

**HASAN KALYONCU UNIVERSITY
GRADUATE SCHOOL OF
NATURAL AND APPLIED SCIENCES**

**GLOBAL WARMING AND EFFECTS ON
UNDERGROUND WATER**

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IN
CIVIL ENGINEERING**

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**Global Warming And Effects On
Underground Water**

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In
Civil Engineering
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**Supervisor
Assist. Prof. Dr.Hüseyin Çağın KILINÇ**

**by
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ABSTRACT
GLOBAL WARMING AND EFFECTS ON
UNDERGROUND WATER

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There are situations such as climate change, drought and precipitation that can be seen due to different climate structures in the world and especially due to global warming. Since there are many different climates around the world, it is not possible to make a global interpretation due to global climate change. Global warming will create serious deformations in agricultural activities, in animals and plants and in the habitats of people and create problems for life. When we go deeper, the most important reason for global warming is human beings. In this study, the effects of global water resources, precipitation, drought, climate change, global warming on water resources and underground water resources were investigated. Not only on global warming, but also on the effects of global warming such as climate change, precipitation and drought, water resources have been studied, recommendations have been given, and past and recent protocols have been examined.

Keywords: Global Warming, Climate Change, Drought, Water Resources, Underground Water Resources

ÖZET

KÜRESEL ISINMANIN YERALTI SULARINA ETKİLERİ

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Dünyada farklı iklim yapıları sebebiyle ve özellikle küresel ısınmaya bağlı olarak görülebilecek iklim değişikliği, kuraklık ve yağışların değişmesi gibi durumlar söz konusudur. Dünya üzerinde çok farklı iklimler bulunduğundan kaynaklı, küresel iklim değişikliğinden dolayı dünya genelinde bir yorum yapılması söz konusu değildir. Küresel ısınma, tarımsal faaliyetlerde, hayvanların ve bitkileri ve insanların yaşam alanlarında ciddi deformasyonlar yaratıp hayata karşı sorunlar çıkaracaktır. Konunun derinine inildiğinde, küresel ısınmanın en büyük sebebi insanoğludur. Bu çalışmada dünya üzerinde bulunan su kaynakları, yağış, kuraklık, iklim değişikliği, küresel ısınmanın su kaynakları ve yer altı su kaynaklarına olan etkisi incelenmiştir. Sadece küresel ısınma üzerinde değil, küresel ısınmanın etkisi olan iklim değişikliği, yağışlar, kuraklık gibi durumları su kaynakları üzerinde çalışmalar yapılmış, öneriler verilmiş, geçmişte ve yakın tarihte yapılan protokoller incelenmiştir.

Anahtar Kelimeler: Küresel Isınma, İklim Değişikliği, Kuraklık, Su Kaynakları, Yeraltı Su Kaynakları

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LIST OF SYMBOLS

$^{\circ}\text{C}$ Temperature Unit

$^{\circ}$ Shows of Degree

km^3 Cubic Kilometer

% Shows of value a 100



LIST OF ABBREVIATIONS

IPCC	The International Plant Protection Convention
CO ₂	Carbondioxide
ppm	Out of a Million
CFC	Cloro Fluoro Carbon
NO ₂	Diazoxide
O ₃	Ozone
CO	Carbon monoxide
CH ₄	Methane Gas
UNEP	United Nations Environment Programme
UN	United Nations
INDC	National Declaration of Intent

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CHAPTER 1

INTRODUCTION

1.1 General

Water is a very important resource for the survival and continuity of humanity. With the increase of the human population, water use is increasing day by day. Consequently, as increasing in world population, also demands for water have also increased rapidly. It is a vital source for the continuation of the all world. Many activities around the world provide activity through water resources. Continuity of water resources will bring the continuation of these activities. The waters that make up a large part of the earth are called water spheres. Oceans, seas, lakes, groundwater, swamps, permanent snow and glaciers form the world's water resources. The percentage distributions of these formations are as follows, 97% of the water resources are salty water and 3% are fresh water. Since the source of interest to us is fresh water resources, 3% water supply. 67% of the 3% fresh water source is formed by glaciers and 32% is groundwater. The remaining 1% consists of lakes, 11% swamps, and 2% rivers. This total water ratio saves all the time with water cycle (Kılınç, 2016). If the water cycle is explained briefly, the sun heats the water in the oceans and the heated water evaporates and rises to the atmosphere. The rising air currents carry the water vapor upwards in the atmosphere, and the cooler air present there causes condensation in the clouds. Air currents move clouds around the earth, cloud particles come together, grow and fall from the sky as rainfall. Some rains return to the earth as snow and may accumulate in the form of ice dunes and glaciers that can remain in frozen water bodies for thousands of years. In temperate climates, when spring comes, snow covers often melt and melt water flows into the surface of the soil as melted snow and sometimes causes floods (Uluirmak, 2014). Underground fresh water resources are more than the fresh water of rivers and lakes on the earth. Water leaking into the ground is held by rocks. These waters are called underground water resources. Depending on the shape, permeability and gravity of the rocks, underground water resources are either stored away from the earth or emerge as a source on the earth. This water source, which is extracted, becomes a source of life for humans, animals and plants and other living things. A certain portion of the water falling on the earth or formed on the earth leaks from the permeable layers, layers or rock cracks under the effect of gravity. Groundwater seeps between porous rocks, gutters or cracks. The accumulated water is called groundwater.

Nutrition, storage and continuity are very important for the formation and continuity of groundwater resources. If there is not enough nutrition, there is no storage in underground water resources. Continuity is not provided unless there is storage in underground water resources. The most important factor affecting the feeding of underground water resources is rainfall. The more rainfall, the more groundwater resources are fed (Soytürk, 2014). There are some conditions for the storage of groundwater resources, which depend on the different properties of surface, these are, slope, the hardness, the permeability, the varieties of the surface and the vegetation cover. If the groundwater resources are supplied and stored, the continuity of the groundwater resources increases. Groundwater resources may not always accumulate at the desired location. They need an impermeable layer to accumulate. When the impermeable layer is reached, a certain amount of water accumulates on this layer. This kind of accumulated underground water is called ground water. As can be expected, the groundwater level is close to the surface in areas with high rainfall. It is far from the surface in arid regions with low rainfall. The most important factor affecting the amount of ground water is the climate change (İlgar, 2016). Ground water level varies from seasons or climate. This level is low in climates or seasons where rainfall is low and this level is high in climates or seasons where rainfall is high. The ground waters move downward with gravity. Where these waters, which move depending on the shape, slope and reach of the impermeable layer, intersect with the earth and spontaneously arise with the with the aid of flow. Ground waters do not occur with the help of flow only. The water of some groundwater resources is hot and the water of some groundwater resources is frostiness. Some groundwater sources are mineral and gaseous, some groundwater sources are drinking water. As it is noticed, fresh water resources occupy very little space in the world. For this reason, humans should use fresh water resources regularly, frugally. Humans affect water resources directly and indirectly. Indirect influence is global warming. Global warming is one of the most important conditions that cause water loss in the world. Groundwater resources are used in many different ways. These varieties vary according to the feeding, storage, resource types of the ground water and proximity of the ground water to the earth. The varieties are diversified as spring water, artesian spring water and thermal spring water, respectively. Spring water is called the waters where the water emerges. Packaged water, called bottle or glass water, is often referred to as spring water. Spring waters can be used in different ways. Water is taken from sources and distributed to cities, villages and neighborhoods by means of pipes. Streams, rivers, or streams are often the starting points and feeding, spring water or rain water. Drilling tools of

ground waters (with materials produced by human beings) are called artesian water. It can be used for feeding crops or plants in agricultural fields. It can be used where there is no spring water or the spring water does not reach. This type of water provides groundwater access to the settlements with the help of pumps, but these waters are never used as drinking water without treatment. If the spring waters rise to the surface as hot, these spring waters are called thermal water sources or fault sources. It is increasingly important to understand what might happen when climate changes . In climate change, what people understand is temperature rising but the main point that we have to focus on is it will be effect not only temperature but also climate and it will also occur extraordinary nature events. As it is said, people just think that the temperature will increase, they do not emphasize on this issue. World can stand on maximum up to 2°C average global temperature rising. After 2 °C, it is obvious that there will be huge damages on environment and ecological life (Kılınç, 2016). Although global warming creates a perception that people will warm the air, the breaks in the glaciers will bring cold air flow and show a tendency to cool down in climates. These damages will lead to irreversible losses in water resources and affect the world negatively. People think that these water resources can be conserved and maintained only if they are used sparingly and carefully. On the one hand, they are right, but the only effect is not the types of use. Global warming, which is one of the biggest damages that people cause to the world, causes this water source to decrease and decrease its efficiency. Groundwater resources will continue to decline as global warming and unbalanced use increase. It is the name given to the increase in the average temperatures measured on land, sea and air throughout the world as a result of the greenhouse effect, which is thought to be caused mainly by the gases released into the atmosphere. Sun's effective is the magnetic field of the sun and the solar wind, which emerge in the form of protons and electrons, are described as a shield against cosmic radiations in the Solar system. This shield, which is weakened by the variable activity of the sun, transmits cosmic radiations. Excessive cosmic radiation increases clouding and changes the rate of radiation from the Sun, causing global temperature increase. Ultraviolet radiation from the Sun will also cause a change in the ozone layer where chemical reactions occur and thus affect the entire atmosphere. Fossil fuels like coal, oil and natural gas meet a large part of today's energy needs. These fossil fuels, which contain carbon and hydrogen in their structures, are formed in long periods and consumed in a very short period. These types of fuel are the causes of global warming with their oscillations after use. Greenhouse gases are carbon dioxide, Methane, Nitrous Oxide, Hydrofluoride Gases or compounds that cause the

atmosphere to warm up by holding infrared rays in the atmosphere, such as carbons, are called greenhouse gases. The role of greenhouse gas in global warming is very high (Akin, 2004). If global warming continues in this way, it will cause climate change; it will disrupt the balance of the world. It will cause hurricanes, floods, droughts and desertification. With the melting of glaciers in the arctic, the expected floods will flood all coastal areas, which will narrow the world's habitat. Temperature increases cause drought, desertification and forest fires. The rapid consuming of water resources will result in thirst. There are reasons for the depletion of water resources, one of the main reasons is excessive use mankind considers water resources to be infinite and uses water resources unconsciously. Another reason for the lessening of water resources is the serious pollution of water resources as a result of industrialization and the use of water resources. Another reason for the depletion of water resources is the increased evaporation and its consequences due to global warming. These results lead to irreversible conditions, making the water unusable and decreasing again. Using groundwater and surface water resources in an unbalanced, irregular and endless manner in an individual and institutional manner leads to the rapid depletion of groundwater resources. Global warming around the world, climate changes, unconscious water consumption, lakes drying under the influence of human beings, poor water management cause a significant decrease in usable water resources worldwide. The greatest factor in these reductions is global warming (Yüksel et al., 2015). Looking at the causes of global warming that causes climate change; It is seen that it is human origin and arises from the extreme desire and dissatisfaction of human beings. In addition, global warming has a large share of the passion of some companies to make more profits by disregarding nature and people. In the last 50 years, there has been an increase in the accumulation of greenhouse gases such as carbon dioxide and methane in the atmosphere due to depletion of fossil fuels, deforestation, rapid population growth and increasing consumption tendency in societies. This increase has been shown to cause global warming. When greenhouse gas accumulates in the atmosphere, it triggers global warming. Over time, global warming affects the water resources in the world and makes them unusable. As temperatures rise, evaporation from large water surfaces will increase, the groundwater level will drop, and the drying of the soil will inevitably be affected by evaporation. As a result, climate will change regionally and agricultural products and forests will be damaged. Close to water surfaces such as lakes and seas, air humidity and precipitation will increase and floods and floods will occur. In this way, social migration will start with the disruption of balances (Doğan et al., 2010).

1.2 Temperature and Temperature Distribution in the World

As is known in the world, one of the biggest factors affecting people's lives is temperature. Warmth is felt in different degrees around the world, which changes people's quality of life and standards. The geographical distribution of temperature on earth has a decisive influence on latitude, longitude, distribution of land and sea and height. Cities or countries that have coastal sea have different temperatures as well as humidity. On the other hand, the altitude of the countries also varies. As it is known, in places with high altitudes, there is a severe drought in summer and a severe cold in winter. Apart from these factors, other factors also vary in the temperatures of the countries. Depending on the angle of fall of the sun's rays, the temperature decreases as you move from the Equator to the poles. However, the distribution of land and seas prevents this reduction from overlapping with the parallel. The different heating and cooling properties of land and sea have an effect on this situation. The vegetation of the country or the locations investigated has also significantly affected. With the effect of changing ground shapes and height at short distances, the temperature distribution changes in a narrow space. Occasionally, the effect of altitude may conceal the effects of other factors. For this reason, reduced isotherm maps are preferred to eliminate the effects of altitude when examining the distribution of temperature on earth. The average annual temperature provides information about the overall annual temperature balance of a place. However, the average temperature used does not reflect the change in temperature during the year. When the average annual temperature map of the world is examined, the following conclusions are reached. As you move from the equator to the poles, the temperature generally decreases. The highest temperatures occur in the northern hemisphere on the land around the Tropic of Cancer. At low latitudes, the land is warmer than the sea, and at high latitudes the sea is warmer than the land. The reason for this situation is that the land warms more than the seas at low latitudes and loses more energy at high latitudes. Since the land effect is dominant, the northern hemisphere is warmer than the southern hemisphere to 45° latitude. After the 45° latitude, the southern hemisphere is warmer than the northern hemisphere because the sea effect is dominant. Usually the temperature values in the Northern Hemisphere are higher than the Southern Hemisphere. This is due to the fact that the Northern Hemisphere occupies more land and the Southern Hemisphere occupies more space.

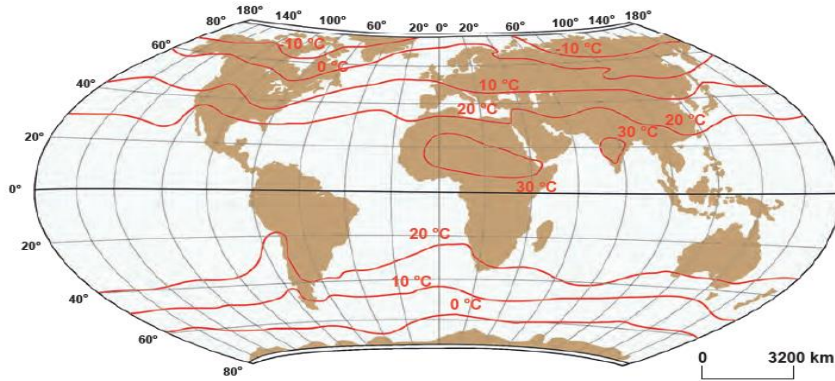


Figure 1. 1 World Temperature Curves

Figure 1.1 presents the details of temperature and temperature distribution on Earth. Global Warming, which is the main topic of this subject, has a significant share in this distribution and temperature. The effects of global warming cause temperature increase in some places and decrease in temperature in some places. This directly affects the lives of people and all other living things in the world.

