing serious hydrological imbalances that adversely affect land resource production systems;
- (f) **”land”** means the terrestrial bio-productive system that comprises soil, vegetation, other biota, and the ecological and hydrological processes that operate within the system.



**Figure1.** Loss of vegetation cover is a distinct criterion of desertification (AGM archive)



**Figure2.** Expansion of natural desert is resulted in vegetation losses and ultimately in desertification (AGM archive)

## 2.2. PRINCIPLES

The main principles taken into consideration for developing the Turkish National Action Programme are as follows:

- a. Stating spatial distribution of desertification and its level by using scientific measures on the lands experiencing desertification/land degradation.
- b. Identifying ecosystems which need to be protected primarily and putting related reclamation initiatives in the agenda.
- c. Analyzing current environmental protection and sustainable use policies and identifying gaps and deficiencies.
- d. Identifying scientific, economic, social and technical criteria in new and/or additional policies on implementation approach.
- e. Informing the public through all kinds of publications and broadcasting for creating/increasing public awareness on desertification.
- f. Providing effective participation of all related public institutions, local administrations, civil society organizations, local communities and other groups at local, regional and national level to combat desertification.
- g. Establishing national strategies to mitigate impacts of desertification and land degradation.

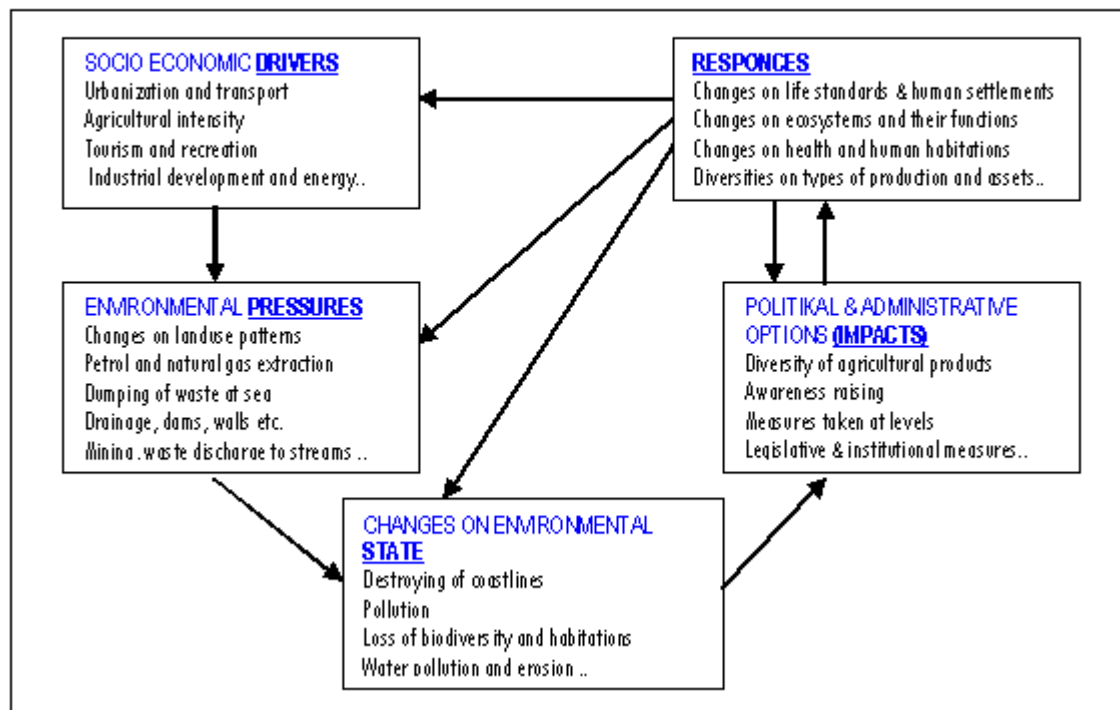
- h. Developing sustainable land and water use, protecting biodiversity areas and preventing arising social conflicts.
- i. Establishing early warning systems through centralized information networks.
- j. Networking with other countries for information flow.

### **2.3. APPROACHES**

There has been a parallel effort in relating the cause and effect of desertification, by the United Nations Convention to Combat Desertification since its empowerment in 1994,, and the Driver-Pressure-State-Impact-Response- (**DPSIR**) framework concept developed by the European Environment Agency (Figure 3), which seeks to contribute to the identification of the causes of desertification and their remedies within the National Action Programmes. Thus, these programmes should be in accordance with the **DPSIR** approach to illustrate the **DRIVER, as the inappropriately expanding urbanization-soil sealing, the PRESSURE, as the resulting excess waste water discharge and its pollution as the STATE**, with effects on the fishermen, who make their living from these resources **as the IMPACT**, finally forcing local and country administrators to take precautions on the matter **as the RESPONSE. Another example to follow would be** the lack of the infrastructure facilities and the proximity of the market **as a DRIVER**, the occupation of the fertile soils by industry **as the PRESSURE**, followed by heavy metal contamination in the environment as the **STATE**, resulting to a decline in the productivity of the soil **as the IMPACT**, and the **RESPONSE** to follow the support of the civil society organizations and legal amendments in the parliament, with local and country administrators taking precautions on the matter.

In view of the importance of driving forces and of changes in land components, the assessment of land degradation can not limit itself to a one-off survey of its most conspicuous impacts. This requires scientifically sound and reliable indicators, monitoring and early warning systems that capture resource quality and ecological processes, as well as related human intervention- the decision- making processes that underline land use and management systems. Assessment of the socio-economic driving forces and the cultural attributes and indicators linked to land degradation is crucial to reversing land degradation and generating win-win scenarios for mitigating threats from desertification, biodiversity and climate change through the promotion of sustainable land use (FAO, 2002).

Land Degradation  
Assessment Framework (Ecosystem approach)



**Figure 3.** Driver- Pressure-Impact-State-Responses (DPSIR) circle.

Criteria in the Action Programme are defined in accordance with information set up by the International Union of Soil Science, the UNEP World Summit 92 and the European Environment Agency.

#### 2.4. OBJECTIVE

The National Action Programme to Combat Desertification aims at identifying reasons of desertification and responses for solving problems with the participation of state, local organizations, land-owners and local people. The National Action Programme to Combat Desertification is therefore in line with the United Nations Convention to Combat Desertification.

### 3. DESERTIFICATION RISKS IN TURKEY

The total arable land of Turkey is about 28,054,000 ha. The main income of the country is agriculture and agriculture based industry. However, the prime soils cover only 17.5% of the total land surface and the productivity of the rest of the soils is limited by topographical, chemical (e.g. high calcium carbonate content, alkalinity and low organic matter), and physical (e.g. water logging, texture) attributes.

The diverse topography along with deforestation and unsuitable tillage and irrigation management has been inducing the rate of erosion in the country for centuries. The majority of the country's

soils (76.5%) are prone to erosion risk due to the dominant steep slopes (>6%), and 72% of the soils are more or less affected from water and wind erosion. Alongside these unsuitable conditions, the misuse of lands, i.e. soil sealing, soil exploitation, over use of fertilizers and irrigation, improper use of indigenous environmental friendly (Kapur and Akça, 2003) agro-ecosystems, constantly degrade the soils of the country.

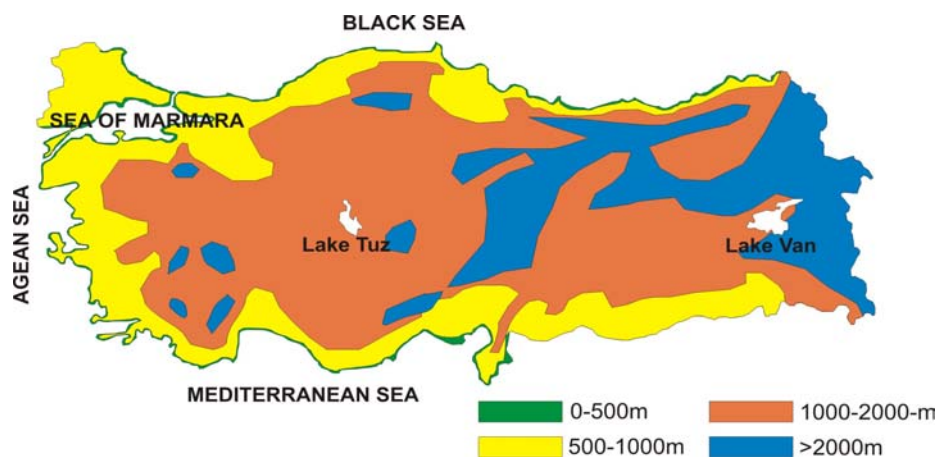
The high population increase in the urban regions causes the intensive use of arable land around the former. According to the census of 2000, 40% of the country's population lives in rural areas (23.8 million out of the total 67.8) with an average of 1.21ha/man arable land, mostly allocated for cereal production (country average ~2000kg/ha). This is equivalent to a low net income rate, which results to migration from the rural areas to urban, particularly from the east of the country to the west. The Government Statistics Institute (2003) data reveals that from 1990 to 2000, the urban population increased by 30%, i.e. from 33 million to 44 million, whereas the rural increased at a much lower rate (4.3%).

The data above reveals the pressure of both natural and human induced factors on soils and land where sustainable land management policies along with legislations are urgently needed, since the rate of quality loss of land and soil, in the coming decades will ultimately be the common jeopardy in the country.

### **Topography and Erosion**

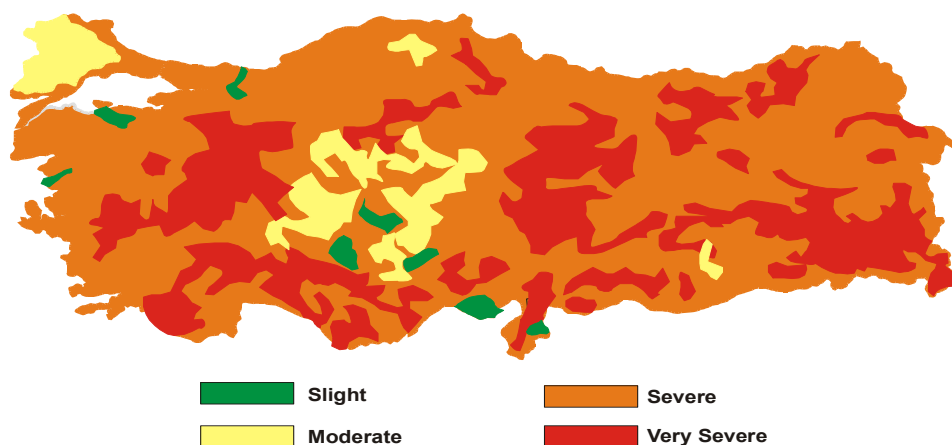
The climate, vegetation, population, economic life and particularly soils of Turkey are highly affected by the diverse topography of the country. The major causes of this diversity are due to the tectonic movements of the recent geologic periods and accumulation of volcanic products, which have created an elevated mass with an average altitude of 1132m. Thus, plains of 0 to 250m altitude cover only one tenth of the country, whereas places higher than 800m cover two third and half of the country which is higher than 1000m (Izbirak, 1975; Dinç et al. 1997). Most mountain ranges extend from west to east and great ranges appear in forms of arches alike the Taurus Mountains in the south, with almost the development topographically identical highlands and basins between the ranges (Figure 4).





**Figure 4.** Elevation of Turkey (modified from Izbirak, 1975; Darkot and de Agostini, 1980)

Erosion is one of the most severe rural environmental problems affecting 81% of the total land surface in varying levels of severity (Figure 3). About 73% of the cultivated land and 68% of the prime agricultural land (Klingebiel and Montgomery’s (1961) land capability classification –LCC-classes of I through IV) are prone to erosion. Stream bank erosion affects 57.1 million ha while wind erosion degrades another 466,000 ha. As a result, about one billion tons of soil is transported to the sea every year. The share of severe erosion is also relatively larger in areas where agriculture is practiced without soil conservation measures. Conversely the actual erosion rate in the eastern part of the country is lower due to the dominant pastures (Figure 3). Erosion has also caused negative impacts on reducing the life of dams through siltation, despite the abatement programs initiated 25 years ago by the Ministry of Forestry, SHW<sup>1</sup> and GDRS<sup>2</sup>, which have only been implemented to an area of 2.2 million ha (CCD-TURKEY, 2003).



**Figure 5.** The simplified actual/potential erosion map of Turkey (modified from GDRS, 1981)

<sup>1</sup> SHW: State Hydraulic Works (DSI, Turkish Acronym)

<sup>2</sup> GDRS: General Directorate of Rural Services (KHGM, Turkish Acronym)



## Climate

In general, Turkey's climate is considered to be Mediterranean, which is dominant in the western part of the continental mainland of the sub-tropical belt, and is the product of the seasonal shifting of the frontal depression of the North-East Atlantic, and the Golf low pressure.

Territorial tropical streams coming from the North Africa and Arabian deserts generally create dry and hot climatic conditions with long duration in most parts of Turkey except the Black Sea and North-East Anatolia.

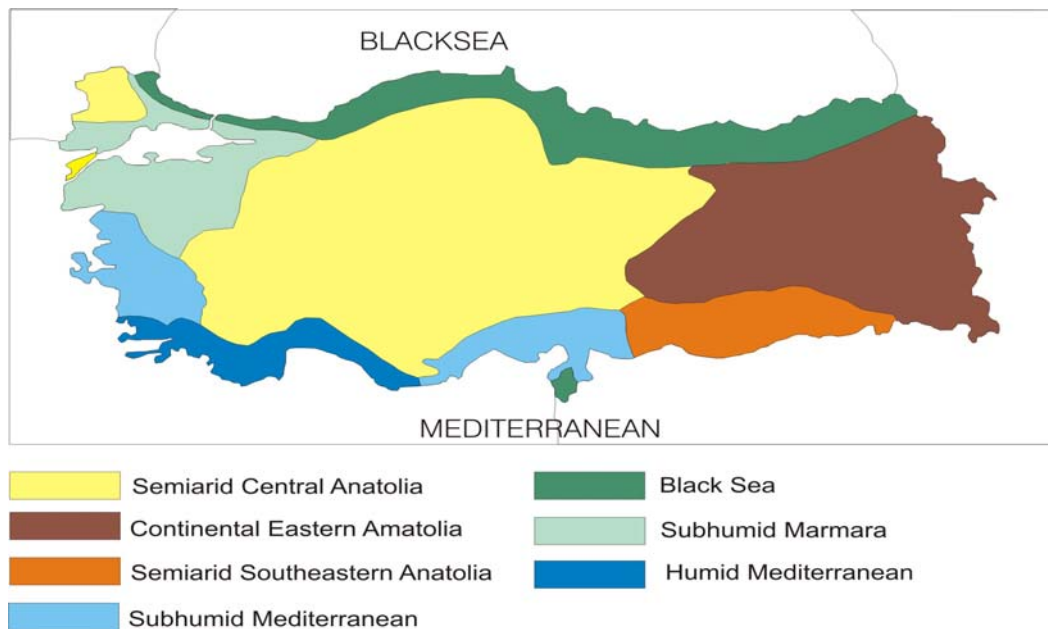
Turkey has diverse climatic types, primarily because of being located in the transition zone under the effects of the polar and tropical atmospheric conditions. The Second reason is the sudden changes of altitudes and topographic characteristics. Turkey is divided into seven main climatic regions under five major climate types. However, some important climatic conditions such as the uneven distribution of rainfall and the fluctuating temperature frequently induce desertification processes.

### **The major climate types in Turkey are as follows (Figure 6)**

**The Mediterranean Climate:** Dominant in the coastal zones of the Aegean and Mediterranean Regions. It is hot and dry in the summer, and mild and rainy in the winter.

- The humid Mediterranean Climate: Rare snow and frost events in the coastal area, with an average annual precipitation of 1000 mm pouring in the winter.
- The semi-humid Mediterranean Climate: The average annual precipitation is around 600-800 mm. Precipitation occurs usually in the winter.
- **The Black Sea Climate:** The average annual precipitation is more than 1000 mm occurring mostly in the fall and winter. The average annual temperature is around 8-12 °C.
- **The Semi-humid Marmara Climate:** Dominant throughout the Marmara Region except the inner part of Thrace and Black Sea coasts. The temperature is not as high as the Mediterranean climate in the summer, and is lower in the winter. The average annual temperature is around 500-700 mm.
- **The semi-arid (steppe) Climate:** Extends throughout the Central Anatolian Region, including Central-West and the Lakes Region, as well as the western part of Eastern and South-Eastern Anatolian Regions. The terrestrial influence leads to large scale differences in temperatures between seasons.

- The Semi-arid Central Anatolian Climate: Cold in the winter, with decreasing temperatures in the east. The maximum precipitation occurs in the spring and the minimum in the summer at a rate of %10 in the summer.
  - The Semi-arid South-eastern Anatolian Climate: Hot in the summer with a terrestrial and tropical desert influence affecting the annual temperature regime. The average annual precipitation is less than 500 mm, and the rate of evaporation is highest in Turkey.
- **The Continental Eastern Anatolian Climate:** Severe terrestrial conditions prevail as long and cold winters. Precipitation is higher than the precipitation of the Central Anatolian Region and mainly occurs as snowfall in the winter.



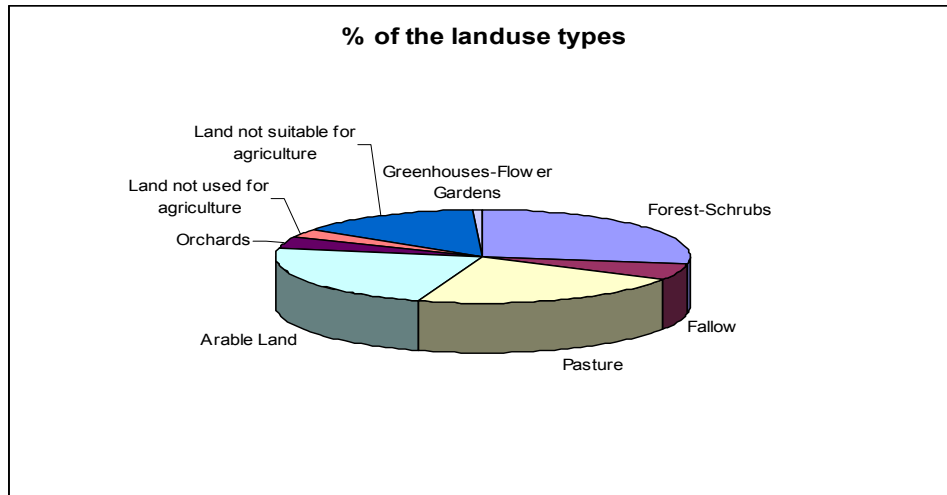
**Figure 6.** The climatic subdivisions of Turkey

## LAND USE

The land use of the country is determined by its diverse topography and climate, thus with various types of land use and crops e.g. while citrus being the main tree crop in Mediterranean region, and tea is the main in the northern part (Figure 7).

Intensive production for two or three crops a year, along with greenhouse practices, are mainly undertaken in the alluvial plains of the country in the Mediterranean and Aegean regions with high yielding capacity due to the favorable climatic and soil conditions, whereas, constraints of production arising from the low amounts of organic matter contents throughout the country apart

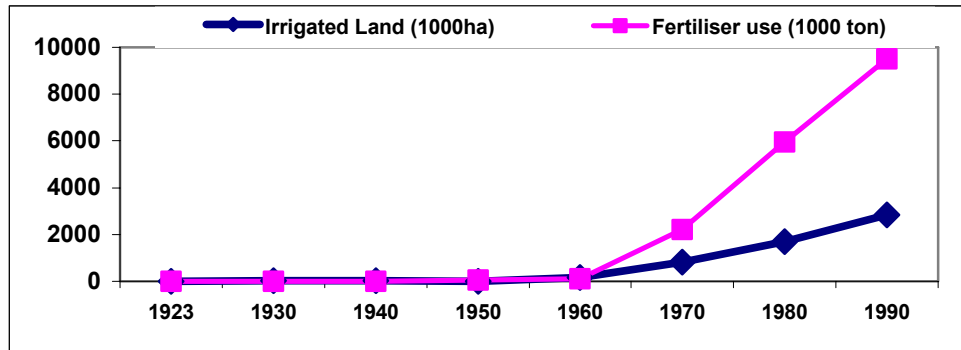
from the forest areas –the highlands- have to be considered together with minimal/optimal tillage, irrigation, green manuring and fertilizer use for conservation and carbon management.



