

Short-Review Article

Non-Climatic Factors Causing Climate Change

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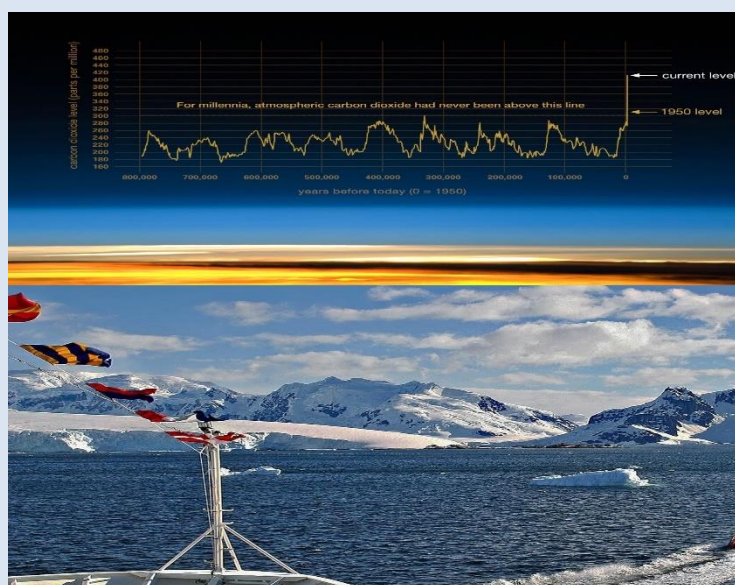
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Abstract: Climate change refers to fluctuations in the global climate of the earth or in regional climates over time. It describes changes in volatility or average weather conditions or average (normal) weather on time scales that fluctuate over decades and millions of years. These changes might be due to the internal processes on Earth, or external forces (for example, fluctuations in the intensity of sunlight), or more recently to climate change-related activities. Especially in recent applications, in the field of environmental policy, the term "climate change" often refers only to current changes in the new climate. The issue of climate change and its potential effects on various economic and social sectors is one of the challenges of human technology. Recent studies show that the emissions from greenhouse gases are a major cause of global warming. Greenhouse gases also play an important role in understanding the Earth's climatic history. According to these studies, the effect of greenhouse gases, which generate heat by trapping heat by greenhouse gases, plays a key role in regulating the earth's temperature. This work evaluates the non-climatic factors that cause climate change.

Key words: Climate change; Environmental policy; Greenhouse gases; Global warming

Graphical Abstract:



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Introduction

Climate change refers to fluctuations in the Earth's global climate or in regional climates over time. It describes changes in fluctuations or average weather conditions - or moderate (conventional) climates on time scales that fluctuate between decades and millions of years. These changes may be due to the internal processes on Earth, or external forces (for example, fluctuations in the intensity of sunlight), or more recently to climate change-related activities. Especially in recent applications, in the context of environmental policy, "Climate change" often refers only to current changes in the new climate, including an increase in the average surface temperature (earth) known as global warming. In some cases, the term is also used to assume a human cause-and-effect relationship, as used in the United Nations Framework Convention on Climate Change (UNFCCC). The UNFCCC uses the term "climate volatility" for changes of inhuman origin [1].

Climate Change Factors

Climate change is caused by fluctuations in the earth's environment, natural processes around it, and the impact of human activity on it. External factors that can shape the climate are often called climatic forces, including processes such as fluctuations in solar radiation, the rotation (position) of the earth, and the amount (concentration) of greenhouse gases [2-4].

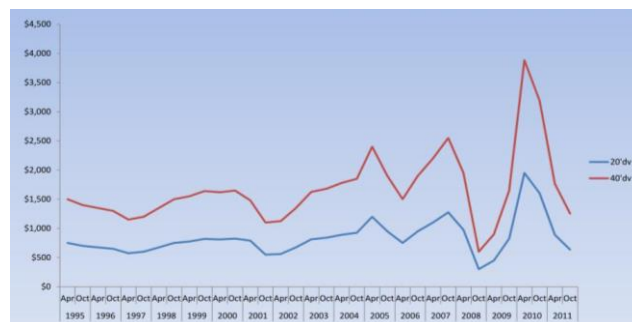
Ocean Volatility

At almost a decade-long scale, climate change can also be resulted from the changes within oceanic systems. Many of the climatic conditions, most notably the South Oscillation, include the Pacific Decadence, the North Atlantic Oscillation, and the Arctic Ocean Oscillation, which are known to be specific conditions within the climate system, at least because of their existence. To some extent, heat has been stored in the oceans and moved between different sources in a variety of ways. On longer time scales, oceanic processes such as thermo-haline rotation play a key role in heat redistribution, and in the event of change can greatly affect the climate [5-7].