1.3 Precipitation and Precipitation Distribution on Earth

Precipitation is the event that air masses come down to the surface in liquid or solid state as a result of cooling by passing through a cold place or rising by encountering a layer of cold air. When people say ‘rainfall yağmur, rain comes to mind. But rainfall should not mean only as rain. There are varieties such as rain, snow and hail, which feed water resources. Annual rainfall is expressed in mm, cm and m and daily rainfall is expressed in kg / m². It is expressed in length units, based on the altitude of the annual rainfall in an area. They can occur in many different forms, rain, snow, hail. The distribution of rainfall to days, months and seasons during the year is called the rainfall regime. The precipitation regime is as important as precipitation. Because the same amount of rainfall that falls in summer or winter is not at the same level of benefit to the soil. In summer, due to seasonal conditions evaporation and the need for soil will increase in the amount of rainfall is not the same amount of benefit and yield, but the rainfall in the winter months, come with the accumulated water to provide a more nutritious state. On earth, precipitation is regular in some regions and irregular in some regions. There are places where rainfall is distributed regularly as well as climatic zones where rainfall is distributed unevenly. For example, precipitation on the Equatorial Zone and the eastern Black Sea coast generally spreads regularly throughout the

year. The precipitation regime of such places is regulated. Precipitation is collected in certain months of the year in Central Asia and the Mediterranean Region. In such places, the precipitation regime is irregular. In order to be orderly, it must have continuity and a similar amount. Due to factors such as general air circulation, land and sea distribution, landforms and elevations, all parts of the earth do not receive the same amount of precipitation. There are places in the world with a lot of rainfall. If mentioned; The most rainy places; equator and its environs, monsoon regions, western coasts of the land of the middle belt and eastern parts of the land of the hot belt. The average annual rainfall is over 1000 mm. The places with the least rainfall; Around 30 ° north and south latitudes, polar regions and inland areas of the middle belt surrounded by high mountains. The average annual rainfall here is below 250 mm. Precipitations are very high in some place (Figure 1.3) and some place it very low in a world (Figure 1.2)



Figure 1. 2 Places Where the Precipitation is Low on the World Map



Figure 1. 3 The Places Where the Precipitation is High

1.4 Drought and Drought Distribution in the World

Water is necessary for the survival of life. Throughout history, all civilizations have been established at the water's edge and have been able to develop their civilization to the extent that they can use water. Water has brought the end of many civilizations as well as the beginning of civilizations. Uncontrolled increases and decreases in the amount of water in the rivers adversely affected the socioeconomic activities of the communities and caused many of them to lose their existence or leave their homes. Drought is a natural disaster that is difficult to prevent but can minimize damage when necessary measures are taken. However, it is also known that factors such as excessive and misuse of resources, environmental pollution, distorted urbanization, industrialization, population growth and destruction of forests cause climate change. Unexpected increases in precipitation and temperature values, decreases or changes in precipitation type are important results of climate change. Drought is a more important problem with climate change (Figure 1.4). For this reason, the causes and consequences of drought should be investigated and ways to minimize the negative effects of drought should be found (Yeğnidemir, 2005).

Drought has a large economic impact on agriculture, animal husbandry, forestry, fisheries and related sectors. The decrease in yield in plant and animal products, insect infestation, plant diseases, forest and grassland fires and wind erosion are some of the negative effects of drought on the economy. Decrease in plant and animal species, forest and grassland fires, degradation of natural ecology and soil erosion are environmental losses caused by drought. Some of these effects return to their former state with the end of the drought, while others continue for some time and sometimes are permanent. Disputes among water users, decline in quality of life, public safety endangered and health problems are among the social impacts of drought. Migrations to areas where water resources and food are sufficient are problems for many countries. In general, these migrations to drought-free areas and cities create increasing pressure on the social infrastructure of cities (Şimşek, 2010).

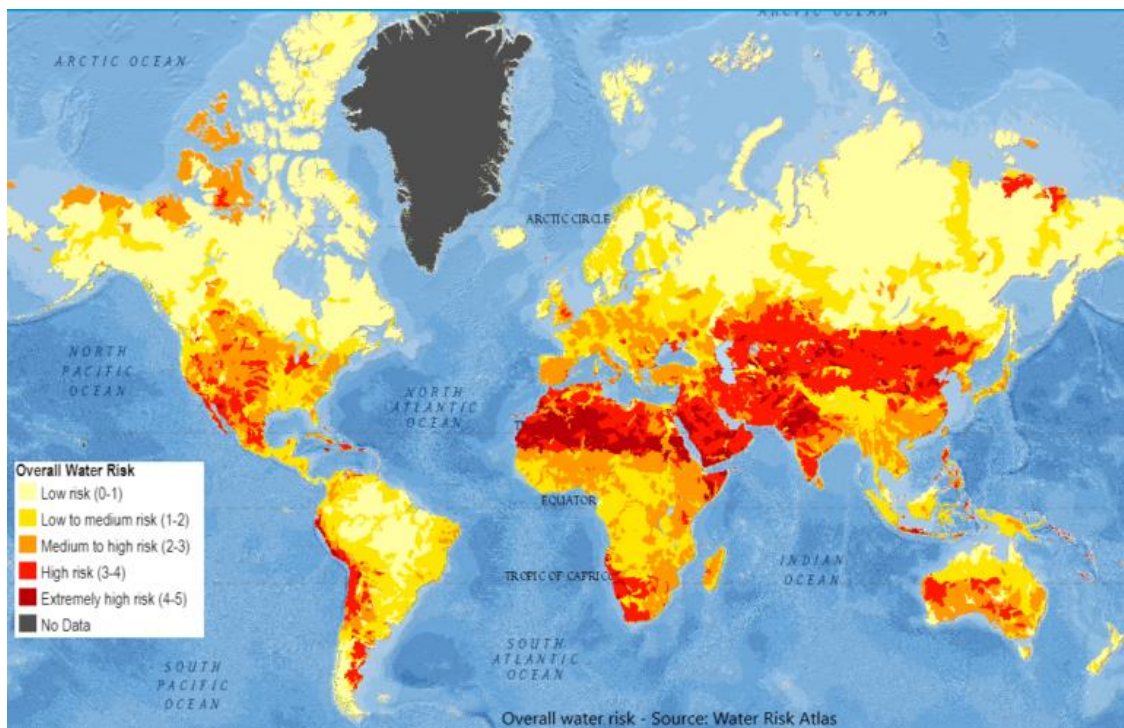


Figure 1. 4 Provides Information On Drought In The World

1.5 Climate Change in the World

Found in these days of the world, there are multiple environmental problems. These environmental problems are experienced in different environmental environments. Environmental pollution, which creates many negative consequences such as air, soil and water pollution, endangers the life and continuity of human beings and living lives and brings the end of many living beings. On the subject mentioned, the main and main source of these problems is the behaviors that humanity has made the ecological balance of the world for their own interests. If these pollutants are to be considered as a whole, the biggest environmental problem is climate change. The climate system is a complex and interactive system that covers atmospheres, land surfaces, snow and ice, oceans and other water bodies and living things. This system gradually changes over time, under the influence of its internal dynamics or due to changes in external factors. External forces include natural phenomena such as volcanic eruptions and solar variability and human-induced changes in the composition of the atmosphere. Effects of extreme weather phenomena, Extreme temperatures Increased in tropical storms, Changes in precipitation patterns, Moderate storm rise, Energy demand imbalances, Increased coastal areas, Effects on human health, Impact on water resources, Increases in the number and type of disasters global warming leads to climate change. Climate change has consequences that can change the physical and human geography of our planet.

Some causes of climate change are, as a result of continent shifting, the change of the current wind systems on the earth and the flow systems in the ocean are the causes of climate change in the long term. After the volcano eruptions, the gases reaching the atmosphere form a layer and prevent the passage of rays, causing a decrease in temperature. Considering the fact that glaciers in the Arctic and Antarctic continents reflect the majority of incoming solar rays, play an important role in the formation of winds, and have a significant impact on the earth's climate. Anthropogenic activities increased with the industrial revolution. As a result, increasing deforestation, misuse of land and the destruction of trees, the lungs of the world, caused deforestation to accelerate climate change. The significant increase in greenhouse gas emissions from past to present is one of the most important reasons for the deterioration of the existing climate structure. Major changes in people's daily life and working environment, the rapid increase in urbanization and a number of agricultural activities affect climate change (Figure 1.5). In terms of sustainability, the lack of importance given to renewable energy sources, as well as not reducing the use of fossil fuels, lead to climate and environmental destruction that are difficult to recycle (Akbulut, 2019).

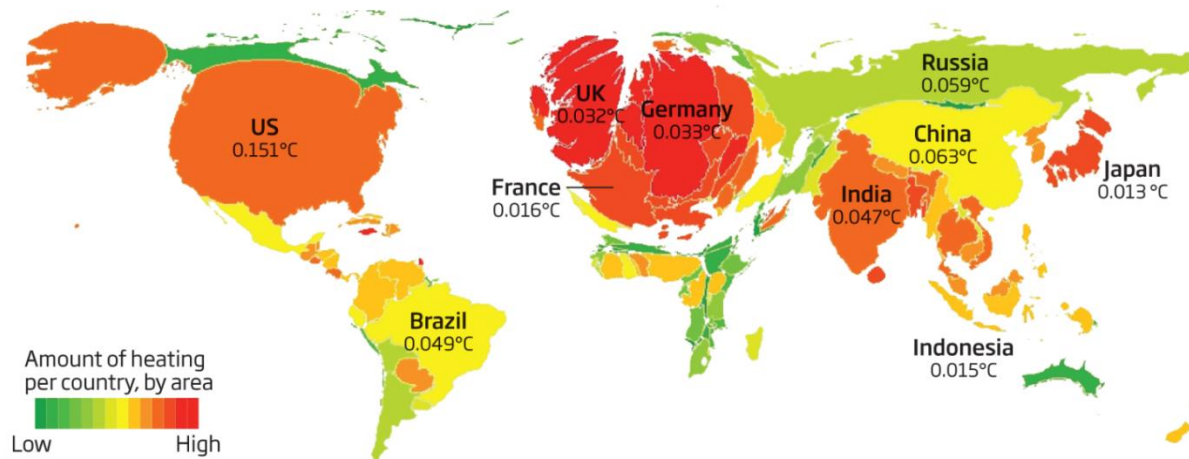


Figure 1. 5 Climate Change Affects on World

Climate change describes the weather conditions and the fluctuations of its properties. In recent years, Scientists are concerned with global warming, which is related to the impact of human activities on the climate system, although natural greenhouse effects are increasing. In human life, the importance of climate is associated with the positive or negative effects of climate on social and economic life and its consequences (Demir et al., 2013). Many institutions and organizations, such as national and international, central and local governments and non-governmental organizations, have made different efforts to determine climate change and its impact in order to maintain a better and healthier lives of people. But these efforts and efforts are often not enough. For this reason, the intensity of climate change increases day by day. It should be ensured that human beings work hard and more sensitive as mentioned before.

1.6 Aim of the Study

In this study, the effects of global warming and groundwater resources were investigated. In the introduction, talked about how water is formed, its distribution in the world, the water resources in the world and the water cycle. Then informed about underground water resources. After that, the types and use of groundwater resources were discussed. Not only global warming but also global warming brought about the effects of drought, precipitation, climate change and temperature. Then, the decrease and the factors causing these water resources were mentioned. Finally, another sub-topic of global warming was discussed. When talking about global warming, how it was formed, its impact on the world and life, water resources and groundwater resources were mentioned.

CHAPTER 2

LITERATURE REVIEW

2.1 General

Under this title, other studies related to global warming and close to the thesis about water resources are briefly given names and their applications are mentioned.

According to Kılınçer et al., (2002), water is an indispensable natural resource for living things; In the absence of vegetative production is significantly restricted. Agriculture, which is the most user of water, includes functions related to the production of cultivated plants. Agriculture, the total national income of the 19%, that represents 9% of the exports and because it provides about jobs to 51% of the population in world, the social and the economic aspect plays an important role in the lives of the people.

Turan and Eren studied (2008), the increase in the world population and the decrease in the sensitivity to the environment causes the depletion of water which is an important input for agriculture, industry and technology. In addition, existing resources become unusable due to pesticides, chemicals used in industry and unconscious behavior of people. As it is vitally important and has economic functions, development cannot be achieved without water and desired prosperity levels cannot be achieved and poverty cannot be prevented without development.

According to Tamer (2007), due to unplanned industrialization, industrial enterprises discharging waste water without any treatment also causes significant damages to our water resources which are used as both drinking and irrigation water. However, some companies in the packaged water sector cause serious decreases in the land where they are entitled to long-term use, especially due to the excessive withdrawal of groundwater. The negative examples that we give about the importance of water still show that the necessary precautions are not taken for conscious use and protection. In particular, unconscious pollution of fresh water resources threatens not only the water resources we use for drinking water supply, but also the living beings living in it, and results in indirect recycling in the ecosystem. For all these reasons, water, which is the most basic vital support system of the earth, has been described as a strategic resource in the last quarter century. Water supply, which is the indispensable input of many sectors for economic development, has been identified with oil.

2.2 Global Warming and Water Resources

Kadioğlu (2007) working on , 'Global Warming' is the name of the general title that covers many sub-topics such as the danger of extinction of living species, the destruction of water resources, the destruction of vegetation and soil, climate change, degradation of atmospheric equilibrium and ozone depletion, and environmental pollution.

Keleş ve Hamamcı (2005) studied, human sovereignty over nature has been justified with the understanding of modern science. In the modern era, science aimed to acquire and put knowledge into practice. In the application of science, in other words, the concept of using nature for human lies. Science will enlighten human beings through knowledge and make them independent of nature, and will provide human sovereignty over nature by processing nature through technique. The quest for superiority in nature has disturbed the harmony between man and his environment. Human damage to the environment was not recognized in the early days due to the nature's self-renewal. Contrary to this belief, as the quality and quantity of environmental pollution increased, the environment could not protect itself and began to deteriorate rapidly.

Woolhiser and Pegram (1979) working on , the air temperature has increased in the last century due to the CO₂ content in the atmosphere and the modeling is expected to increase in the coming period. It is important that the model reflects seasonal temperature differences during the development of air temperature, water temperature and precipitation models. Woolhiser and Pegram simulate seasonal oscillations by modeling precipitation data with Fourier Series. They have developed methods to obtain the maximum affinity estimation of Fourier series coefficients. Studies were conducted on four stations in the United States. The results obtained provided sufficient approximation in the affinity ratio test.

Tuna (2006) studied, the problem of global warming is the most important indicator of the globalization of environmental problems. Global warming as a result of the melting of glaciers, rising sea levels and as a result of the risk of extinction of many communities living in coastal cities have raised this problem. In addition, global climate change is experienced as a result of global warming and the climate, water, atmosphere and soil structure of the world is adversely affected.

According to Saraçoğlu (2011), it is estimated that glacial melting events on the earth will cause floods and erosion with rising sea levels, causing the islands and coastal areas to be submerged. This is expected to cause significant damage to biological diversity in coastal

regions. One of the important atmospheric events expected in the global warming process is the result of severe increases in land and sea surface temperatures in some regions, severe temperature differences between regions and the occurrence of severe air currents such as storms and tornadoes, disasters are expected to cause an increase in frequency and severity.

Karaman and Gökalp (2010) working on, drought is the most important negative consequences impact of global warming and subsequent climate change on precipitation regimes. It is predicted that there will be more rainfall in the regions that have received precipitation before, and this problem will increase further in drought regions. In other words, global warming will cause floods, floods and hurricanes in some regions and severe droughts. This situation will expose many people to the danger of hunger and thirst. The tendency to warm up in the atmosphere results in more evaporation, drought and irregular rainfall. Therefore, humanity has been exposed to the risk of periodic droughts all over the world as a result of decreasing useful rainfall due to irregular rainfall. Water scarcity, which quickly became a major problem, directly affected 26 countries with a total population of 300 million in the 1990s. It is known that the world population will getting reach day by day 9.3 billion in 2050 and water scarcity will be experienced in 60 countries due to climate changes. In 1990, approximately one third of the world's population lived in countries that use more than 20% of water resources, while 60% of the larger total by 2025, the decline in water resources without climate change will result in changes in the potential to generate energy. Based on the changes in river flow, it is possible to draw a similar trend in water resources. Groundwater is a major source of drinking and potable water, especially in rural areas in arid and semi-arid regions. The aquifer is fed by rainfall, rivers and lakes. It was understood that the flow changes occurring from year to year were due to changes in precipitation rather than changes in temperature. The rise in sea level will cause salt water interference in coastal aquifers. The amount of this interference depends on the hydraulic gradient of groundwater. Shallow coastal aquifers are at greatest risk. The decrease in precipitation caused by the rise of the seas is the reason for the decrease in the volume of collectable water and will reduce the amount of the fresh water resources which are low.

