

O 12. OVERVIEW OF THE NEGATIVE EFFECTS OF CLIMATE CHANGE

Fatma KUNT¹, Busenur KÖPÜKLÜ^{1*}, Flora MERKO²

¹*Necmettin Erbakan University, Environmental Engineering Department, Engineering Faculty,
Konya, Türkiye.*

²*Aleksander Moisiu University, Department of Economics, Durres, Albania.*

E-mail: bnur.kpkl@gmail.com

ABSTRACT: Climate change has negatively affected the entire ecosystem from past to present. The increasing population, especially with the development of industry, has led to excessive consumption and increased greenhouse gas emissions. Today, climate change is seen as a serious environmental problem and important studies and research are carried out on this subject. In order to find a solution to this problem that affects the whole world, scientists come together at conferences on the subject. Increasing rainfall, floods, landslides, drought and air pollution due to increasing greenhouse gases on a global scale pose a fatal threat to agricultural areas, food security and clean water resources. Many studies were described in this review article. Information was given about marine protected areas established for marine life affected by climate change. In particular, the negative effects of climate change on human health and psychology in Turkey and the world were mentioned.

Keywords: Climate Change, Ecosystem, Effects, Health, Human, Psychology

1. INTRODUCTION

The atmosphere required for the existence of all forms of life on Earth is essentially a combination of different gases. Molecules of 78.08% of nitrogen and 20.95% of oxygen in the atmosphere constitute 99% of the volume of clean and dry air. The remaining approximately 1% of dry air consists of argon (0.93%), an inert gas, and trace gases whose quantities are very small. Although its accumulation in the atmosphere is small, carbon dioxide (CO₂), an important greenhouse gas, is present at a rate of 0.0377%. The most important natural greenhouse gases are water vapor (H₂O) and CO₂, methane (CH₄), nitrogen monoxide (N₂O) and ozone (O₃) (Türkeş, 2008). Weather is all the atmospheric phenomena that can be experienced and observed anywhere on earth and at any time. Climate is defined as the combination of the average characteristics of all weather conditions that can be experienced and observed anywhere and at any time on earth, their temporal distributions of their frequency of occurrence, observed extreme (extreme) values, violent events and all types of variability. (Türkeş, 2001). Climate can affect human activities, well-being and health in different ways. From past to present, humanity has attempted to organize its shelters, food and energy production in order to create a lifestyle generally compatible with climate and environmental conditions, and to adapt itself to this resource. Climate change can be defined as statistically significant changes in the average state of the climate or its variability over many years. Climate change can be defined as statistically significant changes in the average state of the climate or its variability over many years. Climate change can occur due to natural internal processes and external forcing factors, as well as continuous anthropogenic (human-induced) changes in the composition of the atmosphere or land use. Changes in climate occurred between glaciers and ice ages, in the form of major changes in average temperatures in various parts of the world, and also included changes in precipitation. Throughout the Earth's very long geological history of 4.6 billion years, there have been many changes in the climate system by natural factors and processes at all time scales from millions of years to decades. Climate changes in geological periods have not only changed the world geography, especially through glacial movements and changes in sea level, but also created permanent changes in ecological systems. However, since the mid-19th century, it has been realized for the first time that human activities also affect the climate. Therefore, today, climate change can be defined by taking into account human activities that increase greenhouse gas accumulation. For instance, in the United Nations Framework Convention on Climate Change (UN FCCC), climate change is defined as "A change in climate resulting, directly or indirectly, from human activities that disrupt the composition of the global atmosphere, in addition to the natural climate change observed for many years." a comparable period." (Türkeş, 2008). Climate temperatures have an impact on all living events. In addition, climate change