Figure 1. Volatility of container ocean freight PowerPoint Presentation.

Climatic Memory

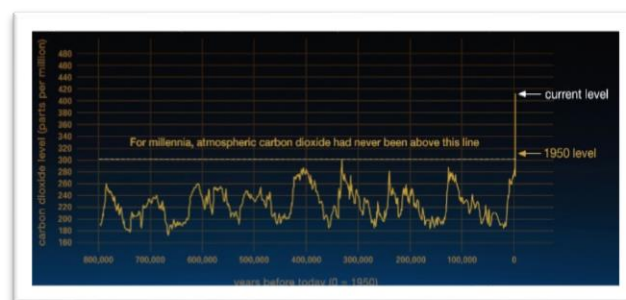
Most forms of fluctuation within a climate system can be considered as waste, in the sense that the current state of the climate not only reflects its inputs but also the history of how it originated and reached this stage. For example, a decade of drought can destroy lakes, completely dry up deserts and expand deserts. Instead, these conditions can lead to less rainfall in recent years.



In short, climate change can be a perpetual spontaneous process because different aspects of the environment respond to the inevitable fluctuations in different proportions and in different ways [8-9].

Non-climatic Factors Causing Climate Change Greenhouse Gases

Recent studies demonstrated that greenhouse gas emissions are a major cause of global warming. Greenhouse gases also play an important role in understanding the Earth's climatic history [10]. According to these studies, the greenhouse effect generated by heat trapped by greenhouse gases plays a key role in regulating the earth's temperature. Over the last 600 million years, carbon dioxide levels have probably ranged from more than 5,000 ppm to less than 200 ppm, mainly due to the influence of geological processes and biological innovations. More carefully, it was argued that fluctuations in emissions of tens of millions of tons per year are not well correlated with climate change, in which plate tectonics is likely to play a more dominant role. However, there are many examples of rapid changes in the amount of greenhouse gases in the Earth's atmosphere that appear to be closely related to extreme warming, including the Paleocene-Eocene maximum period (Paleocene-Eocene, Permian-Trasic extinction), reptile and dinosaur extinction And the end of the Earth's glacial period in the Scandinavian (Varangian) region. During the modern era, rising carbon dioxide levels have been



a major factor in global warming since the 1950s [11].
Figure 2. The relentless rise of carbon dioxide [12].

What are the consequences of global warming? Temperature and the amount of snow and rain both affect the climate. Temperatures and rainfall in each region are also affected by latitude, altitude and ocean currents in that region. Climate change is a phenomenon that changes the effect of the above factors on the climate of each region and leaves adverse effects. Some of the known consequences of climate change are:

- Rising sea levels and declining freshwater resources.
- Regional climate change in the high latitudes and the northern hemisphere.
- Change in rainfall and wind direction.
- Increased natural disasters such as hurricanes, tornadoes and floods.
- Increasing the rate of drought and developing desert areas.
- Increased air pollution in some areas due to increased hot winds.
- Possible effect on the spread of diseases such as malaria.

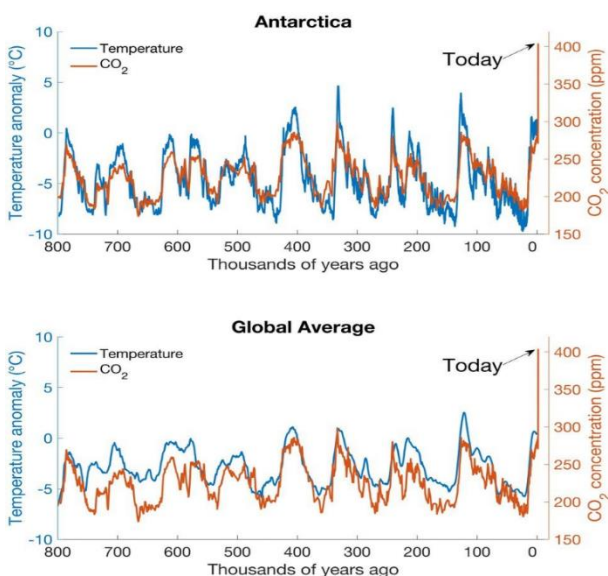


Figure 3. CO₂ levels are at their highest in 800,000 years [13].

Characteristics of Recent Climate Change

Human Impacts on Climate

Human factors are activities by which humans change the environment and affect the climate. The biggest current concern is the increase in 2CO levels due to the fossil fuel combustion emissions, which result in aerosols (cooling particles in the atmosphere) exerting a cooling effect (on climate). Other factors, including land use, ozone depletion, and deforestation, also affect the climate [14].