According to research from Özey (2001), the first study by scientists on climate change was the definition of the greenhouse effect of the atmosphere by the French mathematician Baron Jean Baptiste Fourier in 1827 . Fourier compared the Earth's atmosphere to greenhouse glass and stated that the surface temperature affects the chemical composition of the atmosphere in

the way that a greenhouse glass holds and heats the air. After Fourier defined the greenhouse effect of the atmosphere, the effects of the gases forming the greenhouse effect on the Earth's climate were started to be investigated. As a result of the researches, the idea that CO₂ concentration could have an impact on the world climate was first put forward by Tyndall in 1863. Studies from this time until 1896 focused on the impact of CO₂ gas on the Earth's climate . The best models showing how the CO₂ concentration will change over time include those from Manabe in 1971 and Wetherland in 1967 . In these studies and other studies, it was stated that the CO₂ concentration would increase from 320 (323) ppm to 375 ppm from 1967 to 2000 and this would increase the average air temperature by 0.50 °C provided that the relative humidity and other factors remained constant. Experimental results published in 1988 and 1990 confirmed the results obtained from these studies. Indeed, the measurement results published on this date show that the average air temperature increases by 0.50 °C and the CO₂ concentration is 340 (350) ppm.

Babuş (2005) studied, the main cause of human climate change is the greenhouse gases whose concentrations increase in the atmosphere. As a result of increasing greenhouse gas concentrations, surface temperatures increase globally. The global warming caused by increasing temperature causes changes in other climate elements that are related to each other. For example, with increasing temperatures, precipitation and density change, snow and glaciers melt, sea levels rise, and all these changes affect natural and socio-economic systems. Increasing concentrations of greenhouse gases in the atmosphere are at the root of all these events. Therefore, when making predictions about climate elements, the change in the concentration of greenhouse gases in the atmosphere is taken as the basis.

Houghton (2005) working on, with the increasing use of fossil fuels since the beginning of the industrial era, the natural concentration of greenhouse gases, which is naturally present in the atmosphere and creates a greenhouse effect, has started to change. This has caused the atmosphere to retain more heat and a process called global warming has started to be seen. In the simplest terms, global warming is the artificial rise of the earth's temperature as a result of increasing the concentration of greenhouse gases in the atmosphere.

Greenhouse gases trap the infrared radiation reflected from the surface of the earth and prevent these rays from escaping into space, disrupting the energy balance of the planet and causing the surface temperature to rise. This effect of greenhouse gases is called the greenhouse effect and the warming that occurs in this way is called global warming.

According to Tuna (2003), decreasing water resources due to rising temperatures due to global warming will not only have an impact on drinking water. Reduced water resources, drought and therefore will damage the vegetation cover, so that indirect erosion and will also cause soil loss. With the impact of climate change and desertification, reduced forests, loss of biodiversity, floods may have more severe impacts in less developed countries (especially in the tropical climate zone). Another problem of underdeveloped countries is the decrease in agricultural land as a result of the abuse and pollution of the land. Such shortages will probably lead to increased poverty and social conflicts. All these crises are dangerous because they are all interdependent and self-sustaining. Water shortage, for example, may cause conflict on existing resources.

Küçükılavuz (2009) and Şen (2005) studied, underground waters are undoubtedly the most important natural resources of the world. Because it is the only source that can supply the water needed to sustain life in dry periods. Feeding of underground aquifers is provided by rains, rivers, lakes and melting snow. Water quickly flows through the macro-pore or crevices to reach the aquifers under the ground and it fills all empty places. Nutritional status varies depending on the structure of the rock and soil in the upper region of the aquifer. The structures that will affect the increase in nutrition are the high number of macropores, crevices and cracks. Feeding, called fast feeding, can take place in every rainfall. Therefore, changes in precipitation regime are important for aquifers. It is concluded that the changes in precipitation rather than changes in temperatures should be considered in order to understand the flow changes that vary from year to year. In other words, the water occupancy rates of aquifers are directly related to climates.

Özkay et al.,(2008) working on , stated that agriculture is the largest user of underground and surface water resources. With today's irrigation practices, agricultural production is increased; In addition to loss of resources, the environment is damaged and natural balance is disturbed. They stated that it was foreseen that agriculture could not maintain this position for a long time due to the increasing population and water requirement on the one hand and the fresh water resources expected to decrease due to climate change on the other hand.

According to some notes from IPCC (2001), the effect of climate change on stream flow and groundwater recharge varies regionally and among scenarios, largely following projected changes in precipitation. There are significant species in different regions in stream stream volumes - these regions increase and decrease for the type. However, due to factors such as the imbalance of hydrological behavior over time, the shortness of instrumental recordings and the reaction of river flows to factors other than climate change, these trends are a result of climate change. confidence is low. Higher temperatures mean that a greater proportion of winter precipitation falls as rain instead of snow, and therefore is not stored on the land surface until it melts in the spring. Especially in cold eras, an increase in temperature still means that winter precipitation falls as snow, so there will be little change in flow timing in these regions. Flood size and frequency will increase in most regions and low flows will decrease in many regions. Changes in low flows are a function of changes in precipitation and evaporation. Evaporation generally is projected to increase, which may lead to lower flows even where precipitation increases or shows little change. Predicted climate change can further reduce stream flow and groundwater regeneration in most of these water-stressed countries - for example, in Central Asia, South Africa and countries around the Mediterranean.

Elgaali E., Garcia L. (2002), the research projects an increase in temperature ($4^{\circ} - 7^{\circ} \text{C}$) and winter precipitation and a decrease in summer precipitation. Based on these projections the study region is expected to get drier. These dry conditions have adverse effects on water supplies in the region. Following the projected precipitation patterns, a decrease in water supply will occur. In 2060 a reduction in water supplies will occur from midseason (April/May) to the end of the season (June-Sept.). In 2090, based on the projections, water will be short over the whole season. High projected temperature increases ET and alters snowmelt time causing a shift in water availability to late winter and early summer. The study region is one of the regions most vulnerable to climate change. Water shortage is already a problem in the region. If precipitation amounts and timing change as projected, the water resources in the region will be under more stress.

Homer - Dixon (1999) working, water crisis is likely to occur in the coming years due to the increase in population growth rate. In addition, greenhouse gas creates uncertainty about the possibility of climate change caused by this and directly affects water consumption. So much so that climate change will shift the way of precipitation, and therefore there will be a need for more extensive water. This type of water shortage is generally expected to be seen in inland areas. In addition, some parts of the Middle East and Africa will continue to suffer. This will leave this region with a high population growth rate difficult.

Bariş (2007) studied, considering the effects of global warming, the most important problems are, decrease in agricultural production potential, decrease in water resources, increase in the need for agricultural and drinking water, damage to animal and plant habitats, decrease in the presence of water and heat stress caused diseases caused by health problems. Also, increases in summer drought can lead to desertification and erosion. Due to sea level rise, low flood-delta and coastal plains and estuary and ria-type coasts, which are dense settlements, tourism and agricultural areas, may be inundated. Transport and agriculture may be affected by sudden snow melts and avalanches. In the absence of consensus on fundamental measures to halt or slow down global warming at an international level, in the coming years; As drought increases, water resources will increase significantly and productivity in dry farming will decrease. Some species will not be able to grow.

Chaouche et al., (2010), has investigated, studied and studied precipitation, temperature and evaporation in the context of climate change on France's Mediterranean coast, suggesting that the region's water resources are sensitive to climate change. This sensitivity affects water resources by periodically showing positive and negative changes. Researchers discovered high local trends in both observation and model simulation values and suggested that this was related to the properties of Mediterranean climate characteristics. The study found that monthly temperatures increased in spring and June, a decrease in rainfall in June, but increased in November from 1970 to 2006.

Langan et al., (2001), their study on water temperature and air temperature data, they observed that there is nothing change in the average annual temperature but there was an increase in the average maximum daily temperature values in the spring and winter months. They found that the flow rate was not significantly affected and there was a strong direct proportion between air and water temperature. This reveals that the temperature in the river is directly caused by climate change.

According to Amadore et al., (1996) working on, the shallow and open aquifers in the arid and semi-arid regions opened up seasonal stream flows. According to the region where these are born, there is a decrease or increase according to local conditions. Increases in the evaporation will cause the ground water to be stored. The main problem for aquifers in the coastal areas is the rise of sea water. In this kind of salt water will enter the aquifers. Of course this will depend on the slope where the brine inlet condition will be located. The coastal aquifers found in the group are the most at risk group. The rise in the sea level, as well as the decrease in the next year, will cause a decrease in the volume of water to be collected. Instead, the quantity of fresh water, which is small, will be further reduced.

In the study of Yenigün et al., (2009), search an answer to the question of how changes in climate that are predicted to occur will affect the water potential of the region. Given the magnitude and importance of the material resources spent on the structures (irrigation, electricity, etc.) in the basin, the trend in terms of monitoring the changes (in terms of operation) and the protection of structures and lands (against flood risk) after the whole or part of the project control, and its dynamic implementation.

2.3 Impacts of Climate Change on Underground Water Resources

There are various studies in the literature about the effects of climate change on the watershed and the watersheds in the watershed. Langan et al., (2001) 30-year flow, water temperature and air temperature data in their study on the average annual temperature did not change, but observed an increase in the average maximum daily temperature in the spring and winter months. They found that the flow rate was not significantly affected and there was a strong direct proportion between air and water temperature. This shows that the temperature in the river is directly caused by climate change.

In a study by Yu et al., (2002), the impact of climate change on water resources in southern Taiwan was investigated. The data obtained as a result of the trend analyzes on the meteorological data of the basin studied in the previous years and the continuous model "rainfall-flowing water" and the amount of water flowing according to the future climatic conditions were calculated. As a result of the calculations, it was determined that climate change has a significant effect on daily rainfall. In addition, the amount of water flowing into the future climatic conditions increased during rainy seasons and deviated during dry seasons.

Legesse studied conducted to determine how a basin in southern Ethiopia is affected hydrologically from climate and land use changes, the basin is divided into two parts with homogeneous hydrological characteristics where climate and land use changes can be applied on the model. The model was very consistent with the measurement results and a 10% decrease in precipitation amount and a 30% reduction in the amount of water flowing from the basin were determined. Likewise, due to climate change scenarios envisaged by the IPCC, it is foreseen that the temperature in the region will increase by 1.50 C and the amount of water leaving the basin will decrease by 15%. In the present use, it is predicted that the amount of water coming out of the basin will decrease by 8% as the agricultural and pasture basin becomes a forest area.

According to Şen's study (2006), Climate change is becoming more and more influential on the hydrological cycle, water resources, their local-regional-global management and the distribution of WIPP. These effects will emerge very slowly and over many years, and mankind has already felt the harmful signals of this. For this reason, the changes in the field and time behaviors of water resources have been experienced in different parts of the world. From now on, climate change impacts must be addressed in every water resource development effort. Since the beginning of our concern for the consequences of global and the fact that changes in the air movement between air and air continue to have significant and broad impacts in many sectors of the economy, society and the environment. For example, the characteristics of many land and water ecosystems are significantly influenced by the availability of water. In the ecosystems of wetlands, by the quality of water in rivers and aquifers is also affected. Water is an integral part of human life and many other activities. The most striking example of this is agriculture. However, industry is also vital for electricity generation, transport and waste management. However, the availability of clean water also affects economic development.

Eckhardt and Ulbrich (2003) examined the impact of climate change on groundwater supply and flows in low mountainous basins of Central Europe in an eco-hydrological model developed by computer. As a result of the studies, due to climate change, a small amount of winter rainfall will fall as snowfall. They predicted that in the summer they will occur in the form of a decrease in groundwater supply and flows up to 50% per month, which will cause problems in underground water and hydroelectric production.

Loaiciga studied (2003), climate change and climate change hydrological and aquifer

investigated the effects of the process. It has shown that climate variability should be taken into consideration in the process of exploiting aquifers, and that changes in groundwater use may affect the aquifer more fundamentally than climate change due to global warming.

According to Woocay and Walton (2006), in order to better understand the general flow system around Yucca Mountain and how climate-related changes affect groundwater in their study, they analyzed groundwater geochemical data from 211 sampling stations in the Amargosa Desert and found that the warmer and drier climate in the last 14000 years affected the groundwater.

As a result, Erkan (2008) was working on, many studies have been conducted focusing on the impact of climate change on hydrology by focusing on the water cycle and the use of human and environmental water in water resources. Most of them have focused on changes in water balance, such as changes in river, sea, river and stream flows throughout the year. A smaller number of studies have examined the impact of these changes on water resources, for example the reliability of a water reservoir or the risk of flooding. Fewer studies have clearly examined possible adaptation (adaptation) strategies. At the same time, opportunities for adaptation to climate change in the water sector and the assessment of constraints should also be considered. In this assessment, not only a small number of studies specifically examining climate change, but also the accumulation of adaptation to changing conditions in different parts of the water sector.

CHAPTER 3

Material & Method

3.1 Material

In this chapter, the relationship between the water resources in the world, global warming and underground water resources are examined.

3.1.1 Global Warming

Global warming is the name given to the increase in average temperatures measured in land, sea and air as a result of the greenhouse effect, which is thought to be mainly caused by greenhouse gases released into the atmosphere. Global climate change is climate change caused by rising greenhouse gases in the atmosphere as a result of activities such as human fossil fuel consumption, industrial and agricultural activities. These climate changes include drought, desertification, imbalance and precipitation, flooding, typhoons, storms, hurricanes etc. Deviations are manifested by symptoms such as increases in meteorological events. As they say, people just think the temperature will increase, they don't emphasize it. World can stand on maximum up to 2°C average global temperature rising. After 2°C, it is obvious that there will be huge damages on environment and ecological life (Kılınç, 2016).

The biggest reason for global warming is the unnecessary and empty use of fossil fuels. Fossil fuels, tar, dust and toxic gases pollute the atmosphere. Fossil fuels are used in sectors such as industry, domestic and commercial. The increase in the use of fossil fuels in transportation vehicles such as automobiles, aircraft and ships causes pollution. Atmospheric gases, particulate matter and dust clouds directly absorb the solar radiation to the world and absorb the rays reflected from the earth to the global warming, while at the same time causing the amount of oxygen required for human life in the atmosphere to decrease. As can be expected, global warming is a dangerous place for human beings to cover a wide area of the world. Over time, the water resources will decrease, the rays reflected to the world will cause extinction of many living things on the earth, increase the water level in the seas and poles and melt the glaciers in the poles. Many examples can be added, such as those mentioned. These examples have one thing in common, which is that human beings make the world difficult to live with their own hands every day.

In other words, global warming, the rapid spread of forest fires with the onset of scorching

temperatures in a region of the world, the occurrence of droughts, the delay of seasons, the increase in desertification, even reaching the level that would endanger even human life, on the other hand at the same time the effects of excessive rainfall in another part of the earth. will cause flood disasters, extreme erosion, natural disasters, the formation of regions that are difficult to live from cold, and people will constantly migrate from the region. Like the first people, they will emigrate to countries with more comfortable weather conditions during their seasonal transition. It should be known that global warming will not only cover one part of the world, but all parts of the world.

