

Global Attention to Turkey Due to Desertification

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Abstract Desertification has recognized as an environmental problem by many international organizations such as UN, NATO and FAO. Desertification in Turkey is generally caused by incorrect land use, excessive grazing, forest fires, urbanization, industry, genetic erosion, soil erosion, salinization, and uncontrolled wild type plants picking. Due to anthropogenic destruction of forest, steppe flora gradually became dominant in Anatolia. In terms of biodiversity, Turkey has a significant importance in Europe and Middle East. Nine thousands plant species naturally grown in Turkey, one third of them are endemic. Also, endemic species of vertebrates, thrive in the lakes and marshy areas. The studies of modelling simulation of vegetation on the effects of Mediterranean climate during the Roman Classical period by using vegetation history showed that, in 2000 years BP, Mediterranean countries were more humid than today. Turkey is a

special place on the global concern in terms of desertification because of biodiversity, agricultural potential, high population, social and economical structure, topographical factors and strategic regional location. Communication among scientists, decision makers and international non-profit organizations must be improved.

Keywords biodiversity · climate · desertification · land degradation · Turkey

1 Introduction

Desertification is defined as “land degradation in arid, semiarid and dry subhumid areas resulting from various factors, including climatic variation and human activities” (Intergovernmental Negotiating Committee of Desertification (INCD), 1994). Desertification is an essential global problem, this term is widely used, and often misunderstood (Kassas, 1999). Actually, desertification is a broader concept and perceived as ‘desert creep’ and ‘encroachment of the Sahara’ in the earlier times of this conception (Bovill, 1921; Stebbing, 1935). In fact, these kind of desertification problem are actually a small part (perhaps 10%) of the worldwide desertification problem (Kassas, 1999).

Many studies showed that the importance of protecting and restoring the soil resource is risingly

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been recognized by the world community (Barford et al., 2001; Lal, 2001). Rio Agenda 21 (UNCED, 1992), UN Framework Convention on Climate Change (UNFCCC, 1992), the 1994 UN Framework Convention to Combat Desertification (UNFCD, 1996) and Kyoto Protocol (UNFCCC, 1997) are indicative of the recognition by the world community of the relationship between soil degradation and desertification on loss of biodiversity, threat to food security, increase in poverty and risks of accelerated greenhouse effect and climate change (Lal, 2003).

Desertification concept includes the following significant features: (1) Reduction of vegetation productivity, (2) decline in species diversity and (3) increase in aeolian processes such as erosion, transportation, sand deposition (Brown, 2003).

Desertification issue is concerned chronologically as given follows: (1) UN Conference on Desertification (UNCD) hold in 1977 (global socio-economic and environmental problem), (2) In 1968–1974, Sahelian drought and famine occurred the first international effort to combat desertification has began, (3) In Rio, 1992, developing countries insisted to attention on desertification, especially in Africa, during the UN Conference on Environment and Development (UNCED), and (4) In Paris on 17 June 1994, the UN Convention to Combat Desertification was adopted (Türkeş, 1999).

The world losses over six million hectares of its land per year by desertification and 70 m² is minimum area of arable land required to feed a person (Haktanır, Karaca, & Omar, 2002).

2 Major Desertification Factors in Turkey

2.1 Climatic factors

Climatic factors may be lead to desertification in Turkey (Türkeş, 1999). Climate is a variable phenomenon in that climatic conditions may change in response to external forcing and because of its own natural variability (Haktanır et al., 2002).