**Figure 7.** Distribution of land use types.

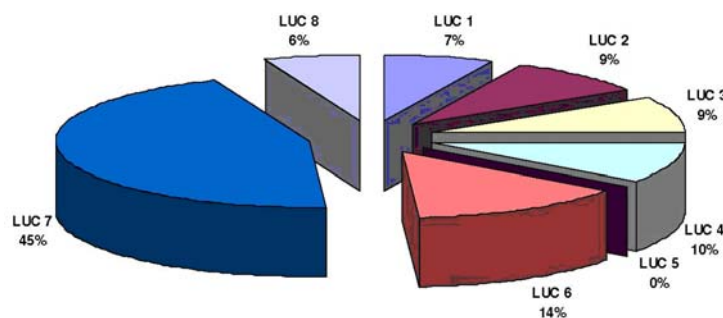
The sharp increase in irrigated lands and fertilizer use in 1960 illustrated in Figure 8 is compatible to the increase in the construction of water reservoirs throughout the country and shift of crop patterns. The drawbacks that could develop from the increased use of fertilizers, especially phosphorous, may result to the increase of toxic Cd in the soils. However, a detailed zinc (mainly associated with Cd in soils and rocks) survey undertaken (Özus, 2001, Eyüpoglu et al. 1995) in the soils of the country has revealed its deficiency which may also point out to the non-toxic levels (low risk) of Cd apart from soils developed on volcanic and metamorphic rocks.

Soils with high production capacity and with a wide range of agricultural uses, (soils of Land Capability Class -LCC-I, Klingebiel and Montgomery, 1961) cover 7% (about 5 million ha) of the total land area (77.9 million ha) of Turkey. This proportion is equal to about 1/5 of the potential agricultural soils of the country. The highly to moderately productive soils (soils of Land Capability Class I, II, III) comprising an area of 19.1 million ha, with none (LCC I) to one or more moderate to severe limitations (LCC II and III) for some uses, require some kind of conservation practices to assure stability and sustainability of production as the essential part of the management system.



**Figure 8.** Irrigated land and fertilizer use in Turkey at a historical perspective (SIS, 2003)

Permanent limitations as water logged conditions as well as salinity would demand expensive investments in land management particularly for LCC III soils. This is almost equal to 1/4 (25%) of the country's land. However, there are 7.4 million ha land which is marginally productive (LCC IV), where parts of this is currently used for cultivation, pastures, forests and settlement areas, which cover about 4.9 million ha. About 573 000 ha of land is occupied by various industries and urban settlements, most of which is of Prime Quality (LCC I) and larger than the cultivated soils of many townships. Land with increased erosion due to misuse -unplanned- is about 6.2 million ha and the total non-arable (unsuitable for cultivation) (LCC V, VI, VII) land is 6.3 million ha (Cangir et al., 2000, Figure 9). This land however is suitable for forestry as well as mixed forest use with numerous indigenous cash-crops throughout the country, as particularly valuable agro-ecosystems comprising olives (*Olea europea*), carobs (*Ceratonia ciliqua*).



**Figure 9.** Distribution of Land Use Classes (LCC) of Turkey (Cangir at al, 1996)

The available water for irrigation is also an important factor limiting land use priorities. The water resources of Turkey (26 Basins, 186.5km<sup>3</sup> annual) are quite high when compared to the countries in the Mediterranean Basin (State Hydraulic Works, 2003). Despite the abundant water resources of the country, the economically viable irrigated land is only 8.5% of the total arable land. Therefore, rainfed cereal production has been the major practice since centuries. Followed by the

use of the extensive rangelands mainly for small ruminant production particularly in the Eastern parts, this has been an indigenous practice.

Turkey is a rich country in terms of diversity and related geology. However, soils overlying ophiolitic rocks are often apt to erosion in East Anatolia. The sedimentary rocks and carbonates of Central Anatolia and the overlying soil are also prone to wind erosion. In the Mediterranean region where crystallized limestones are dominant, however, soil is especially shallow and stony that can not adequately support natural vegetation. Moreover, in alkaline and saline environments of alkaline (pH>9) soils of ophiolitic origin with high pH often prevents the growth of some plants. Mine exploitation is also a cause of land degradation in the country.

Although Turkey is not a water rich country according to world average, in terms of renewable water potential, Turkey has the highest water potential in Eastern Mediterranean Watershed and in the Middle East. However, the average altitude, which is more than 1100 m and mountainous topography are reasons for high distribution costs to adequately share these water resources within the country. Steep, very steep and precipitous lands represent %62 of the total lands in Turkey. Moreover, average steep lands, which need to be protected against erosion, represent %14 of the total lands in Turkey.

Ultimately, an important part of the agricultural and forest lands as well as rangelands of the country are insufficient in water use and because of the highly sloping topography, degradation of the vegetation and soil, they face an erosion risk. Moreover, the misuse of agricultural land due to overpopulation has caused the non-renewable eradication of the natural resources and natural habitats.

#### **4. CAUSES AND DEFINITIONS OF DESERTIFICATION IN TURKEY**

Land/soil degradation and natural resources degradation should be included in the concept of 'desertification'. In this framework, there are three major causes for the occurrence of desertification, these are namely the natural, technical, and socio - economic, administrative and legal causes.

##### **4.1. THE NATURAL CAUSES**

**Soil degradation as water and wind erosion, and the movements of the sand dunes:** The weathering soil and geological materials can be transported/eroded due to natural causes such as climate, water, wind, ice and gravity, and topographic variability, along with soil characteristics such as contents of organic matter, texture and structure, efficient profile depth and water

permeability, as well as density of vegetation, forests and rangelands. The movements of the sand dunes occur due to the continuous effect of the wind on the friable sandy materials.

**Decline of soil productivity/soil quality due to leaching plant nutrients from the surface and subsurface horizons:** In the regions with high or fluctuating precipitation plant nutrients are leached from the surface and/or from root zones by surface erosion and/or by water percolating through the profile.

**Climate change:** Local or global climate changes (increase of temperature and climate oscillations) lead to: drought at macro and micro catchment levels, mitigation of biodiversity and crop production. Moreover, the changing and shifting of the growing periods of the crops due to the climate oscillations are the causes of the drastic declines in yields.

#### 4.2. TECHNICAL CAUSES

**Deforestation:** Degradation due to forest fires, illegal cutting, and over-grazing.

**Over-grazing of rangelands, especially rangelands on hillsides:** Deficiency in or lack of some administrative processes such as fertilizing, weed control, and insemination, along with mismanagement, accelerates erosion, especially in the rangelands on hillsides,

**The human-induced destruction of the hydrogeologic cycle: The unsustainable** management of the artesian wells due to over and misirrigation causes the reduction and fall of the ground water table along side the intrusion of the saline water in the coastal areas.

**Stubble burning:** Stubble burning leads to the loss of the biological quality of the topsoil, also preventing the preservation of soil moisture ultimately accelerating erosion. Stubble prevents the direct contact of rain with the soil especially in the slopes and decreases the intensity of the raindrop effect in turn reducing the speed of the surface flow, and increasing percolation of the rain water in to the soil, thus decreasing the intensity of erosion.

**Mismanagement of agricultural lands, and inappropriate/excess irrigation:** Soil degradation and reduction in crop productivity due to land mismanagement, such as the lack of polycultural cultivation systems and appropriate mechanization along with the negative interactions of the overuse of manure and pesticides.

**The lack of ground water management** in special natural protection areas and the lack of an authority to be established for an institutional planning to intervene on farmer water use programmes and pattern/type of irrigation in order to avoid overuse of water resources.



**Inappropriate use of agricultural and forest lands (Soil Sealing):** Inappropriate urbanization, occupation of prime land by the industry, extraction of soil materials for the construction activities and mining cause the degradation of the natural resources.

**Salinity build up in agricultural lands and increase of aridity:** Over-irrigation, use of low quality irrigation water, lack or unmaintained drainage conditions, over-fertilizing and inappropriate fertilizer uses are the causes for increasing salinity, which decrease soil productivity, and increase the levels of sodium, leading to aridity. In the areas with over-precipitation and/or over-irrigation, the leaching of the alkaline cations in the profile is followed by the increase of the acidic cations.

**Soil pollution:** Accumulation of the organic and/or inorganic wastes of industry as well as the domestic wastes like the detergents and toxic elements.

**Physical degradation of the lands,** compaction, degradation of soil texture, undesirable physical structures of soil due to soil processing which is not suitable to the soil structure and soil type.

#### **4.3. SOCIO-ECONOMIC, ADMINISTRATIVE AND LEGAL CAUSES**

- **Problems arising from the lack of legislation:** The authority to land use and land management for different purposes belongs to a number of institutions and lack of coordination between them cause conceptual confusions upon the rational management of the natural resources. Thus, it is crucial to be rational without political and populist concerns while making legislations on the protection and use of natural resources as well as the inappropriate distribution of land ownerships and their legislative implications.

- **Migration and rural poverty:** Loss of natural resources in the region leads to income reduction and migration to areas with better job prospects.

- **Unawareness of land management:** It is crucial to train farmers on contemporary methods of, cultivation practices and demonstrate the importance of living within natural ecosystems.

### **5. DESERTIFICATION IN TURKEY**

#### **5.1 NON-RECOVERABLE DESERTIFICATION**

Factors/problems that lead to loss of land and water resources that can never be recovered are as follows:

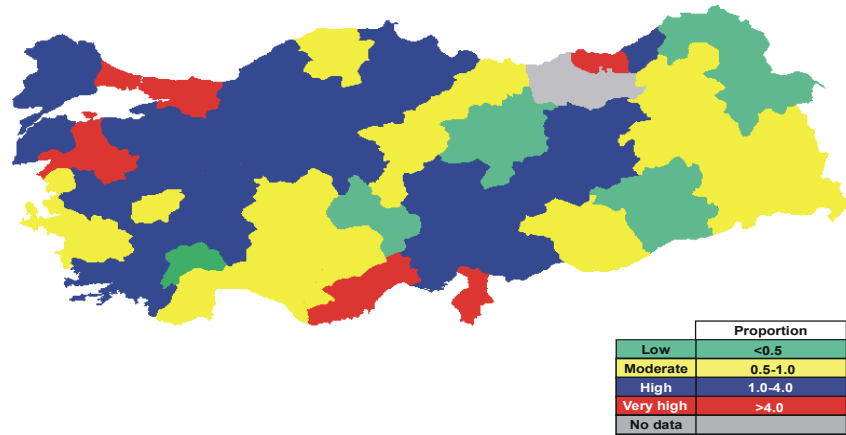
- **Soil Sealing/Improper Urbanization:** Soil sealing in Turkey has started in the 1950s and accelerated by the 1960s due to the unplanned industrial sprawl/ordeal upon agriculture (Figure

10). Thus, the mismanagement of the natural resources was an absolute outcome of the implementations of the shortsighted profit based policies that induced mass migration from rural areas to the urban. The data of the State Statistics Institute (2001) revealed a 30% increase of urban population from 33.656.275 in 1990 to 44.006.274 in 2000, whereas the rural increased at a much lower rate (4.3%).



**Figure 10.** The expansion of urbanization threatening the arable lands and natural habitats in Adana, southern Turkey (Cangir et al., 1966)

The second rush of migration of the 1980s followed by the one in the 1990s, to the relatively developed, namely the urban and sub-urban regions of southern, western and central parts. That progress has had more drastic impacts on the environment and the prime agricultural soils around the towns with adverse resilient effects on the abandoned soils and natural vegetation. A striking example, to the inappropriate use of land, due to migration, is the permanent loss of the highly productive soils around the towns of Adana and Mersin and the loss of the citrus orchards of the latter. The inappropriate urban expansion of the Kahramanmaras town as well as the loss of its productive land had been induced in the early 1950s by the migration of the people from the rural areas, which has followed a uniformly increasing trend until 1995. This drastic phenomenon has unfortunately continued until today by the ever increasing textile and related industries. Figure 11 shows the soil sealing situation in Turkey.



**Figure 11.** Proportion of agricultural land sealed for urban purposes (Cangir et al. 2000)

- **Raw Material/Soil Extraction:** This is the misuse of the soil, along with the underlying and overlying rocks as raw materials in the construction industry and other industries as bricks and ceramics.

Soil sealing, which stands for the permanent loss of soil by ‘covering of the soil surface’ by ultra structures, is a term coined by the European Union Environment Programme / European Environment Agency, which, is equivalent to ‘resource consumption’ of the United States Ministry of Agriculture, Natural Resource Conservation Service and ‘distorted urbanization’ or ‘improper urbanization’ and ‘out of purpose use of lands’ according to several local sources. ‘Soil sealing’ is the consequence of the improper growth of the cities and of industrial areas on the productive plains. Bursa, Adana, Mersin, Izmir, Izmit, Istanbul, Gaziantep and some other cities can be good examples of this inappropriate urbanization on fertile soil. Moreover, soil sealing can be a regional problem arising from the inappropriate use of the soil, as seen in Thrace.

For centuries, particularly in the last 50 years, there has been overuse of natural resources to provide raw materials for the soil industry and other industries. Moreover, in the Mediterranean climatic areas, the soils of the forests are occupied by greenhouses. Factories, established in the productive plains, would use the adjacent soils, causing the loss of the productive soil and water resources in a non-recyclable way. However, the inappropriate use of soils has been partially to completely prohibit following the efforts of some universities, municipalities and civil society organizations (e.g. T.U. Tekirdag Faculty of Agriculture - volunteers; Mersin University - City Council - Chamber of Commerce; Cukurova University – Municipality- NGOs) in the last decade. Following the prohibition, unfortunately the local sprawlers and migrants occupied particular agro-ecosystems inducing desertification and the current unsustainable use of the natural resources.

The use of the productive soils, particularly of the fertile alluvial plains, as raw material sources for the construction of ultra and infrastructures has been a menace following the demographic changes of the 1950s and 1960s. The main consumption of soil resources are for the brick and ceramic industry with approximately 440 factories consuming 2.000.000 tones of soil in a year out of the 60.000.000 tones of the countrywide reserve. These factories are mainly located on the arable land and fertile moderately deep to deep Mediterranean Red Soils (Luvisol-Cambisol), i.e., the fertile soils of the Mediterranean shrub agro-ecosystems of olives, carobs, vines, figs, citrus, almonds and apricots. Moreover, the vast amount of soil materials (over 450 million tones) used for the dam walls of the large and small reservoirs (app.504), which is equivalent to 213.138 ha topsoil of degraded forest areas and marginal agro-ecosystems, is also one of the main irreversible resource consumptions in the country along with sealing.

**Erosion is the major impact of desertification, which is caused by the mismanagement of the land. It is a land degradation phenomenon accelerated by unplanned land management- the human impact- rather than natural causes. Deforestation, an on-going process for centuries in Anatolia, is the major driving force of land degradation reached by the unplanned and illegal cutting of forests to provide materials or fuel for heating, along with improper settling policies and overgrazing.**



**Figure12.** Floods as a result of land degradation in upland cause drastic catastrophes in lowlands

Land degradation accelerated via deforestation in the last decades, causes loss of traditionally and regularly used lands as well as change of local climates, ultimately increasing flood and landslide episodes with human casualties (Figure 12). This rapid degradation, together with the inappropriately developing tourism, causes the cultivation, urbanization, and occupation by green house constructions of the sand dunes and lands with maquis, in the coastal areas, in turn

increasing the susceptibility to erosion. In this context the precautions to be considered are as follows

### **5.2.1. Erosion**

Soil erosion occurs where the balance between soil, water and vegetation and in turn the biotopes in the eco-system are degraded. The main factors of the natural balance such as climate, topography and geologic structure are stable and cannot be largely changed by human intervention. The most prominent effect of man to the natural balance can be determined by the intervention to natural vegetation. Erosion is accelerated in case this balance is destroyed, most probably due to the lack of knowledge in natural resource management, as well as short-term interests (Figure 13).



Figure 13. Sample areas where soil are being lost by severe erosion (AGM archive)

### **5.2.2. Deforestation**

Forests all around the world are and have been affected by the intensity of human abuse throughout history (Figure 14). Degradation of the forests for creating new settlement areas, the change in the traditional land use methods, illegal cuttings, overgrazing and fires are some of the basic factors. The loss of the vegetation cover from the soil surface after a forest fire coupled with the impact of black ash, which increases the temperature of the soil surface, consequently increases the impact of an expected drought. Deforestation leads to global and local climate changes and this leads to the destruction of the hydrologic cycle. All these are the causes of flooding, landslides and soil erosion. However long-term erosion is more important than all these factors, which is responsible for the destruction of the ecosystems in the deforested highlands and plains. The problems created by erosion can only be solved in the long-term, sometimes with state aid and this can be very costly and difficult.

According to some amendments in law, country soils should be used for country interests and property rights should be arranged. Disagreements on properties lead to degradation of forests in some places. Despite the protective measures securing the country's forests by the Constitution, some parts of the forest land is under the threat of misuse due to land ownership, population increase, and economic development.



**Figure 14.** A sample of heavily degraded forested land by overgrazing where the soil and climate conditions are quite fragile to be rehabilitated

All these cause floods, landslides and soil erosion. Moreover, in the long-term erosion is more important than all these factors, which destroys ecosystems in the deforested mountains, forests and plains. The problems created by erosion can only be solved in the long-term, sometimes with state aid and this can be very costly and difficult.

According to some amendments in law, country soils should be used for country interests and property rights should be arranged. Disagreements on properties lead to degradation of forests in some places. Although protection of country's forest is brought into safety by the Constitution, some small parts of forest land was gone out of forest regime due to problems of land ownership, population increase, and economic development etc.

### **5.2.3. Degradation of Rangelands**

Irregular grazing (heavy, early, uncontrolled etc), especially on the hillsides, and cultivation are the major reasons of degradation of the rangelands. Overgrazing causes destruction of the botanical composition of the natural vegetation and also decreases rangeland efficiency leading to erosion. In the arid and semi-arid areas, where precipitation is insufficient and its distribution is irregular, the following measures have to be taken in order to protect the natural rangeland areas:

- a) Grazing management
- b) Cultural and technical measures;

- fertilizing,
- seeding,
- soil and water conservation measures (terracing, contour furrowing, ditches, etc.),
- weeding,
- water ponds/reservoirs for animals etc.

#### **5.2.4. Loss of Organic Materials in the Soils**

Loss of organic matter in the soil is accelerated by the burning of the stubble, excess tillage of soil and mismanagement of the lands in the country, especially at locations with a dominant semi-arid climate. Organic matter in the soil should be increased through the use of animal manure, along with the incorporation of stubble tillage and green manuring techniques into management programs. The increased development of aggregates by increased organic matter and the use of several updated and traditional soil conservation methods, in turn increases the chemical efficiency and the quality of the soil, as well as improving its physical and biological conditions.

#### **5.2.5. The Physical Degradation of Lands**

#### **5.2.6. The Improper Use of Lands**

“Soils should be used according to proper management techniques and their natural characteristics” principle should not be ignored. Due to improper use of lands, soil concreting and erosion accelerate thus the loss of soil is getting increased.

In the 1950s, new classification approaches were replaced with Classifications of Land Capacity and Compatibility to Dilute Agriculture. These new approaches degrade soil quality at the minimum level and depend on the traditional environment friendly eco-system use. These classifications are in the form of Land Quality Classifications, which concern SLM programmes as the base of national action plans. They also aim to reduce the impacts of misuses.

#### **5.2.7. Loss of Available Water**

The potential of the available water, which is necessary to sustain life decreases via increasing evaporation by the mismanagement of the land, over-consumption of underground water resources, the decreasing capacity of the environment to retain water, the lack of techniques to conserve water in the soil, and the reduction of the total usable water due to inappropriate urbanization.

### 5.2.8. Aridity (Salinity and Alkalinity)

Salinity and alkalinity (increase of sodium-15%-and pH-8.5- in the soil) is another problem caused by irregular urbanization, population growth and immigration from rural areas to cities. Improper irrigation, over-irrigation, lack of maintenance of the drainage facilities and overuse of the underground water, together with the extraction of saline sea water in the coastal areas are the causes of increasing soil salinity. The economic burden to solve these problems can be greater in the course of time. Therefore, it is normal that soils in the regions without a Sustainable Land Management programmes lose their chemical productivity/quality due to increasing salinity. The foreseen irrigation of the productive rangelands of the Mus Plain without the development of sustainable land and water management programmes would degrade its rangelands, as well as the agricultural and forestry ecosystems in the area. Degradation of the Vertisols, which are susceptible to irrigation, and cultivating of crops like the sunflower, would degrade the balance of nature and lead to desertification.