When statistically and climatologically, significant climatic changes are observed in the world. Average annual, winter and spring average temperatures tend to rise, especially in southern parts of the earth, but average summer and especially autumn temperatures are decreasing in the north. The effects of global warming are already seen as territorial losses in Bangladesh, the Maldives, Pakistan and Indonesia. Again as a result of global warming, some islands in the Kribati region of the Pacific Ocean have disappeared under ocean waters. In Peru, a quarter of the glaciers have been destroyed by global warming. The glaciers covering africa's Klimanjaru Mountains are melting. The Mediterranean region is also vulnerable to the effects of dangerous climate change (IPCC,1992).

Especially in the last 30 years, a chain of events has emerged with the phenomenon of global warming, which is very different from previous climate changes, accumulates and affects each other and triggers many natural disasters. Problems will persist due to rising global warming, and even after a certain breaking point, even the future of humans and other creatures will be in danger of irreversible catastrophes. Some events caused by glaciers of global warming in the Arctic and high mountains continue to melt due to rising global warming. Sea level has increased by 15-20 cm in the last 20 years, and another result is that global warming will reduce the capacity and reserves of water basins and increase environmental pollution as a result of the increased need for water for life. Social life is also closely related to water use (Akin, 2006).

Considering the factors causing climate change, which are seen as the most important environmental problem for today's life, it is observed that the intensive use of fossil fuels with greenhouse gas effects is at the top. In particular, intensive use of coal, oil and natural gas for the above-mentioned purposes, degradation or rapid destruction of forests and other ecosystems causes global warming, which leads to climate change. Some developments that

occur in the natural functioning of the ecosystem may also have an impact on climate change. However, these effects are insignificant in addition to human effects. It is possible to give an example of the emergence of some greenhouse gases and dust clouds during volcanic eruptions in the volcanoes but given the potential for action by volcanoes all over the world, it will not be difficult to see that this effect will be insignificant along with human-based impact.

3.1.2 Gases Causing Global Warming and Their Properties

Global warming is the rapid increase in the atmospheric proportions of gases causing greenhouse effect as a result of human activity. Some activities such as increasing human activity with the Industrial Revolution, developing industry, increasing the amount of fossil fuels used, the rapid expansion of the developing technology and increasing the living standards, the environmental pollution with these efforts and the efforts of people to use the world as they want, but not in the amount of gases causing greenhouse effect in the atmosphere. caused more than necessary. Especially with the rapid increase of greenhouse gases towards the end of the 20th century, natural disasters caused by global warming and threatening the life of plant and animal species, especially human beings, began to be seen. Unfortunately, these disasters deplete the species of plants and animals and make the world uninhabitable. For example, the species are extinct in catastrophes caused by direct and indirect damages to human beings such as Caspian tigers in animals, Tasmanian wolves, and plants such as lake bulbs and snow flowers. There are some gases that create a greenhouse gas effect. These are carbon dioxide, methane, diazoxide, halocarbon, ozone, carbon monoxide. . Apart from these gases are also gases, but these gases give the greatest impact on nature. Carbon dioxide (CO_2) is the gas that has the largest share in greenhouse gases. Although the rate of atmosphere in the atmosphere has never decreased for millions of years, it has increased significantly after the Industrial Revolution. As a result of global warming and climate change, this gas increases its concentration in the atmosphere day by day. The vast majority of CO_2 emitted to the atmosphere as a result of human activities for certain purposes comes from fossil fuel use. Methane Gas (CH_4), on the other hand, is the most greenhouse effect after CO_2 in the atmosphere. Compared to the increase rate of CO_2 , it has increased its concentration in the atmosphere very seriously since the Industrial Revolution and continues to increase. There has been a slight decrease in methane gas emissions since 1990, but if human beings continue to operate in this way, the decrease in this release will decrease and

increase its intensity over time. Methane gas emissions are the result of fossil fuels, burial of waste and residues, animal husbandry and human activities. Diazoxide (NO_2) Gas is increasing like other gases after the Industrial Revolution. Generally, the density of the chemical industry and animal feeds increases during production. The amount of diazoxide in the atmosphere increases with each passing day. Halocarbon gases such as chlorofluorocarbon (CFC) are released into the atmosphere using sprays and coolers in the perfume industry. These gases convert O_3 in the ozone layer of the atmosphere into oxygen and its derivatives, causing the ozone layer to become thinner. Thus, because the ozone layer, which holds a large part of the ultraviolet rays coming from the sun, is thinner, more than enough ultraviolet rays come to the world and cause various damages and warming on the earth. Halocarbon gases are also gases that cause global warming by keeping sun rays reflected in the atmosphere (Appenzer and Dimick, 2004). Ozone (O_3) Gas, as it is known, creates a ozone layer of the atmosphere and absorbs the ultraviolet rays coming from the sun and plays a big role in making the world a habitable planet, but it also maintains a certain degree of temperature on the earth by being a greenhouse effect. This is both good and bad for some living things. Carbon monoxide (CO) is a poisonous gas that is formed in smoke caused by insufficient combustion of fuels such as natural gas, gasoline, coal, wood, gas oil, oil, improper use of heating devices such as stove water heaters and insufficient ventilation. It is an odorless, colorless, tasteless and non-irritating gas. As it can be understood from the reasons of formation, this gas, like other gases, increased and continues to increase after the Industrial Revolution. In the table below, the distribution of the gases with the effect of greenhouse gases and the types of uses causing them are indicated. As mentioned CO_2 is the most effective gases in world. In Figure 3.1 it shows a CO_2 emission of all world.

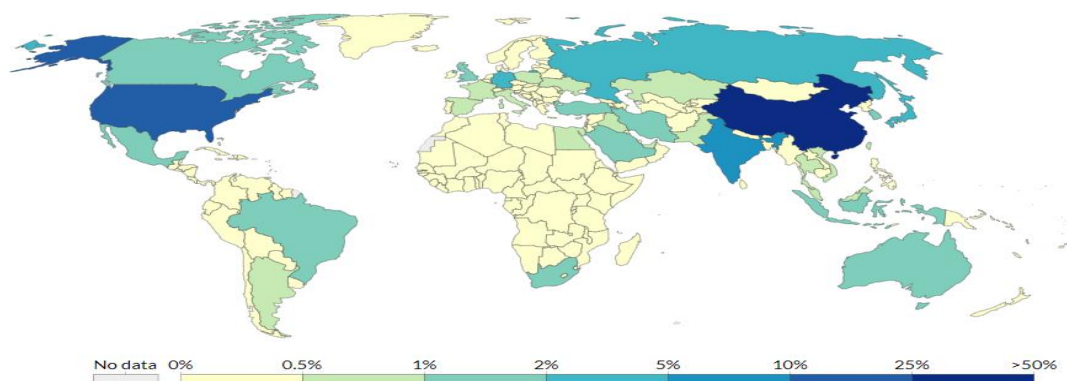


Figure 3. 1 Distribution of CO_2 Causing Climate Change

3.1.3 Water and Undergroundwater Resources

Water is the source of life for all living things on Earth. Water, which is called the source of life on earth, constitutes 2/3 of the world and 70% of the human body. Only with these sentences is it understood how important a source for human beings. Mankind humasn waste every day by using water resources unbalanced. The increase in the world population and the decrease in the sensitivity to the environment causes the depletion of water, which is an important input for agriculture, industry and technology. In addition, existing resources become unusable due to pesticides, chemicals used in industry and unconscious behavior of people. Even this factor alone leads to depletion of water resources in the world after a while. Negative examples of the importance of water, however, indicate that the necessary measures for conscios use and protection have not been taken. In particular, unconscious pollution of fresh water resources threatens not only the water resources used for the supply of drinking water, but also the living beings living in it, and results in indirect recycling in the ecosystem.

The total amount of water in the world is approximately 1.4 billion km³, of which 1.3 billion km³ (97.5%) is composed of saline water and 0.035 billion km³ (2.5%) is composed of fresh water resources. 97% of the fresh water on earth is groundwater. When look at the distribution of water resources on earth (Figure 3.2); Asia, Europe and Africa, Asia, South and North America are the most densely populated continents in terms of population. 20% of surface fresh water was stored in Asia and another 20% in large lakes in Huron, Michigan and Superior. Rivers account for only 0.6 % of total fresh water reserves. The availability of 0.3 % fresh and potable fresh water in lakes, rivers, dams and ponds, and 90% of fresh water resources trapped in poles and under ground, indicates that the amount of fresh water that can be easily exploited is very low. Approximately 500,000 km³ of the total water in the world returns to the atmosphere every year by evaporation in the seas and on the soil surface and falls back to the earth as precipitation in the hydrological cycle. The rainfall on the earth is 110.000 km³ annually, 42.700 km³ of it flows to surface and reaches rivers and seas and lakes in closed basins. 9.000 km³ of this amount is technically and economically usable (Hekimoğlu and Altindeğer, 2008).

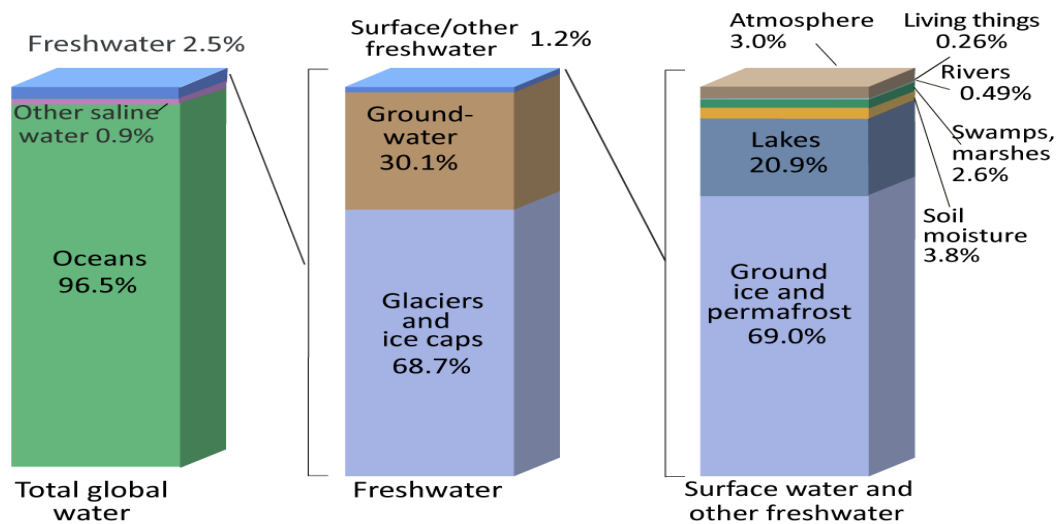


Figure 3. 2 Water Distribution in the World

The short-term water shortages, which lack of water to meet daily basic needs, once again provide an understanding of the value. The fact that a producer with a very large soil presence does not have the opportunity to irrigate other than rain has to emphasize the importance of having to grow the same product pattern every year. Due to unplanned industrialization, industrial enterprises discharging waste water without any treatment also causes significant damages to our water resources which are used as both drinking and irrigation water. However, some companies in the packaged water sector cause serious decreases in the land where they are entitled to long-term use, especially due to the excessive withdrawal of groundwater. The negative examples that give about the importance of water still show that the necessary precautions are not taken for conscious use and protection. In particular, unconscious pollution of fresh water resources threatens not only the water resources use for the supply of drinking water, but also the living beings living in it, and results in indirect recycling in the ecosystem. For all these reasons, water, which is the most basic vital support system of the earth, has been described as a strategic resource in the last quarter century. Water supply, which is the indispensable input of many sectors for economic development, has been identified with oil (Tamer, 2007).

The availability of usable water in nature varies greatly with time and place. The amount of water resources on the earth is constant and the distribution is irregular. Irregularity is mentioned in some of the water resources in the poles, underground, seas, oceans, lakes, rivers. The rapid increase in the world population and the diversification of the demands for water, increasing the unnecessary uses, decreases rapidly each day due to pollution and

climate change. This is crucial for the continuity of vital resource countries. Water is also a source of energy. Therefore, it has a strategic feature that determines national development. Judging As an example, in Cyprus people's inability to find the origin of sufficient water resources are exported from Turkey to use fresh water. If it is necessary to give another example, it cannot find sufficient water supply in the Arab Emirates, thus making sea water a significant expenditure and making it into drinking water. Israel, which obtains the available water requirement by sea treatment, clearly shows that it makes the best use of even scarce resources. This country, where a liter of drinking water is sold well above the required price, also obtains and exports serious agricultural products. To illustrate the opposite, Somalia, which fights famine, is unable to fulfill the necessary agricultural activities and meet the food needs, despite the fact that it is located on the Indian Ocean. This is a clear indication that they will confront each other for water resources.

In recent years, with the rapid population growth, industrialization and increase in agricultural activities, as in all waters, the pressures on groundwater have increased significantly. In many places, the feed-draft balance in groundwater could not be achieved, and groundwater resources were severely polluted. In addition, the groundwater regeneration time is very long and it is very costly and takes a long time to recover the groundwater once it is polluted. Because of these characteristics, these resources should be managed privately and every stage of their situation should be monitored with necessary monitoring and potential hazards should be identified and prevented without affecting groundwater (Soytürk, 2014).

3.1.4 Precipitation on World

Water falling from the atmosphere to the earth in solid or liquid form is called precipitation. Liquid rain is in the form of rainfall. Solid state precipitation can be snow, hail, dew, rime. When it comes to rain, people first think of rain, but rainfall can occur in more than one way. Rain and snow are the two most important hydrological precipitation types, and the important difference between them is that the water falls to the surface immediately after rain, but the snow usually melts after a long time. In Figure 3.3 shows type and place rainfall to all world. In other words, it is the direct feeding of precipitation that comes to earth in solid state. Snow, avalanche, such as rain water supply over time, rain-type rainfall is fed directly to the water source.

Water droplets from condensation in the atmosphere they are initially very small. A combination of these clouds come together when they meet and become a whole. However, rainfall does not fall from every cloud. There are certain conditions for precipitation to occur. One of the most important conditions is that the precipitation grains should reach a certain size. The cooling of the air is an important factor in the condensation process, which plays a major role in the formation of precipitation. If the temperature and humidity capacity of the air mass is sufficient, precipitation usually occurs. There are multiple different precipitation types on Earth. These are, respectively, Convective, Orographic, Front Rainfall. Factors that allow these precipitation to be different are factors such as air temperature, humidity, cloud density, and location of clouds.