Fossil Fuels

With the onset of the Industrial Revolution in the 1850s and its acceleration so far, human consumption of fossil fuels has raised the 2CO level from 280 ppm to more than 370 ppm today. This rate is rising up to 560 ppm by the end of the 21st century. Along with rising the methane levels, these changes occur, causing temperatures to rise by about 1.5–4.4 °C between 1990 and 2100.

Land Use

Prior to the widespread use of fossil fuels, the greatest human impact on the local climate was probably due to the land use. Irrigation, deforestation, and agriculture fundamentally change the environment. For instance, they can change the amount of water entering and leaving a particular place. They can also change the reflection of the earth by affecting the earth's cover and changing the amount of sunlight it absorbs. It was reported that the climate of Greece and other Mediterranean countries has changed steadily due to the deforestation between 700 BC and AD (the wood of these forests was used to build ships, buildings and as fuel). Resulting in the new climate in the region has become mostly hotter and drier, and the tree species used in ancient times to build ships are no longer found in the area. William Rodiman's Controversial Hypothesis The early anthropogenic hypothesis states that the increase in agriculture, along with deforestation, increased the carbon dioxide and methane over the past 8,000–5,000 years. These increases, which go back to previous degradations, could be responsible for the delay in the onset of the next glacial period, according to the Rodiman hypothesis [15].

Interaction of Factors

If a particular factor (for example, solar fluctuations) acts to change climate, there may be mechanisms in place to exacerbate or reduce its effects. These are also called positive feedback (positive and negative feedback). The climate system as a whole is stable with respect to these feedbacks: positive feedbacks are not unstoppable. Part of the reason for this is the strong negative feedback between temperature and scattered radiation: radiation increases in proportion to the fourth power of absolute temperature.

But there are a number of important positive feedbacks. The glacial and intra-glacial cycles of the current glacial period represent an important example.

It is believed that rotational oscillations (ground) create timing for the advance and regression of ice sheets. However, these layers themselves reflect sunlight into space, thus promoting their cooling and growth, known as ice-reflection feedback. In addition, rising sea levels and the spread of ice reduce plant growth and indirectly

reduce carbon dioxide and methane. This causes more cooling. Also, for example, rising temperatures due to human evaporation of greenhouse gases can lead to the regression of ice sheets that expose the darker surface of the earth, resulting in more absorption of sunlight.

Carbon can also act as important positive feedback, accelerating that process by raising its levels in response to the warming process [16-20].

Water vapor can certainly act as a feedback agent (with the exception of small amounts in the stratosphere) unlike other major greenhouse gases. More complex feedbacks include the possibility of changing the patterns of rotation in the ocean or atmosphere. For example, an important concern in the modern era is the melting of the Greenland ice sheet, which will accompany the subsidence of water in the North Pole and impede the circulation.

This could affect the bay flow and heat distribution to Europe and the east coast of the United States. Potential feedback is no longer well understood and may prevent or increase the heating process. For example, it is not known whether rising temperatures increase or inhibit the plant growth, which in turn can more or less reduce the carbon dioxide levels. Also, rising temperatures can more or less cause cloud cover? As this has a cooling effect on the balanced cloud cover, any change in increasing clouds can also affect the climate [21].

Evidence for Climate Change

This evidence comes from a range of sources that can be used to reconstruct the ancient climates. Most of this evidence is indirect climate change that is inferred from the fluctuations in indicators. Also affect the climate, such as plant growth, plant age knowledge by counting growth rings, ice sheets, sea level change, and ice layer regression.

Examples of Climate Change

Climate change has continued throughout the history of the earth. The long-standing field of climatology provides information on past climate change, while complementing new climatic observations. Undoubtedly, most of these prehistoric changes are due solely to natural factors. There has been a debate about how climate change is affecting the world economy. In a report dated October 29, 2006, by Nicholas Sjaastern, an economist at the World Bank (Economic Director and Senior Vice President of the World Bank), he stated that climate change could affect the growth of the economy so that it could bankrupt up to one-fifth of the economy. Unless an effective action is taken against it [22-25].