**Figure 15.** Salinity is a mainly human-induced problem which results in loss of soil fertility

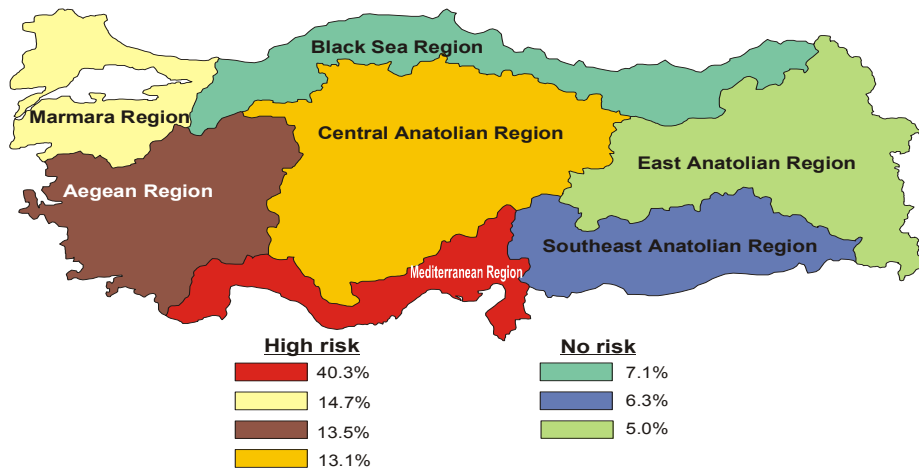
### 5.2.9. The Salinity Problem of the Irrigated Soils

Natural salinity of the soils is not harmful for the sustenance of the ecosystems. The real problem in the soil related to aridity is the secondary salinity and/or alkalinity, which occurs after the misuse of the land. The main reasons of salinity prone aridity are namely, over-irrigation, insufficient drainage conditions and the inappropriate quality of the water used for irrigation. The usual measures taken to rehabilitate arid soils are primarily, the construction of the open and closed drainage facilities, and the use of some restoration materials such as gypsum and sulphur. The prevention of the salinity prone aridity concerns both technical and social aspects. The solutions of the former are more difficult to achieve due to its financial aspect, which would follow an ever-increasing trend parallel to the uncontrollable population increase.



### 5.2.10. Pesticide Use

Despite the present overuse of pesticides in parallel to intensive agriculture, a potential risk exists for the near future particularly in the Mediterranean, Aegean and Marmara Regions of the country (Figure 16). The highest pollution risk is in the south due to the consumption of 40% of the total agricultural chemicals; whereas the risk in the East is relatively low due to the land use i.e. the natural pastures.



**Figure 16.** The use of pesticides in Turkey (Ministry of Agriculture-MARA, 2001)

Due to the misuse of the agricultural chemicals the balance of the natural habitats of the country are continuously degrading. “Integrated Pest Management” practices, to include biological warfare, should be common throughout the country to avoid the damages caused by the chemicals-used to combat plant diseases, pests and weeds- on the ecosystems.

### 5.2.11. Soil Pollution

Impacts of potential air pollution, especially in Marmara, Aegean and Cukurova ports can cause big environment degradation in the near future. Moreover, population growth and immigration cause intensive agricultural activities in the productive soils. Chemical manure applications lead to potential soil pollution (Figure 17).



**Figure 17.** Uncontrolled industrial expansion is the main cause of air and soil pollution as well as big environmental degradation.

### **5.2.12. Degradation of Natural Vegetation and Biodiversity**

Turkey has a special place in the world in terms of flora and its unique natural vegetation. However, the natural vegetation of Anatolia has been degraded continuously throughout history, by being one of the oldest settlement areas in the world. In particular, agriculture, livestock, mining, deforestation have destroyed the natural balance and accelerated the erosion in the country. Intensive agricultural production violated the natural vegetation and the habitats of Anatolia. The decrease of biodiversity and the biologic quality of the soil due to this misuse can be seen in the wetlands, and especially in the coastal dune areas. Destruction of the natural vegetation of the dunes eradicates natural prosperity and on the other hand causes the pollution of the marine environment. This degradation has been continuing since centuries and is accelerated in the recent decades due to the insufficient measures seeking the recovery of the impacts of desertification in terms of the natural vegetation.

## **6. APPROACHES AND PRINCIPLES TOWARDS ESTABLISHING THE FRAMEWORK OF SUSTAINABLE LAND MANAGEMENT**

### **6.1 Approaches of the National Action Program of Desertification (NAP- D)**

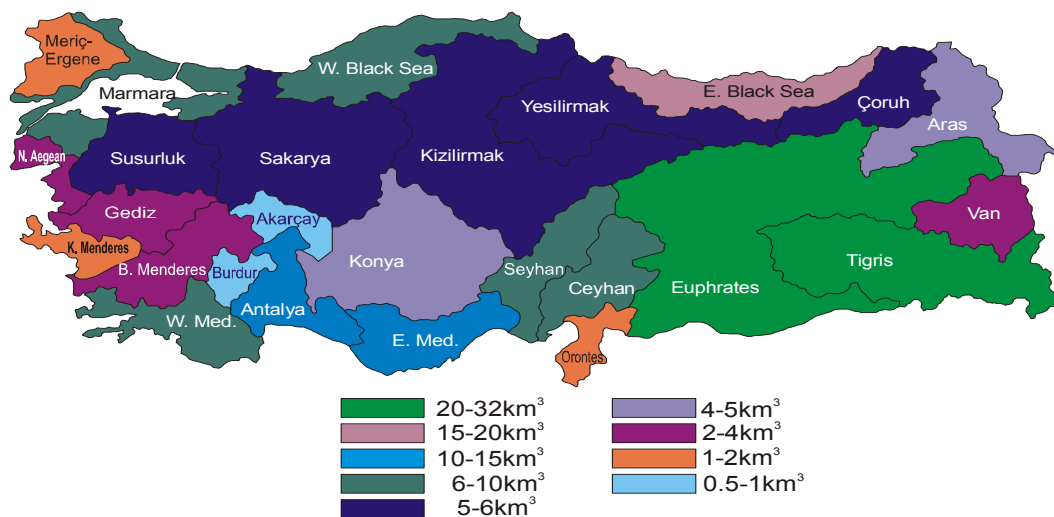
The NAP of Turkey recommends that the study scale on land degradation and desertification be based on the present *River Basin Catchment* (Turkey has 26 basins) and sub-basin wise divisions for sustainable land management (SLM) developed by the State Hydraulic Works (DSI). These are equivalent to landscape units some of which may also qualify for anthroscares (♦). When a

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(♦) The anthroscape is basically a landscape unit for assessment of human impact on land systems. As such it becomes the basis for coupling socioeconomic considerations in our assessment of land. In many situations the anthroscape will merge with the urban landscape; with the uncontrolled expansion of cities, the boundaries become blurred and give rise to a number of new and unique environmental problems. At other locations, the anthroscape is the terminal part of a watershed or the hinterland of wetlands. In either situation, it presents unique conditions and problems for land use and land management. As the concept and definition of anthroscares is improved several issues will have to be addressed. Some of these include: Developing guidelines to identify and characterize anthroscares and subsequently to recognize typologies so that they can be aggregated. The third step, aggregation or classification,

landscape is not considered as an entity, perturbations on one part may have intended and unintended consequences on another or on adjacent units (Figure 18).

The negative impacts are a function of both the landscape character and strongly influenced by the socioeconomic aspirations of the land users. When a top-to-bottom approach is adopted or where the land users is considered as just another variable, full participation of the land user is not guaranteed and the system is set up for failure. NAP-D attempts to assure full participation of the land users by adopting a bottom-to-top approach enabling a continuing dialogue among all concerned and ensuring a feed-back mechanism to cater for missteps. The NAP-D consists of 63 activities based on sustainability with the proactive participation of governmental, non-governmental and local administrations. The synergy built into this approach minimizes discord in the social components of the process.



**Figure 18.** The river basins of Turkey (av. annual flow –km<sup>3</sup>) (SHW, 2003)

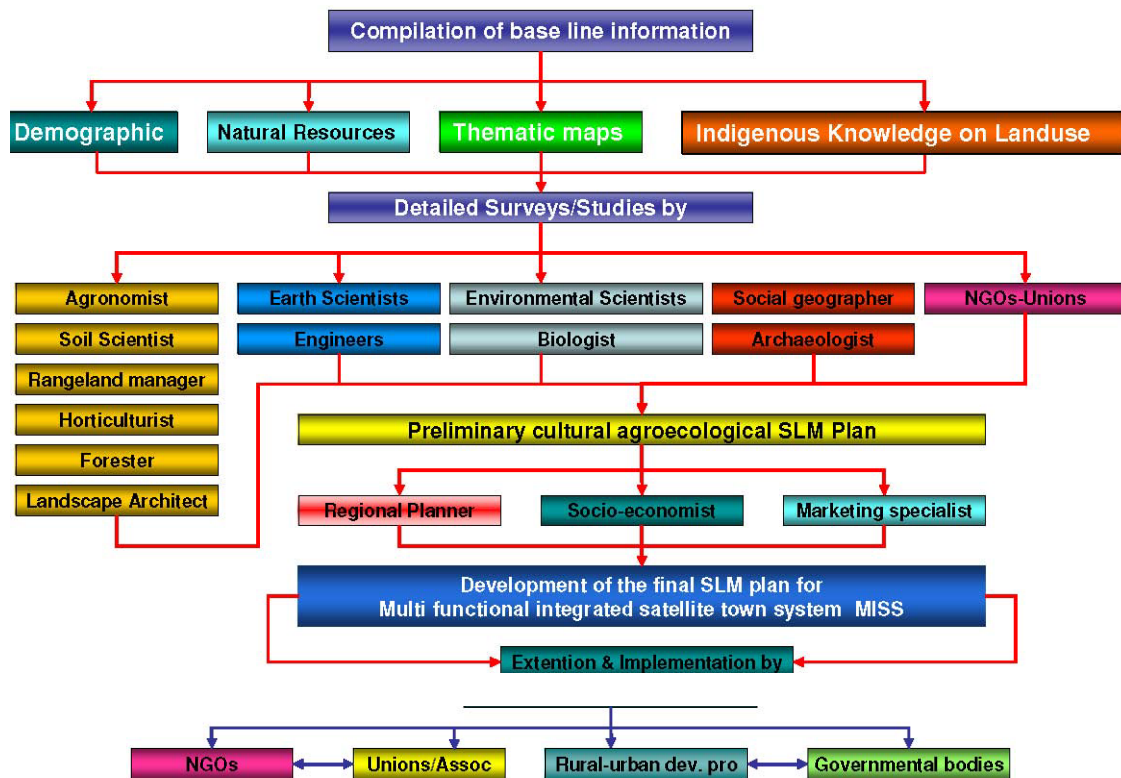
The development of the management programmes targeting the conservation and the sustainability of the natural resources as well as their rational use can be fulfilled only by the implementation of the Turkish National Action Programme to Combat Desertification. In actual fact the foresights of this plan should be adapted to the macro policies of the country. The decisions to be taken by the state during establishing SLM programmes will bear utmost value for the success of the policies seeking the improvement of the country. Moreover, strengthening country level macro policies to

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would become necessary when comparisons between anthrosapes are being made or when studies on land management or mitigation technologies for land degradation are to be implemented over a larger scale. Some anthrosapes have a high proportion of disturbed or reworked soils requiring redefinition of the mapped natural Soil Series and also the need for different kinds of map units – special map units to identify disturbed soils. Anthropically-induced characteristics in soils are poorly understood and hence ignored. This is a new area for study.

include the components of the NAP-D depends on establishing an effective public opinion.

The multi-integrated NAP-D of Turkey prepared by the Ministry of Environment and Forestry was recommended for implementation to the local administrations, with its foreseen holistic and interdisciplinary approach, as the ultimate challenge for sustainable land management. Soon after, the Ministry of Agriculture and Rural affairs passed the Law of Soil Protection and Land Use from the Parliament complementing the foreseen phases of the implementation of the NAP-D of Turkey. Both Ministries empowered the Governorates of all townships of Turkey for the collation and development of the data bases of the natural resources and all other land-based data, which will be accompanied by field studies/trials and proceed with the development of the SLM programmes of the antropscapes shown in Figure 19.



**Figure 19.** Framework of the multi-integrated NAP approach

The next set of activities to follow accordingly includes:

- a. Development of the initial Cultural and Environmental Sustainable Land Management Plans.
- b. Development of Sustainable Land Management programs for Multi-Integrated Satellite systems (MSS) at sites of successful indigenous land management for the enhancement of the participation of the local communities in the process of implementation of the NAP-

Desertification.

- c. Integration of the Soil Protection and Land Use Law to the NAP-D at selected anthrosapes to address regional and rural development strategies and accelerate provisions on socio-economic equity within the different regions of the country. The Kizkalesi (Mersin township-Southern Turkey) site is an example for the ancient biodiversity-olive-goat husbandry-cereal cultivation management satellite settlements linked to the administrative centre located on the coast.
- d. The Sustainable Land Management Programs and their implementations at country-wide representative-pilot-sites will integrate soils, water, topography, biotopes-biodiversity reserve areas, crops, animal production, fertilizers and population/heritage data/information as shown in Figure 19. Figures 20 to 23 illustrate the various selected anthrosapes of Adana (an agro-ecosystem of biodiversity/forest-olive-carob-vineyard-cotton-citrus-selected indigenous wetland vegetation for conservation management), Silifke-Mersin, comprising the Kizkalesi site (an agro-ecosystem of biodiversity/forest-olive-goat husbandry-cereal-carob-selected indigenous wetland vegetation for conservation management), and Van (an agro-ecosystem of biodiversity/forest-extensive well managed small ruminant graze lands-almond-cereal-sugar beet) determined to serve as a foundation in the process of developing the SLM programmes of the representative anthrosapes.

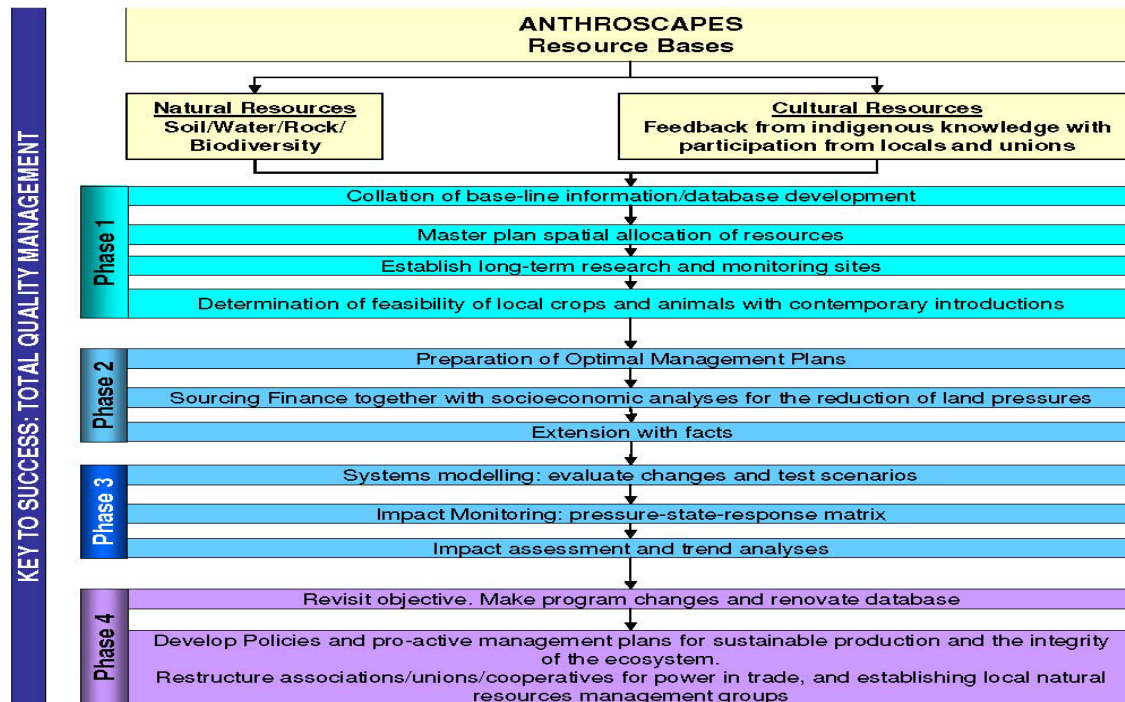
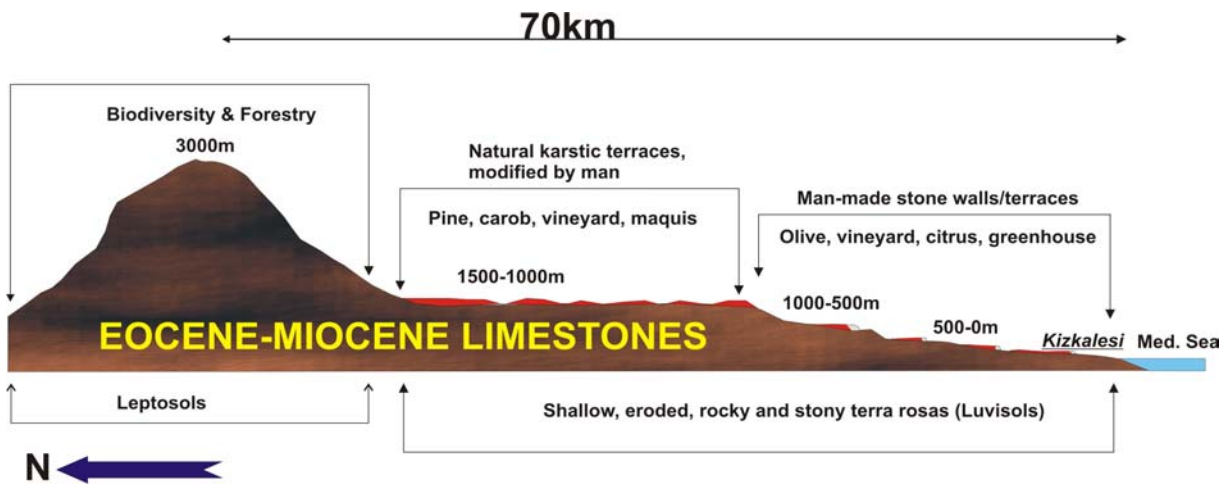


Figure 20. The phase-wise approach to Sustainable Land Management Programs and their implementation



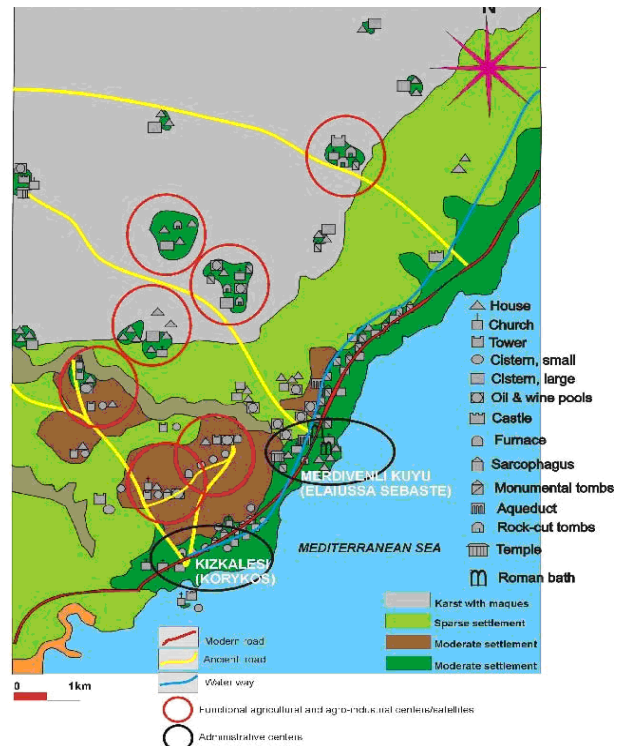
**Figure 21.** The Kizkalesi Antroscape

The figure shows an anthroscape modeling. This is almost a classical example of the concept of anthroscape, and is identified by names derived from its geographic/geologic location and modes of land use development.

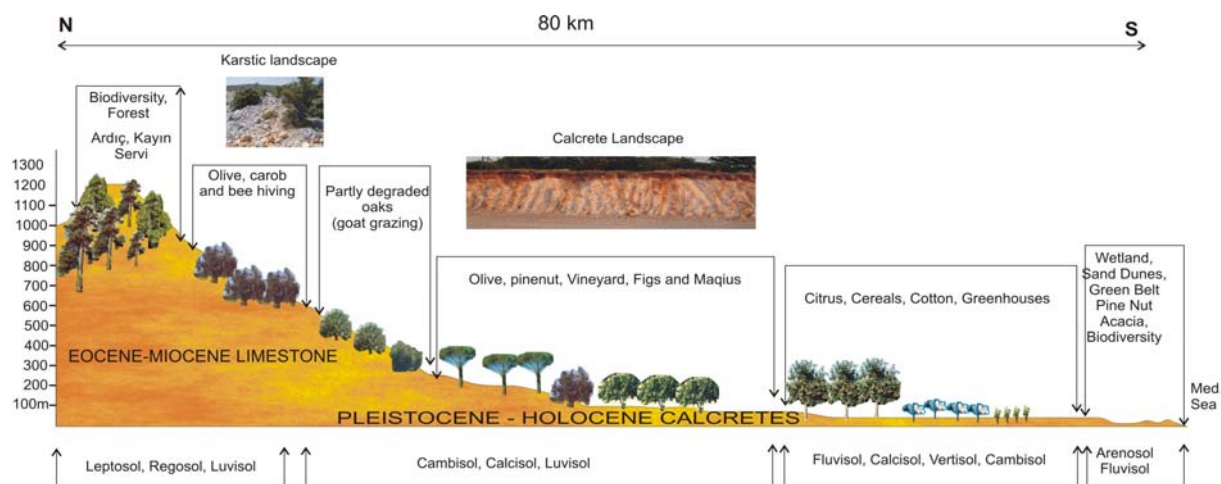
An anthroscape presents unique conditions and problems for land use and land management issues that will have to be addressed.