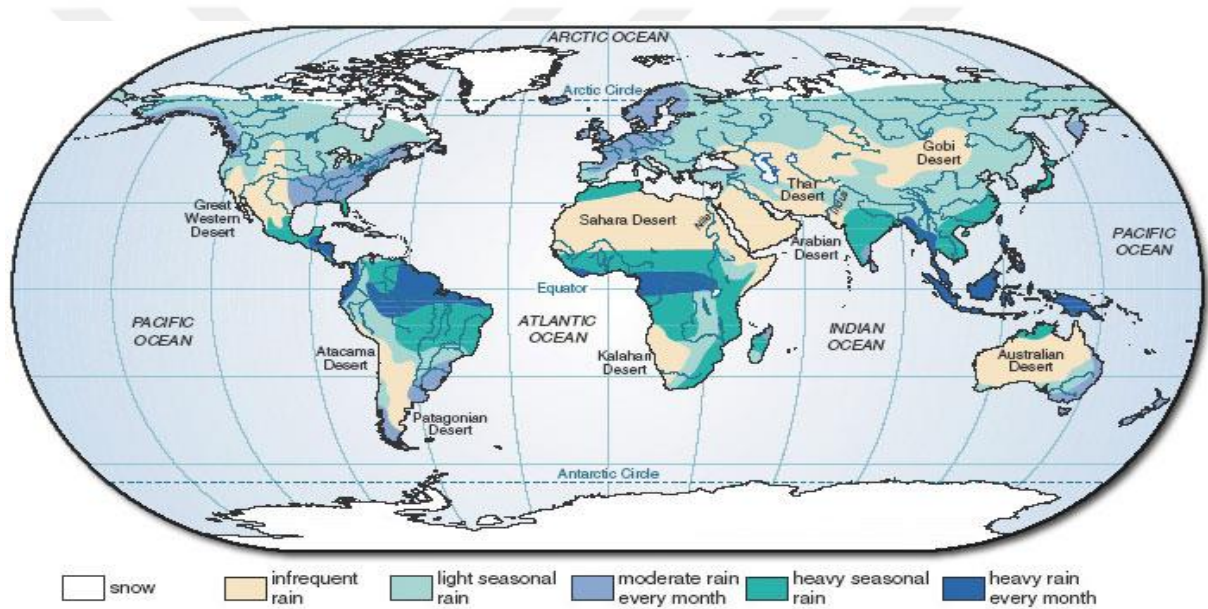


Figure 3. 3 Formation And Types Of Precipitation

Türkeş mentioned the general conditions of precipitation in the world in 1996 and 1998. Precipitation has generally increased in land areas at high latitudes in the Northern Hemisphere, especially in the cold season. In contrast, after the 1960s, there was a sudden drop in precipitation in the subtropical and tropical regions stretching from Africa to Indonesia. These changes have also been observed in rivers, lake levels and soil humidity. Severe droughts in the subtropical zone and especially in the Sahel region of Africa in the 1960s caused tens of thousands of people to migrate and millions of animals to die. Sudden reduction in subtropical belt precipitation began to affect the world in the 1970s. Significant decreasing trends in rainfall and drought events have been more pronounced in winter. The Asian side of the world has been heavily affected by the dry conditions in about 20-25 years

between the early 1970s and the mid-1990s. The most severe and widely distributed ones of droughts in 1973, 1977, 1989, and was formed in 1990. In general, the Eastern Mediterranean Basin and Turkey's year and especially during the winter rains, the head of 1970 decreased significant observed between the mid-1990s tendencies may be related to the decrease in frequencies of the frontal mid-latitude and Mediterranean low pressures that are effective in this region, especially in winter, and increases in high pressure conditions at the ground and upper atmospheric levels. On the other hand, especially in the spring and summer rainfall of some stations with terrestrial precipitation regime, an increasing trend is observed especially in summer (Türkeş, 1996a and 1998a).

Precipitation is an important source of variability in water balance over time and place. Changes can have most important repercussion for hydrological and water resources. These results may also change due to the direct or indirect effects of people on the water resources of the world. Hydrological variability that occurs over time in a particular basin is affected by the variability of precipitation that occurs throughout the day, season, year and year. The frequency of floods is affected by changes in rainfall between years (year to year) and changes in short-term precipitation (such as torrential rainfall). The frequency of low or drought surface flows is mostly affected by changes in seasonal distribution of precipitation, variability from year to year, and long drought periods. These influences are caused by humans and affect living things all over the world, and unfortunately many of these effects cause undesirable events. There are different trends in various parts of the world; for example, there is an increase in the mid and high latitudes of the Northern Hemisphere (near the poles), especially in autumn and winter, and a decrease in both hemispheres, tropics and subtropics. Today's climate models simulate the increase in high and medium latitudes and annual equestrian precipitation in most equatorial regions and the resulting decreases in the subtropics. However, in many of the world's wide geographies, changes due to global warming naturally remain small when compared to the variability that occurred over a decade of time. While global warming and climate change take action in a long time and disrupt the world order, they show their effects in a very short time and influence the world. Changes in seasonal precipitation are even more variable spatially and depend on changes in climatology of a region. Again, these climatological changes are caused by humans.

In general, the biggest changes in land precipitation (in percentages) are found in regions close to the poles, some equatorial regions and Southeast Asia, although there are large differences between climate models. Changes in the frequency of torrential rainfall are often

difficult to remove from global climate models due to their rough spatial resolution. However, there are signs that global warming and heavy rainfall will increase. This is a very dangerous situation for the coastal settlements. There is a situation mentioned throughout the thesis, which is the first thing that comes to mind when people say global warming, but unfortunately it is not right to mention only drought. Confidence in this statement depends on trust in global climate models. More generally, uncertainty and imbalance in precipitation forecasts of general circulation models greatly determine the uncertainty that exists in evaluating the impact of hydrological systems and water resources. Rising temperatures may mean that a smaller portion of the precipitation will be in the form of snow. In areas where snow is currently marginal, snow may no longer rain and may have significant consequences for hydrological regimes. These estimates are less uncertain than possible changes in precipitation size. As mentioned, a vague and unstable order awaits people.

3.1.5 Drought on World

Drought is actually a normal and recurring climate event. It is caused by decreasing rainfall that spans one or more seasons. The climate is actually like a domino. When rainfall decreases, water resources are reduced, so that the required water resources become unusable over time. However, increasing temperatures and decreasing precipitation in many parts of the world as a result of global climate change increase the frequency and severity of drought events. Drought is a natural phenomenon that starts very slowly, develops over months and even years and affects large areas. It starts slowly, but when things start to work, it may be too late for things. It has serious economic, environmental and social impacts in very large areas and sometimes even in a whole country. Drought occurs in all climatic zones, but the sensitivity of the area to drought and the degree of impacts can vary considerably from one region to another. For example, if the vegetation of the country is dense, it reflects the drought effect to a minimum, but this can be maximized if something else happens.

Water scarcity is a larger problem. It is known that one third of the world's population is affected by water scarcity and this number increases due to population getting high, urbanisation and the increase in agricultural and industrial water use. Simultaneously, the contamination of the water resources results in a decrease in the amount of usable water. Water shortages are also expanding rapidly due to climate change and water management errors. It is estimated that in 2025, 1.8 billion people will live in consummate water lack and two thirds of the world's population will live in water-stressed areas (UN Water, 2014).

However, the grow in require due to population and development is not the only cause of water scarcity. Excessive evaporation, the angle of solar rays coming to the world, and the position of countries in the world are other reasons of water scarcity. Water resources are used in non-ecological ways, consumed in a largely demand-oriented manner, and water scarcity is exacerbated by the human hand. If it is mentioned, water pollution caused by unnecessary consumption, indifference and air pollution is completely human. It shows that the water crisis will become more widespread in the coming years with the effect of global warming. As it is known, global warming and climate change and drought will increase. The struggle against drought and water turning point in the era of climate change requires, above all, to move away from the old understanding that sees huge interventions to nature as a great success and not to repeat the same mistakes. The solution is possible by approaching the rules of ecology and an understanding of rehabilitation in accordance with nature (Figure 3.4).

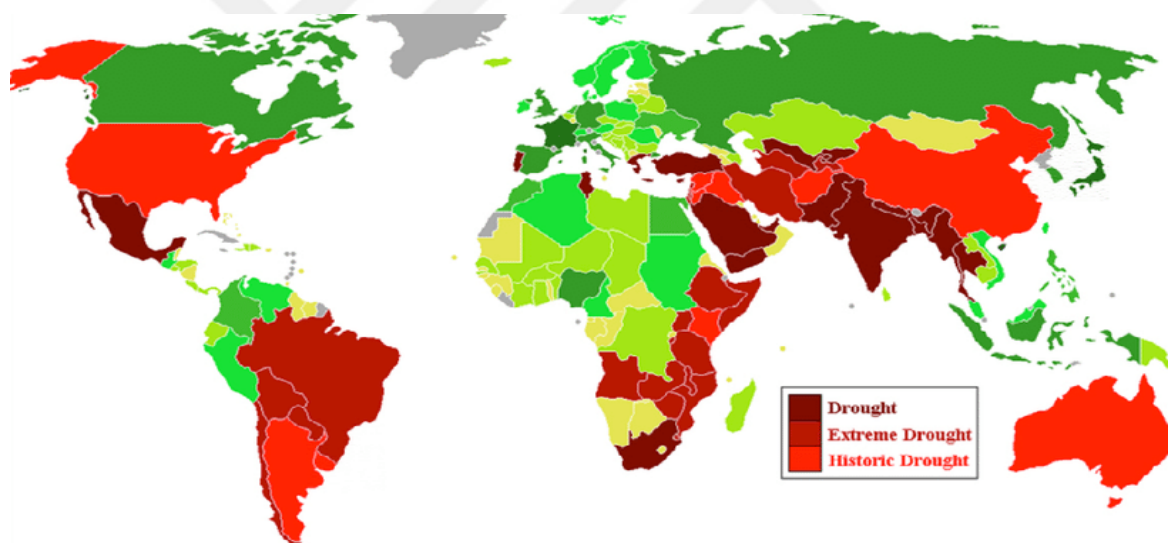


Figure 3. 4 Drought Status of Countries Around the World

Water is general and most important factor that should exist for the survival of the creatures on earth, the greatest source of life and their existence. If water is used carelessly for both human beings and other living things; the drought catastrophe that all countries emphasize can come to the fore. Other important elements such as reckless use are global warming and global climate change. Drought; It is defined as the relationship between the temporary imbalance in the moisture content of a region and water scarcity in that region. In general, drought is manifested by the emergence of unexpected water shortages and shortages. Although the decrease in precipitation triggers drought, the main damages are due to the lack

of moisture on the ground, the lack of accumulation of water in river flows and reservoirs (embankments, dams, natural lakes) as required and thus not well managed. The major factor supporting these causes is global warming and global climate change as mentioned. Decreasing rainfall and decreasing water resources are not the same. It is also difficult to say when and where the drought begins and when it ends. During the drought, continuous discussions between meteorologists, water and climatologists continue, and often begin and continue in the same way to tell how long a drought situation will last and its extent as a field. A definition and solution to which all these professional groups will ally have not been possible until now. In this respect, defining and monitoring droughts is very important for the society. Drought adversely affects the life of living beings, economy, agriculture and industry. To end this event affecting all areas; the reasons for the occurrence should be investigated, the results of the research should be evaluated in the best way and the effects of the results on humanity should be minimized. For this, too much burden and responsibility on human beings. The main reason for this is that all responsible people are human beings. To prevent this problem called drought, the following precautions should be taken.

In the study area, it is observed that the dry periods follow each other and the rainy periods follow each other. In other words, the beginning of an arid period is more likely to follow the arid years. This should be taken into account when making plans for the use of existing water resources during dry periods. The event to be mentioned is that if there is a problem related to drought in any place, it will continue to do so. Plans and studies should be done with this in mind. Drought can affect the yield of crops, especially when plants with long growing time are included in the agricultural production pattern. As it is known, the biggest source of the plant is water. In case of drought anywhere, the yield of plants inevitably decreases. In areas where drought is likely to occur, support irrigation is recommended during periods outside the irrigation season. In areas that are susceptible to drought and where it can be experienced at any time, water management should be given a special importance and studies should be carried out. Water structures such as dams and ponds should be built in places organized by experts. Starting from individuals, it is essential that all segments of society and states use and utilize this finite and most important resource, water, in a very good form. It is necessary to raise awareness and educate people about the causes, effects and consequences of drought, to protect the nature and to use water resources in an un wasteful way, to monitor the growth of drought, humid and dry areas and their severity and with this, early warning system should be established in line with drought monitoring and facilities. Solutions should be developed to

prevent drought from having more impact on world precipitation and therefore on groundwater resources in the near future. When water levels of dams are fed by rivers and streams, there may be problems in hydroelectric power generation. For this reason, it is necessary to work with experts and make the necessary planning.

3.1.6 Climate Change on World

Global warming is the name given to the getting high in average temperatures measured on land, sea and air all long the world as a result of the greenhouse effect, mainly thought to be the cause by greenhouse gases released into the atmosphere. Global Climate Change is the climate change caused by global warming, which everyone knows is the cause of greenhouse gases that increase the amount and intensity in the atmosphere as a result of its activities such as human consumption of using fossil fuels, doing industrial and agricultural activities. These climate changes include drought, desertification, imbalance and deviations in precipitation, floods, typhoon, storms, hoses and so on. meteorological phenomena.

Climate change is the difference that occurs as a result of changes in the atmosphere that can be described as positive or negative. Summarizing in a short sentence, winter characteristics appear pending the summer months and summer characteristics appear pending the winter months. These differences are the changes in climate parameters. Global climate change is actually the product of the world's effort to adapt to human beings. The effort of the world to adapt to human beings actually leads humanity to a disaster. But, as you can imagine, unaware of this, people are still trying to adapt the world to themselves. This situation affects not only mankind but also the lives of living things all over the world.

Some living things in different ecosystems exhibit adaptability to adapt to changes in their environment, in other words, to survive. Some realize this adaptation by adapting themselves to changing environmental conditions, while others demonstrate their ability to camouflage against the dangers that threaten their lives. The world is trying to achieve this harmony by changing the climate parameters. This hopes that in the future, the severity of the bad scenarios likely to be experienced as a result of climate change will be less and that the struggle against global climate change will be successful with the efforts of human beings (Gökkür, 2015).

The decrease in water resources due to climate change will have a negative impact on agricultural production. Logically, water is the main food source of agricultural production, so the decrease in water resources has a direct negative impact on agricultural production. Besides to the dilatation of arid and semi-arid areas, the increase in the average etesian temperature will increase desertification, salting and erosion. The area covered with seasonal snow will be reduced and the time covered with snow will shorten. The change in flow time and volume resulting from snow meltdown will adversely affect water resources, agriculture, transportation and energy sectors. In addition, global warming will lead to changes in glaciers, rising sea levels and shifting climate zones (Türkeş et al., 2000).

Rapid and serious changes in the global climate system are inevitable to have socio-economic impacts; water scarcity, decrease in agricultural and forestry products, consequently decrease in the country's agricultural sector, decrease in oxygen, energy bottleneck as a result of a decrease in water resources, serious water problems after a certain period of time, and consequently tourism opportunities; increased social and economic difficulties due to natural disasters such as floods, storms, tsunamis, migration, increased health costs due to adverse effects on human health, and climate change in less developed countries to have the resources to deal with their problems.economic and political importance.

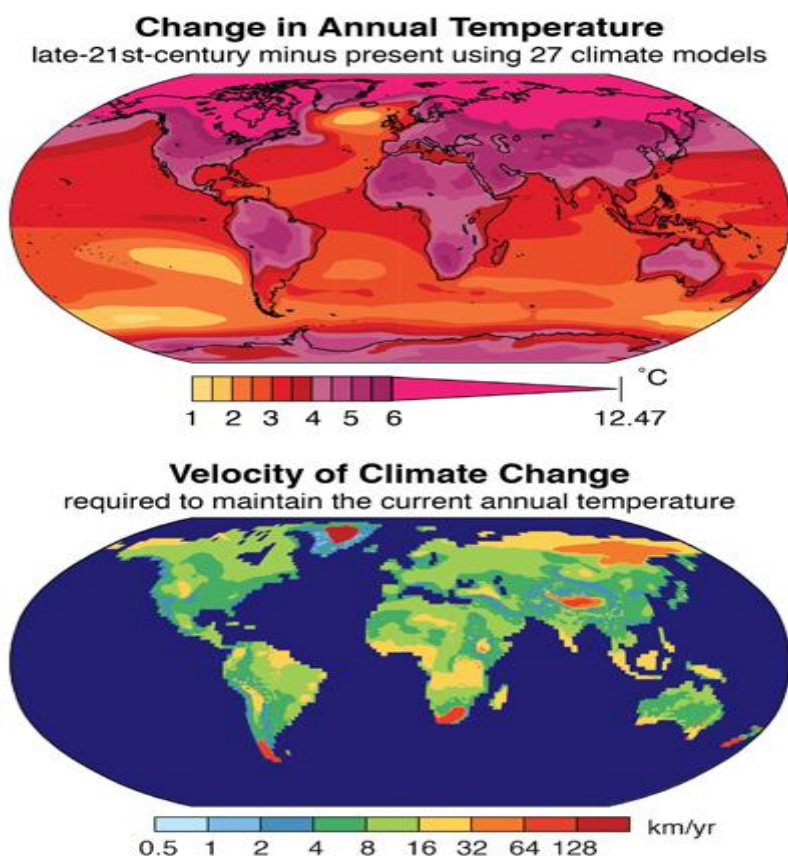


Figure 3. 5 Global Temperatures and Velocity of Climate Change in the Late 21st Century

The top map is a 21st-century map, depending on current warming trends. It shows global temperatures in the late 20th century. The sub-map is the speed of climate change, or the species in any region, to experience a climate similar to the present day in the 21st century. It shows how much it should migrate by the end of the 20th century.