Proceeding Book of ISESER 2023

may have different effects on agriculture, industry, and all economic conditions. With the explosion of fossil fuels in the Industrial Revolution, many emissions were released into the atmosphere. In addition, human causes such as the release or destruction of natural vegetation, especially forests, land use change, and urbanization, have increased greenhouse conditions by triggering heat retention in the atmosphere (Karadeniz et al., 2019). The Report on the Physical Foundations of Climate Change, which is the first of the Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC), which brings together the most comprehensive and up-to-date scientific studies on climate change; has been stated that risks related to climate change will be earlier and more dangerous than expected (Birpınar, 2022). The effects of climate change started in the 17th century (Hulme, 2009), and human-induced factors such as industry development are shown as the most important reason (Akbulut et al., 2021). Today, climate change is seen as a serious environmental problem, and significant studies are carried out on this issue. While climate change is not taken seriously in some societies today, and the reality and effects of this issue are not believed, it is taken very seriously in some communities (Hulme, 2009). Since the end of the 19th century, it has been understood by French Joseph Fourier, Swedish Chemist Svante August Arrhenius, and some scientists that the carbon density in the atmosphere has increased as a result of fossil fuel use and that nature cannot cope with this ecologically, and it has been recommended to reduce emissions quickly. However, the world, especially the West, remained silent to these warnings, and instead of reducing the use, they increased it further, increasing the carbon emission value, today which was around 5-6 billion tons annually at that time, to 40 billion tons (Birpınar, 2022). Tackling climate change and its impacts requires well-informed and concerted action by a variety of actors from different sectors of society. Additionally, climate change response strategies need to be placed within a multi-purpose context of environmental, social, technical and economic developments whose future is inherently uncertain. Climate change scenarios have been a central tool in climate change research for decades. These scenarios describe plausible, consistent and internally consistent pathways for the future of climate change. Since we cannot know the future with certainty, the uncertainty of climate change scenarios should be structured with scientific rigor. "What could happen?" The question should be investigated and "What should happen?" The question needs to be planned. Scenarios therefore serve in two ways: first, different groups of actors (politics, business, science, society) can coordinate their thoughts from different perspectives, develop a common understanding of the situation and co-produce new knowledge. Secondly, climate change scenarios can support strategic planning by revealing different paths from a multi-purpose perspective and under uncertainty. Various types of scenarios should emerge through coordinated efforts to consistently address different aspects of climate change (Auer et al., 2021).

2. RESULTS AND DISCUSSIONS

Due to increasing greenhouse gases on a global scale, the first World Climate Conferences (WMO, 1979) were held in 1979. Decisions were taken to restrict the use of chemicals that cause problems, especially due to the depletion of the ozone layer over Antarctica, and the Vienna Convention for the Protection of the Ozone Layer (UN, 1985) was signed in 1985. The mentioned agreement was the first globally successful agreement in the field of environment and climate (Birpınar, 2022). As in the Third Assessment Report (TAR) of the Intergovernmental Panel on Climate Change (IPCC), all emission scenarios based on the IPCC's fourth Assessment Report suggest that atmospheric particle accumulations, surface temperatures, and sea temperatures may rise throughout the 21st century; It predicts that land and sea ice and glaciers will decrease in area and volume. It is predicted that seasonality and latitudinal shifts in precipitation may occur as a result of some arid and semi-arid regimes becoming drier. It is predicted that precipitation may increase in Africa and Antarctica in winter and South and East Asia in summer. There are decreases in winter precipitation in Australia, Central America, and South Africa. According to the Hadley Center's climate models (UKMO/DETR, 1999) and the application of another model, significant reductions in water recharge and flows are expected for centuries to come, particularly for the Eastern Mediterranean basin and the Middle East. In the Northern Hemisphere, snow cover and sea ice spread are predicted to decrease. The Antarctic ice shield is expected to gain mass due to more precipitation, while the Greenland ice shield is expected to lose mass as the increase in flows is predicted to exceed precipitation (Türkeş, 2008). These climatic changes, together with the increase in temperature and decreases in precipitation regime, are expected to significantly affect Mediterranean agriculture, which is sensitive and based on irrigation (IPCC, 2013).

Proceeding Book of ISESER 2023

Accordingly, it is predicted that climatic changes will affect food availability and prices, restrict low-income societies' access to sufficient food, and even cause a food security problem (Türkeş, 2020). When the recent effects of climatic changes on the earth are examined, it has been observed that Turkey is among the risk group countries. In this context, some natural disasters (such as floods, storms, heat waves, extreme weather events, and forest fires) are expected to increase due to climate change (Türkeş, 2008). In addition, the Mediterranean Basin, which includes Turkey, is one of the regions where the effects of this global temperature increase will be widely seen. It is stated that the increase in temperature is expected to occur in the Mediterranean Basin in the near future and the decrease in precipitation will further reduce the already insufficient water resources and cause serious problems. The changes expected to occur in the total annual precipitation amount in the 2081-2100 period compared to the 1986-2005 average are presented in Figure 1 (IPCC, 2014).