The *Kizkalesi (Korykos) anthroscape* is composed of human-made terrace walls (wide spread in the Mediterranean basin) constructed on karstic surfaces that were conserved and also were useful for water harvesting throughout their history of utilization.

The site is an example for the ancient biodiversity-olive, goat husbandry, and cereal cultivation management.

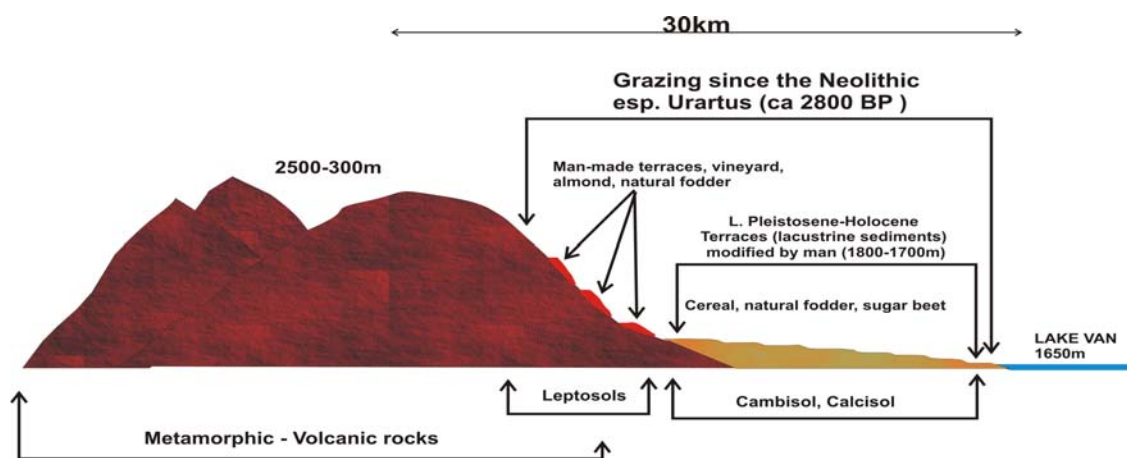


**Figure 21.** The Kizkalesi ancient multi integrated satellite system settlements



**Figure 22.** The Adana Anthroscape

Problems of the local people on income generation and conservation management, i. e., conserving while producing, can be solved with integrated, multi-sectoral **Sustainable Land Management (SLM)**. The SLM for relevant regions should and is expected to establish Multifunctional Integrated Satellite City structures, that interact with agricultural and forest lands by amalgamating concepts of ideal land use with urbanization, industry, transportation, tourism, infrastructure and energy.



**Figure 23.** The Van Anthroscape

## 6.2. Strategies and Priorities Established in the Framework of Sustainable Development Plans

During the recent years, it has become clear, that there is a strong connection between economic development and the management of the natural environment. However, earlier land use initiatives and their implementation disregarded the strong relation between the conservation of the natural resources and the strategic plans for countrywide development, despite the milestones laid down for the sustainable development and conservation of nature during the Brundtland Commission

Report in 1987 and in Agenda 21 in Rio de Janeiro World Summit. The new concepts developed here were found to be paradoxical to the earlier paradigm of development, which only considered the increase of production despite the protective measures needed by nature. However, fortunately the concepts developed by the UNCCD are now widely accepted by the decision makers of today. Accordingly, the outcomes/recommendations of the above mentioned initiatives to be regarded, as a win-win process, in environmental conservation and management are as follows:

- There is a very important and positive connection between economic development and environment,
- Unsuitable economic policies have negative impacts on the environment,
- Reducing poverty is necessary to solve environmental problems,
- Economic development should be managed in accordance with environmental values and,
- Sometimes global and regional cooperation are necessary in order to complete national and regional activities, because environmental problems do not depend on political borders.

Even then, the comprehensive acceptance of these proposals does not guarantee their effective implementation. Unfortunately most of the environmental problems have been becoming more intense and acute, despite the acceptance of the measures stated by the UNCCD. There are **ten new principles**, which are not consistent with most of environmental policies accepted by the OECD members during the last 30 years.

- **Principle 1- Determining priorities carefully.** Earnestness of the environmental problems and shortage of financial resources make it necessary that rehabilitation activities are divided into stages.

- **Principle 2- Getting better value for money.** Most of environmental policies are needlessly expensive, including successful ones. Applying the cost effectiveness principle makes possible to do more with limited resources. Environmental experts and economists should work together in order to solve environmental problems through low-cost methods.

- **Principle 3- Benefiting from “win-win” opportunities.** There is a need to make concessions for the conservation of nature, while developing management initiatives in agro-ecosystems, while some benefits can be obtained as byproducts of drafted policies with the aim of increasing productivity and decreasing poverty. In case of shortage of the resources, the latter should be preferred as a policy.



- **Principle 4- Using market tools when it is suitable.** Market oriented incentives in order to decrease the degradation of the environment are the best in principle and in implementation. It is in contrast with the traditional “order and control” models.

- **Principle 5- Nursing administrative and regulatory capacity.** Today several countries try less officious policies and accept that civil society organizations can be helpful to obey them. Disclosures of the private companies and the state institutions, which damage the environment and public training campaigns, have a bigger impact than traditional regulatory approaches.

- **Principle 6- Working with the private sector.** Being aware of limited regulatory capacity and urgent private investment need, the world attitude is switching to an attitude of dialogue and of negotiation with the private sector.

- **Principle 7- Participation of citizens.** While dealing with environmental problems of a country, the opportunity of success would be high, provided that local citizens participate (social sensitivity). This policy has been well-known, for years, to rural programs and it has just started to be known to urban programs on pollution as well as on waste management. Participation is necessary for four reasons: Firstly, local citizens can prioritize activities better than state officials. Secondly, local citizens know cost reduction solutions better than state officials. Thirdly, action and work from communities generally ensure conducting an environmental project till the end such as the soil conservation and aforestation projects. Fourthly, local citizens can be helpful in establishing administrative regions for change. There will be objections to most of the environmental reforms by the people, who pollute and destroy the environment without any punishment. Therefore, public participation is very important for these reforms.



**Figure 24.** Participation of local people on the decision making and implementation of activities is the core element of National Action program.

- **Principle 8- Promoting implementation partnerships.** Solving environmental problems collectively is easier. Partnerships between state, private sector and public institutions for priority applications become more and more common. The need for cooperation on some environmental issues makes these partnerships sometimes valuable. International cooperation becomes common as well.

- **Principle 9- Considering management more important than technology.**

Instead of the old technology, it is possible to adapt the measures of the new management concepts. Rehabilitated management applications complete equipment investment and sometimes replace it. Talented managers can achieve big success with small cost. On the contrary, untalented managers can waste benefit from new technology. Improved management and public investments are therefore very important.

**Principle 10- Considering environment issues from the beginning.** Precaution to protect environment is much cheaper and more effective than treatment.

Those ten principles are helpful for the preparation of new environmental policies. Accordingly, putting local people in the center of environmental strategies, determining and dealing with the causes of behavior pattern, and considering political dimension of environmental reform are characteristics of new environmental policies. In Turkey, this reform has not been completed yet. Actually, it is just started. Some policies related to conservation and sustainable use of soil and water resources are summarized as follows:

- **Price and Market Policies:** The basis of price and market policies in Turkey is to support price and procurement policies. Applications in this framework are supportive inside and protective outside.
- **Input Price Policies:** Subsidizing agricultural inputs for increasing agricultural production.
- **Agricultural Foreign Trade Policies:** Agricultural products foreign trade is trying to be balanced in terms of internal market, supply, demand and price for years. Since January 1996, all kinds of export have been liberalized except products, whose export has been abolished by legislations, regulations and international conventions.
- **Loan Policies:** In order to encourage and support agricultural development, preferential and privileged enterprise, investment and equipment loans are provided to the sector.

- **Structural Policies:** Production control by limiting plantation areas exists for three products i.e. for hazelnut since 1983, for tobacco since 1986, and for tea since 1987.

However, there is still no production planning and production policy. Products are chosen randomly and included to the programmes mostly due to political reasons. Developing and rehabilitating plants and animals with high productivity are being supported, and seed production, greenhouse and livestock improvement and water products production are being encouraged in several ways.

Another structural policy is the arrangements of the agricultural infrastructure. Works related to irrigation investments, land rehabilitation, energy supply, water supply and transportation to villages, protection and use of soil and water resources are implementing by State.

- **General Service Policies:** Agricultural research, training and publication are carried out by State institutions, and universities which play an important role on the subject matter. Combating crop and animal diseases and pests, and the manure, fodder and nutrient are being implemented in accordance with the state policies.

- **Planning Policies:** Country development plans are renewed every five year by State Planning Organization (SPO). These plans cover improvements achieved and precautions to be taken, and public institutions are bound by these plans. Policies, strategies and objectives for sustainable, productive and rational use of country resources are emphasized in these plans. In addition to these, the preparation of some master, regional and microcatchment plans tools as well.

## **7. MEASURES TO SOLVE PROBLEMS ON NATURAL RESOURCES MANAGEMENT**

The SLM approach integrates a number of disciplines and scientific bodies related to the environment, namely Forestry, Agriculture, Biology, Meteorology, Geodesy, Geology, Civil Engineering, Geomorphology, Archeology, Urban and Rural Planning, Landscape Architecture, Sociology, Economics, etc. .

The variability in, Geological structure and altitudinal differences, different climates, drainage network systems and watersheds with different characteristics lead to, the development of different rangelands, forests, and agricultural basins. All these various ecological conditions create affluence in natural resources, diversity and habitats. Sustainable Land Management (SLM) would provide the sustainability and the conservation of the natural resources and find solutions to the desertification problem. The methods to prevent desertification should be considered with its socio-economic dimension.

## 7.1. Measures Related to Soil Management

**Current Situation on Soil Resources in Turkey.** Arable soils cover an area of about 11 million ha out of the total 73 million. These soils are deeper than 90 cm and do not have any root limitations, and add up to 15.2% of the total. In other words, provided these soils are at optimal humidity conditions, they can be tilled with appropriate agricultural equipment, without causing problems related to the effective profile depth.

The country comprises 32 soil associations, i.e., SMUs (Soil Mapping Units) each with two to three STUs (Soil Typological Units) and a few with one, according to Lambert et al (2002) and Özden et al (2002) (Table 1). For coding the soil types the new World Reference Base (WRB) for soil resources (FAO/ISRIC/ISSS, 1998) has been used in association with the FAO-UNESCO revised legend (FAO, 1974, 1990). The Leptosols are the dominant soils followed by Calcisols, Fluvisols, Cambisols, Vertisols, Kastanozems, Regosols, Arenosols, and Alisols.

**Table 1.** Distribution of Soil Mapping Units (Özden et al. 2002)

Umbric Leptosol/Dystric Cambisol	2.286
Mollic Fluvisol/Eutric Vertisol	0.224
Calcaric Fluvisol/Vertic Cambisol/Calcic Vertisol	7.019
Calcaric Regosol/Calcaric Cambisol	0.066
Mollic Leptosol/Petric Calcisol/Calcic Vertisol	2.475
Mollic Leptosol/Lithic Leptosol	17.736
Lithic Leptosol/Chromic Luvisol	1.424
Salic Fluvisol/Eutric Vertisol	0.138
Haplic Calcisol/Mollic Leptosol	1.363
Luvic Calcisol/Eutric Leptosol	0.959
Lithic Leptosol	7.094
Calcic Vertisol/Calcaric Fluvisol	0.203
Rendzic Leptosol/Haplic Cambisol/Luvic Kastanozem	7.588
Haplic Andosol	0.173
Haplic Arenosol	0.180
Haplic Kastanozem/Haplic Cambisol	3.376
Eutric Vertisol/Vertic Cambisol	1.119
Dystric Leptosol/Haplic Kastanozem	0.036
Chromic Luvisol / Haplic Alisol / Haplic Acrisol	2.224
Haplic Calcisol/Vertic Cambisol	6.027
Calcic Vertisol/Petric Calcisol/Luvic Calcisol	1.286
Calcaric Cambisol/Eutric Leptosol	9.468
Mollic Leptosol/Vertic Cambisol	0.201
Mollic Leptosol/Haplic Cambisol/Haplic Andosol	0.625
Vertic Cambisol	0.630
Eutric Cambisol	0.010
Eutric Leptosol/Haplic Cambisol/Eutric Vertisol	3.780
Luvic Calcisol/Calcic Vertisol	0.615
Luvic Calcisol/Petric Calcisol/Calcic Vertisol	3.102
Luvic Calcisol/Petric Calcisol	0.629
Luvic Calcisol/Haplic Calcisol	16.405
Eutric Fluvisol	0.191
Water Bodies	1.337
Marsh	0.012

Soils with moderately deep profiles with root restrictions at 50-90 cm constitute 9.299.614 ha and 12.7% of the total area. The crop productivity in the moderately deep and deep soils can be improved and sustained by shifting from the monoculture cultivation to the rotational polycultural cropping systems.

Shallow soils constitute 23.7 million ha and 32.5% of the total land area with an effective profile depth of 20-50 cm, whereas, soils with depth less than 20 cm, constitute 28.908.455 ha and 39.6% of the total land area (Table 2).

Table 2. Effective Profile Depth Distribution Areas (ha) and Ratios (%)

Distribution Areas and Ratios	Effective Profile Depth (cm)				TOTAL
	Deep 90+	Moderately deep 50-90	Shallow 20-50	Very shallow 0-20	
Area (ha)	11.108.114	9.299.614	23.696.973	28.908.455	<b>73.013.156</b>
Ratio (%)	15.2	12.7	32.5	39.6	100

The distribution of the stony soils, which can prevent erosion on the slopes, is 2.989.093 ha. This area is 11.3% of the potential agricultural soils. The implementation of stone collection projects in these slightly sloping lands would rehabilitate the quality of the lands. An area of 1.856.000 ha can be included in to this project, which adds up to 62.1% of the total stony land. Stone collection is determined to be impossible on 25.495.238 ha land, which makes up 49.7% of the total stony area.

The problem of stoniness is present on 28.484.331 ha and 34.8% of the whole land area of the country except land without soil and water surfaces.

The drainage problem in Turkey covers 2.775.115 ha and %3.6 of the total land area. Lands, with insufficient drainage, that can be rehabilitated without much investment, cover 1.689.358 ha and 60.9% of the lands with drainage problems. Some poorly drained areas that need high expenses for rehabilitation cover an area of 776.312 ha. Areas of untended drainage cover 283.381 ha of land, whereas excessively drained areas cover 26.064 ha of the total land area.

Areas of salinity and alkalinity are totally 1.518.722 ha and 2% of the land area of Turkey with a 614.657 ha (40.5% of total problematic area) of land under rehabilitation. .

Saline areas in need of huge investments for rehabilitation cover an area of 504.603 ha; alkaline soils cover 8.641 ha; low saline-alkaline soils cover 125.663 ha; and saline-alkaline soils cover 264.958 ha out of the total.

## **Historical perspective of the Legislations on Soil Protection in Turkey**

The Turkish Environmental Policy Law has been covering the legal statuses related to land degradation and soil protection since the early 1980s. However, some evaluations concerned with agricultural applications and soil protection calls attention to the Five Year Development Plans prepared at various terms. For example, the 3rd Five Year Development Plan covers the period from 1973 to 1977 and emphasizes the provinces affected by erosion and environmental problems which are the regions unable to use their natural sources sufficiently and rationally (Haktanir et al., 1996). The determination of policies during that period, were based on agricultural pollution bound to fertilization and pesticide use. Thus inspective measures were taken in order to avoid the misuse of both fertilizers and pesticides (SPO, 1973).

Land planning, based on the rational management of soils, and was established in the 1977 by the action programme undertaken by the government. The new program consigned the 1 and 2 class arable lands i.e. the highly productive soil, only to agriculture.

In the 4th Five Year Development Plan (1979-1983), "the regions without a land management plan" were decided to be devoted to environmental protection. The 1983 action program pointed out to the importance of land management planning studies to be conducted together with ecological basin surveys in cooperation with local administrations (SPO, 1979).

Erosion, environmental pollution created by natural disasters, industrialization, and modernization in agriculture are defined as environmental problems in the 5th Five Year Development Plan. In that definition the environmental policies were determined (SPO, 1984) and the environmental problems were identified at the planning stage of land use and investment, and all steps were taken in accordance with the concerned regulations (Haktanir et al. 1996).

The first decision directly related to the environment takes place in Article 56 of the 1982 constitution of the Republic of Turkey. Article 44 includes the Productive Use and Protection of Soil; Article 45 includes the prevention of Unplanned Use of Agricultural Lands, Meadows and of the arable public lands (Official Gazette, 1985a), The regulation for the use of arable lands other than agricultural purposes (1989; 1995), The law for land organization in irrigated areas and a supplementary regulation (Official Gazette, 1984), and Pastures.

By these laws liability is given to the government for planning the productive use of soil and prevents the loss of soil by erosion. According to Article 45, distribution of land to the landless farmer should not reduce the productivity of the soil, forests and other soil resources, and sizes of land ownerships (Official Gazette, 1982).

The Turkish constitution is unique in comprising the only group of laws, which are directly related to the protection of the soils and land of the country. Some other indirectly related laws and regulations are; the law defining the sale the regulation on the Environmental Impact Assessment of 1993, states the significance of protecting the agricultural areas under development, namely the 1st, 2nd and 3rd class rain-fed soils and plantation devoted to special products (Official Gazette, 1993).

The main goals of all these arrangements sought well planned land distribution to the landless farmers and the planning of the use of land in agricultural reform areas. Corresponding to these actions, the Ministry of Agriculture and Rural Affairs was authorized for the planning of using of the land. The 1st Article of the Environment Law comprises the most profitable/sustainable use of rural and urban lands, natural resources, and the protection of soil. The protected lands were determined according to land use measures in the rural and urban areas and their protection principles (Official Gazette, 1983). The main goal, as defined in the 1st Article of the Agricultural Reform Law, was the profitable use of the soil and its protection (Official Gazette, 1985b).

The Turkish constitution and a number of other laws attribute the protection of agricultural land to the government. The opinions developed until now were based on limited assumptions mentioning only the non-renewable resources and the limited highly productive areas in Turkey. For undertaking these duties granted by the public management and Constitution and Laws, the agricultural land use is bound to regulations. Another regulation for the use of agricultural land in Article 7 states that the 1st and 2nd class soils in rainfed areas, and 1st, 2nd, 3rd and 4th class irrigated soils can not be used for purposes other than agriculture. Article 8 states that irrigated lands can not be used for other purposes, provided other profitable alternatives do not exist.

The major law related to land use in urban areas was the law of Restructuring of natural resource management (dated 09.05.1985), with an insufficient protective power in need of renovation. This is followed by the recently proposed laws and regulations prepared by the same institutions related to soils and forests and presented to the concerned establishments. These are; (1) The Law outline of the Soil Protection and Land Improvement, and (2) The Law outline of the National Forestation Mobilization, (3) The regulation outline is on soil pollution control and soil protection. This outline has been prepared in accordance with the Environment Law at Article 8 (code 2872/1983). The aim of this regulation is the protection of the soils from pollution and the establishment of the legislative and technical foundation of the soil use of Turkey for a balanced development.

These past initiatives, unfortunately, could not materialize the necessary coordination of the

related bodies and the contextual-oriented approach, which is the essence of the SLM Programmes needed for the establishment of the major anthrosapes in Turkey. The recent linkages to national priorities are the legislations of “Soil Protection and Land Use” (Legislation no.5403, issued in 2095), the Law of “Pastures and Meadows” (Legislation no. 4342, issued in 1998) and the “Law of Forestry” (Legislation no. 6831, in force since 1956).

These all three Legislations have aimed towards the conservation of the renewable and non-renewable natural resources (soil/land, water, biodiversity, crops, and forests) of the country and point out to the development of the relevant integrated management programmes. Such programs to be accomplished by teams of amalgamated professionals employed in the government, non-governmental organizations and rural development unions/cooperatives. The recent 8th Five Year Development Plan (Act No. 697 issued at 27.06.2000) also comprises appropriate regulations for the development and implementation of the sustainable management programmes sought to support the industrial and agricultural growth of the country, to cope with the ever-increasing rate of population. The other supplementary regulations to the said major legislations are being issued upon request and are in need of the relevant incorporating bodies and issues.

## **Measures**

- **Prevention of Salinity:** Natural salinity to some reasonably low extent is not problematic. To provide an optimal salinity balance in the soil, the implementation of leaching techniques of the soluble salts is necessary. Therefore:

- a. Suitable drainage should be established.
- b. Excess irrigation water should be applied to leach the soluble salts from the root zone.
- c. Water table depths should be controlled for salinity management to provide a uniform leaching of the salts and contribute to the indigenous use of saline areas, i. e., allocating past wetlands and saline areas to income generating halophyte management.
- d. As a second choice the border and line methods could be applied to prevent the hazards of salinity.