3.1.7 IPCC's Global Climate Change Forecasts

Due to excessive rainfall, storm and sea level rise, a significant increase in terrestrial floods, floods and erosions, i.e. natural disasters, melting of glaciers, reduction of snowfall, increase in temperatures and droughts based on climate change, decrease in the success rate of access and consequently the decrease in hydroelectric power generation, agricultural productivity, serious health problems due to hot or cold weather, increase in drought in forest areas and more frequent and more regions of forest fires, the weather phenomena due to these problems may be a problem. An increase in erosions, a shot of 1 to 3.5 degrees is expected up to 100 years on average. These are just a few of the problems that will reach out to a wider audience and will grow rapidly and be seen more often.

IPCC'nin İkinci Değerlendirme Raporu'na göre bazı öngörülerden bahsedilecek olursa, In addition to the future effects of increases in greenhouse gases as well as aerosols, for the term emission scenario, an increase in global average surface temperature of about 2 ° C by 1990 is foreseen by 2100. Considering the low and high short-cut values, the global average temperature is expected to increase between 1 and 3.5 ° C by 2100. According to these predictions, global average temperatures will rise by at least about 0.1 ° C every 10 years, even if the most favorable or optimistic conditions for the protection of the global climate system are met. According to the best shorthand values, global average sea level up to 2100 approximately 50 cm. The best estimation of sea level rise has been developed mainly based on the positive contribution of thermal expansion of the oceans and the melting of mountain glaciers and cover glaciers (sea and land glaciers at the poles). According to the low and high predictions, the expected increase in sea level until 2100 will be between 15 cm and 95 cm (IPPC, 1996a).

3.1.8 Some Predictions for Climate Change and Measures to be Taken

Due to the climate and especially the precipitation climatic features of some countries in the world, it is not as rich in water resources in terms of water resources as it is. This issue needs to be taken into consideration, in order to prevent serious water shortages that may be faced in the future, realistic water policies supported by laws should be established and urgently implemented. Instead of traditional and waste-based irrigation methods traditionally used in agriculture, the use of pressurized-closed pipe irrigation methods (including sprinkler and drip irrigation), where water loss through leakage and evaporation is the least, should be encouraged and appropriate financial support should be provided to the producers wishing to use these methods. In this way, wasted water resources will be corrected and consumed as much water resources as needed. This will extend the life span of the water resources, which are the basic needs of living things on earth. One of the most important consequences of human-induced climate change (global climate change due to the strengthened greenhouse effect) is the increase in the severity, duration and impact of forest fires in the world (symptoms already in many regions of the subtropical climate zone). Taking into account the decreasing trends in rainfall since the early 1970s, the likelihood and danger of ever-present forest fires in the world may be a greater problem, as experienced during the very hot and dry summer of 2007 and 2008 in many regions. The options for the possible impacts of climate change on water resources and desertification are numerous, as mentioned. There are of

course a few solutions and suggestions to prevent this. A few of these should include more effective, rational and economic management of existing water and land resources, forest protection, monitoring of key indicators of desertification such as changes in soil, biological productivity and diversity and vegetation, and drought prediction systems. Thus, both desertification and drought of countries will decrease in time. The problems arising from the excessive use of groundwater resources, the arbitrary use of human beings and the wastefulness and mismanagement of these uses should be scientifically put forward, monitored, and solved by controlling under applicable and serious legal regulations. These regulations should be based on severe sanctions, and people should be discouraged. Within this framework, underground water tanks should be preserved and kept for 'bad' days; As is the case in developed countries, surface waters (regimes, large rivers, artificial ponds and dams, etc.) should be used instead of groundwater in irrigation, energy and industry, unless required. In addition, especially in urban drinking water supply, water structures (ponds, dams, etc.) established only for the purpose of providing drinking water should be utilized and natural spring waters provided that they are sustainable and environmentally sensitive. If we do so, underground water resources, one of the most efficient water resources in the world, will be used for longer periods and the danger of exhaustion will decrease over time. Considering that future warmer, arid and water resources will continue to decrease in this way, agricultural plant varieties suitable for more arid and hot conditions should be determined; research projects on adaptation should be developed and supported. Not only scientists, but also all human beings must put effort and effort on these projects. Sustainable agriculture and forestry principles should be applied; improper use of agricultural and forest land should be arrested; Deliberative that forests are carbon pit, enough resources must be allocated from the budget for afforestation, erosion control and meadow / grassland improvement. In this way, while studies for erosion and other natural disasters will be done, water resources and precipitation on the world will be fed more. In order to avoid being dehydrated and unprepared, as in most cases, when important droughts occur, whether or not they are associated with global climate change on the world, a number of plans or plans that are to be seriously prepared at national, regional and watershed or should implement and apply.

These plans include the drought alert with institutions and universities working and producing information on issues such as drought (disaster) analysis and monitoring, assessment of the effects of drought (meteorological, agricultural, hydrological, socioeconomic), determination

of geographic areas and socioeconomic sectors that are vulnerable to the effects of drought. relevant and competent institutions to ensure In this way, serious measures will be taken for the droughts that will be experienced in the future or expected to be experienced and thus the continuity of the studies on the world will be ensured in common. An effective, functional and multi-disciplinary / multi-sectoral 'National Action Program', aimed at combating desertification and drought in the world, should also include a contemporary plan, which applies to all affected countries. Since most of the drought indices, which are widely used in disaster analysis and monitoring, which is one of the most important elements of such a plan, are sector and system based, multivariate and multi-purpose indices should be used to analyze, characterize and monitor drought. In addition, the information carried and explained by drought indices, the effects of drought incidents on various systems and sectors, drought risk levels, various geographic area units and product types should be tested with various information related to drought susceptibility levels.

3.1.9 Impact of Global Warming on Water and Groundwater Resources

With the development of industry and technology, air, water and soil pollution has caused irreversible damage to the earth. Although water resources are directly polluted, they have been indirectly exposed to many effects. It was found out that the greenhouse gases in the atmosphere increased the temperature of the earth. One of the most important factors affecting evaporation from the surface of the lake is the surface temperature. Water sources are affected from this heating in many ways such as the decrease of rainfall and the melting of glaciers. There is a direct correlation between surface temperature and evaporation. Therefore, surface temperatures increase as a outcome of global warming and evaporation increases due to the direct proportion between them. As evaporation increases, resources on earth are having more evaporation than expected and will continue to increase.

One of the most important impacts of climate change will be its impact on water resources. Different parts of the globe will be affected by this change at different rates. Symptoms such as flow changes, melting of glaciers, changes in timing of flows cannot be explained only by regional temperature and precipitation changes. Freshwater resources near the coast will be adversely affected by a possible sea level rise. If floodplains are generally considered to increase, floods will increase and regional and seasonal distribution of underground and surface resources and it will change. Due to climate change, the decrease of rainfall feeding groundwater, unconsciously drilled wells for irrigation, and groundwater withdrawal caused

the withdrawal of many lakes. Decreases in water levels are observed in many reservoirs.

Decreasing water resources due to global warming due to climate change have a negative impact on agricultural production. In addition to the expansion of some arid and semi-arid areas of the earth due to global warming and climate change, the increase in annual average temperature will increase in desertification, cracking of soil structure, salinization and erosion. During the season, the amount of snow and snow-covered earth will decrease. The flow from snow melt will reduce the volume of water over time, which will adversely affect water resources, energy sector, transport and agriculture. In addition to this, the melting of glaciers from global warming and the rise in sea levels based on this situation will cause serious tsunamis and landslides in climate zones (Türkeş et al., 2000; Kanber et al., 2010).

The impact of climate change on water resources is due to changes in precipitation characteristics. Rainfall is the major source of variability in water balance at the time and place scale. Changes in precipitation due to climate may have significant consequences for hydrology and water resources. The hydrological variability that occurs over time in a particular watershed is influenced by the variability in rainfall during the daily, seasonal, annual and decade cycles. For example, the frequency of floods is due to changes in rainfall intensity from year to year and differences in short-term rainfall (such as heavy rainfall). There is also strong evidence that the frequency of heavy rainfall will generally increase with global warming. Drought frequency is again due to changes in seasonal distribution of precipitation. Despite the slight increase in winter rainfall due to climate change, significant decreases in summer rainfall will occur. Decreasing precipitation will adversely affect water resources and the amount of water per capita will be significantly reduced due to population growth. Excessive use of groundwater during dry periods will cause sea water to enter these areas and irreversibly deteriorate water quality. Snow cover will decrease and snow melting time will change and shift to earlier time. (Kanber et. al., 2010).

Global warming caused by increasing temperature causes changes in other related climate elements. Global warming: drought, changes in hydrological cycle, decrease in volume and quality of water resources, mixing of clean water resources into the sea and water problem, rising of sea level, melting of snow and glaciers, excessive evaporation, increase in meteorological disasters, changes in amount and regime of rainfall, fires are also the source of problems. Global warming has economic, sociological and psychological effects as well as physical effects. Decrease in agricultural and forestry products, energy bottleneck due to the

decrease in water resources, limitation of tourism and recreation opportunities, many sectors being affected negatively, coastal areas being at risk, migration due to increasing social and economic difficulties, and the negative effects on health. The fact that crises are experienced due to the fact that the less developed countries do not have the resources to cope with the problems reveals the socio-economic and political importance of climate change (Karaman and Gökalp, 2010).

Underground waters are undoubtedly the most important natural resources of the world. Because it is the only source that can supply the water needed to sustain life in dry periods. Feeding of underground aquifers is provided by rains, rivers, lakes and melting snow. Water quickly flows through the macropores or crevices to reach the aquifers under the ground and fills these areas. Nutritional status varies depending on the structure of the rock and soil in the upper region of the aquifer. The structures that will affect the increase in nutrition are the high number of macropores, crevices and cracks. Feeding, called fast feeding, can take place in every rainfall. Therefore, changes in precipitation regime are important for aquifers. It is concluded that the changes in precipitation rather than changes in temperatures should be considered in order to understand the flow changes that vary from year to year. Increases in evaporation will cause decreases in the ground water to be stored. (Küçükılavuz, 2009; Şen, 2005).

3.2 Method

In this chapter, technical, economic and social measures taken in the world against global climate change are examined.

3.2.1 Measures Taken For Global Warming and Water Resources

At the First World Climate Conference, where the first serious steps were taken regarding the protection of the global climate system, the importance of the issue was brought to the attention of the world countries for the first time. In this conference, it is stated that if the use of fossil fuels as energy sources and deforestation continues, the accumulation of carbon dioxide in the atmosphere may increase to a great extent and as a result of this increase there may be significant and long term changes in the climate. As the studies on the subject increased, a scientific consensus environment, which is rarely seen in the world, was formed with the participation of scientists. The Villach Meeting on Evaluation of the Role and Effects of Carbon Dioxide and Other Greenhouse Gases on Climate Change yapılan held in Austria in

1985 was an international meeting to evaluate the role and effects of carbon dioxide and other greenhouse gases on climate change. In the meeting, the discussions about how climate change will take place have been spent with the efforts of countries to reach an agreement on the political level rather than scientific basis. Villach Meeting was effective in informing the public; Failed to bring innovation beyond the issues discussed at the First World Climate Conference (Babuş, 2006).

The conference on konferans changing atmosphere düzenlen held in Toronto by the Canadian government in 1988 was held with the wide participation of the scientific community and politicians and it was a meeting to discuss the measures to be taken against climate change. The Toronto Conference is important for the development of political options to combat climate change on an international platform. In this conference, as an international target, it has been proposed to reduce carbon dioxide emissions from the greenhouse gases by 20% and to prepare a framework climate agreement to be developed by protocols (Türkeş, 2001).

For several reasons, it is difficult to draw quantitative conclusions about the effects of climate change. Different studies have used different methods and scenarios, but the most important one is that different systems are transferred to climate change in a different way. Nevertheless, it is possible to derive some quantitative generalizations below.

- Changes in resource reliability in systems with large water reservoir capacity will be proportionally smaller than changes in river flow, reducing use time and quantity.
- The potential impacts of climate change should be assessed within the framework of other changes affecting water management. Few studies specifically compare climate change with other pressures. In many environmental environments, it is possible that, in less than 20 years, the effects of climate change will remain small, among other pressures. This will, of course, depend on the system.
- The probable effects of climate change will be the greatest in today's distressed systems.

The overwhelming majority of studies on the impact of climate change on water resources have focused the environment on human beings. In many parts of the world, water supply systems are increasingly being managed to maintain rivers / lakes and wetlands. This increases the demand for effective water or reduces the availability of water. Estimates of the quantitative impacts of climate change on water resources are often under-trusted. This phenomenon reflects a confidence in climate change scenarios and a very low confidence in

the pressures on water resources. These may be caused by changes in demand or legal conditions. However, the techniques applied to predict the effects of a particular scenario are well established (Küçükkılavuz, 2009).

In December 1988, at Malta's initiative, the UN General Assembly adopted a resolution on "Global Climate Protection for The Present and Future Generations of Mankind". The resolution stated that the global climate is a common heritage of mankind and is a common problem. In the same year, under the leadership of the World Meteorological Organization and the United Nations Environment Programme (UNEP), the Intergovernmental Panel on Climate Change (IPCC) led the United Nations Environment Programme considered a threat on a political level for the first time, the first step towards obstruction has been taken (Madra, Şahin, 2007).

29 October-7 November 1990 in Geneva II. World Climate The Conference is the penultimate step towards a global agreement. The first IPCC report and the conference opened the debate on climate change and greenhouse gases generated on the basis of the Ministerial Declaration is approved, including 137 in the country side is well located in Turkey. In addition, it has been requested to reduce net CO₂ emissions globally by 1-2% each year, and it is emphasized that developed countries have the opportunity to reduce their energy-related CO₂ emissions by 20% until 2005 (Doğan, 2007).

At the meeting held in Berlin on 28 March-7 April 1995, it was described as an important and historical opportunity to prevent global warming, especially by voluntary environmental organizations. Nevertheless, the Berlin Order, which emerged as a result of this meeting, is very important in terms of establishing its legal obligation initiatives and objectives. At the same time, this meeting is the first of the climate conferences that the parties to the United Nations Framework Convention on climate Change will hold every year after that. The second IPCC report released in the same year, "avoidance of dangerous climate change", the first time to submit a claim for a declaration of obligation (Kılıç, 2005).