According to UNEP (1993), soil vulnerability to desertification in Turkey is given in Table I and shown in Figure 1 (Yıldız, 2005). This map is prepared by using total normal yearly rainfall and evapotranspiration data come from 265 meteorological station. Evapotranspiration was calculated station

Table I The arid regions and their assessments in Turkey (UNEP, 1993)

P/PET	Region	Assessment
0.05–0.20	Arid	Open to desertification (no in Turkey)
0.20–0.50	Semi-arid	Open to desertification (Konya Plain and Iğdır sub-region)
0.50–0.65	Dry sub-arid	Open to desertification (South eastern and central Anatolia regions)
0.65–0.80	Semi-humid	Open to desertification (West and around dry sub-humid areas)
0.80–1.00	Semi-humid	It may be vulnerable to desertification
1.00–2.00	Humid	Non risk for desertification (Black Sea Region)
>2.00	Very humid	Non risk for desertification (at Rize and Hopa district)

P/PET; Aridity index; p, precipitation (mm), evapotranspiration (mm)

by station according to Penman-Monteith formula (FAO, 1998). Point station data was interpolated and mapped by using Inverse Distance Weighting method (Johnston, Jay, Hoef, Krivoruchko, & Lucas, 2001). Most areas in Turkey are under desertification and/or high potential for desertification and only small part of areas non-risk places (Table I and Figure 1).

Türkeş (1999) indicated that climatic factors may be lead to desertification in Turkey and investigated spatial and temporal variations of precipitation and aridity index series in period of 1930–1993. According to Türkiye (1999) annual and winter precipitation totals have decreased at many stations. Severe and widespread dry conditions occurred especially in 1973, 1977, 1984, 1989, and 1990. The decrease of winter precipitation may have resulted in a degradation of soil moisture content and a depletion of the ground water level. It is estimated that annual average temperature over Turkey will increase approximately by 1–3 °C during the last century (International Panel of Climate Change (IPCC), 2001).

Degradation of vegetation cover decreases carbon sequestration capacity of dry lands, thus increasing emissions of carbon dioxide into the atmosphere. According to The State of Institute of Statistics of Turkey (SIS) calculations, there will be a large increase in the amount of greenhouse gases caused by fuel