It is necessary to determine the special agricultural and forestry eco-systems to develop a current technology with economic inputs and to use traditional SLM models. In conclusion, halophyte management should be applied in the saline areas. Halophytes are important both because they are highly beneficial fodder for animals and they also protect nature against the degradation of



wildlife and especially erosion. By implementing halophyte management the following benefits would be provided to the given ecosystem:

- The use of saline areas as sustainable crop production systems.
- The improvement of agro-forestry management to protect vegetation and soils as well as create income generating tools for the local people.
- The use of the halophytic vegetation as quality fodder

- **Prevention of Soil Pollution:** Fertilizer/manure management programmes should be established that would be suitable to regional agricultural production planning and needs as fertilizers, animal manure, green manure, and compost applications. Chemicals used for weed control are responsible for pollution of the soils Necessitating the development and implementation of integrated pest management programmes to include biological warfare.

Land degradation, particularly soil pollution in Turkey, is not very severe and an immediate threat when compared to other Western and Central European countries. However, the diverse topography when coupled with precipitation is responsible for the high rate of erosion which is a major factor of natural degradation induced by human activities in the country. The erosion of the productive topsoil decreases the net income of the agriculture-bound people and is the major cause of migration to industrialized urban areas leading to the sealing of prime soils. The irreversible consequence of soil sealing which is also accelerated with the high population increase, causes shifting of forest areas, wetlands, primary saline zones and other fragile environments to agriculture.

Excess use of irrigation water is responsible for the development of secondary salinity in the primary (geologically) saline zones as well as the fertile alluvial plains of Turkey, which are actually the gene zones of numerous crops particularly cereals, legumes and halophytes. Thus, irrigation management plans should not only be based on the concept of conventional cash crop production but also for the crops present on environmentally friendly and stable indigenous rainfed agro-ecosystems, which necessitate the incorporation of the halophyte production in Central Anatolia (steppe), the olive-carob-vine production in the semi-arid Mediterranean (karstic), and cereals in the Southeast Anatolian Regions (calcrete). This paradigm in sustainable land use management aims to increase the welfare of the urban people and decrease the threat of excess water use in fragile steppe, karstic and calcrete topographies, which are also the carbon pools of the world. Hence, the concept of agro-ecosystem based land use assessment should primarily be

considered in the development of sustainable land management strategies particularly with the incorporation of indigenous environmental friendly technical knowledge.

## **7.2. Erosion Control**

**Current Situation:** In addition to human factors, natural factors like topography, geology and climate would increase erosion. Generally, Turkey has a high and mountainous land structure accelerating erosion along with its geologic structure. Erosion in Turkey is the major factor to degrade natural resources, which is weakly effective on 7.2% of the lands, moderately effective on 20% of the lands, and strong on 58.7% of the lands. Moreover, wind erosion is seen to be effective on 0.65% of the total land area of the country. About 99% of the soils are threatened by water erosion, whereas only 1% is under the threat of wind erosion. Erosion is the major environmental and ecologic problem in Turkey and causes poverty and migration. In addition, erosion is very influential in terms of destroying the ecosystems and pollution of the water.

### **A) Measures to be taken against Water Erosion**

The primary precaution to be taken against the action of water in conserving the soil is the prevention of the transportation of the soil particles by the movement of the water from the raindrops. Accordingly the main soil protection methods are as the following:

- i. Use of lands according to their quality: The use of the Land Quality approaches/concepts and Classifications recently developed as the main instruments in the management of land.
- ii. Protection of the vegetation cover: Cereal cropping with stubble, rotational cropping, protection of THE natural habitations, and the use of erosion-resistant species (Figure 25).
- iii. Cultural measures: Contour line cropping, striped cropping, appropriate plowing techniques and mechanization.
- iv. Physical measures: Terracing, and weeded- water lines.

Prevention of the inappropriate use of natural habitats. However concessions could be made for the alternative uses of parts of these areas, with the exception to provide some income generating tools for the locals, who have already settled in the especially significant areas by regarding the musts of sustainability, and the concepts of conservation management.



**Figure 25.** An area which was a seriously eroded area improved by plantation of tree/bush

### **B) Measures against Wind Erosion**

Wind erosion is common in the plains of the arid and semi-arid climatic regions of Central (Konya, Karapınar - Taspınar; Kayseri- Yesilhisar–İncesu etc.), and Eastern Anatolia (Iğdir – Aralık), as well as the Blacksea and Mediterranean coasts.

Wind erosion occurs most of the time on the bare lands without vegetation, when the velocity of the wind is more than 7200 m/h, mainly in the spring and summer months due to the sparse plant cover on the overgrazed rangelands and on the over-cultivated/tilled soils for weed control.

Thus to prevent wind erosion there are primarily three methods as in the following:

- a) Measures to decrease the wind velocity on the soil surface,
- b) Measures to restore soil characteristics in order to increase water retention in the profile,
- c) Protection and rehabilitation of the vegetation.

### **7.3. Measures Related to Use of Water Resources**

**Current Situation:** The precipitation regime of Turkey differs according to seasons and regions. The average annual precipitation rate in Turkey is 646 mm, which means the fall of an average of 501 billion m<sup>3</sup> water on the lands of the country, where 274 billion m<sup>3</sup> of this water returns to the atmosphere via evaporation from the soil and water surfaces as well as the transpiration of the vegetation, 69 billion m<sup>3</sup> of this water would be leached to the ground waters, and 158 billion m<sup>3</sup> would flow to the seas and lakes by rivers. Some 28 billion m<sup>3</sup> water out of 69 which is supporting the underground water would return to the aboveground water.

Moreover, 7 billion m<sup>3</sup> of water enters Turkey from the neighboring countries. So, the water potential of Turkey is 193 billion m<sup>3</sup> in total. If 41 billion m<sup>3</sup> additional losses are taken into account, then the renewable water potential of Turkey makes up to 234 billion m<sup>3</sup> in total.

Aboveground Water	Annual Average Precipitation (mm)	Water Quantity (billion m <sup>3</sup> /year)	Gross Water Potential (m <sup>3</sup> /year)	Technical and Economical Consumable Potential (billion m <sup>3</sup> /year)
Domestic	646	501	186	95
Abroad			7	3
Sub-total			193	98
Underground Water			41	12
Total			234	110

Technical and economical consumable above-and-underground water quantity is determined to be 110 billion m<sup>3</sup>. 95 million m<sup>3</sup> out of this water is from domestic rivers, 3 million m<sup>3</sup> is from abroad; and 12 billion m<sup>3</sup> is from underground water.

The present average amount of water use per person is 1642 m<sup>3</sup>/year in Turkey, which is less than the world average. Turkey is unfortunately, not a water-rich country compared to other countries with sufficient water resources.

Water Potential per Person in some selected countries and Continents:

Country	Amount of water use per person (m <sup>3</sup> /year)
Turkey	1.642
Average in Asia	3.000
Average in Western Europe	5.000
Average in Africa	7.000
Average in South America	23.000
World Average	7.600

Turkey has 26 watersheds and the annual total water flowing from these watersheds is 186 billion m<sup>3</sup>. Although watershed efficiencies differ from one another, the Euphrates and Tigris constitute 28.5% of the country potential.

According to the State Statistical Institute data, the population of Turkey will be 90 million in 2025 and 94 million in 2030. In this case, in 2025 the water use quantity per person will be 1200 m<sup>3</sup>/year. Population growth and change of water consumption habits would most probably exert pressure on water resources. Moreover, these predictions will only be valid in case all resources

will not be degraded in 25 years. Therefore, Turkey has to protect her natural resources and use them very efficiently to leave clean and sufficient water to the next generations.

The total land area of Turkey is 78.3 billion ha and 28.1 million ha of this is used for agriculture. The areas to be irrigated with the current water potential are 8.5 million ha. And 2.7 million ha out of this is irrigated land constructed by the DSI. Moreover, the GDRS and the local people irrigate land of about 2 million ha.

The areas to be irrigated in Turkey as follow:

Water resource	Potential of soil resources	
	Million hectare	%
Aboveground	7,9	93
Underground	0.6	7
<b>Total</b>		<b>100</b>

## Measures

### A) Protection of Soil Water against Drought

Water, kept in the soil profile from precipitation and irrigation, is the amount of the available water harvested for plant use.

### B) Use and Protection of Water Resources

The excess use of the underground water for agricultural practices, the pollution caused by the industry and agriculture via waste water and pesticides, the construction of the improper drainage facilities for gaining arable land and eradication of malaria in the wetlands, and the improper use of water for exotic high water demanding crops. would cause the reduction of the water resources. Ultimately the loss of the habitats and bio-diversity lead to the degradation of soil leading to climate changes and desertification. In order to protect water resources and use them rationally sustainable water **management programmes together with the sustainable land use programmes should be developed.** Moreover, effective legislations with strong sanctions are necessary to support water resources development and rational use.

Protection of water resources is possible only by the cooperation of different vocational disciplines, managers and people. Therefore, training and creating awareness is an important component of protection.

Wetlands are highly important natural ecosystems with their unique plant and animal species needing protection with detailed planning, management and methodologies. These areas have been subject to abuse by being improperly accessible to the public for decades. Wetlands have different meanings for different sectors by yielding different products. Wetlands are seen as mono-product systems by some sector. However, governments can integrate and coordinate natural resources management and solve this problem, so that the integrated potential of the wetland ecosystems can be used in an environmental friendly manner.

#### **7.4. Measures Related to Pasture and Rangeland Management**

##### **Current Situation**

Grass and rangelands are one of our main natural resources together with animal production and have an active role to protect nature.

In Turkey, livestock production mainly depends on rangelands, which are widely threatened by overgrazing. For example, while in 1935 rangelands were 44 million ha, today they only cover an area of 21.5 million ha of I, II, III, and IV class lands, which in fact prime agricultural lands are recently decreasing by 15%. Population growth and mechanization practices are the main reasons of converting rangelands as arable lands, which are located in Eastern (41%) and Central Anatolia (28%).



**Figure 26.** Traditional summer rangeland practices on the upland meadows in Turkey

Grass and rangelands in the Aegean and the Mediterranean Regions are in better condition compared with the ones in Central Anatolia in terms of climate and soil conditions. Large cattle breeding units are established on 0.47 ha grass-rangelands in the Aegean and on 0.46 ha grass-rangelands in the Mediterranean, where 20-30% of the natural rangelands in the Aegean and

Mediterranean Regions are covered with natural vegetation, whereas 70% of the land is either bare or occupied by improper use.

In Turkey;

- Rangelands are public property in general,
- Rangelands are in common use of the villages,
- Free herding is common,
- Over-, irregular-, inappropriate grazing is common in rangelands.
- Fodder production is not well programmed.
- Lands are not used according to their capacity. VI and VII class lands are used as agricultural areas instead of rangelands except the areas used as forests. Controversially, the I, II, III and IV class lands are used as rangelands, though they are ideal for agricultural use.

Because of all these reasons water and soil issues in the rangelands become a problem in need of urgent solutions. According to some measures the annual average soil loss in Turkey is around 500 million tones. This rates erosion as the most prominent problem, which effects 59.5% of the rangelands, and is 12.8 million ha out of the 21.5 million ha.

### **Measures**

In order to use rangelands appropriately, it is necessary to take some measures namely as, (i) developing managing programmes and (ii) Taking cultural and technical measures to improve their degraded quality.

Unfortunately, the present regulations of rangeland management are not properly implemented in Turkey today. Factors such as over, early and uncontrolled grazing, together with drought and cold along with the density of weed distribution are increasing the degradation of the natural status of the grasslands.

The primary action to be undertaken in the mitigation of the degradation of the grasslands should be the establishment of a national “**Herbarium**”, without overlooking some regional ones already established. The Rehabilitation of the rangeland composition would only be possible by the use of the information to be obtained from the national Herbarium. As a primary initiative the “**Guideline for the Grass-Rangeland Vegetation of Turkey**” is already prepared by the Rural

Services Investigation Institutions on soil and water protection. Through this work, rangeland vegetation to be used against erosion has been determined in a country level.

In order to protect natural rangeland areas against overgrazing the following measures have to be considered:

- determining the appropriate number of animals for different pastures in relation to their rangeland capacity,
- grazing in relation to seasons and seasonal duration,
- providing uniform distributions of the animals in the rangelands and,
- selecting the appropriate animals in relation to rangelands.

**The cultural and technical measures**, to be taken in the rangelands to decrease soil degradation and increase productivity in the rangelands, are; manuring/fertilizing, vaccination of the animals, taking soil and water protection measures such as, terracing, steep furrowing, and constructing ditches, combating weeds and, constructing animal ponds for drinking water.

Implementation of “Rangeland Management Rules” together with “Cultural and Technical Measures” is effective in rangeland rehabilitation.

### **7.5. Measures Related to the Management of Forests and Other Natural Resources**

#### **Current Situation:**

The Forestry Law has been in force since 1937 in the country. The main principle of the Law is the conservation and the sustainable use of the forest areas. The protection of the existing forests, the support to be provided to the social and economical development of forest villages, the increasing contribution of forests to the national economy, and establishing new forests in the potential forest areas are some of the latest improvements related to forests in Turkey.

According to the data obtained for 2004, the total forest area in Turkey is 21.2 million ha and 27.2% of the total land area. However, 49% of this represents the degraded forests that do not provide timber revenues. Degradation of the vegetation due to natural reasons as well as the human impact is the major factors, which accelerate desertification.

Almost all forest areas in Turkey are managed according to the available management plans. All sectors/all actors of land-based use aim to increase the number of “protected areas” for the sake of biodiversity, endemism, and scientific research. These protected areas have different names and statuses such as the national parks, the natural parks, the natural monuments, and recreation areas.



The state owns the property rights of almost all of the forest areas (99%) in Turkey. Expert teams of the General Directorate of Forests determine the borders of the forest areas and their cadastre. Despite the legal and institutional measures, the lack and incomplete cadastre of some areas in the forests causes conflicts between citizens and the institutions, and accelerates the destruction of the forests due to misuse.

There has lately been great pressure on the green areas around cities due to migration from the rural areas to the urban, along with unplanned tourism. Unluckily, an area of 473.000 ha has become a non-forest residential land by some legal amendments that has led to deforestation followed by desertification.

Afforestation and prevention of erosion is the main task of the forestry sector allocating vast amounts of resources since the 1950s to this effort.

There are around 7.5 million forest villagers living in 20.293 forest villages in the country with their incomes bound to agriculture, livestock and forestry, which are oriented towards the management-use-benefit relationship by the Ministry of Environment and Forestry for generating tools for a better income.

## **Measures**

Forest resources and areas should be managed with the aim of sustainability in order to sustain social, economical, cultural and psychological needs of the next generations. The demands of the society from forestry can be summarized as in the following; wood and wood products, water, food, fodder, medicine, fuel, shelter, employment, recreation, landscape diversity, carbon reserves etc. In order to sustain the multi-value of the forests, all kinds of external impacts, such as fire, varmint, diseases and misuse, should be eliminated and a sustainable protective-use balance should be provided. Legal subsidies on forest products should be decreased or abolished so that incomes can return to the forests.

The Turkish National Forestry Programme has been completed in 2004. In order to accomplish the objectives of forestry determined in this program, all measures should be taken for all processes from planning to monitor. In this sense, the participation and cooperation of the sectors should be strongly developed.

The protection of the forests depends on, first of all, delineation of the borders, marking them on the fields and documenting them legally. Completion of forest cadastre is necessary for safety of forest areas in the future and sustainability of forestry activities. For this reason, working with qualified personnel and new technology in the Cadastre Commissions is unavoidable.

Laws related to forestry should be reviewed by considering realities of the country and the region and the developments in the world. New arrangements should be made, to mitigate the current degradation of the forest areas.

In the areas for afforestation or soil conservation, all kinds of conflicts should be solved with the local people.

National awareness and sensitivity to protect forests should be created through training and campaigns. Ownership problems should be solved by completion of the forest cadastres, particularly, in the areas sensitive to forest fires.

Local communities, industry and labor force, non-governmental organizations, forest villagers and women as individuals should be encouraged to participate in planning, implementation and development of national forestry policies.

Blasted forest areas should be afforested by using suitable technologies immediately, and institutional, technical and administrative capacity should be improved for this purpose.

Improving conditions of forest villagers through several rural development projects, along with income rising initiatives by trade of forest products in addition to employment, providing additional incomes to villagers through protection of afforestation areas by village legal entities, breeding harmless goat species, controlled grazing in forest lands; would prevent the transformation of forest areas into agricultural areas.



**Figure 27.** A general view of reforestation practices being implemented in a formerly deforested area

There should be legal amendments on keeping forest areas as forests and limiting settling areas within the forest boundaries. Rural development should be sustained and tourism development plans should be developed in order to remove pressure on forests.

The main strategy in forest management is managing forests to raise incomes of the local people and encouraging people to maintain these resources.

## **7.6. Measures Related to Fauna**

**Current Situation:** As a result of the increase of population and development of the industry in the world, natural resources are degraded. Especially, the misuse of nature and disability to protect nature lead to extinction some the fauna species. As it is well known, all living things are in need of each other with the others in their ecosystem. The extinction of these species or their decreasing population would degrade soil structure and lead to desertification. Some important national and international legislation to rehabilitate and protect fauna in order to avoid the degradation of natural cycles are given below:

### **National Legislation:**

- Hunting Law 4915
- Fishery Products Law 1380
- National Parks Law 2873

### **International Legislation:**

- Bern Convention (European Convention on Protection of Wildlife)
- CITES Convention (Convention on International Trade in Endangered Species of Wild Flora and Fauna)
- Bucharest Convention (Convention on Protecting Blacksea against Pollution)
- Biological Diversity Convention
- Barcelona Convention (Convention on Protected Areas in the Mediterranean and Biological Diversity).

Turkey owns 120 viviparous species out of 150 living in Europe. 92 fresh water fish species and 363 sea fish species are living currently in Turkey. Almost all of the frog and reptile species and around 454 bird species are present in Turkey today.

## Measures

In the framework of combating desertification, determination of the existing fauna, monitoring of the fauna in order to eradicate dangers, and the sustainable use of other resources is of prior importance.

Although Turkey has a big potential in terms of biodiversity, the lack of the inventories related to these values, insufficient national research, and lack of technical and scientific cooperation to protect diversity, environmental problems arising from industry, domicile, agriculture, tourism and transportation, and negative impacts of all these problems on the living nature cause desertification. Therefore, the cooperation between related institutions and civil society organizations is important to assume obligations in the national and international conventions. Legal arrangements should be undertaken and monitored according to scientific evaluations, and active participation of the local administrations should be provided.

### 7.7. Measures on Management of Soil Resources

**Current Situation:** There are numerous soil types in Turkey representing almost all of the different soil types in the world. Therefore, agricultural products have different productivity levels and qualities.

The reasons of limitations on the productivity levels of the soils and on modern agricultural practices are as follows: Degraded and steep lands, shortage of organic matter and nitrogen, shortage of useful phosphorus and microelements, sensitive soils against erosion, drought, salinity, wetness and drainage, low level of hydraulic permeability, high amounts of clay contents, compacted and massive layers preventing root development, high amounts of carbonate contents, and low biological activity.

The lack of the implementation of the available land use maps, some of which are in a reconnaissance level and some detailed (the south east Anatolian irrigation project area and the previous state farm soil maps), and their interpretations to be undertaken to incorporate in to land management programmes along with the preparation of the detailed soil maps of the other basins with economical significance, is the prime task to undertake and accomplish for Turkey. The demand and supply of soil and water resources should be examined in terms of quantity and quality; conditions of sustainable agriculture should be investigated; and National State Policies should be determined in accordance with Land Use Planning and Agricultural Production Planning.

The initiative to prepare the “Improved Soil Map of Turkey” (1:100.000) was started in 1966 and completed in 1971 by the former Directorate General of TOPRAKSU. The Great Soil Groups with high categorical classification levels were determined in the reports and the improved Maps (1:250000) covering 26 large scale Micro catchments were accomplished. However, the accuracy level of these maps is around 75%. These maps are made up in order to recognize lands for intensive use and settlement and determine their general potential. They are not suitable as resources for general and special planning studies.

The total land area of Turkey is 77.899.700 ha, where 36% of this is cultivated agricultural lands, 27.6% is grassland and rangelands, 29.8% is forests and scrubs and 6.5% is settling areas, non-productive areas and water surfaces.

The land use capability classes and sub-classes are available in the improved Turkish Soil Maps. In this technical report, information on the agricultural lands suitable for cultivation, the limited agricultural lands and the unsuitable lands for cultivation is available. .

The I. class land use capability agricultural lands are fertile soils, without restrictions in use and cover an area of 5.085.000 ha (6.5% of the total). The II. class land use capability agricultural lands, which also comprise the prime soils, cover an area of 6.773.000 ha (8.7% of the total). The III. class land use capability agricultural lands are in need of moderate measures for cultivation and cover an area of 7.283.000 ha (9.3% of the total). The IV. class land use capability agricultural lands are has limited uses and covers an area of 7.425.000 ha (9.5% of the total).