Assessing the effects of climate change on Iran

Temperature and precipitation: In order to assess the vulnerability of the country due to lack of control over greenhouse gas emissions, six different scenarios have been designed. These scenarios are themselves a combination of different models and scenarios such as two GC models HadCM2 and ECHAM4, three diffusion scenarios (IS92a, IS92b and IS92c) and three different climate sensitivities. In these combinations, three different conditions for the emission of greenhouse gases are considered, which are:

A) Low emission rate

B) Keeping the emission rate constant in the current conditions

C) High emission rate

Finally, the modeling results performed between the combinations of different scenarios and climatic sensitivities demonstrated that for case (a) the temperature increases between 1 to 1.5 ° C, for case b) the temperature increases between 2.5 to 4.5 ° C and for case (C) This increase in temperature is between 5.9 and 7.7 ° C. The same combinations were also used to depict the changes in rainfall in the country, the results of which are:

For conditions A - 11% to 19.1% decrease in precipitation compared to the base year.

For conditions B - 30.9% to 50% reduction compared to the base year.

For conditions c - 58% to 80% reduction compared to the base year [26].

Water resources: To investigate the effects of global warming on Iran's water resources, various studies have been conducted using the hydro-meteorological data and runoff models that have been integrated with diffusion scenarios and temperature changes. The results of periodic runoff data collected from 398 hydrometric stations show that the flood index has changed in 47% of them.

In addition, climate change has been clearly observed in the 600 meteorological stations studied during the years 1990-2000. The long-run runoff model used for 30 river basins shows that the increase in temperature increases the runoff volume in winter due to the conversion of snow into rain and in the spring due to the rapid melting of snow. It has also been shown that rising temperatures affect runoff in catchment areas and reduce runoff fluctuations due to rainfall [27].

Agriculture:

The increased temperature due to climate change may reduce the fertility of rice seedlings, decrease the shelf life of corn, immaturity of wheat and reduce the germination of potatoes. On the other hand, climate change by reducing the amount and timing of rainfall, according to historical data, reduces wheat and cotton

production. So that recent droughts in the period 1998-1998 reduced 1,050,000 tons of irrigated wheat and 2,543,000 tons of dry wheat turned. These results demonstrated that the agricultural sector of Iran is very vulnerable to the phenomenon of climate change [28-30].

Forest and Land Use

Global warming has a severe effect on the forest sector. Changing the natural growth of forest plant species, especially resistant species and the extinction of semi-resistant species are examples of these effects. The natural growth of disturbed forest plants leads to reduced wood production and non-wood products in the forest.

Invasion of forests and pastures and exacerbation of plant diseases can accelerate the land erosion, especially in the arid and semi-arid regions. Rising sea levels in the Persian Gulf and the Sea of Oman are destroying mangrove marine forests. Due to the decrease in the amount of forage in forests, which can in some cases be a sign of the beginning of desertification, environmental conditions for wildlife in forest areas are rapidly unfavorable. Rising temperatures and droughts are destroying vegetation and consequently accelerating soil erosion, which ultimately due to the weakening of the ecological capacity of the region due to these degradations, adverse social consequences such as migration occur. Comparing the situation in Iran with previous periods shows that the country's environmental performance has improved, and the Iranian index has increased by 9.1 points in the last decade. But given the environmental situation in Iran in recent years, this has come as a surprise to many [31-34].

Yale University in the United States has recently published a report showing the progress of Iran's environmental situation; however, some experts believe that for some reason the country should not be considered in these statistics [26]. In the report "Environmental Performance Index" or EPI 2020 countries Published by Yale University, USA, Iran is ranked 68th out of 180 countries and has a score of 47 (out of 100). The situation of countries such as Turkey, Saudi Arabia, Egypt, China, Qatar, etc.

It is worse than Iran in this ranking. Also, countries such as Denmark, Luxembourg, Switzerland, Britain, France, and Austria have had the best environmental performance. Iran has reported improvements in the country's environmental performance in previous periods, and Iran's index has risen 9.1 points in the past decade. But given the environmental situation in Iran in recent years, this has come as a surprise to many [35].

Of course, despite the Iran's progress in terms of rankings compared to the previous year, the score of the country's environmental performance index has been declining from 58.16 to 48. In this index, Yale University, statistics are taken from the countries themselves, now you yourself Judge how we can trust these numbers in a country where many statistics are not known. "What we know is that Iran has dropped all the standards we are looking at." On the other hand, it seems that climatic factors were also effective in improving Iran's ranking, for example, Iran's rainfall in the current water year has increased by 32% compared to the long-term average. The rains in the past year have been such that some wetlands and vegetation have been rehabilitated and dams have overflowed. From the east and Sistan-Baluchestan, which goes to the desert, you can see that the deer gave birth to multiples. This has led to an increase of 13 rankings, which of course is hopeful. Achieving the rank of 67 and improving the situation in some environmental areas is weaker in some indicators.