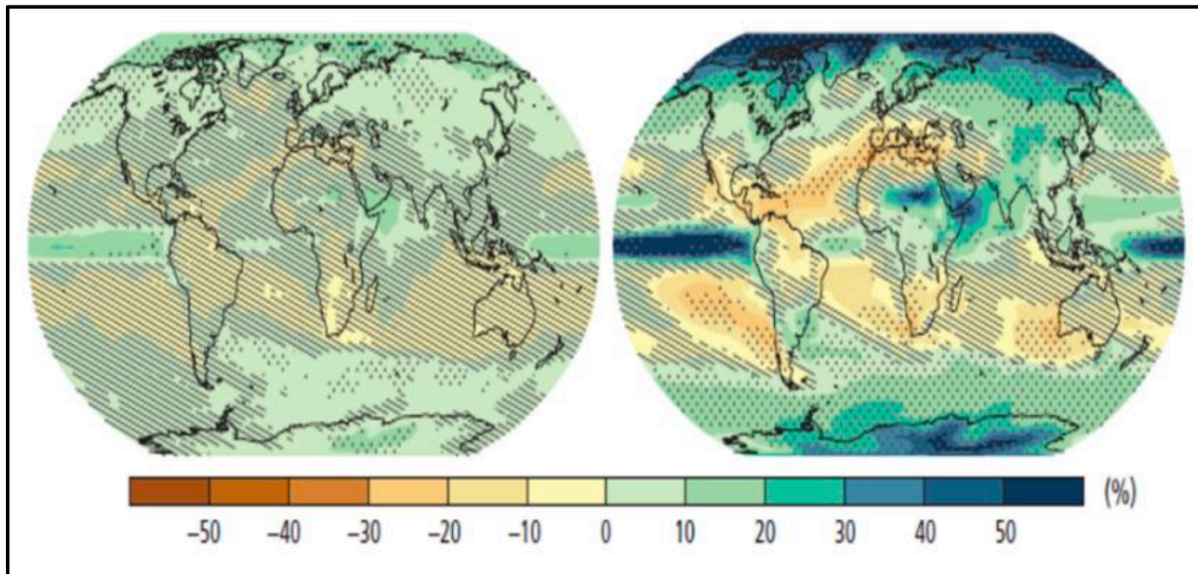


Figure 1. Expected changes in total annual precipitation for the period 2081-2100 (IPCC, 2014).

Viticulture, a significant branch of agriculture, is expected to be affected by climatic changes in different ways and levels. Sustainability and food safety must be ensured against the possible effects of climate change in the production of grapes and grape products with alternative evaluation methods such as table grapes, raisins, wine, grape juice, grape juice, molasses, and fruit pulp. Considering that the temperature increase will increase further in the future, it is estimated that the vineyard areas will show a latitudinal shift and the geography of viticulture will change significantly (Figure 2). In the Northern Hemisphere, it may increase towards the polar regions at intervals suitable for viticulture, but in the Southern Hemisphere, the viticulture may decrease and be prevented due to the lack of sufficient land areas (Soltekin et al., 2021).

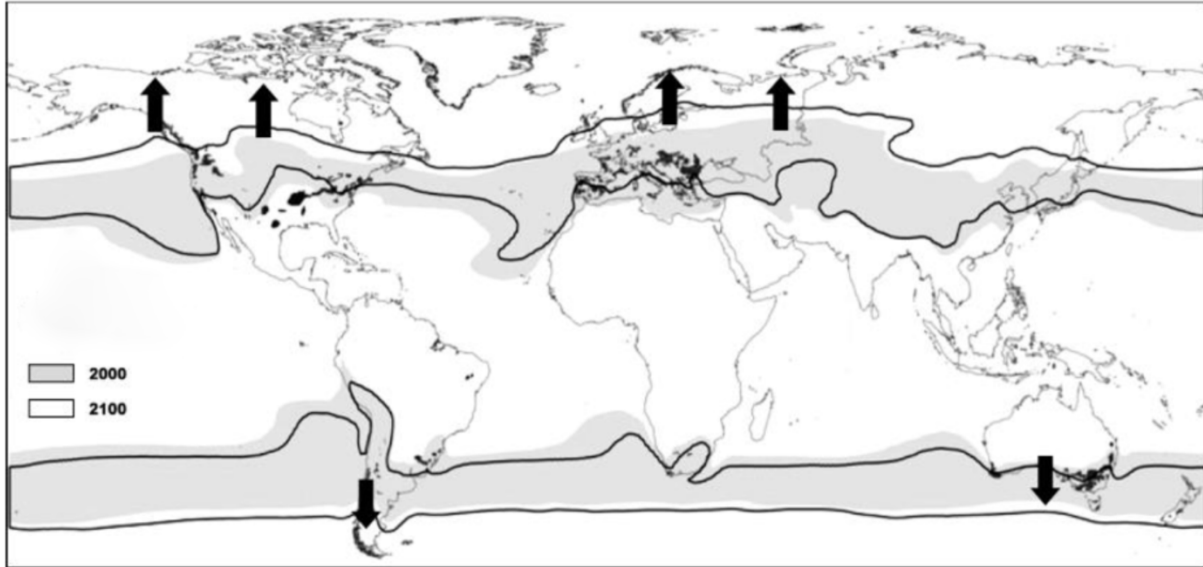


Figure 2. Effects of climate change on isotherms and viticultural zones (2000-2100) (Soltekin et al., 2021)