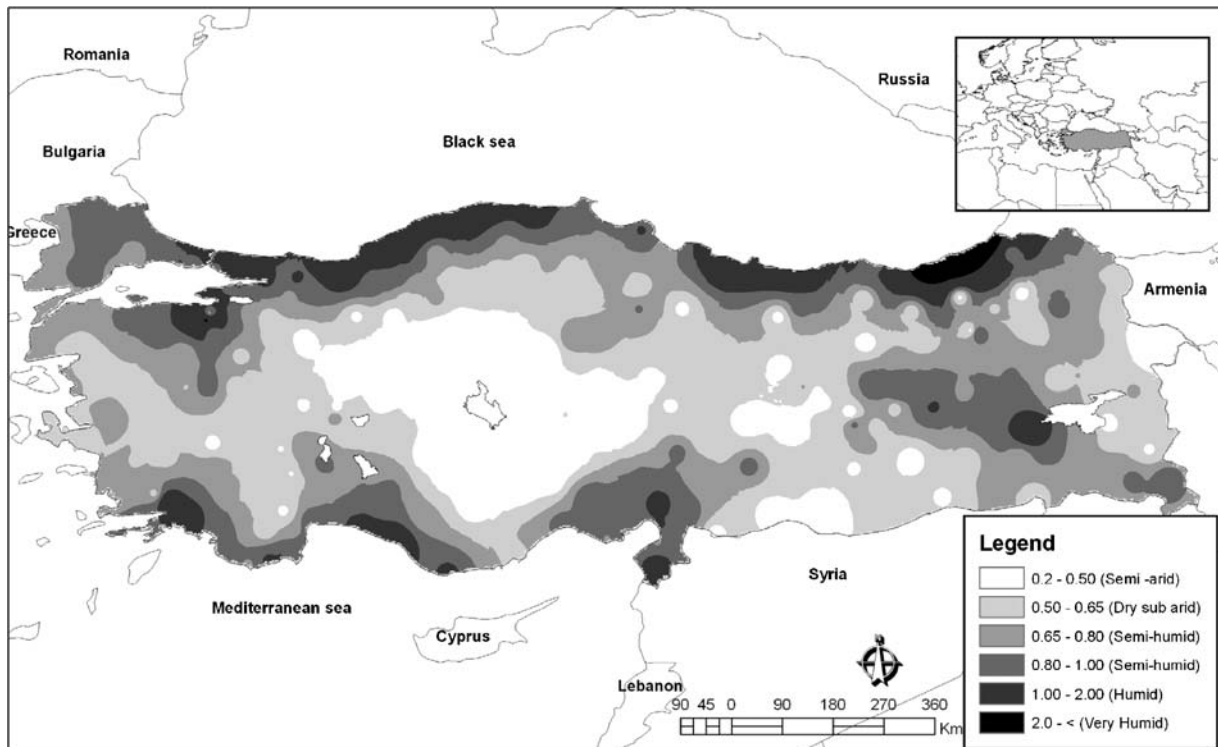


Figure 1 The aridity map of Turkey (Yıldız, 2005).

consumption in the period of 2000–2020. In 2000, 34% of CO₂ emissions were caused by electrical generation, 32% by industry, 17% by transportation, and 16% by other sectors. When compared with other countries of the world in terms of basic CO₂ indicators, it is seen that Turkey is ranked 23rd in total CO₂ emissions (National Report on Sustainable Development, 2002).

Climate change in Turkey is characterized by diverse climate types and regimes. Previous studies showed that (1) annual mean air temperature for Istanbul (covered nearly 90 years of data starting from 1860) were fluctuated (Erinc, 1969), and (2) annual mean temperatures rose by approximately 0.5 °C between 1930 and the mid-1960s and was observed cooling trend during the years of 1965–1990 (Türkeş, Sümer, & Kılıç, 1992).

2.2 Land degradation

Land degradation has been a dominant problem throughout the past decade. Land degradation is generally occurred by the human activities such as agricultural mismanagement, overgrazing, deforestation, industry and urbanization (Özden, Dursun, &

Sevinç, 2000). The results of agricultural mismanagement are soil erosion, salinization, waterlogging, nutrient losses, plow pan forming, structure destruction or compaction, and farm land fragmentation. Forest have been degraded by fires, overharvesting, incorrect use for fuel wood, clearing forests for farm and urban uses.

Turkey is mountainous and hilly country with average altitude of 1132 m (Özden et al., 2000). Due to climatic and topographic condition to soil erosion is the major problem in Turkey and almost 86% of land is suffering from some degree of erosion (Özden et al., 2000). The topographical structure of Turkey is generally sloping, high landed and mountainous. About 73% of cultivated land experiences of 68% of prime agricultural land are prone to erosion in Turkey (Turkish National Report, 2000).

Actually, 4.49% of the soils in Turkey are exposed to salt problem and especially this problem appeared in GAP regions after started irrigation (Haktanır et al., 2002). Total salinization area in GAP region was 5,550 ha in 1987, 7,498 ha in 1997, and 11,403 ha in 2000, respectively (Cullu, Atmaca, Şahin, & Aydemir, 2002).

2.3 Ecosystems

In Turkey, forests constitute 26% of the total land area and approximately 11.4% of the forest land is productive forests and 14.6% is degraded forests (Kaya, 1998). Forest degradation can be due to the unregulated, excessive, extensive tree felling in forests, shifting agriculture, overgrazing on forestlands, forest fires, diseases and poor environmental awareness of the importance of natural resources (Haktanır et al., 2002). Kaya (1998) indicated that four million hectares of forests has degraded and needed afforestation urgently. Actually, the Ministry of Forestry established an afforestation program in the 1980s, with annual 150,000 ha afforestation planning. However, this goal has not been achieved in recent years, due to budget cuts.

National Tree Improvement Plan was initiated in 1993. this program and a number of other programs are planning the establishment of in situ gene conservation and ex situ collections (Kaya, 1998).