Coastal areas: The north of Iran is the center of agricultural production. The energy industries are located in the south and are the center of oil extraction and export. Most major export ports are located in the south.

The presence of these industries in the north and south of Iran shows the extent to which the coastal areas of the country are vulnerable to the effects of climate change. According to the data collected from three stations at different times during ten years, the average increase in sea level in the Persian Gulf and the Sea of Oman was 4.5 mm per year, which is the scenario matches. Some of the effects of rising temperature and sea level in coastal areas are: coastal erosion in the north and south, flooding of lowlands such as Miankaleh Peninsula and Gorgan Bay, widespread whitening of coral reefs, infiltration of saline water in freshwater due to Coastal landslides are all examples of the vulnerability of the northern and southern coasts of Iran [36].

From a socio-economic perspective, climate change has severe adverse effects on household health and well-being, including the provision of fresh water in coastal areas. The infiltration of saline water into surface and groundwater is one of the most important consequences of climate change in the region - especially in the catchment area of the Karun River. Karun River is the main source of drinking water for cities with a population of more than one million people Sea level and reduction of river discharge has been one of the topics discussed about this river.

Health: Climate change has a direct impact on human health. Global warming is expected to increase cardiovascular, respiratory and infectious and

microbial diseases. Malaria, one of the most common diseases in the tropics, is also common in tropical provinces of Iran. Research on the incidence of malaria from 1982 to 1988 in the country showed that the incidence of this disease is growing despite the increase in health facilities. Iran is one of the countries that has diverse habitats due to its four seasons' climate and Caspian, desert, mountainous and tropical regions. This diversity has caused the dispersal of various plants and animal species throughout the country, but despite the situation. The specific climate of Iran has created conditions that few countries have even in Europe. Due to some natural factors and human activities, we are witnessing the extinction of a large part of this biodiversity in some areas [37].

Biodiversity in Iran is presented at three levels of genetics, species and ecosystem, more than 1400 vertebrate species with various habitats and different habitats such as Arasbaran, Zagros. Also Hyrkani have been identified in the country, all of which have interesting diversity in the region. But in recent years, for various reasons, most of which are related to human activities, the country's biodiversity alarm has been sounded and has caused concern among environmentalists. Of course, this situation is not unique to Iran, but this wave of concern has occurred in most countries of the world, and experts believe that the reason is unbridled human activities. In fact, in the current century, biodiversity loss is largely the result of human activity feedback and a serious threat to survival on Earth, despite efforts over the past 20 years to destroy habitats, over-harvest agricultural land, and Groundwater and its pollution due to overpopulation, climate change and other problems caused by neglect, the process of extinction of the world's biodiversity continues. Due to the importance of the issue, the United Nations initially designated December 29, 1993 (the date of the Convention on Biological Diversity) as the International Day for Biodiversity, but in December 2000, the UN General Assembly aimed to raise awareness of biodiversity issues. May 22 (June 2) was designated as the International Day for Biodiversity (IDB) and each year, according to the circumstances, chooses a slogan for this day, which this year is the slogan "Our solutions are in nature." [38].

Solar oscillation: The sun, as a perishable resource, provides almost all the energy of the climate system, and is a complete part of the formation of the Earth's climate. At the longest scales of time, the sun becomes brighter as it continues its main evolution. At the beginning of the history of the earth Earth's history it was thought to be too cold to hold water on the earth's surface, which led to what is known as the paradox of the young sun. At newer scales of time, different forms of solar fluctuations there are also 11-year solar cycles

and longer periods of change. However, the 11-year cycle of sunspots does not appear clearly and spontaneously in climatological data. These fluctuations have been instrumental in the emergence of short glacial periods and, in some cases, global warming from 1900 to 1950 [39].

Climate change and its effects in Australia

Extreme wildfires experienced in New South Wales (Australia) became more pronounced in 2019-20 and are a warning, and climate change seems to be one of the main drivers. Climate change caused by high levels of greenhouse gases causes these fires and intensifies them; however, not all changes can be attributed to the greenhouse gases. Australia experiences fires every year in late winter, but the fire continued for nine months this year. NSW had the highest rate of damage, with more than half of Portugal being burned, 2,400 homes destroyed and 26 dead [37-39].