The soils of I., II. and III. class land use capability classes have to be allocated to agriculture apart from some exceptional cases. They cover an area of 19.141.000 ha, which is 24.5% of the total.

The potential arable land suitable to agriculture covers an area of 26.566.000 ha, which is 34% of the total. Although the total area to be used for agriculture in Turkey is 28.1 million ha, the arable lands cover an area of 26.6 million ha. However, the former includes both the absolute and potential agricultural areas.

The total distribution of the agricultural soils is not a large part of the total area as assumed. Sum of the absolute agricultural lands and potential agricultural lands constitute one third of the total area.

Grass and, rangelands, forest and shrub areas belong to the V., VI. and VII. Land use capability classes and cover an area of 46.790.000 ha (59.9% of the total). The VIII. class areas are to be allocated to wild life and wetlands, and cover 5.8% of the total area.

The major problem effecting productivity of soil is erosion. In Turkey, the total area that is not affected from erosion is just 5.1 million ha and 6.5% of the total land.

73% of the cultivated agricultural lands, which cover an area of 20.486.000 ha area, are prone to erosion problems. 68.1% of the potential agricultural lands, an area of 18.097.000 ha area, has erosion problems. Erosion affects 86.5% of the lands throughout the country.

Problematic agricultural lands, that have erosion and insufficient soil productivity problems, cover an area of 23.228.000 ha and 82.8% of the total area. Erosion is a problem on the cultivated agricultural lands, which is 73% of the total. However, erosion is a problem on the potential agricultural lands as well at a ratio of 68.1%.

As a result of the misuse of lands, the erosion on the cultivated areas covers 6.176.000 ha and 22% of the whole agricultural area of the country.

There is 640.000 ha grassland area in Turkey. 385.000 ha out of this area is the available part to be cultivated as agricultural land. 592.000 ha of grassland area have some different problems. 2.587.000 ha rangeland is the available part to be processed as agricultural lands. The lack of land use plans and insufficient legislation on the issue are the reasons of the misuse. 20.764.000 ha rangelands have soil based problems due to the misuse contrasting their land use capability classes.

## **Measures**

According to the land use capability classes, only 51.370.000 ha land out of total area (65.9%) are used properly, and 25.371.000 ha land out of total area (32.6%) are misused. The misused area within absolute and potential agricultural lands is an area of 4.787.000.

Measures to protect soil resources, which will be considered in the National State Policies, are summarized as in the following:

- Current laws, regulations, decrees, notifications should be reviewed and laws should be made clearer to prevent confusion.
- Commissions for Land Use and Layout Planning under the coordination committee of governorship should be established immediately in each province and find solutions to the related problems. This coordination committee should audit and direct city plans; city environment and satellite town plans; tourism layout plans; highways; small, middle and big scaled organized industry region plans; open mining layout plans; soil industry and raw material area plans. The Ministries of Agriculture and Rural Affairs, Industry and Trade, Public Works and Settlement,

Environment and Forestry and the General Directorate of State Hydraulic Works, Local Administrations, related University, Chambers of Industry and Trade, representatives from related trade associations, should take part in this commission. The Commission will be able to minimize the mistakes on the planning stage of settling areas through coordination of different disciplines and scientific tools.

- VI – VIII land use capability classes should take priority and allocated for the industry, soil resources industry, open mining, urbanization and tourism settlement areas and should be empowered through legislations. In the Environmental Impact Evaluation Reports, only agricultural lands in the IV land use capability class should be able to get permission for some very special cases.

- I, II, and III. land use capability classes in the dry areas and I, II, III and IV irrigated agricultural land capability classes will not be able to get permission except military purposes and State Airports.

Preparation of the Detailed Soil Maps, **Land Use Planning** and **Sustainable Land Management Programmes** should be initiated urgently.

In order to evaluate agricultural inputs and production resources, and investigate our agricultural soils in an integrated manner, Centers for Basic Research and Development should be established.

To establish Land Use and Agricultural Operation Production Plans, more effective works should be conducted on soil work and land use research. Land Use Plans and Agricultural Operation Production Plans can be made up through the institutional approach and Agricultural Production Planning should be made up through scientific designing.

The population of Turkey will be doubled in 35-40 years. This proves the significance of agricultural production planning because of need of food. It is essential to restructure 25.371.000 ha land via Land Use Planning.

### **7.8. Socio-economic Measures**

The intense rainfall of may 20-21 1998 in the Western Blacksea Region caused the occurrence of violent landslides, which compelled Turkey to implement the Urgent Rehabilitation of Flood and Earthquake project (TEFER-Turkish acronym) of Turkey by the support of the World Bank. In the framework of the TEFER project, rehabilitation of the watercourses in the region has been achieved, and works on the estimation of landslides with 72 hour notices have been initiated.

A contemporary example to the socio-economic measures for sustainable land use is the MEDCOASTLAND Project carried out with the support of the European Community, which aims to provide the participation of farmers and civil society organizations, and ultimately develop initiatives to raise the incomes of the local communities. The project includes the majority of the countries of the Mediterranean Catchment area. Similar kinds of projects are being implemented by the European Community and other international institutions, especially in the regions where the Mediterranean Ecosystem is dominant.

## **8. METHODS, TOOLS AND CRITERIA TO PREVENT DESERTIFICATION AND REDUCE ITS EFFECTS**

### **8.1. Determination and Mapping of Risky Areas**

#### **8.1. Determination and Mapping of Risky Areas**

Thematic maps of land degradation show the general situation of the soils in Turkey. Mapping is important in terms of determining the change of the soil, indicating problems related to desertification, land planning, and implementation of projects which aim the appropriate use of the soil resources. Mapping of some problematic areas, such as aridity, drainage, erosion etc., would make it possible to determine the measures and priorities in the mitigation of desertification.

**Current Erosion Risk:** Erosion risk related to land use and vegetation.

**Potential Erosion:** Sensitivity of soils against water erosion without considering land use or vegetation.

**Stable Areas:** Areas that are not affected from erosion. They consist of a well-developed top soil and soil structure and do not attain any risks of erosion. Generally, they are not used by people or are used properly. In these areas, the existing vegetation and/or topographic and soil conditions are suitable to prevent erosion.

**Non-stable Areas:** Areas that are affected from erosion.

**Erosion Tendency:** Predictable tendency to erosion, depending on the magnitude and expansion.

**Pedologic Mapping:** Maps regarding the main rocks together with the soils.

#### **Completed Mapping Works**

Prof. Dr. Kerim Ö.Caglar and his collaborators accomplished the first “Soil Survey Map” for Turkey in 1943. The second soil survey map was prepared by the American soils expert Harvey Oakes and his Turkish collaborators in 1954. Ultimately the, “**Soils of Turkey**” and “**The**



**General Soil Map of Turkey**” was published based on the relations between soil-water, vegetation, and the parent rocks at a scale of 1:800.000. Later in 1955, in Adana, the basic soil mapping studies were started and soil classifications through air photographs (1:10.000) have been accomplished.

**The studies on the preparation of the “Enhanced Soil Map of Turkey”** were started in 1966 at a scale of 1:25.000 and completed after 5 years work, which was based on the American Soil Classification System. In the following years the **“Provincial Soil Resource Inventory Reports and Maps”** were prepared and published, which involved provincial soil entities, soil problems, types of soil use ways and soil classes and the necessary changes of the 26 basic catchment areas at a scale of 1:200.000 and 67 provinces each at 1:100.000 scale.

As a result of all these detailed works, **“The Erosion Map of Turkey”** was prepared at a scale of 1:100.000 in 1981.

**The “Soil Management Map of Turkey”** was prepared in 1987 at a scale of 1:100.000.

Precipitation diagrams of 60 meteorology stations from 1957 to 1982 were analyzed and the **“R Precipitation Erosion Index”** was determined along with the **“Isoerodent Maps”**, which indicated the **“Erosive Potentials”** of variable precipitation levels. Significant hydrologic data was obtained through this work, to lead investment projects on the enhancement of soil and water resources, and determine measures on soil conservation works.

## **8.2 Determination of Implementing Institutions; The National Action Planning Committee (NAPC) and Institutional Measures to Implement Action Plans**

The implementation of the SLM programmes in the selected areas should be the major task of the functional National Coordination Committee to be established under the leadership of the Focal Point, and the National Action Planning Committee. The responsible body for the preparation and implementation of the SLM programmes should function through the network mentioned above and by establishing the cooperation with the regional state institutions and civil society organizations. The SLM approach and socio-economic organization models are established through national and international projects in the areas where the Mediterranean Eco-system is dominant. Similar SLM programmes related to the other eco-regions of the country will be undertaken in the second stage of the implementation of the National Desertification Action Programme. The inclusion of the part related to implementation in to the Country Development Plan, and into the National and Social Development Plan of the National Action Programme, is the must in reaching the target of the National Action Programme of Desertification.

### **(i) Land Use Planning**

- Land Use Principles and Measures: Using parametric measures and SLM ecosystem management approach, supported by the European Union, instead of currently used Land Use Capability.
- CORINE 2000 Land Cover/Use maps should be updated periodically and changes in land use should be observed.
- Land use policies should be applicable.
- Legislation on water use, soil and rangeland should be made and/or enriched.

### **(ii) The Legal Status of Land Use and Soil/Natural Resources Protection in Turkey**

Numerous laws and regulations were issued since the establishment of the Turkish Republic in the constitution and separately, for preventing misuse of land. However, the problem of degradation is still pending as the main shortcoming for the progress of the country, despite the initial applications for prevention of misuse and obtaining data for the development of local criteria, especially in combating erosion and unplanned urbanization.

Soil degradation is the process of the loss of soil quantity and quality, both from the perspective of productive capability and as a resource capable in its own right of sustaining diverse activities. The process is complex and it is convenient to divide soil degradation into two main types as the erosion and actual removal by water and wind and the loss of fertility arising from chemical, biological or physical changes (UNEP/FAO, 1983). Human activities have radically reshaped world's natural land cover. The often indiscriminate destruction of forests and woodlands, overgrazing of vegetation by increasing livestock populations and the improper management of agricultural land have all resulted in the degradation of extensive land areas.

Over the last 5 decades social, economic, agricultural and technological systems have dramatically changed, whereas less obvious are the significant changes in natural and physical systems which are mainly due to human interference. Factors affecting agricultural sustainability may be of a bio-physical, social, economic, technical, institutional or cultural nature. The comprehensive concepts of soil degradation and desertification reflect the combined but variable influence of natural and human factors on agricultural sustainability.

Desertification leads to a decrease in the biological productivity and, consequently reduction in plant biomass. In general, desertification refers to the reduced productivity of desirable plants, alterations in the biomass and diversity of the macro and micro flora and fauna, and accelerated

soil deterioration with increased hazards for human occupancy. In such conditions, agriculture becomes an unsustainable, risk activity. Soil degradation is the result of one or more processes which decrease the current and/or potential capability of soil to produce goods and services. Biological degradation is the reduction and degradation of vegetation, humus and living soil organisms. Soil degradation and erosion generates economic and environmental impacts. Reduced crop yields, increased needs for agricultural inputs, intensified uses of remaining land and expansion on to marginal land, reductions in the value of land and even loss of land because of the absence of the vegetative cover, are some consequences of soil degradation. The cost of erosion generated damage beyond the eroded areas may be 50 or more times greater than those places where erosion actually occurs (UNEP, 1992). Of all human activities, agricultural production has had the greatest impact on soil degradation. Excessive human pressure can destroy soils in a few years or decades, and the destruction is often irreversible. The pressure to expand the area under farming has resulted in more and more utilization of marginal land, most often with various detrimental consequences. Especially in developing countries, overgrazing and over-cultivation on steep hillsides has led to serious soil erosion. Agricultural areas suffer the consequences of increasing transportation, industrial development and housing. Table 2 shows the recent global assessment of soil degradation estimates (ISRIC, 1990).

Land degradation diminishes the ability of affected countries to produce food and consequently entail the reduction of regional and global production potential. They also cause food deficits at regions with impacts on world food reserves and food trade. Preventing land degradation is certainly much more efficient and economical than reclaiming degraded land. The latter becomes more difficult and costly with the advanced degree of degradation.

Processes and causes of land degradation and the Percentage of the land being affected

Water erosion	55.7 %		Deforestation	29.5%
Wind erosion	28.0 %		Agric. Activities	28.1%
Chemical degradation	12.1 %		Over-exploitation	7.0%
Physical degradation	4.2 %		Bio-industrial act	1.2%
Overgrazing	34.5%			

Conservation of over exploited agricultural resources is one of the most urgent tasks to be undertaken, as cultivation extends to marginal areas in many parts of the world. The land use in planning agriculture and forestry should be based on the scientific assessment of soil capacity and management of the top soil. Criteria for this are specified below as categories of arable land,

**Enhancement areas**, capable of sustaining intensive cropping for higher population and consumption levels, **Prevention and Restoration areas**, stripped of vegetative cover which has totally or partly lost its productivity.

Agricultural production, can only be sustained on a long term basis, if the land, water and forests, are not already degraded. Thus, the essence of land use should depend on the criteria mentioned above. Land is the basis of national sovereignty, and a primary factor in production of food and fiber. Its use is the determinant of the quality of life for the present and future generations. Proper land use is fundamental for achieving the political, social and economic goals of a society. Land provides food and fiber together with unrenovable materials such as minerals, and fuels, and is an essential element in the control of pollution and the maintenance of productive ecosystems. Consequently, the way in which land is used will shape the way in which a society functions.

There are limitations for high quality land devoted for production, thus imposing the need for a rational use in order to use the land wisely and obtain maximum sustained benefits in the country. Current societal land issues, enhanced by the loss of high quality land, includes, residential and industrial infrastructure, access for mineral exploration and development, settlement of claims on land ownerships and preservation of sites with recreational, historical, cultural, and aesthetic importance. These imperative needs, leading to the increased demands for such land, should lead policy makers to rationally consider the future as well as the present land use.

### (iii) **Financial Resources**

The most important subject to actualize the action is financing. Possible financial resources are as in the following:

- a. State contribution
- b. United Nation Environment Programme, World Bank and European Union,
- c. Contributions of Civil Society Organizations
- d. Private contributions

### (iv) **International Cooperation**

After signing The United Nations Convention to Combat Desertification in 1998, Turkey has tried to participate in international and regional works. Turkey is in the Appendix 4 of the Convention, namely North Mediterranean Regional Implementation Appendix. International cooperation of Turkey with the Convention has been regulated in accordance with this appendix. Turkey has been participating into projects MEDRAP, MEDCOASTLAND and CLEMDES with other

Mediterranean countries, Greece, Italy, Portugal, and Spain etc. Through this cooperation, Turkey enhances its national capacity, network, and experience of related institutions on the convention and desertification.

Participation to the meetings such as particularly Conferences of Parties (COP), Committee for Revision of Implementation of the Convention (CRIC), Regional Action Programme (RAP), and Sub-Regional Action Programme (SRAP) is important in terms of benefiting and exchange of experiences. Moreover, participation of all related national institutions, universities, civil society organizations and interested experts should be promoted.

An active follow up program is necessary for improving cooperation by means of bilateral, regional and global conventions and for harmonizing implementation in Turkey with new techniques and new approaches.

In order to benefit from these mechanisms effectively, it is necessary to establish coordination and cooperation between national institutions. At the same time, partnerships with countries from European Union, Central Asia and Mediterranean should be encouraged. Especially, projects with the financial support of European Union and other sources should be identified to increase knowledge and capacity of the institutions.

#### **(v) Role and relations of the Unions and public bodies**

Municipalities and Governorates are individually trying to establish environmental management plans, following their empowerment by the acceptance of the local Administration Act in the parliament. Unfortunately management plans are tendered to private companies, which hire consultants of different backgrounds, whose expertise is not based on the concepts and approaches employed for the establishment of the NAP-D and the Law of Soil Protection and Land Use. This establishes the need for local and institutional capacity building at different implementation levels. In addition, attempts are underway to develop the national coordination bodies as well as the local ones on land/environmental issues to implement the NAP-D in the country. The MEF is already empowered to monitor and approve the management programs to be developed by the local authorities under the supervision of the NCB.

Finally, such an effort should not be viewed as a one-time assistance. Monitoring of both the socioeconomic and land resource base must commence before the onset of the activity, and continue even after the system is in place. Land degradation and desertification is nefarious in the sense that it can take many forms. Correcting the present set of processes may not nullify the problem but may spawn a whole series of other processes. Hence, the effort must also be viewed

as a learning process for the long term sustainability of the systems.

#### **(vi) Monitoring and Establishing of Early Warning Systems**

Index models should be developed with the leadership of several sciences such as Climatology, Meteorology, Agricultural and Forestry Engineering. Those efforts should be supported by high technological facilities. For instance, the **P/Pet index** is an important parameter on the **evaluation** the land conditions. The approach used to calculate the Pet values concerns the use of the changing conditions of Climate and geomorphology as well as the annual precipitation averages. In addition to this method, some other microclimatic methods can be used.

Establishing the early warning systems is also an important tool on mitigation of the negative effects of drought and desertification. Reduction in precipitation or precipitation less than normal when there is need for water is defined as drought, and causes important hydrological imbalance and degradation of the natural productivity of the land. Furthermore, there are some other definitions related to drought according to its duration.

Uncertainty on the beginning and the end of the event, the cumulative increase, and the high economical dimension is the difference of drought different than the other natural disasters. Drought is defined as its frequency, its violence, its duration and its impact area within a region.

#### **(vii) Major National Intuitions and Their activities on Combating Desertification**

The following activities have been carried out through the responsibilities of the respective institutions in Turkey:

**-The Ministry of Environment and Forestry (MEF).** MEF's activities related to land management, drought and desertification cover the following subjects:

Protection and rehabilitation of the environment; usage of lands and natural resources effectively both in rural and urban areas; protection and improvement of the natural plant and animal entities and natural resources of the country; prevention of environmental pollution; protection and improving of forests, taking precautions to raise incomes of the forestry farmers; all types of meteorological activities. In particular, MEF is also responsible for the coordination of the national focal institutions of a number of international and regional conventions as well as developing the direct relations with the UNCCD, NAP and other desertification and land management issues over the country.



**Figure 28.** The protection and sustainable management of existing forested land as well as establishing of new forest areas are the main duties of MEF. The picture illustrates a successfully planted area nearby Istanbul



**Figure 29.** A successfully rehabilitated land by tree/scrub plantation in a hilly area where was a degraded area which is subject to loss of soil through potential erosion

MEF carries out its duties in accordance with the law responsible for the establishment of the Ministry. The Ministry has several general directorates and branches such as Afforestation and Erosion Control General Directorate, General Directorate of Forestry, General Directorate of State Meteorological Services, Nature Protection and National Parks General Directorate etc which are the core institutions responsible for land and natural resource management.

The MEF has also prepared the National Environment Strategy and Action Plan (NEAP) and National Forestry Programme (NFP) through the active participation of all related stakeholders.

- **The Ministry of Agriculture and Rural Affairs (MARA).** Mara's activities related to land management and desertification cover the following subjects: Allocating, planning, rehabilitation of grass and rangelands, and determining land use principles; Preparing projects on suitable fodder plants, weed and seed production; Working on the prevention of erosion in agricultural lands, preparing projects with related institutions and contributing to these projects; Establishing basic standards and criteria to classify and assess agricultural lands; Classifying, protecting, improving agricultural lands according to the determined standards and criteria, preparing land use plans for agriculture taking into account ecology, economics and the environment, in close cooperation with other related institutions; Harmonizing agricultural land use plans with the European Union agricultural land use plans; Proper use of agricultural lands; Determining agricultural lands and developing inventory; Supporting research on agriculture etc.

- **The Ministry of Energy and Natural Resources (MENR).** The following activities related to drought and desertification are carried out by the MENR: Undertaking survey, planning, and

preparing projects in order to improve catchments; Preparing feasibility and master plan reports for optimal economical and technical solutions in projects related to water resources in the catchments; Building dams and hydroelectric power plants; Building facilities for irrigation and drainage; Building structure against flooding; Working on the use, protection, survey and research of underground water; Research, survey and piloting projects on renewable energy resources (sun, wind, geothermal etc.); promoting public awareness and training on energy saving in the sectors; Working on the rational use of the energy resources.

- **Activities of Universities and Other Education Institutions.** Universities (Çukurova, Istanbul, Ankara, Ege, Dokuz Eylül, Middle East Technical, Istanbul Technical, Yıldız Technical, Blacksea Technical, Thrace, İzzet Baysal, Selçuk, Atatürk, and Yüzüncü Yıl) implement projects through their Forestry, Agriculture, Environment, Science, Engineering, Economic disciplines and departments, which include monitoring, definition and prevention of desertification and drought related studies.

- **Local Administrations and Civil Society Organizations.** Local administrations serve as public organs to manage and maintain the respective local resources in coordination with the national institutions. Local administrations in Turkey are Governorates, Municipalities, Metropolitan Municipalities, Special Provincial Administration, District (town) Administration and Village Administration. The members of the Provincial Municipal Councils and Councils of Elders, mayors and village headmen, are elected by local representatives.