At the third UNFCCC meeting in November 1997, a historic step was taken and the Kyoto Protocol, which is binding for developed countries, was implemented. In the protocol, industrialized countries defined as Annex-I are foreseen to reduce their total carbon emissions by 6-8% between 2008 and 2012, and no obligations are identified for developing countries defined as Annex-II. The United States (Australia), one of the two countries that have not yet signed the Protocol, signed the Protocol, led by Bill Clinton, but Congress did not approve it.

Under George W. Bush The United States declared that the negotiations for the Kyoto Protocol in 2001 were strictly refused to sign unless the obligations of Annex II countries were increased. As mentioned above, the period stipulated by the Kyoto Protocol for the fulfillment of the obligations of the Contracting Parties began as of February 2005 (Pamukçu, 2006).

At the Buenos Aires summit in 1998, the Kyoto Protocol took its final form and the two countries were given two years to make the Kyoto Protocol operational and were required to regulate the market mechanisms according to the protocol. At the summit held in Bonn (Germany) in 2001, a consensus was reached on market mechanisms, while at the Montreal (Canada) summit in 2005, the Kyoto Protocol as set out above was enacted and decided to be valid until 2012. Stephane Dior, Canadian Environment Minister of the time, also came into force in Montreal Action Plan, which he called har the ‘map of our future’ (Pabuçcu, 2006).

3.2.2 Kyoto Protocol

The Kyoto Protocol is an agreement for developed countries to reduce their greenhouse gas emissions by 5.2% compared to 1990. The aim is to reduce the five-year average emission values of greenhouse gas - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs and PFCs - from 2008-2012. The countries that have accepted this protocol have promised each other the promise to reduce their emissions of carbon dioxide and greenhouse gases and to increase their rights through carbon trade if this is not the case. The Protocol expects countries to reduce the carbon levels emitted into the atmosphere to those found in 1990. The signed protocol entered into force in 2005 among the signatory countries. This is because in order for the protocol to come into force, the 1990s of the ratification countries (the amount of carbon released into the atmosphere) must reach 55% of the total emissions on earth. Important articles of the Kyoto Protocol (UNFCCC, 2008) ;

- The amount of greenhouse gas released into the atmosphere will be reduced to 5%.
- Legislation to reduce the amount of greenhouse gas from industry, motor vehicles and heating will be reorganized.
- More tax will be imposed on those who consume more fuel and produce more carbon.
- Warming with less energy, taking long journeys with less energy consuming vehicles placing technology systems that consume less energy in the industry will be provided and environmentalism will be the basic principle in transportation and garbage storage.

- It will turn to alternative energy sources to reduce the amount of methane and carbon dioxide released into the atmosphere. For example, bio diesel fuel will be used instead of fossil fuels.
- Waste processing will be rearranged in high energy consuming enterprises such as cement, iron and steel and lime factories.
- Systems that produce less carbon in thermal power plants, technologies will be introduced.
- Solar energy will be paved, nuclear energy will have zero carbon in the world will be brought to the fore in the world.

3.2.3 Copenhagen Protocol

This meeting was planned as the end point of the Bali Roadmap, which was decided two years ago, in order to formulate decisions on climate change and the new commitment period after 2012 under the Kyoto Protocol. The 2009 United Nations Conference on Climate Change, or the commonly used Copenhagen Summit, was held in Copenhagen, Denmark between 7 and 18 December 2009 with the participation of 192 countries to reduce global warming and greenhouse gas emissions. In March 2009 the first conference on climate change was held in Copenhagen. Connie Hedegaard chaired the Copenhagen Conference, which began on December 7 at the Center Bella Center "conference and exhibition hall. Danish Prime Minister Lars Løkke Rasmussen took up the post when Hedegaard, who was also the Danish climate minister, resigned on 16 December. "The Copenhagen Consensus" was accepted, although there were reports in the press that negotiations were progressing very slowly and that the conference would fail. Nevertheless, this consensus was found to be insufficient by environmental organizations and industrializing countries (Benlisoy, 2010).

Important articles of the Copenhagen Protocol ;

- On the basis of equality and sustainable development, it is an agreement that will keep the temperature rise below 2 ° C compared to the pre-industrial period, and aims to reduce the temperature increase below 1.5 ° C after 2015 with a review.
- It is acknowledged that the year for emissions to reach the highest global level is needed and this year will be longer in developing countries.
- Development aspects of climate change, including low carbon emission development strategies, are confirmed.

- The new adaptation fund will be managed through an equal representation system and will be distributed through effective and efficient fund arrangements.
- Developing countries will communicate both their supported and unsupported actions every two years through their National Communication.
- Under the Convention, it was decided to establish the Copenhagen Green Climate Fund (CGCF) to ensure financial flow for all major areas. A significant portion of the new fund will be distributed through the CGCF (DSİ, 2009).

3.2.4 European Council of Gothenburg

The European Union's proposals for solutions to the problems of global climate change have generally been within the framework of energy. In order to prevent global climate change, the EU has taken a more determined attitude in the world climate summits than other industrialized countries in order to reduce greenhouse gases and change the industrial policies of the world countries. As one of the first documents to draw a general route, the European Council in Gothenburg in June 2001 adopted the European Commission proposal on "Sustainable Europe for a Better World: the European Union Strategy for Sustainable Development". In this meeting, the fight against global climate change was identified as a key priority of the EU's development strategy. The recommendations in this document are as follows: Reducing greenhouse gas emissions by 1% per year from the level of 1990 to 2020 for the post-2008-2012 first obligation period of the Kyoto Protocol; Establish more successful environmental targets for energy tax, such as automatically setting taxes to the minimum inflation level; To gradually remove all state aid in the production and consumption of fossil fuels by 2020 and to develop alternative business resources to meet unemployment in the relevant sectors, and also to take into account the special case of coal in particular candidate countries within the framework of EU accession negotiations; Until 2010, at least 7% of the fuel consumed by automobiles and trucks is provided with alternative fuels including biofuels (Türkeş and Kılıç, 2004).

3.2.5 Paris Climate Conference

At the Paris Climate Conference held in December 2015, an assessment was made on the sum of the emission reductions committed by the countries that submitted a National Declaration of Intent (INDC) to combat climate change by October 1, 2015 and will not exceed the total amount of carbon dioxide that can be released into the atmosphere by 2030 to keep global

warming at 2 degrees. At this level, expectations have been put forward to ensure the reduction of national emissions. While the pursuit of endless economic growth is considered to be a threat to sustainability, most economists and governments are still reluctant to take a serious interest in the consequences of economic growth on the biosphere. As a result, even global warming to 2 degrees is a very high risk it is clear that it is evaluated as. At this temperature, it is thought that many poor countries, billions of people, countless ecosystems, species and most affected areas will be dragged into disaster. Therefore, it is argued that the objectives of the fight against global warming should be determined in such a way that the warming, which is now 1 degree, increases to 1.5 degrees. Otherwise, the general concerns that concerns about the dangers of climate change will is becoming a situation (WWE, 2015).



CHAPTER 4

RESULT & DISCUSSION

4.1 Discussion

In order to prevent the negative effects of global climate change, the measures to be taken worldwide within the framework of Kyoto Protocol and Copenhagen Agreement are given.

It is aimed to reduce the amount of greenhouse gas emitted to the atmosphere to 5%. Emissions should be reduced by making arrangements in the systems of heating and heating, industrial and motor vehicles that cause the increase of greenhouse gas. In fact, the desired and should be, with less energy warming, less energy to cover long distances, to consume less energy to produce better quality products, garbage storage and recycling should be environmental principles and should be applied. Biodiesel fuels should be used rather than fossil fuels. Arrangements for waste should be made. As is known in cement, iron - steel, gypsum and lime factories, there are high energy consumption situations. Therefore, the production stages of these enterprises should be rearranged. In thermal power plants, systems and technologies that produce less carbon should be preferred and panels for solar energy should be installed and emission should be minimized.

Measures should be developed to ensure the efficient use of water, to prevent contamination of water resources, and to prevent wrong irrigation. Irrigation in agriculture should be done by irrigation unions in places where there is water constraint. Flood prevention structures were built on the river beds in order to prevent floods (reverse dams and flood traps). Water resources and fertile agricultural areas should be protected. Problems arising from overuse and mismanagement of groundwater resources should be resolved. The fight against erosion should be enabled, measures to prevent or slow down desertification should be developed, and cultivation of less dependent water products in arid regions should be planned.

If it is to be realized, coastal areas that will be inundated should be determined and plans should be developed for this purpose. Through public media, students should be made aware of the impacts of global climate change in schools and environmental protection in schools. Thesis studies should be conducted on measures against global climate change in universities and scientific studies should be encouraged. The use of renewable energy sources should be increased. Energy saving efficiency and savings should be ensured in all sectors. Drought-resistant plant species should be developed and produced. In water use, saving measures

should be used in homes, workplaces, agriculture and industry (Şahin, 2018).

Developed countries have played a pioneering role in the political initiatives of international agreements prepared with the aim of limiting the amount of emissions, developing alternative energy sources in order to scientifically prove climate change and solving the problem of water resources. . However, although the first steps taken to solve the problem were carried out by industrialized countries, an important step in practice could not be taken unfortunately (Türkeş et al., 2001). It is possible to say that the problem of climate change is more of a state problem. Because if governments approve and implement the protocol, all economic sectors will be affected. Therefore; Industrialized countries such as the USA, Japan, Canada and Australia have not accepted the Kyoto Protocol because of their economic concerns such as maintaining their position in the global market, maintaining their economic development and not causing unemployment. The climate conferences are a clear indication that the seriousness of the issue is understood by the whole world. However, although the decisions are not yet fully implemented, the experts argue that the set goals will be insufficient for the future of the planet. The Kyoto Protocol's entry into force and its place in international law will not be sufficient to prevent climate change. The first thing to be done is to reduce the use of fossil fuels to the extent possible and to increase the efficiency of renewable clean energy by using state policies. In addition, people need to give up their current consumption habits and learn to use energy more efficiently in their daily lives. In order to prevent the negative effects of global climate change, the measures to be taken worldwide within the framework of Paris Agreement are given. Unlike the Kyoto Protocol, the Paris Agreement provides for a specific global temperature target. The result of the negotiations was to keep this increase below 2°C at the end of the century and to continue efforts to achieve 1.5°C . The “Carbon Budget” which is not included in the Kyoto Protocol and which is taken into consideration in the Paris Agreement, reinforces efforts to determine the peak year for emissions. According to this calculation, only one-third of the total carbon budget needs to be used in order to remain at the promised temperature rise, because two-thirds have already been used. In this sense, countries are expected to reach the peak emission levels as fast as possible and decrease in order to avoid consuming the total global carbon budget. Thus, from 2050 onwards, a balance between human-induced emissions and the capacity of the pharynx it intended.

Unlike the Kyoto Protocol, the Paris Agreement imposes responsibility on all countries. The agreement will enable countries to act according to plans that they determine according to

their capacities with common but differentiated responsibilities and will be based on Intended National Contribution Statements (INDC). In the present case, the INDCs can unfortunately only maintain the temperature rise of the earth at a temperature close to 3 degrees. At the summit, it was decided that all parties should be evaluated in 2023, taking into account the total objectives and subject to a re-evaluation process every 5 years. The results of this evaluation are intended to guide countries to make their goals more ambitious.

With the agreement, it has become a necessity for developed countries to provide financial resources to developing countries for the financial burden of their efforts to combat climate change. Other countries will be able to provide financial assistance on a voluntary basis. Increasing the combat capacity of the countries most affected by the climate change and having the ability to combat it, strengthening the adaptation measures and it will be a source of climate finance to be established in order to develop other measures they may hear. In this resource, which is defined as “Green Climate Fund”, the developed countries billion dollars. This will be the base figure and will be updated and maintained according to concrete needs analysis from 2025 onwards. The agreement will be deemed formally in force when the total greenhouse gas emissions caused by countries exceed 55 percent of the global emissions. Thus, the agreement is international will become part of the law.

At this point of transformation, it is thought that the Paris Agreement will have a very important function and the countries that are parties to the agreement will have to put this ecological transformation into their agenda on the basis of combating climate change. However, although the Paris Agreement tries to provide an ecological transformation in the fight against climate change, serious debates are inevitable and advancing in the fight against problems. The struggle against the global problem will also constitute an important agenda.

There are two claims to focus on these past emissions. The first is that these accumulated carbon dioxide gases are currently causing climate change. Secondly, it claims that industrialized countries are enriched by burning fossil fuels and thus have the most resources to guide the present. On the other hand, the human race recognized that climate change was a serious threat from the 1980s onwards. However, emissions from some industrialized countries were already decreasing by then it even states that European Union emissions stopped rising in 1979 (The European Union, 2015).

This method can also compare current and expected emissions in this century instead. The reason for global annual emissions is currently rising is the rapid growth of emerging economies, particularly in Asia, the Middle East, Central and South Africa. Almost all of the growth in carbon emissions in this century will stem from developing countries (Clarke, 2014). Therefore, climate change at the end of this century mostly depends on what developing countries will do to slow down their growth.

Instead of comparing national emissions, per capita emissions can be looked at. People around the world have both benefits and harms to emissions. People in countries with rich, industrialized, or virtually full-scale, industry have the highest per capita emissions. So maybe they should do more individually than in China, which causes much less emissions. And instead of ever comparing emissions, wealth should be compared. As a result, richer people will be better able to cope with climate change and better shoulder the global cost of cutting emissions. The pioneering of this also improved countries should.

The United States will be one of the most responsible countries if responsibility is measured on per capita emissions. China is number one if compare total national emissions. Climate scientists should prevent global emissions from rising until 2020, and have reached the conclusion that the increase in temperature caused by global warming on the earth will remain below 2 ° C. This will require developing countries to reduce expected emissions, as this is the case with the highest growth rates. But it does not seem fair to put all responsibility on them because they are industrialized. They have not yet managed to enjoy the lifestyle of rich people in countries. This creates the problem of free trade. In order to solve the dilemma of these developed countries, they must provide material and moral support to the developing countries by the developed countries, so that both the developed countries and the developing countries act together and make the world a better habitable state. (Yanardağ and Bozkurt, 2017).

Although developed countries have a greater share in the formation of climate change, the impact of the problem is not limited to developed countries. Especially in the present century, climate change affects the whole world, albeit in different ways. Therefore, climate change is a global problem and can only be resolved through global efforts.

Global warming poses a huge threat to the world with the climate changes it brings. However, the main reasons underlying this are human factors. Rapidly developing technological advances especially after the industrial revolution have also caused the destruction of nature

and the inability to renew resources and it will be bad situation for all countries.

According to data from the United Nations (UN), the world's fresh water resources are rapidly depleted due to the lack of precipitation, excessive evaporation, rapid consumption and pollution from global warming. As a result of the exponential growth of the world's population and economy, it is growing exponentially in the destruction of nature and the environment. As a result of global warming, water resources are decreasing and drought is occurring. As a result, environmental pollution occurs. Since there are serious problems in the ecosystem that keeps a country and a geography alive, living species will be extinct in the future.

Countries in the world are drifting towards a major water supply shortage. This problem is increasing day by day. To prevent this, new measures should be taken to encourage the efficient use of water in all sectors and existing supports should be continued. It should be ensured that the ground and surface water sources are not contaminated in any way. Preventive measures against water pollution should be implemented without compromise.

The right of access to water should be guaranteed by the constitution. Nuclear, hydraulic power plants, solar, wind and geothermal energy sources and bio fuel products should be put into operation. Natural balance should not be disturbed when hydroelectric power plants are installed. Dried wetlands should be re-watered. It is necessary to instil conscious water consumption by giving seminars to people about water consumption. Industrial production leakages should be prevented. Leak wells should be closed.