Biodiversity includes all plant species, animals, microorganisms, ecosystems of which species are a part, and diversity between species, between species and ecosystems. Each of the components of biodiversity (genes, species, and ecosystem) alone cannot be an indicator for the whole biodiversity because these components Biodiversity is actually determined by the interactions of many factors that change spatially and temporally. At the same time, all the components of biodiversity play a vital role in its survival by providing human needs through ecological products and services. However unfortunately, the current levels of human impact on biodiversity are unprecedented and unique, so that it has affected the entire planet and has led to the destruction of biodiversity at impressive and large levels. The severity and extent of species extinction now associated with human activities is much higher than normal in the past. This impact on biodiversity will obviously have a negative impact on the services and products provided by biodiversity, while the livelihoods of many people, especially local communities, depend on biodiversity [40].

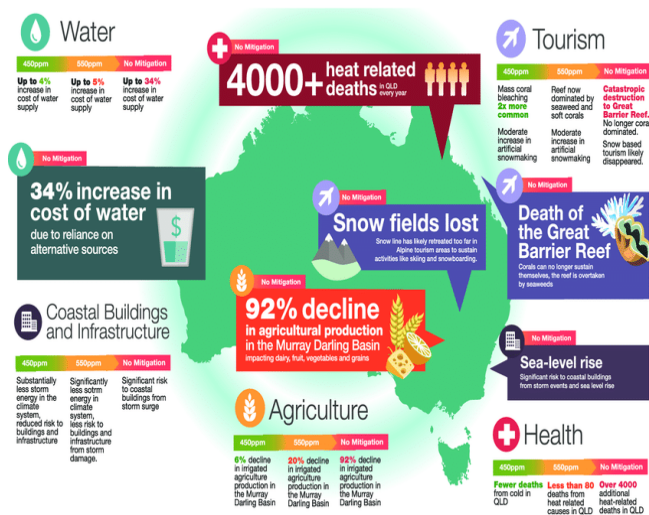


Fig. 4. Climate change impacts in Australia: projections for the year 2100

Indirect human stimuli include demographic, economic, political, social, scientific, technological, and cultural issues, while major direct stimuli include changes in local land use and land cover, species introduction or displacement, and effects of toxins. And chemical fertilizers, harvesting and exploitation, climate pollution and finally climate change. Climate change in recent decades has had profound effects on biodiversity. Climate change, such as increasing concentrations of carbon dioxide in the atmosphere, rising Earth and ocean temperatures, changes in evaporation rates, and rising sea levels, especially warmer and higher local temperatures, have led to changes in the reproductive time of plant and animal species. Or the time of migration of animal species, the length of the growth period, the distribution, the size of the population and the frequency of pests and diseases. Although the initial production of many species may increase due to the increase in carbon dioxide concentration, there will be a sharp decline in the net production of biomes and ecosystems. Because a change in the amount of primary net production will lead to a change in the composition or performance of ecosystems. In addition, the livelihoods of many indigenous and local communities will be adversely affected, and ultimately changes in biodiversity at the ecosystem level and landscape in response to climate change and other pressures (deforestation, non-native species) [41]. It will affect and change the place more. Climate change is caused by changes within the climate system as well as external factors. Emissions of greenhouse gases and aerosols from human activities change the composition of the atmosphere, and with the increase of these gases, the earth becomes warmer.

The continuation of these changes in the present century will be far greater than ten thousand years ago, and combined with land use changes, the spread of non-native / invasive species, the ability of species to migrate and their ability to survive in fragmented habitats is likely [42].

Cut the piece. Rising temperatures, changes in snow and rain patterns, severe climatic events such as heavy rainstorms and recorded high temperatures are other aspects that affect society and ecosystems. Climate change is any major change in the size of the climate (such as temperature and evaporation) that lasts for a continuous period of time (a decade or more). Climate change may be the result of natural factors and processes or human activities. Global warming is a term that is commonly used interchangeably with climate change when they are not the same. Global warming refers to a moderate increase in atmospheric temperature near the Earth's surface. Global warming is only one aspect or part of climate change, although it is also the most important. An important way to dream and be aware of the causes and effects of climate change is through indicators. An indicator represents or indicates the state or trend of environmental or social conditions in a specific place and time period. For example, long-term global temperature measurement is used as an indicator for dreaming and better understanding the effects of global climate change. Extensive scientific studies indicate that severe weather events such as heat waves and large storms are likely to occur more frequently in the future. While in the definition of climate as the state of the atmosphere at a particular time and place and most of it occurs in the lower layers of the atmosphere and its popular and common aspects can be the temperature, evaporation, clouds and wind Is the average long-term climate in a pure place. While temperatures can change in minutes and hours, climate change sometimes occurs over long periods of decades to centuries. Climate is expressed not only by the average temperature and precipitation but also by the type, frequency, duration and intensity of weather events such as heat waves, floods, droughts and storms [43].