Grasslands, mostly covered by herbaceous plants, occupies 21, 245,000 ha and decreased the area of grasslands because of primarily anthropogenic effect (Tan, 2001). As a result of accelerated destruction forest, steppe flora gradually become dominant in Anatolia. Cultivated areas cover 35% of the total area of Turkey that is majority being in the steppe ecosystems (Tan, 2001).

2.4 Biodiversity

Genetic resources are a common heritage of humankind with an international significance (Solh, Amri, Ngaida, & Valkaunj, 2003). Loss of biodiversity (genetic erosion) is occurring at a rapid rate in many areas of the world. During the last century, loss of biodiversity become environmental concern at national, regional and international levels (Solh et al., 2003).

Turkey has a unique position with its richness of genetic diversity (Kaya, 1998). In terms of biodiversity, Turkey is one of the rich countries of Europe and middle East (Haktanır et al., 2002).

Forest in Turkey has almost 564 woody species (76 species endemic) (Kaya, 1998). Species endemism in Turkey was high due to climatic and topographic diversity of Turkey and the limited extend of Pleistocene Glaciation. About 9000 plant species are naturally grown in Turkey, one third of them are endemic (Tan, 2001).

The factors that cause the loss or decline of forest biodiversity in Turkey can be classified into five district groups: (1) habitat alteration, habitat fragmentation and habitat loss, (2) over-exploitation of plant species, (3) pollution of soil, water and atmosphere, (4) introduction of exotic species and (5) industrial agriculture and industrial forestry (Kaya & Roynal, 2001).

Loss of biodiversity in wetlands in Turkey started in especially when Malaria disease was common. One of the major tasks of DSI was to drain marshes hosting malaria vectors and causing epidemic disease (Burak, 2002). According to DSI's records, more than 100,000 ha of marshes were dried out between 1955 and 1970.

3 Conclusions

The UN has been studying about the desertification control since the early 1970s because of high world population, unbalanced food production and its negative effects on the economy. In 1992, Rio de Janeiro Environment Conference, the UN pointed the desertification of many countries, such as Turkey. The UN has been studying the desertification control and, actually, it has focused on Africa because it is the most likely place to be desert. The term of desertification often misunderstood. Desertification is a broader concept that not only place is like 'desert creep' and 'encroachment of the Sahara' but also is a global issue covering climate change, loss of biodiversity and epidemic diseases, wind and water erosion, overgrazing, unsustainable farming practices and urbanization.

Spatial and temporal variations of precipitation aridity index series of Turkey, for the period 1930 and 1993 showed that total annual and winter precipitation have decreased, in 1973, 1977, 1984, 1989 and 1990, severe and widespread dry conditions occurred, due to depletion of winter precipitation, affecting degradation of soil moisture, caused reduction ground water level. For total CO₂ emissions, Turkey is ranked 23rd when compared with other countries. Soil erosion is also significant land degradation factor due to topographical conditions. Salt problem has occurred in 4.49% of Turkish agricultural soils. Urbanization and soil sealing also has become a serious problem on the fertile agricultural lands.

Simulation studies give better understanding historical climate and climate change. During the Roman Classical period, in 2000 years BP, Mediterranean countries were more humid than today by simulation of vegetation history using the pollen method (Reale & Dirmeyer, 2000).

The Ministry of Health, The Ministry of Forestry, The Ministry of Agriculture and Rural Affairs, The Ministry of Public Works and Settlement, The Ministry of Energy and Natural Resources, The Ministry of Environment, The Ministry of Industry and Trade, The Ministry of Interior, The Ministry of Labour and Social Security and the State Meteorology Service work together in environmental protection issues in Turkey. The saying that for UN is “UN is useful but not a functional organization.” In Turkey there are many regulations, laws, institutions about environmental problem; however, they are not functional. Functionality of institutions and organizations is urgently needed to solve desertification.

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