When we look at the studies conducted on the negative effects of climate change, it has been observed that marine protected areas are also greatly affected. Marine Protected Areas (MPAs) are one of the main management tools to ensure the conservation of biodiversity and achieve significant ecological and economic gains in marine ecosystems. However, the rapid expansion of marine ecosystems fueled by drivers of global change raises major concerns about the potential of MPAs to retain ongoing biodiversity. The climate of the oceans is linked to the distribution of ecosystems and more extreme climate events such as heat waves (MHWs) (as well as long-lasting normal warm water events). Heatwaves are increasingly being reported and benthic habitats in tropical and temperate ecosystems around the world are associated with severe mass mortality events (MMEs) of species. The effectiveness of MPAs is debated, as most existing MPAs were designed without considering climate change stressors. Considering this fear, climate-adapted management of MPAs (incorporating climate change into MPA design and management in various forms) has been proposed as a tool to confront climate change in the local environment. Managerial issues and global stressors may overlap with ongoing local threats. Even in areas where hunting is prohibited, the presence of uncontrolled, non-consumptive recreational activities such as SCUBA diving has been documented to be harmful. The main impact associated with the overcrowding of divers is direct physical damage to reef habitat-forming species such as corals, gorgonians, sponges, and bryozoans. Paradoxically, MPAs may attract more visitors from surrounding areas, although this local impact may be higher in MPAs than in non-protected areas (Zentner, 2023). The aim of Zentner's service on this subject in 2023 is to investigate how climate-adapted local measures and protection of coralligenous sections in MPAs can be improved. This is intended to increase survey and climate propagation in the Medes Islands, a small and extremely densely lit Mediterranean MPA (Zentner, 2023). She first carried out demographic monitoring of an important habitat brand, gorgonian (*Paramuricea clavata*), as the stress of climate change increases, especially heat waves and recreational diving, as well as their interaction. Secondly, it used field data to estimate the long-term viability of this species through size-structured matrix population models. Finally, it investigated how different climate and local management scenarios could enable the conservation of this important habitat-forming species (Zentner, 2023). In addition to all these, natural disasters and weather events, which are the most well-known effects of climate change, negatively affect people's psychological states and cause anxiety about the future (Fritze et al., 2008). According to the World Health Organization (WHO), health; can be used as a state of complete well-being, not only of illness or disability but also of the person's mental and social abilities (World Health Organization, 2005). In the 1986 Ottawa Health Promotion Agreement, it was emphasized that a person's physical, social, and mental capacity should be able to define himself and his environment, cope with negative stress situations, and meet personal comforts. However, according to this agreement, health sectors are