Circulation changes: Rotational fluctuations in some cases, due to their impact on the climate (Earth), cause the development of solar fluctuations, because minor fluctuations in the Earth's rotation cause changes in the distribution and frequency of sunlight that reach the Earth's surface. The trend is quite predictable based on the principles of physics and is due to the interaction of the Earth, the Sun and other planets, which are considered to be the driving forces in the glacial and intra-glacial cycles of the current glacial period. , Such as the frequent advancement and regression of the

desert desert in response to the deviation of the path of rotation (position of the earth).

Volcanic eruption: Any type of eruption that occurs at different times in each century can affect the climate, which takes several years to cool. For example, the eruption of Mount Pinatubo in 1991, the effect of which is rarely visible in the global temperature landscape. Massive eruptions, known as large volcanic eruptions, occur only a few times per hundred million years, but can change the Earth's climate for millions of years and cause mass extinctions. Scientists initially thought that dust scattered in the atmosphere by large volcanic eruptions was responsible for cooling it by partially blocking the transmission of solar radiation to the earth's surface. However, measurements show that most of the dust scattered in the atmosphere returns to the earth's surface within six months [44].

Antarctica at risk of biodiversity loss; another masterpiece of climate change

Researchers on Antarctic biodiversity have concluded that the biological conditions in the region are changing as a result of numerous human activities, and that the species in the Arctic may be completely altered. One of the species that may appear in this area are oysters. Researchers analyzed Antarctica and identified a list of invasive species that are likely to come to the region by 2030. British surveys of Antarctica have led to a list of 13 species of invaders, of which oysters have the highest chance of invading the area. The researchers wrote in their findings that the Peninsula region is most likely to be involved in the negative consequences of human activities. They say the mice have already invaded the area and are likely to increase in number as new species become more established in the area and climate change worsens the situation. But the most important candidates for invading Antarctic species are seashells and invertebrates [45-47].

Of course, there are other species that are endangered for biodiversity in this area. These include worms, mites and spring-tailed insects. "The Arctic Peninsula is by far the busiest and most visited part of Antarctica, as most of the tourist areas and research sites have been set up in the area," said lead author Kevin Hughes. As a result, non-native species are transferred to these areas in different ways. Visitors can bring non-sterile seeds and soil attached to their clothes and shoes to these areas. Food supplies and cargo containers can also bring new species to the area, for example. Mice, insects and plants are more likely to be transmitted this way.

Figure 5. Warming archives [4].

As a result, it is very difficult to remove them once they have settled in the area. Some islands in the area, such



as Marion and South Georgia, have been occupied by mice. But researchers do not expect that to happen on the main island of Antarctica, because the living conditions there are not good and it is still very cold. However, they expect the mice to survive by hiding in research centers in the area. Mice may still be able to survive in research centers, but by the next 30 years there will be many species that will occupy most of Antarctica and threaten biodiversity [48].

Adverse Effects of Climate Change on Iran

Based on the research and evaluations carried out in the Climate Change Empowerment Plan under the auspices of the United Nations Framework Convention on Climate Change and using the scenarios proposed by, if the concentration of carbon dioxide doubles by 2100, the average temperature in Iran It will increase by 1.5 to 4.5 degrees Celsius, which will cause significant changes in water resources, energy demand, agricultural production and coastal areas. Changing temperature patterns, declining water resources, rising sea levels, coastal degradation, loss of agricultural and food crops, deforestation, drought intensification and threat to human health are some of the direct detrimental effects of climate change. One of the indirect effects of climate change is the economic damage caused by the countermeasures of developed countries [49].

Estimation of Sustainable Utilization Model of Common Groundwater Aquifers

The growth and expansion of the population on the one hand and the supply of water to provide food to the growing population on the other hand in recent decades has caused serious differences among the users of water resources. Due to the limited resources, the need for sustainable use of these resources is evident. In systems consisting of several independent decision makers, game theory is a powerful tool for users to achieve a stable equilibrium point. The purpose of this study is to present a dynamic model in order to resolve the differences between the users of the common greenhouse and achieve a stable balance.

A) Static game model without cooperation,

B) Dynamic game model without cooperation,
C) Model with full cooperation. In order to compare the results of the above scenarios, the exploitation of a common groundwater aquifer - which is located between two urban and agricultural exploiters in the hypothetical region, has been studied. The results show that the revenues from the model with full cooperation are more than the models without cooperation [50].