Local Administrations have important responsibilities for delivering public services to the public, cooperating with central state administrative bodies in order to increase public welfare in all cases as well sustainable use of lands and other resources.

The Special Provincial Administration has the authority to make different regulations on areas such as soil protection, prevention of erosion, education, health, agriculture, industry and trade etc.

Most of the Civil Society Organizations are driven by volunteer members. However, there are some foundations with different statuses. One of them is the ‘cooperatives’. In particular, cooperatives and unions, organized in the areas of agriculture and forestry, should participate actively in the implementation and the monitoring of the Programme.

Some important civil society organizations are quiet active in soil protection, sustainable development, sustainability of forest and agricultural areas, protection of natural resources. They can contribute to the implementation, monitoring and evaluation of the UNCCD Action Programme. In combating desertification and conserving natural resources of the country, the following are the most active bodies: The Soil Science Society of Turkey, Chamber of Forestry



Engineers, Chamber of Agricultural Engineers, The Forestry Association of Turkey, Development Foundation of Turkey, Association of Natural Life Protection, TEMA, ÇEKÜL, Association of Environmental Protection and Research, ORKOOP.

The NAP of Turkey consists of 63 activities proposed, selected and approved as the core and the most important activities for the mid and long terms taking into consideration the capacity, duties and the responsibilities of the related institutions given by the respective legal statuses (Annex 1). These activities are dynamic and considered that should be updated in accordance with the achievements provided and/or being implemented in the years to come. Sustainability with the proactive participation of governmental, non-governmental and local administrations is the critical strategy for the success of the programme. The synergies built into this approach minimize discord in the social components of the process.

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Ankara- Kurtboğazi  
1985



Ankara- Kurtboğazi  
2006



Durusu-1965



Durusu-2006



Burdur-1960



Burdur-1985



Burdur-1999

**Annex 1. List of activities undertaken, foreseen arrangements to be undertaken by the relevant institutions in the specified periods within the scope of the National Action Plan for Combating Desertification.**

**POLITICAL AND LEGAL ARRANGEMENTS**

<b>Action No</b>	<b>Name of the action</b>	<b>Activities Undertaken &amp; Completed</b>	<b>Activities to be undertaken</b>	<b>Responsible Bodies*</b>	<b>Foreseen Period</b>
1	Integration of desertification combating programs to the country's development plans	The preparation of the National Action Plan for Combating Desertification is completed. Implementation of the plan is planned to be completed until about 2020.	I. Preparation of the Desertification Action Plan and Integration to Development Programs II. Integrate the NAP to responsible bodies' annual programs and monitoring the actions	National Coordination Unit of MEF, SPO, MARA, MPWS, MENR and CSOs	Continual
2	Adaptation to EU norms in the field of environmental protection, agriculture, forestry and pasture	Several activities are being undertaken in the field of environmental protection, agriculture, forestry and pasture in order to develop compatibility to EU norms	I. Pursuance of the EU Aquis II. Restructuring for the adaptation to the EU Aquis	EUSG, SPO, MPWS, and related public institutions	5 years or more
3	Enhancing and Expansion of Rural development Policies	Various rural development projects were undertaken and some are still going on.	I. Development and expansion of regional and basin scale planning policies II. Take necessary measures to ensure the participation of NGOs, locals and other related bodies to rural development plans III. Allocation of sufficient public resource, development of resource generating dynamics and establishment of rural development funds IV. Ensuring coordination among the institutions serving to rural areas V. Adoption of national rural development regulation and practices with those of the EU.	MEF, SPO, MARA CSOs, MPWS and LAs.	Continual
4	Development of Programs and Policies on Natural Resources Management	Various research projects were undertaken on fertilizer and pesticide use	I. Development of agricultural support policies for ensuring conservation of soil resources II. Development of national policies to minimize the hazards of the use of agricultural chemicals. III. Sustaining and enhancing development supporting programs on conservation of degradation of natural resources at forest and adjacent villages IV. Development of conservation techniques of natural species in integrated pest management V. Determination of agricultural, grazing, forestry, tourism, industry, settlement and natural life zones by land management planning VI. Preparation of directives for the prevention of non-industrial settlement at zones suitable to Industrial development	MEF, SPO, MARA, Farmers Unions, Fertilizer Manufacturers, MPWS, CSOs, MENR and MoH.	3-5 Years
5	Development of policies for the sustainable use and	Some ecosystems and special areas (National parks, wetlands,	I. Development of legal arrangements for the conservation of ecologically important sites II. The implementation, monitoring and auditing of the legislations	GNAT, MEF, UMA and MPWS	1-3 years

	conservation of wetlands, highlands, uplands and coastal areas	specific protection areas etc.) of Turkey have been taken under protection with the specific laws.			
6	Realization of the strategies, precautions and policies of the Turkish NESAP in-situ preservation of the Turkish Genetic diversity	NES, NEAP and National Plan on In-situ Conservation of Genetic Diversity are accomplished.	I. Development and implementation of programs relevant with the plans as soon as possible.	SPO, MARA, MEF and MPWS	5 years
7	Development of marine and lake ecosystem management policies	I. Prohibition of: a. inappropriate urbanization, b. waste water and solid matter discharge to the marine environment II. Restructuring environmental- friendly settlement plans on the coasts III. Management of marine and lake ecosystems in a way which is sustainable and encouraging ecotourism in these sites.		SPO, MARA, MEF, MoCT, LAs, MoEA, private enterprises, UACT, UMA and MPWS	3-5 years
8	Development of policies towards solid waste management which result in environmental problems	Environment Law was amended by the Turkish Parliament	I. Special importance should be given to minimizing waste and recycling. II. Establishment of 'Waste Commodity Exchange Markets' at national and regional levels. III. Establishment of 'Waste Management Units' with separate budget within the boundaries of metropolis cities.	UCCET, Las, MEF and GDPB	1-3 years
9	Increasing the efficiency of National Coordination Unit established for the coordination of combating desertification	Draft regulation on National Coordination Unit was prepared.	I. Issuing a regulation on working principles and procedures of National Coordination Unit established for ensuring implementation of the UNCCD at national level.	MEF, MARA, MoEA, MENR, CSOs, MPWS and UCCET	1 year
10	Expansion and supporting farmers organizations such as agricultural cooperatives etc.	I. Development and expansion of Agricultural Commodity Exchange Markets II. Making arrangements in order to increase effectiveness of farmer organization in marketing agricultural products and deciding agricultural policies.		MARA, Relevant institutions and MoIT	3-5 years
11	Taking necessary precautions in order to prevent environmental problems originates from the use of advance technology in agriculture		I. Taking necessary measures for ensuring development of environmentally sound technologies suitable for different ecological conditions of Turkey. II. Establishment of effective extension system which will enable transfer of developed technologies to the farmers.	MARA, MEF and Universities	3-5 years
12	Increasing the participation of those who will benefit from the development agricultural infrastructure services		I. Making legal arrangements which give maintenance and management responsibilities of agricultural infrastructure services to those who benefit from the agricultural investments II. Passing a law from the parliament which ensures that certain percent of the cost of agricultural services is met by the farmers	MARA, LAs and GNAT	1-3 years
13	Forming policies which are supportive to rural industry and develop and support agriculture-based industries	I. Supporting investments in rural areas II. Ensuring integration of agriculture and industry III. Establishment of efficient and cost-effective agricultural input-output markets and increasing cooperation and coordination with foreign countries in this field.		SPO, MARA, MoIT, Banks and TT	1-3 years

		IV. Ensuring domestic processing of agricultural products V. Preparation of plans which secure that input requirements of the agriculture and industry sectors are met domestically as much as possible VI. Encouraging development of small and medium scale industries in rural areas VII. Determination of pricing policies on the basis of production planning and for the main products (Cereal, sugar beet, milk etc.) or regional and monoculture products (Tea etc.) as well as for genetically important products (mohair etc) and integrating other products with export potential into this policy VIII. Substitution of new products and production methods by means of economic incentives.			
14	Passing the 'Land Use Law' and 'Soil Protection Law' from the parliament	1. Draft law has been prepared. 2. The regulation on Prevention of Soil Pollution was issued.	I. Making legal arrangements for prohibiting housing or other construction works on I, II and III class arable lands and irrigated arable lands and protecting these areas II. Amendment of the Article 11 of Law on Selling Treasury Lands (No 4070) in order to make possible use of V, VI and VII class lands for agricultural purposes III. Ensuring gradual implementation of this provision IV. Supporting farmers for implementation	MARA, LAs, GNAT, MPWS, MoIT, MENR, MEF and CSOs	1-3 years
15	Elimination of legal measures which causes decreases in forest areas and replacing them with new legal measures for ensuring sustainability of forests	Various articles of the Forest Law (No 6831) are being amended.	I. Amendment of Forest Law to halt 2/B practices II. Amendment of the Afforestation Regulation for increasing practicability of incentives for private afforestation III. Resolution of ownership conflicts in forest areas with the participation of forest villagers and by taking into consideration their demands IV. In order to reduce negative effects of air pollution on forests, amendment of the regulation on Protection of Air Quality in a way in which air quality standards are replaced by ecological quality standards	MEF, MARA and GNAT	1-3 years
16	Development of legal measures which sustain integrity and prohibit the fragmentation of arable lands.	The regulation on determining whether the size and resources of agricultural establishments are sufficient is in place and operational.	I. Restructuring regulations for securing the optimal farm sizes of the law of inheritance II. Optimization of the large and small farms by taxation, non-eligibility in revenues, provisions for infrastructure and crediting III. Heritage related provisions of the Civil Law will be amended in order to prevent unlimited fragmentation of agricultural lands.	MoJ, SPO, MARA, Universities, MoF and GNAT	3-5 years
17	Passing the 'Land Consolidation Law' from parliament	Land use planning is carried out for sites where land consolidation project is implemented.	I. Determination of settlement and industrial regions and allocation of appropriate land for social, cultural, and public building sites II. The preparation of the land use plans at the sites selected for land consolidation III. Expansion of land consolidation activities and encouraging participation of the private enterprise into these activities IV. Reconsideration of the technical basis of the land distribution regulations by the use of parametric soil evaluation criteria suitable to Turkey	MARA and MPWS	1 year
18	Providing technical support to association of farmers in accordance with the Farmer Unions Law	Farmers Union Law is in place and operational.	I. Ensuring association of farmer in each town on the basis of a product or product group II. Ensuring effectiveness of Central Unions of the town level farmer associations and supporting local and central level unions with technical programs.	MARA and MoIT	More than 3 years
19	Updating laws, by-laws and regulations relating to conservation and management of natural resources	Several law, by-law and regulation regarding protection and management of natural resources were put in force.	I. Ensuring update of laws, by-laws and regulations relating to conservation and management of natural resources II. Establishment of natural resources database and making legal arrangements needed for the access to information.	GNAT, MEF, MARA and MENR	1-3 years

20	Passing the 'Water Law' from parliament	Underground Water Law (No 167) is in place.	I. Allocation of water resources, sectoral and inter-sectoral water use planning II. Updating Underground Water Law (No 167) in accordance with changing needs and requirements III. Planning of the per capita drinking-use water amounts in the long term, taking into account development in the tourism and industry sectors IV. Planning inter-sectoral distribution of drinking and use waters V. Making reforms in water rights and laws and improvement of inter-sectoral water allocation process.	MENR, MoCT, MARA, Las and MEF	3-5 years
21	Amending the 'Mining Law' to ensure that exploiters of all type of mines shall prepare and implement exploited land rehabilitation programs after the exploitation of a mine	1. EIA is required for mining activities. 2. Mining Law was amended by the Turkish Parliament. 3. The regulation on the control of construction waste, debris and soil is in place.	I. Ensuring further degradation of lands degraded as a result of mining and quarry activities and reallocation of these lands to agricultural production, assuring land rehabilitation after exploitation of mine or quarry, strengthening the law and its enforcement.	GDMSE, GNAT, MEF, MARA and MENR	1-3 years
22	Amending organic laws of the State Hydraulic Works, MARA and MEF to enable them to work in an integrated manner at the watershed basin	I. Passing the ' Framework Agriculture Law' from the parliament, which introduces a holistic approach to agricultural issues II. Amending organic laws of the State Hydraulic Works, MARA and MEF for integrating such works into them and reviewing these laws in order to prevent overlapping and duplication of works.		MARA MEF and MENR	1-3 years
23	Development of a plan which aims at reduction of greenhouse gas emissions.	The Framework Convention on Climate Change has been ratified by the Turkish Parliament	I. Identification of contributor sectors II. Ensuring coordination among relevant institutions III. Development of strategies in order to implement policies defined and measures taken IV. Integration of global warning (greenhouse effects) and related issues into national education and training programs starting from primary school education V. Monitoring climate changes at national and regional levels, identifying variations and variables, works on climate forecasts based on models, impact assessment of climate change, identification of possible damages, adaptation works and policy analyses	MARA, MEF, MENR, MoCT, MoNE and SPO	Continual
24	Taking awareness raising and deterrent measures on environmental pollution and expanding these measures.	I. Preparation and implementation of regulations and circulars in the field of environmental pollution II. Taking measures which will ensure deterrence against environmental crimes III. Levying tax on pollution sources for soil rehabilitation IV. Enforcing those institutions who cause environmental pollution to employ environmental experts V. Monitoring the implementation of the regulation on Control of Soil Contamination VI. Taking measures which will ensure monitoring of and compliance with EU norms.		MoCT, MEF and GDPB	1-3 years
25	Government support to environmentally sound measures and practices of private sector and farmers	I. Identifying, awarding and making publicly known those farmers who follow environmentally sound practices II. Encouraging and supporting all investments (especially in alternative and renewable energy resources) which are environmentally preventive.		TT, MoCT, MEF and MENR	3-5 years
26	Facilitating activities of civil society organizations activating in the field of environmental issues.	Informal associations and forums of Local Agenda 21 are formed in several regions and several activities are conducted	I. Supporting soil conservation and land rehabilitation activities of professional organizations and CSOs II. Ensuring public access to environmental information, development and enhancement environmental crime concept, making operational ecologic police, and development of voluntary	MEF, MARA, CSOs, GDS and LAs	Continual



		in order to increase the public awareness on environmental issues.	environmental auditing concept and auto-control systems III. In deciding about public support to research activities, taking into account environmental costs and benefits of proposed researches.		
27	Ensuring fastidiously preparation, supervision and implementation of Environmental Impact Assessment (EIA) reports in accordance with the EIA Regulation	1. EIA has a widespread implementation. 2. EIA related legislation was amended in order to reduce the delays originating from EIA practices.	I. Encouraging establishment of professional private consulting companies that will take part in the preparation of EIA reports II. Requiring EIA for agricultural practices (Projects) III. Identification of agricultural lands in which environmentally sound traditional farming systems are in place and supporting maintenance of these farming systems IV. Taking necessary measures which will encourage the participation of local people, local administrations and CSOs into preparation and assessment process of EIA reports.	MEF, MARA, CSOs and relevant institutions	Continual
<b>NATURAL RESOURCE MANAGEMENT</b>					
28	Updating land capability classes criteria according to Turkey conditions	1. Preliminary land classification was done at Turkey level by using USA-SCS Land Capability Classes and maps of this classification were published. 2. Preliminary land use capability classes of pastures were identified.	I. Better adaptation of USA-SCS classification system into Turkey's conditions or development of peculiar system for Turkey II. Updating detailed soil surveys and land capability classification and establishment of Land Use Capability Units III. Resurveying uncultivable lands which are of VI and VII land use capability class and corresponding approximately to 6,3 million hectare area, determining the area than can not be cultivated and ensuring use these lands for pasture and forestry purposes IV. Making necessary arrangements in order to use these lands for pasture and forestry purposes V. Identification of proper pasture areas by means of soil surveys VI. Achieving classification of pasture lands in accordance with land use capability classes VII. Resurveying cultivable lands which are of I-IV land use capability class and corresponding to 4.8 million hectare area and ensuring use of these lands for farming.	MEF and MARA	1-3 years
29	Determination of state of desertification in Turkey and identification and monitoring of vulnerable lands.	1. Arid, semi-arid, semi-temperate and temperate areas of Turkey were identified. 2. Degraded lands resulted from erosion, drainage, salinity, inappropriate land use etc) are identified through soil surveys. 3. Isoerodent maps which show erosive potential of rainfalls is prepared. 4. Erodibility of Turkey's soil is mapped as the Large Soil Groups. 5. Erosion mapping of three rainfall watershed have been completed. 6. Pilot projects are being	I. Identification of state of desertification and establishment of appropriate indicators by taking into account data available in Turkey II. Displaying state of desertification in accordance with various indicators III. Identifying sensitive areas and starting form these areas the research and investment activities necessary for combating desertification, IV. Establishment of necessary monitoring systems and minimum measurement network for desertification V. Taking necessary measures to identify and rehabilitate the areas that are most affected from land degradation VI. Establishment of monitoring and evaluation systems VII. Protection of productive soil used by the soil industry and orientation of soil industries to alternative areas	MEF, MARA, MoIT, LAs and MENR	1-3 years

		implemented.			
30	Identification and adaptation of agriculture pasture and forest plants which are resistant to drought.	-	I. Conducting adaptation research concerning drought-resistant plants II. Developing cooperation and joint works with neighboring and regional countries in the subject-matter.	MEF and MARA	Continual
31	Preparation and development of the detailed surveys for mapping and classification of the soils of Turkey for sustainable land and water management.	1. Maps interpreted according to the present soil surveys and soil inventory reports. 2. Detailed soil surveys are conducted before land use planning of certain regions. 3. Soil surveys for specific purposes are being conducted. 4. A Soil Data Base for Turkey is being developed at a scale of 1/25.000 by digitizing the earlier soil maps (1938 USDA Soil Classification System). 5. A methodology was developed for the use and distribution of information from the data base.	I. Conducting detailed soil surveys in accordance with the FAO/USDA systematic and establishment of digitized soil data base II. The establishment of soil analyses laboratories functioning with contemporary methodology to undertake the analyses necessary for the soil survey. III. Obtaining relevant soil and land information and data held by other public institutions and CSOs by signing a protocol and incorporation of this information and data into data base system after harmonization and standardization of them IV. Determination of the most suitable use of land, by benefiting from soil maps to be prepared according to the international standards, and by taking into account quality of soil, land capability, sustainable development principle and national and regional plans requirements V. Harmonization of methodology of erosion mapping with that of the EU member states. VI. Ensuring application of Land Use Plans and soil management projects in all areas.	MEF, MARA, MENR and CSOs	More than 3 years
32	Conducting inventory of land and water resources which is necessary for sound planning and, based on this inventory, establishment of national data bank	1. Land and water resource inventories have been carried out for large and small scale irrigation projects. 2. Land and water resource inventories have been carried out at watershed and province levels.	I. Conducting inventory of land and water resources, which will constitute a data bank at national level II. Determination of farming lands by taking into account soil, topography and other ecological characteristics of the region as well as socio economic structure, vegetative production capacity of the land, and sustainable development principle III. Determination of lands with specific ecological conditions and sufficient soil depth, which have already been opened to farming or suitable to farming, and allocation of these lands for specific agricultural productions (tea, hazelnut, olive, popish etc.)	SSI, MENR and MARA	3-5 years
33	Preparation of National Action Plan on soil protection and land rehabilitation.	Separate arrangements and implementations are done at the local levels.	I. Preparing soil conservation plans including physical, cultural and other rehabilitation measures for the prevention of chemical, physical and biological degradation of soils II. Soil conservation and rehabilitation measures should be taken in the form of short and long term plans and project implementation should be started from river basins or micro catchments therein III. All institutions and CSOs should work together in a integrated manner at the basin scale IV. Soil conservation projects should also be annexed to plans and projects to be prepared for achieving following works and activities: a) in preparing rehabilitation plans for urban, industry, tourism and similar developments, b) in planning construction of motorways, highways, railways, airports and harbors, c) in planning	MEF, MARA, MENR, CSOs and other relevant planning institutions	More than 5 years

			establishment of energy production, transmission and distribution systems, ç) in planning enterprises of mining, petroleum, sand/gravel quarries and stone quarry, d) in using soil as the raw materials for industries (i.e. ceramics and pottery industries), e) in all kind of digging and filling works done during dam, pond, motorway constructions, f) in constructing settlement and transport buildings on the coast of seas, lakes, dams and rivers, extracting sand and gravels from coasts, discharging wastes to coasts or seas and planning of other areas that can affect coasts, g) in planning parks, recreation areas, sportive facilities, military and other training camps, ğ) in planning treatment, waste disposal and annihilation establishments, h) in constructing irrigation channels and ditches and in digging wells, i) in planning establishments with agricultural purpose, j) in planning investments which require changes in land uses, V. In order to implement soil conservation measures and techniques, sensitive areas including degraded lands and dam reservoirs should be taken under specific protection		
34	Preventing practices which result in reduction in the productivity of soil	Several researches on input use, productivity in production and diversity are conducted.	I. Using soils according to their natural quality capabilities and preventing practices of inappropriate farming techniques II. Monitoring and auditing use of land and agricultural inputs III. Conducting research on productivity and product diversification IV. Rewarding of rural communities who contribute agricultural sustainability by state through several ways	MEF and MARA	More than 5 years
35	Implementation of the decisions taken within the scope of Biodiversity Convention ratified by Turkey	1. Principles of biodiversity conservation have been transferred to executors through in-service trainings, publications etc. 2. National Strategy and Action Plan on Biodiversity have been prepared.	I. Expansion of bio-diversity conservation activities implemented under the GEF II project II. Expansion of the project to whole country III. Ensuring coordination with relevant institutions in order to implement the decisions of Biodiversity Convention IV. Making legal arrangements to conserve bio-diversity of those lands which lie outside the protected areas V. Creating public awareness and organizing informative campaign on bio-diversity	MEF, MARA and Universities	Continual
36	Preparation of Sustainable Land Use Planning	Land use planning is done in some regions	I. Launching the activity ‘Determination of Sensitive Areas’ covering sector-based land uses at national level with the aim of environmental protection and control II. Providing data to municipalities, which are responsible for the implementation of rehabilitation plans, and to relevant ministries in deciding places of small scale industry centers III. By conducting detailed soil surveys and mapping activities, preparing land use plans including economic, social, ecological and physical conditions of the basin, sound agricultural techniques that prevent soil loss and degradation, land use forms and land capability classes etc. IV. Protection of productive soil used by the soil industry and orientation of soil industries to alternative areas V. Conducting physical planning activities which identify land use priorities at national level VI. By amending the regulation on ‘use of agricultural lands for non-agricultural purposes’, identifying farming lands that require absolute protection and preventing use of the lands with I, II and III land use capability class and lands suitable for irrigation for non-agricultural purposes	MEF, MARA, Las, MPWS, MoIT and CSOs	10 years
37	Management of pastures in terms of management plans rules.	1. New Pasture Law is in force. 2. Guide Book on Grassland and Rangeland Plants of Turkey has been prepared by the research institutes of General	I. Conducting research on the ecological and social aspects of pastures and identifying bio-diversity richness of these area II. Determining plant dynamics of pastures (development of a easy method to identify and assess the state of pastures) III. Developing assessment methods for the state of pastures	MEF, MARA, Universities and SPO	More than 3 years