Proceeding Book of ISESER 2023

not solely responsible for health. Healthy lifestyles need to be adopted (World Health Organization (WHO), 1986). According to the Victorian Health Promotion Foundation Mental Health Promotion Framework, individuals' ability to achieve their goals, their social lives, their ability to express their emotions and their communication with other people can shed light on their mental health (Victorian Health Promotion Foundation, 2005). People's opinions about climate change are largely shaped by the media. Information on this subject may be found disturbing by some people and may cause emotional effects such as future anxiety, hopelessness, and fear. Again, although the negative effects of climate change are accepted by some individuals, they may be denied by some, especially if these negativities contradict their interests. Children and young people from all walks of life observe and experience the events around them differently than adults. For this reason, children and young people at these ages are likely to be confused about climate change and worried about the future (Fritze et al., 2008). As the effects of climate change on human health; Hygiene problems and resistance may occur due to heart diseases due to temperature increases, circulatory disorders, lung and respiratory diseases due to air pollution, and water shortage (Aras et al., 2020). While research on the effects of climate change on human health continues, some studies have also mentioned that it may have psychological effects. Natural disasters such as hurricanes, fires, earthquakes, tsunamis, and floods, which increase due to climate change, affect people in many ways. Depending on the frequency of exposure, people exposed to such natural disasters may experience withdrawal in their social lives, anxiety disorders (anxiety of losing loved ones, anxiety of losing their housing rights), and post-traumatic stress disorders (Galea et al., 2007). The psychological effects of climate change on humans have given rise to the term "eco-anxiety". Individuals worry about environmental disasters and the extinction of living things in the world, and the chronic fear and anxiety about this issue is called eco-anxiety. According to this research, the number of people who think that environmental cleanliness in Turkey will get worse is 39% of the population. The self-criticism of the climate that causes products to come about the environment, the climate against people caring about climate change, and the permission of climate conditions to be constantly exposed to content related to climate conditions, disruptions as important reasons that increase the climate affected by climate conditions (Hiwell Psychology, 2022). It has been argued that climate change is a threat to the mental and emotional health of all people. It turns out that the change in climatic conditions and the danger to the planet of young people can lead to negative emotions. A series of survey questions were asked of young people to obtain their opinions on this issue. In conclusion, despite increasing interest in climate change emotions among young people, there is a lack of research on the validity of measurements of such emotions. It has been demonstrated that more efforts are needed to develop survey tools to operationalize young people's feelings about climate change (Martin et al., 2023). Drought, which is a major problem in agriculture, is the negative impact of social and economic recovery. Due to drought, people engaged in agriculture may become unemployed, which increases stress in societies. A study was conducted in Australia about drought and its psychological effects. According to this research, there was an increase in the rate of hospital admissions due to depression among older people and young people living in rural areas. This observed increase was associated with drought (Yusa et al., 2015). In 2012, a heavy rainstorm brought floods to the highest peaks of Val Camonica, an Alpine valley in the Lombardy region of northern Italy. The downpour triggered a massive rockslide that plummeted to the valley floor 2,000 meters below, blocking the valley's main road with debris. A resident of the town in this region describes what it is like to live there now: "Living close to a place with a high risk of floods and landslides has of course led to a deterioration in my psychological health." People living in that area were asked questions about their experiences and generally received these answers. When people talked about the changes, they described how the changes affected their sense of well-being. "If the region and climate change, we have to adapt, and this causes anxiety and preoccupation," said one mountain resident. Such negative impact on mental health was also reported by other participants, young and old. Climate change is "Negative for my mood" and "Climate changes have affected me by slightly changing my mood towards the negative." "I adapt as I get used to the changes." A young man stated that he was more afraid than before, "I am more afraid of the effects of hail and wind for both the car and the garage and outdoor activities." Another mountain dweller said simply: "All these changes are making my well-being worse." Changes in weather and seasons are instead attributed to climate change, affecting people's sense of security, predictability and control, and triggering feelings of anxiety, distress, and uncertainty. Although people are noticing

Proceeding Book of ISESER 2023

significant changes in weather and climate right now, much of this anxiety and concern is directed toward the future (Whitaker, 2023).

Such psychological effects may differ in societies depending on the types of disasters and their destructive effects. In societies exposed to devastating disasters, emergency interventions, and health, economic, and social supports provided by governments also affect the mental health of societies positively or negatively (Fritze et al., 2008). Especially in countries with low education levels or low economies, accessing resources and accurate information is a problem. This problem also brings a feeling of insecurity and hopelessness. The level of poverty and mental health are directly related (WHO, 2004). For this reason, the psychological effects of climate change should not be underestimated. In the long term, its impact on societies can reach significant levels. The most common psychological response often observed after devastating disasters is acute traumatic stress. Such psychological symptoms decrease after disasters when individuals feel safe. In addition, chronic post-traumatic stress disorders (PTSD), prolonged mourning, depression, anxiety disorders, and increases in alcohol and drug use are observed in individuals who have lost their loved ones but survived themselves. It has also been observed that children have more severe psychological problems than adults. For example, during the Cold War, children thought they would not survive into adulthood, so it was known that they experienced hopelessness and anxiety about the future. Again, according to this research, individuals affected by Hurricane Katrina had a high rate of suicide and attempted suicide, domestic violence, and depression (Fritze et al., 2008). In a study conducted after Hurricane Floyd in North Carolina, an increase in child abuse was observed due to increased stress in parents and decreased social and economic support. Again, according to this research, it is assumed that drought has negative effects on mental health in the long term (O'Brien et al., 2014). The expansion at the clinical or subclinical level regarding the mental health effects of disasters, which are among the threats of climate change, is increasing in strength in different diversity and cultures (Crabtree, 2012). In 2007, Galea and colleagues conducted studies in Alabama, Louisiana, Mississippi, and New Orleans to understand the relationships between anxiety disorders and Hurricane Katrina. This survey-based research concluded that individuals, especially those living in the New Orleans area, experienced hurricane-related stress. Physical injury, illness, loss of life, and property are stated as stress factors (Galea et al., 2007).

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