First of all, persons have to think, measures should be taken about global warming, and the find the some idea should be taken as solutions. Climate change; economic, social and environmental conditions. Within the framework of the principles of sustainable development, taking into account the unique conditions of our country, measures to combat climate change and adaptation should be integrated into our national development plans and sectoral policies. In the long term, while increasing our competitiveness on a global scale and maintaining our growth in stability, measures should be taken today for the transition to an economy that emits less greenhouse gas to the world (Küçükılavuz, 2009).

Considering that every unit of greenhouse gas emitted has a cost to our world, the damages to the environment should be taken into consideration in the production, consumption and investment decisions. One of the most important measures to be taken to reduce greenhouse gas emissions, which cause climate change, is to raise public awareness and education on

energy and water saving, especially to change consumption habits.

The creation of a structure that encourages and supports the use of clean and efficient technologies will provide significant support for sustainable development of the world and its countries goals in the long term. The use of renewable energy sources in transportation, industry and heating should be encouraged. Because renewable energy sources always support the nature that's why ratio of global warming will be decrease if persons support for using renewable energy

Global warming is an international problem rather than an individual problem, as greenhouse gases disperse into the atmosphere and cause changes in the climate of the entire world. Policies to increase energy supply security in ensuring energy supply security and taking measures for climate change should be shaped in the center of efficiency, savings, domestic and renewable energy and clean technologies. Private sector investments in these areas should be supported and the problems encountered should be resolved quickly.

Energy efficiency and savings should be increased in all sectors, including industry, transportation, residential and commercial buildings. In this context, priority should be given to increasing efficiency in the production, transportation and utilization of energy, more efficient and economic fossil fuel cycle (improvement of combustion technologies, expansion of combined heat and power plants).

Studies on insulation and eco - design should be supported. The share of renewable energy sources in the world's energy resources should be increased with each passing day and the mentioned renewable energy sources should be used in transportation, electricity and heating production, which is the basic need. For this purpose, the use of renewable energy sources such as hydropower, solar and wind should be encouraged and the necessary infrastructure should be developed within this framework.

Property problems related to geothermal resources should be eliminated and necessary legal arrangements should be made. Biofuel policies should be established with the participation of relevant sectors and with an integrated approach. Preparations should be made to switch to "0" emission technologies such as carbon capture and storage and hydrogen energy. Biofuels more support than the other types of fuels. Actually carbon capture and store also increase.

Necessary measures should be taken in order to prevent the transfer and use of non-standard technologies that consume excess energy in industry. Comparisons should be made to the

developed countries of the industrial sector in the world and necessary structural changes should be made in order to reduce the energy density which is quite high as a result of the comparisons and increase the energy efficiency in industry

The hydrogen energy center should be activated. The use of solid waste landfills for energy purposes should be encouraged. The use of alternative biomass fuels such as hydrogen, bioethanol and biodiesel should be promoted and preparation for the use of hybrid engines should be made. Necessary measures and incentives should be applied for the withdrawal of old vehicles from the traffic and the renewal of vehicle fleets and the maintenance and adjustment status of the vehicles in traffic should be inspected.

Another effect of climate change is on water resources. Freshwater resources should be expected to decrease in quantity in regions where the flow will be reduced as a result of climate change and necessary attention should be given to the issue within the framework of water resources management. It is expected that the ongoing melting of glaciers will accelerate with increasing temperatures and the sea population will be affected by the rise of sea level. Settlements lower than sea level should make the necessary preparations.

In the face of negative changes affecting almost all of the globe, international organizations such as United Nations and European Environment Agency acted and established climate change units within their bodies. These organizations call on countries to be sensitive about climate change and try to have sanction power if international rules are not followed.

The first and direct effect of climate change will be the increase in air temperature. When air temperatures are modeled and predictions are made, it is concluded that the increase in evaporation amount is caused by air temperature. Air temperature modeling is a process especially needed for water budget studies for water resources such as lakes used in irrigation. This topic water resources has an important place in the management. In the budgeting studies, the evaporation value can be directly modeled to predict future water inflow and if the evaporation data are not available, the air temperature can be modeled and the evaporation values can be changed. These estimates are made by statistical methods.

In the last hundred years, the CO₂ content in the atmosphere has increased by 20%. As a result of this increase, the annual average air temperature is estimated to increase by 1⁰C by 2050 and by 3⁰C by 2100. These estimates are made by the so-called GCM (General Circulation Model). This expected increase in air temperature will disrupt the balance of the climate and the world ecology and economy adverse effects (Gündüz, 2008).

Protecting forests and encouraging planting trees are among the most beautiful activities to be done on this subject. Afforestation studies are the best studies that can be done against the effects of global warming and protection of dam reservoir against sediment. Such activities need to be increased.

Educating people, classes and children and adults about global warming is a big step towards reducing global warming, which is considered irreversible. Future generations should be taught not to overdo them at an early age, and it should be explained that it is an advantage to save money without wasting.

Global warming, which has the effect of increasing temperature on the world caused by global warming causes changes in other related climate elements. As it is known, water cycle, nitrogen cycle and so on. such as loops. The most relevant of these cycles is the water cycle. Global warming, drought caused by the increase in temperature, hydrological cycles in the world, decreasing the amount of water resources in the world, decreasing the quality of the water resources, the melting of snow and glaciers and the rise of the sea level based on this, excessive evaporation, natural meteorological disasters, fires, change of precipitation regime are also the source of problems. These problems directly disturb the balance of the water cycle, reduce precipitation and, as mentioned, lead to a significant reduction and depletion of water resources. Apart from these effects, global warming has economic, sociological and psychological effects indirectly by being affected by these effects. decrease in agricultural products, water scarcity due to decrease in water resources and energy shortages due to this, poor quality of the produced energy, negative impacts of many sectors, settlement areas on the coastal areas being at risk of natural disasters; consequently, the emergence of problems in the direction of the welfare of the country, the increase in health costs due to the negative effects on human health, and the crises due to the lack of resources to cope with the problems of less developed countries reveal the socio-economic and political importance of global warming.

4.1.1 The Effect of Global Warming on Water Resources

Global warming endangers many vital resources in the world and also endangers water resources in a serious way. The greatest impact of global warming on water resources is to disrupt the water cycle, which moves in proportion to rainfall and other natural phenomena. The severe drought in global warming is directly related to this cycle and is conducive to disturbing its order. With the deterioration of this cycle, there will be significant reductions in

water resources around the world and perhaps exhaustions. In a logical way, water sources such as rivers, basins and rivers provide sustainability thanks to feedings. Their feed is generally obtained from rain and rainfall provided by the water cycle. If no nutrition occurs nutrition, these resources will be reduced and depleted over time.

Most of the studies on the impact of global warming on water resources have focused on the human factors of the proportion of water in the world. For this reason, it is very important that human beings consume these resources properly and regularly and ensure their continuity.

4.1.2 The Effect of Global Warming on Undergroundwater Resources

As is known in the world, there are many water resources and groundwater resources are one of them. Especially in arid or semi-arid regions where climatic differences are seen in the world, these water resources are an important resource for people and natural life. The aquifer is fed by rainfall, rivers and lakes. It was understood that the flow changes occurring from year to year were due to changes in precipitation rather than changes in temperature. The rise in sea level will cause salt water interference in coastal aquifers. The amount of this interference depends on the hydraulic gradient of groundwater. The most risky parts of the world are shallow aquifers. The decrease in precipitation caused by the rise of the seas is the reason for the decrease in the volume of collectable water and will decrease the amount of fresh water resources that are low (Karaman and Gökalp 2010).

In large geographies of the world, groundwater is a very important resource for drinking water potable water, especially in rustic areas in drought and semi-drought regions. The aquifer is fed by precipitation, rivers and lakes. Water can quickly reach the aquifer through macropores and crevices or by leaking from the permeable rocks above the aquifer. Any change in effective precipitation will also change the feeding process. The effect of a change in the feeding season will be the same. As predicted in almost all scenarios for medium latitudes, increasing winter precipitation generally increases. A high evaporation rate may mean that water deficits in the soil persist longer and compensate for the increase in total effective precipitation. An unpressurized aquifer is fed directly by local rains, rivers and lakes. The rate of feeding aquifer will be affected by the permeability of rocks and soils above it. Macropore, crevice and cleft feeding are among the most nutritional structures. At the same time, feeding increases if there is a high degree of cracks in the soil geology. Nutrition is important in some semi-arid regions. In principle, “fast feeding” can occur every time it rains. Therefore, where this process is predominant in nutrition, seasonal soil will be affected by

changes in precipitation rather than moisture variability. It applies 2xCO₂ scenarios that represent even greater changes than the predicted temperature changes for the 2080s according to the current scenarios (Carter and Hulme, 1999).

In this chapter you can see result and some of discussion about effects of global warming and ground and underground water resources. Global climate change is one of the most important environmental, water resources and economic problems of our age, and it is a very complex problem that creates negative effects in every aspect of life, from human health to agricultural production, especially in our geography. There will be a significant increase in average surface temperatures due to the fact that other greenhouse gases, especially carbon dioxide (CO₂), which accumulate in the atmosphere with the industrial revolution, hold long wave rays emitted from the ground. How these causes can be prevented or reduced has been studied.

CHAPTER 5

CONCLUSION

Global warming has ceased to be a theory, and has become a serious danger facing all over the world. It is stated that people should be prepared for the extreme rainy weather and floods that come after a hot day and that all living things, including human beings, will feel the effects of global warming more. As mentioned earlier, most people see global warming only as an increase in temperature and continue to ignore it for this reason. However, this is not only the increase in temperature on the earth, but also ensures that the season passes are longer than it should be, allowing the temperature to become cold at the same time.

Global warming was due to the continuous increase in greenhouse gas concentrations in the atmosphere, which resulted in the development of technology, especially after the Industrial Revolution. This increase resulting from human activities causes the natural balance of the climate system to deteriorate gradually. Unfortunately, it would be wrong to say that it is the result of the activity of all living things. This situation occurs as a result of mankind making it with his own hands. Global warming is the change in the temperature of the greenhouse gases given to the world as a result of some activities carried out to sustain the lives of the people of the world. Gases such as carbon dioxide, diazotmonoxide and methane, which are called as greenhouse gases, hold the sun and ground radiation and constitute the main factor in the heating of the atmosphere. Of course it would be wrong to evaluate only these compounds or products, but if we want to look at the percentage, the weight is based on these compounds and products. Burning of fossil fuels with use, increasing deforestation, increasing population growth and surplus and unnecessary consumption based on population growth tendencies in societies, the density of carbon dioxide in the atmosphere is higher than before the Industrial Revolution and is increasing significantly every year. Observations made shows that the average global temperature increases by 1°C. Scientists foresee measures are not taken to reduce the average temperature of the world is expected to increase in the greenhouse gas varieties that accumulate or are expected to accumulate in the atmosphere. dramatically at the end of this century due to climate change.

Climate is a system that directly affects the activities of mankind. Where people spend their lives in a one-on-one relationship with the systemic atmosphere.

Climate is not a stable effect, but is a series of physical and chemical phenomena that are constantly changing and evolving. The climate determines the periodic transition of people living in the atmosphere. There is a natural phenomenon that causes climate change and its name is global warming. But there is one more thing to know that global warming is not just climate change. In this study, "The effect of global warming on groundwater resources" was examined. Global warming has had different forms from very hot times to glacial ages. Today, it is the scene of a global warming. Global warming, industrialization and fossil fuel residues are caused by increased density of CO₂ gas in the atmosphere.

Global warming and climate change trigger each other. As mentioned in the previous sentences, global warming prolongs the process of seasonal transitions and causes them to shorten. For this reason, there are endless rains and cold in summer and endless sunny days in winter. The impact of global warming on climate change and the related disasters chain; melting of glaciers, 60 cm above sea level, floods, expected soil losses in some shore areas, mixing of clean water resources and water problem extreme temperature and drought caused by high temperature rise, fires, significant decrease in lake and river waters, destruction or decrease of some species of animals and plants that cannot withstand changes in the world. In some regions, changes in virus types due to overheating and development of epidemics, exceeding the capacity of carrying local and global scale with the migration wave to occur, and as a result of these problems are suggested to become more widespread. Because of these problems, the world has become very difficult to live and human beings and all the living things that are left behind are in very difficult life conditions.

In order to prevent global warming, the climate system should be targeted and avoided from human-induced dangerous initiatives. Information about how these studies should be given is given in the 'Result and Discussion' chapter. Greenhouse effect, gas emissions can be inevitable. The Kyoto Protocol, the Copenhagen Agreement, the Paris Agreement and the European Council of Gothenburg have introduced information, recommendations and obligations on all measures that countries should take from past to present.

Therefore, in the global warming, which is now a danger that cannot be denied to mankind, the period in which the necessary measures will be discussed for a long time has already passed and the stage of action has been reached. Although it is stated as a fact that global

warming cannot be stopped, the political steps taken by the states to minimize the damages and make them controllable are very important. In addition, capital activities should be framed and controlled regularly. The individual must perform persons daily activities within the framework of this consciousness in line with persons duty.

Considering the above mentioned situations, some precautions should be taken regarding global warming, which is a great danger awaiting all living things in the world. If these measures are mentioned, the use of green spaces should be carefully and protected, use of fossil fuel vehicles and materials should be reduced and used unnecessarily, alternative energy sources should be produced and the usage of these sources should be increased, Society should be made aware of education and other activities and these education and activities should be compulsory, recycling should be given more importance and more studies should be done on this issue, all the world's work on this issue should be jointly advanced and implemented, everyone should do their part about global warming and raise awareness about this issue, legal sanctions and treaties should be applied against the effects of global warming. These practices and sanctions should be a deterrent, attention should be paid to the use of energy (water, electricity) and should be used economically, necessary measures should be taken against greenhouse gas emission caused by global warming, all sectors should be saved as a state, waste control and separation should be provided. Must be used for recycling after separation, further measures should be taken to protect nature and natural resources, and measures should be taken to prevent human-induced destruction on nature. It would be more efficient to take these measures with sanctions, the country's administration should give more support to the studies and projects carried out to combat global warming, in order to protect the ecosystem, more precautions should be taken against environmental and air pollution, measures should be taken against pollution and destruction caused by industrialization; restrictions should be placed on the use and testing of nuclear energy, parents should educate their children on the importance of climate change at an early age, public spot works should include climate change, global warming-related trainings should be given to students in addition to theoretical training. Governmental support should be provided for this. The supports provided should be continuously monitored, developed countries should abandon their selfish attitudes, the media should give wide coverage to this issue, because if every person doesn't pay attention, the problems will increase, rapid and distorted urbanization should be prevented. Incorrect land use should not be allowed, the use of substances affecting the ozone layer should be limited, and the country's administration should continuously

monitor and monitor this situation, and international organizations and non-government organizations should increase their activities (Akbulut, 2019).

Throughout the study, a general-to-private strategy was considered and implemented. As a result, many problems of global warming on the world affect and continue to affect human life. The biggest problem is the impact on climate change and water resources. Because these two issues directly affect human beings and reduce the quality of life of people. The greatest impact of Global Warming on water resources is the shortage of underground water resources. Firstly, the ratio of water in the world and its resources, then global warming and the relationship between these two different subjects are mentioned. Based on this relationship, researches and studies have been conducted from different theses. Based on these researches and studies, materials and methods have been entered and studies, protocols and agreements on this subject have been examined. As a result of the investigations, not only global warming was emphasized. Drought, precipitation differences and climate change which is one of the most important reasons caused by global warming are also mentioned. From the beginning of the research to the end, the effects of global warming and the effects of global warming on the world and underground water resources have been mentioned and studies have been carried out on the measures taken and necessary to be taken so far.

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