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# THE IMPACTS OF GLOBAL CLIMATE CHANGE ON TURKEY

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## ABSTRACT

### Introduction
As one of the leading environmental and economic problems of our age, global climate change is a complex problem that has negative impacts on every aspect of life, from human health to agricultural production, especially in our geography. Turkey is among the countries to suffer from negative consequences of climate changes at most due to global warming.

### Aim of the Study
Investigating the impacts of global climate change on Turkey, this research provides measures to be taken and offers theoretical knowledge with reference to the literature and the previous studies performed on this issue.

### Results
As a result of global warming, the increase in the average surface temperature of the Earth was 0.6±0.2°C in the centennial period until the year 2000. This increase reached to 0.74±0.18°C in the past centennial period up to 2005.

### Conclusions
Suggested remedies for future impacts of climate change on ecology, socioeconomics and nutrition in Turkey in the upcoming years have been summarized.

**Key words:** climate change**,** drought, global warning, Turkey

## INTRODUCTION

Climate is the combination of not only the common features of all weather conditions occurring or observed in a region of the world over a long period of time, but also the temporal distribution of their occurrence frequencies, observed extreme values, extreme events, and all variability types. Climate change could be defined as the statistically meaningful changes taking place in the common conditions or the variabilities of climate over a long period of time (1). Most of the potential impacts of climate change will be observed through temperature, rainfall, humidity, evaporation, snow pack, land and sea glaciers, sea level, hydrologic systems and their parts, surface runoff, subsurface flow, freshwater systems, drought and soil moisture, living quarters and flora. These impacts could also be seen as changes in local or large scale climates and as an increase in extreme weather events (2). Average global rainfall in 2015 was 22.5 mm less than the average of the 1961-1990 period, 1033 mm. There have been record breaking rains in the eastern part of United States, southern part of South America, North and Southeast Europe and Japan, whereas droughts have suffered in eastern part of Brazil, Central Europe, South Africa, Mongolia and Southeast Asia. The term global warming refers to the increase in temperature in the lower parts of the earth and atmosphere due to urbanization as well as the rapid increase in the atmospheric accumulation of greenhouse gases emitted to the atmosphere by various human activities such as burning of fossil fuels, deforestation and industrial processes (3,4). One of the most important consequences of global warming and climate change, the reduction of water resources has reached to a point that could prevent sustainable life beyond its environmental impact. The significance of water and water resources further increase as global warming directly and indirectly impact water resources. Due to global warming, serious problems are being experienced with regard to the water resources, and it's expected to cause a decrease in agricultural and forest products, some energy problems and migrations from coastal regions into central regions. To maintain the ecological balance and ensure the sustainable development of human communities, water resources must be used in the most rational way possible to meet today's and future needs (5).

Turkey is a country of high vulnerability to desertification and drought as a matter of its geographical position, climate, topography and soil conditions. Approximately 78 million hectares of surface area comprise 20 million hectares of arid areas and 31 million hectares of semi-arid areas. 86% of our soil is exposed to different levels of erosion. The most significant factor behind our high desertification potential is related to the climate, most importantly irregular and severe rainfall regimes and drought. Arid conditions have been effective in important regions of Turkey between the late seventies and nineties. In the drought index values throughout Turkey, there is a tendency for change from the humid conditions of the 1960s towards arid, semi-humid climatic conditions. Some locales of the Aegean Region shift from humid conditions to arid, semi-humid or semi-arid climatic conditions, and the Southeastern Anatolia Region and the interior continental regions of Turkey transform into arid areas prone to desertification (6).

The global sea level rise for the last century has been measured as approximately 10 cm and 20 cm. The sea level rose 12 cm in the Mediterranean and Black Sea Regions in the last century. In this respect, Turkey is one of the risky countries in terms of the potential impacts of global warming. Unless necessary measures are taken against climate change, the water resources in arid and semi-arid areas of Turkey will add to the existing problems of water resources, especially in urban areas, and the need for drinking water will increase. While the average precipitation in Turkey had been 631 mm for a long time, it decreased by 15% in 1999 and by 30% in 2008. In addition to the decrease in average precipitation, the deviation in the rainfall regime must also be considered. The amount of water per capita in terms of presence of potable water in Turkey is 1,519 $m^3$. Despite common knowledge, Turkey is one of the countries with limited water resources compared to the world average regarding both water availability per capita and the amount of water used (7). As the increase of the drought would cause the need for potable and non-potable water to become impossible to be met, human life would also be in great danger. Increasing amount of waste and debris would threaten existing plant and animal

species. As a result, species that are suitable for these difficult conditions would come into existence, and most of the existing species would face extinction. As the pressure of global warming increases, different climates and living beings in various regions would be affected in different ways, and there would be changes in the number and types of species. Eventually events resulting in irreversible ecocide may be encountered (8). Since sudden and unbalanced climatic conditions can cause erosion, landslide, flood disaster, forest fires and desertification in arable areas, leading to rapid disappearance of agricultural areas, finding food may become an impossibility. Forest fires, desertification and erosions will cause further emission of greenhouse gases, such as CO2, to the atmosphere, and the impacts of global warming would begin to be more visible (6- 8).


**Figure. 25 years of change of the water level of Meke Lake, a Ramsar Site**

Some measures be taken in the context of the Kyoto Protocol and the Copenhagen Summit (4,5) in order to prevent the adverse impacts of global climate change are as follows:

a) Reducing the amount of greenhouse gases released to the atmosphere between 2008 and 2012 to 5%,
b) Investigation of alternative energy sources to reduce the amount of methane and carbon dioxide released to the atmosphere,
c) Heating with less energy, taking long roads with less energy consuming vehicles, deploying less energy consuming technological systems in the industry, and adopting environmentalism as the first principle in transportation and garbage storage,
d) Protecting water resources and efficient farming areas.
e) Problems arising from overuse and mismanagement of groundwater resources should be resolved (5, 10, 11).