		Directorate of Rural Services with the aim of soil and water conservation.	IV. Conducting pasture inventory at Turkey level, searching species combination, and identifying endangered plant species V. Maintaining pasture protection and rehabilitation activities VI. Development and expansion of silvopastoral land use systems.		
38	Development and expansion of erosion control measures and techniques.	1. Local research on the subject was conducted. 2. Research and implementation projects were accomplished in the wind erosion sites, in particular Karapınar region. 3. Isoerodent maps which show erosive potential of rainfalls is prepared. 4. Erodibility of Turkey's soil is mapped as the Large Soil Groups. 5. General Directorate of Aforestation and Erosion Control has been established under the MEF.	I. Adopting soil and water conservation methods, being used in several regions of the world, to Turkey's conditions II. Identifying and implementing sustainable cultivation techniques and input use methods at local levels and according to the land conditions III. Harmonizing methodologies with the Mediterranean countries in the field of soil conservation and erosion IV. Establishing irrigation facilities and methods in wind erosion areas, which best suit to land conditions and use surface and underground waters V. Giving importance to farming with stubble and preventing stubble burning as a measure against water and wind erosion and loss of organic material of soils	MEF, MARA	More than 3 years
39	Expansion of organic (ecologic and biologic) agriculture and encouragement and extension of use of biotechnology	1. Isolated activities are carried out. 2. A regulation related with organic agriculture is in place.	I. Passing the 'Organic Agriculture Law' from the parliament II. Focusing on and giving priority to biological struggle in agricultural pest control and conducting research in this field III. Conducting research on biotechnology according to the regional priorities IV. Training of farmers and consumers V. Determination of production patterns considering external market needs VI. Supporting transfer and implementation of novel technologies	GNAT, MARA, MoIT, UFT and TT	More than 5 years
40	Monitoring the performance of irrigation systems.	1. Irrigation water is priced 2. Separate research projects are conducted.	I. Monitoring performance of irrigation systems (irrigation ratio, efficiency of irrigation, equality in water supply, reliability, satisfactoriness etc.), identifying gaps of the system, and establishing monitoring and evaluation units to fill these gaps II. Taking necessary measures to discipline use of irrigation water to prevent waste of water and negative effects of excessive use of water on soil III. Taking necessary measures to encourage farmers to use appropriate and efficient irrigation methods and conducting training activities IV. Pricing of irrigation water should be based on the amount of water used instead of irrigated area V. Conducting periodical analyses of water and soil quality VI. Collecting and using excessive and leakage waters	MENR, MARA, Irrigation Unions, Irrigation Cooperatives	Continual
41	Expansion of land consolidations activities	1. Compulsory land consolidation program is implemented in the agrarian reform areas.	I. Determining the size of arable land parcels on the basis of research activities conducted in accordance with local economic technical and ecological conditions: minimum parcel size should be at least 2 hectares in dry farming areas, 1 hectare in irrigated areas, 0.5 hectares in specific product areas and 0.1 hectares in greenhouse areas.	MARA	More than 3 years

		2. Voluntary land consolidation program is implemented in the sites where arable land development and irrigation investments are to be done.	II. Necessary legal and procedural measures in order to secure optimal sizes of arable lands III. Expanding land consolidation activities V. Making arrangements to carry out land consolidation activities together with private sector with sufficient capacity VI. Establishment of data base by mapping consolidated lands with suitable scale and achievement of necessary monitoring and evaluation activities on the basis of data base in order to prevent further reductions in the minimum size of arable lands		
42	Monitoring and publication of degradations that might be happen in the natural resources	Turkey Statistic Year Book contains agricultural statistics under the 30 different headings.	I. Periodical publication of changes in natural resources in Turkey Statistic Year Book II. Other relevant institutions should given special attention to supply of data to the Yearbook	SSI, MARA and MEF	1-3 years
43	Ensuring sufficient drainage conditions in arable lands which are to be irrigated.	There are several research and implementation activities.	I. Use of drainage water in irrigation by developing appropriate techniques	MARA and MENR	1-3 years
44	Ensuring conservation and sustainable use of soil and water resources at watershed scale	1. Various projects are ongoing at basin scale 2. Water pollution control implementing regulation was announced 3. Credits allocated to farmers 4. Projects implemented on soil and water use by the abolished TOPRAKSU (Soil and Water General Directorate) 5. Stubble burning are fined by local administrations	I. Establishment of management models by means of which infrastructure services are to be developed and implemented at basin scale II. Starting soil conservation and rehabilitation measures from river basins or micro catchments therein III. Achieving planning of sustainable agricultural production IV. Providing technical and economic supports to those farmers who take soil conservation measures in their own lands and bringing these farmers together for joints works V. Taking soil and water conservation measures at bare lands with potential threats to adjacent arable lands VI. Providing farmers contribution to land reclamation studies VII. Determination of underground and surface water potentials and preventing excessive underground water extraction VIII. Ensuring effective auditing of irrigation unions IX. Establishing measurement facilities which make it possible to deliver measured water X. In order to control the water table level, providing effective control on well digging which is subject to permission and putting limits to the amount of water to be extracted from wells	MEF, SPO, MARA, CSOs and GDPB	More than 5 years
45	Development and implementation of criteria and indicators for sustainable forest management.	1. Regeneration of forests is carried out in accordance with the silvicultural plans and on the basis of natural tree species. 2. Forest protection principles are transferred to executors through several publications and in-service trainings. 3. Procedures and principles about use of forests are determined. 4. Modern forest fire fighting	I. Determination of rules and principles for the use of forest resources at national, regional and forest ecosystem levels II. Preparation of national and regional forest management plans which will ensure sustainable economic benefits from forests III. Enhancing forest fire alert, research and prevention systems IV. Giving priority to biological methods in struggling with forest pests and diseases V. Using new technologies (such as CBS, remote sensing etc.) in inventory, cadastre and planning of forest resources VI. Encouraging public to engage aforestation activities in suitable lands VIII. Encouraging domestication of some forest plant species such as snowdrop, ginseng etc in order to reduce the pressure on these species and controlled use of non-wood forest products IX. Following the developments with regard to criteria and indicator of sustainable forest	MARA, MEF and LAs	3-5 years

		techniques are used in forest fires.	management in Europe and Near East Region levels		
46	Designing sound tourism activities in vulnerable ecological and cultural sites	Long-term development plans were prepared for some protected areas.	I. Adopting long-term development plans of protected areas according to existing conditions II. Preparation of long-term development plans for the areas to be announced as protected area III. During the constructions on coastal sand dunes and sand dune stabilization activities, taking necessary measures for conservation of macro and micro flora and fauna therein IV. Getting support and consensus of al relevant institutions in allocating these lands to tourism.	MEF, MARA and MoCT	1-3 years
47	Taking protective measures to prevent degradation of ecosystems and to rehabilitate degraded ecosystems	1. Degraded forest areas are rehabilitated by artificial regeneration (plantation) and protection. 2. Several ministries are carrying out protection activities for important plant and tree species.	I. Determination of responsible institution II. Preparation of pilot projects in order to protect and increase the number of plant and tree species that have economic value III. Supporting cultivation of those species which are unique, endangered, endemic etc. IV. Taking necessary measures in order to support local people participation to in-situ conservation plant genetic resources and their economic development V. Using common criteria in identifying and registering natural plant cover and endemic species VI. Converting pasture lands with rich biodiversity (i.e. endemic species) into protected areas	MARA, MEF, MENR, TÜBİTAK, Universities and CSOs	Continual
48	Increasing the numbers and areas of protected sites (National parks, Nature parks etc).	37 national parks have been established up to now.	I. Taking under protection the important sites from each ecosystem and regions at national level II. Establishment of management structures by giving chance to local people participation to decision making process of protected areas, where they live III. Providing alternative income opportunities to the local people vicinity of protected areas IV. Identification and improvement of such areas V. Achieving conservation activities for natural habitats in areas with low population density and without sufficient infrastructure. VI. Identifying natural habitats, taking necessary protection measures and determining the responsible institution VIII. Maintaining and protecting land use structure of coastal wetlands as wild life reserve areas	MEF, GNAT, MoCT, MARA, Universities, MENR and CSOs	More than 5 years
<b>ENVIRONMENTAL ARRANGEMENTS</b>					
49	Requiring EIA for the use of productive arable lands for non-agricultural purposes	EIA Regulation is in place.	I. Launching the activities towards preventing non-agricultural use of arable lands from the areas where the potential of agricultural production is high and industry and tourism activities are very intensive	MARA and MEF	1-3 years
50	Integrating water quality protection programs with the soil erosion conservation programs	Protection measures for the prevention of pollution in water harvesting watersheds are implemented.	I. Restricting agricultural activities for preventing water contamination as it is the case around deep wells, sensitive water channels and dam reservoirs II. Requiring EIA from large-scale (> 1000 m <sup>2</sup> ) commercial greenhouses located around sensitive water channels III. Restricting forestry production activities in water harvesting basins and protecting these areas under the 'Protection Forest' status	MARA, MENR, GDPB and MEF	1-3 years

51	Establishment of efficient planning system for the reduction of greenhouse gas emissions	I. Identification of effective sectors II. Ensuring coordination among relevant institutions III. Development of strategies for the implementing policies identified and measures taken IV. Monitoring climate changes at national and regional levels, identifying climate variations and variables, concentration of works on issues such climate forecasts based on models, impact assessment of climate change, identification of possible damages, adaptation works and policy analyses.	MARA, MEF, MENR, MoCT and SPO	Continual	
<b>REGIONAL/RURAL DEVELOPMENT</b>					
52	Improvement of productivity, health, education and nourishment conditions of poor people and facilitating their access to employment and resource opportunities.	1. Collective housing schemes have been carried out. 2. Several rural development projects have been implemented.	I. Supporting local administrations II. Providing necessary infrastructure to rural areas and modernizing existing infrastructure in order to increase living standards of rural people III. Consolidating scattered settlement areas and by means of this planning of infrastructure activities in a holistic manner towards these areas IV. Creating employment and income opportunities in rural areas giving special importance to employment of rural women and enhancing existing income generating activities V. Increasing opportunities for rural people to acquire new skills and occupations VI. Supporting those farmers who deals with household farming and have no sufficient lands in order to reduce migration to cities and prevent the increase in unemployment VII. Increasing well being of rural people through training and guidance facilities on income-generating activities such as trekking, tourist guidance, self of hand crafts and souvenirs etc.	MoNE, MARA, MoH, MEF, TRTC and Employment Institute of Turkey	Continual
53	Integrating environmental issues into regional and urban planning process.	-	I. Considering each region as a sub-system in urban planning, without overlooking the fact that sub-systems are the integral part of the superior system in terms of ecologic, economic and social aspects, and within the scope of interactions between organisms and human activities II. Integrating sustainability of local resources such as farming lands, microclimate, surface and underground waters, forests, marshlands, reed-beds, coasts etc. to urban planning III. Ensuring integrity of local ecosystems in urban planning in order to provide maximum protection to local flora and fauna species.	SPO, MPWS, MoH, GDPB, LAs, CSOs, MARA and MEF	Continual
54	Improvement of socio-economic conditions of forest villagers, alleviating their pressure on forest resources and by means of this, ensuring better protection of forest	1. Activities for this purpose are carried out by the relevant departments of the MEF in relation to the budget allocations. 2. Various credit schemes are available for forest villagers and cooperatives that they established.	I. Giving priority development of forest villages located within or around forest areas II. Developing pilot projects for the development of forest villages in the field of fisheries products and non-wood forest products III. Development of social forestry and agro-forestry models by using multi-purpose trees such as black locust, stone pine etc., supporting production of medicinal, aromatic and ornamental plants and expanding energy forest establishments IV. Supporting forest establishment activities of real and legal persons V. Making necessary arrangements in order to guarantee social security rights for forest villagers	MEF	1-3 years
55	Increasing and supporting investments in small scale irrigation projects.	Some investments are still going on.	I. Putting small water resources and scattered village lands into use II. Prevention or reduction of migration from these areas by increasing agricultural production.	SPO, MENR and MARA	1-3 years

<b>INSTITUTIONAL ARRANGEMENTS</b>					
56	Institutionalizing the cooperation between ministries, professional unions and NGOs for the mitigation of desertification.	I. Establishment of sub-groups for combating desertification and integration of professional unions and CSOs to the program II. Development of standards for collection, evaluation and utilization of data on desertification III. Development of an environmental information system accessible by private organizations, CSOs, and universities IV. Ensuring further integration between rural land use sectors such as forestry, agriculture and agriculture-based professions etc. and other relevant disciplines such as economy, soil science etc. while enhancing extension programs V. Introduction of the NAP-D to the public and providing proactive participation of related bodies to the program implementation.		All responsible bodies	1-3 years
57	Ensuring integrated and watershed-based activities between State Hydraulic Affairs, General Directorate of Rural Services, General Directorate of Afforestation and Erosion Control and the MEF	I. Ensuring integrated and watershed-based activities between public institutions and CSOs.		MARA, MEF and MENR	Continual
<b>FINACIAL RESOURCES AND USE OF TECHNOLOGY</b>					
58	Providing financial and technical support and incentives to agricultural and forestry research institutions.	The MARA and MEF have several regional and subject matter research institutions	I. Providing financial and technical support and incentives to agricultural research institutions. II. Creating opportunity to and supporting private institutions who wish to conduct agricultural research III. Expansion of soil and plant analyses laboratories which will help farmers to identify appropriate amount of fertilizer to be used.	MARA, MEF and private institutions	1-3 years
59	Taking necessary measures to prevent the use of manure as a fuel and encouraging the use of manure as fertilizer	Some activities have been achieved on biogas systems.	I. Training farmers on why they need to use manure and how they store and apply it II. In turn, supply of cheap diesel to farmers III. Encouraging and supporting bio-gas systems.	MARA	1-3 years
60	Development of bio resources-based energies	I. Cultivation of marginal and unproductive land with energy plants which are effective in erosion control and can be used as energy material and fodder II. Supporting private companies working in the field of bio-mass energy sectors III. Ensuring cooperation between agriculture and industry enterprises in order to fully use biologic energy resources		MENR, MEF, MARA, MoIT and SPO	1-3 years
61	Technology transfer, novel technologies and utilization of renewable energy resources	I. Development of information and technologies on resources of energy such as thermal, wind, geothermal and bio-mass etc. II. Identification of possible information or equipments needs concerning appropriate technologies which are environmentally sound and productive III. Mobilization of necessary resources in order to transfer modern and environmentally sound novel technologies to Turkey.		MENR, MEF, TT, Private institutions and Universities	More than 5 years
62	Creation of public awareness and pressure on combating desertification	I. Benefiting from all media instruments in order to create public awareness on desertification II. Lecturing on desertification in schools, integration of desertification into school curriculum and training of adults on the subject III. Development of applied activities towards pre-school children in order to help them to acquire love for nature and positive attitudes and behaviors IV. Encouraging preparation of scientific and ecological periodicals, story books that inspire nature love and contributory source books and availability of these books in libraries V. Benefiting from religious organization VI. Preparation of comprehensive training and extension programs concerning costs of land degradation and awareness creation for farmers especially on negative effects of soil erosion on productivity VII. Demonstrating soil and water conservation practices to farmers or establishment of farmer training camps and benefiting from		MEF, MARA, Religious Affairs of Turkey, Universities, MoNE, TRTC, CSOs and Private institutions	Continual



		<p>media for this purpose</p> <p>VIII. Preparation of booklets on the subject</p> <p>IX. Delivering training and awareness raising programs to farmers on the following subjects:</p> <ul style="list-style-type: none"> <li>- dry farming, soil cultivation techniques,</li> <li>- irrigated farming, irrigation techniques,</li> <li>- detriments of stubble burning,</li> <li>- organic agriculture,</li> <li>- use of fertilizers (commercial and manure) and agricultural pesticides and hormones,</li> <li>- soil productivity,</li> <li>- drainage,</li> <li>- eco-labeling,</li> </ul> <p>X. Integration of global warning (greenhouse effects) and related issues into national education and training programs starting from primary school education.</p>		
63	Ensuring integrated work of education and extension institutions serving for rural areas, research institutions and universities.	<p>I. Expansion of agricultural extension activities</p> <p>II. Delivering applied training to farmers</p> <p>III. Ensuring regular exchange of information between universities, researchers and designer-operator staff</p> <p>IV. Establishment of formal mechanisms which will ensure construction of positive and helpful cooperation between State Hydraulic Works and other relevant institutions in order to support sustainable use of water resources</p> <p>V. Cooperating with neighboring countries in the field of conservation of wild life and prevention of natural disasters</p> <p>VI. Expansion of extension activities consistent with local, cultural and social conditions, in this direction, development of joint training programs with local farmers and application of advanced techniques</p> <p>VII. Development and widespread use of in-service training programs in relevant public institutions for the purpose of soil conservation</p>	MEF, MARA, Universities, MENR and TRTC	Continual
<p>* <b>EUSG</b> : Secretariat General for EU Affairs; <b>MPWS</b> : The Ministry of Public Works and Settlement; <b>MEF</b> : The Ministry of Environment and Forestry; <b>SSI</b>: State Statistics Institute;</p> <p><b>UMA</b> : Under secretariat for Maritime Affairs; <b>SPO</b>: State Planning Organization; <b>UFT</b> : Under secretariat for Foreign Trade; <b>GDS</b>: General Directorate of Security; <b>MENR</b>: The Ministry of Energy and Natural Resources; <b>TT</b>: Turkish Treasury; <b>MoI</b> : The Ministry of Interior; <b>GDPB</b>: General Directorate of Provincial Bank; <b>MoCT</b>: The Ministry of Culture and Tourism; <b>MoF</b>: The Ministry of Finance; TNESAP:Turkish National Environment Strategy and Action Plan, <b>MoNE</b> : The Ministry of National Education ; <b>PI</b> : Private Institutions; <b>MoH</b>: The Ministry of Health; <b>MoIT</b> : The Ministry of Industry and Trade; <b>CSOs</b>: Civil Society Organizations; <b>GNAT</b> :The Grand National Assembly of Turkey; MoEA: The Ministry of External Affairs; <b>MARA</b>: The Ministry of Agriculture and Rural Affairs; <b>UCCET</b> : The Union of Chambers and Commodity Exchanges of Turkey; <b>TRTC</b> : Turkish Radio Television Corporation; <b>UACT</b>: Union of Agricultural Chambers of Turkey; <b>NCU</b>: National Coordination Unit; <b>LA</b>s: Local Administrations; MoJ : The Ministry of Justice; GDMSE :General Directorate of Mine Survey and Exploration ; TUBITAK : The Scientific &amp; Technological Research Council of Turkey</p>				