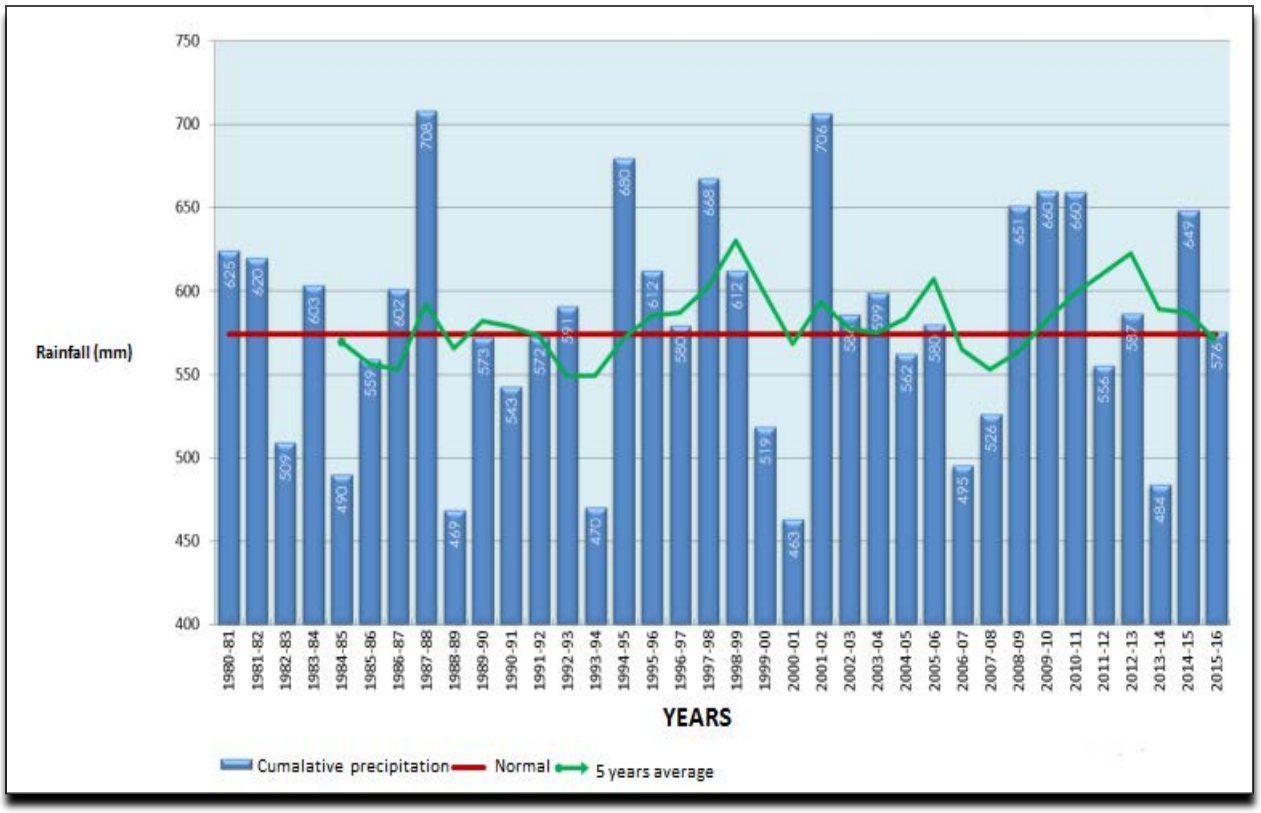


**Figure 2. Turkey's overall annual areal precipitation (12)**

## CONCLUSION AND SUGGESTIONS

The source of life, water will become one of the world's most important problems unless necessary measures are taken in response to climate changes, and water sources in arid semi-arid areas will add new problems, increasing the water demand. The first thing to do against global climate change is the planned and efficient use of water resources. People must be informed about protection of the water balance and the ecological balance of the world as well as postponement of the effects of climate change (5).

In the face of climate change and one of its most important threats, drought, it is necessary to effectively implement strategic plans, projects and policies that are being carried out by all relevant ministries, particularly the Ministry of Food, Agriculture and Livestock, and to renew them according to the changing climatic conditions (6).

Taking global measures against global warming affecting world ecosystems are mandatory. In this regard, the Kyoto Protocol must be signed and implemented primarily by all countries. In this context, important tasks are assigned to each individual, local government, government, and non-governmental organization focusing on environmental issues. Taking general and specific measures to reduce greenhouse gas emissions should be the common objective. Furthermore, research must be done on ecological problems and conservation of fisheries in all our seas, and subsequent studies should be supported on a national basis, taking into consideration the global climate change (13).

The weakest and most vulnerable regions of Turkey in terms of precipitation climatology are Central Anatolia Region, Marmara, Central Aegean and Eastern Anatolia Region. In terms of temperature, Central Anatolia region is also highly vulnerable. Erosion control should be implemented; measures to prevent or slow down desertification should be developed; and cultivation of less water dependent agricultural products should be planned in drought regions. Action plans should be prepared in line with this information (14).

It is impossible to fully predict and explain all the disasters that would take place as a consequence of the increase in global warming. But in order to prevent global warming, all world countries and international organizations should start doing whatever needs to be done without any loss of time. Despite all challenges, humanity has the ability to prevent potential ecological hazards by means of the technology they may develop. No matter how big the problem is in this matter, every individual should do their part. Attitudes and behaviors on the contrary would mean destruction of the world by humankind (15).

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