The depletion and destruction of natural resources shared by several exploiters has become a pervasive rule in the quantitative and qualitative state of exploitation of natural resources, and Hardin referred to it as the "tragedy of commonalities." Explaining the growing trend of degradation of shared natural resources, he referred to the issue of "the benefit of one exploiter against the loss of all." In other words, a user's disobedience to the rules will only lead to his or her own short-term gain, while the loss of his or her wrong decision will affect all users. In the event that players do not comply with the rules and restrictions of the game, appropriate penalties are not imposed or players cannot consider their long-term interests, a tragedy of commonalities awaits players. There are several documents in the field of exploitation of natural resources in general and exploitation of groundwater resources in a special way that has proved the possibility of such conditions [51].

Researchers have long sought to provide models that are consistent with decision-making environments in order to bridge the gap between users and achieve a stable equilibrium. Although much research has been done on the history of game theory, game theory has generally begun to be discussed. Can be attributed to Van Newman and Morgenstern after the publication of *The Theory of Games in Economic Behavior* in 1944. The use of game theory in the field of exploitation of common natural resources in order to resolve differences between exploiters gradually came to the attention of researchers [52].

For example, Fisher in exploiting common water resources in order to use non-cooperative games, Burton and his colleagues in the field of air pollution control and Ghaheri (2007) using non-cooperative games, Coppola and Zidarovsky in Collaborative exploitation of the shared groundwater aquifer studied. Burness and Brill (2001) explained the effect of annual inflation coefficient, the effect of increasing demand, the use of new pumping equipment with greater efficiency during the years of operation, the use of appropriate hydraulic models, etc. on the results of dispute resolution models.

Taking into account the above factors, the advantage of using cooperative models over non-cooperative models

became clear. Coppola and Szidarovszky (2004) examined the resolution of disputes between the Water Supply Authority and the Health Authority. The issue examines the determination of groundwater aquifer exploitation policies to supply the city with drinking water, while part of the aquifer is contaminated with some kind of pollutant. Increasing the pumping flow causes more hydraulic slope and increases the risk of pollution, and on the other hand, reducing the pumping rate will cause dissatisfaction of residents [53].

In order to calculate the changes in the aquifer level due to the decisions of the players, first, using the results of the Mod flow hydraulic model, a neural network model has been taught and then, in order to reduce the computation time, the trained neural network model has been used instead of the Mod flow hydraulic model. The two operators of the joint greenhouse are pumping water. The two can either work together to determine their share of the total pumping rate or operate without cooperation.

The results of the model implementation, in the coastal aqueduct of Santa Barbara in the United States, in a two-player mode, indicate the great advantage of cooperative behavior over non-cooperative behavior. Nakao and his colleagues outlined the benefits of working with two longtime rivals to exploit the US-Mexico border crossing [54].

Based on the latest statistics and hydrographic information of the alluvial aquifer unit and the rainfall diagram of the evaporator station, information about the water level has been available from October 1996 to 2163.53 to October 2012 to 2159.3 meters, with a water level drop of 4.23 meters during this period. Considering the area and taking into account the storage coefficient of 5% and water level drop of 4.23 meters, the reservoir volume changes equal to 143.77 million cubic meters, which during the statistical period of 76-75-91-90 for 16 years shows 8.66 million cubic meters per year of reservoir deficit. According to the statistics of the year 1988-89 and the protection statistics of the regional water organization, there were a total of 1572 water sources in this study area. Of all these sources, there are 1518 wells, 5 springs in Sakht Formation and 1 spring in alluvium, 30 aqueducts in alluvium and 18 motor pumps. In total, the total annual discharge from the study area is estimated at 252.39 (194.4 wells, 4.23 aqueducts, 51.04 springs and motor pump 2.71) million cubic meters. It should be noted that the total water discharged from water sources in this area in the plain (consumed for 7 months) and for agricultural use (250.14 million cubic meters) and drinking (2.19 million cubic meters) and industry (0.07 million cubic meters) [55].

One of the basic pillars of water resources management in the current situation is the optimal use of available

resources. In order to consider the various dimensions and complexities of water resources systems, managers and planners today have resorted to using optimization models as an efficient tool to achieve optimal decisions. A variety of evolutionary, deterministic and indefinite, static and dynamic, linear and nonlinear optimization models are used in various aspects of water resources management. The development of human knowledge and the creation of new tools and their combination with existing optimization models have provided new opportunities for better decision-makers in the development and planning of water resources.

Creating tools and the need for access to modern technology such as the World Wide Web and GIS Information value of new data and information due to behavioral changes in watersheds and the importance of rapid use of this information for analysis, design and information in emergencies as well as public education and consumption Water conservation has created new coordinates in water resources management.

Today, with the rapid development of information technology, a new space has been provided for the development of new tools for the analysis, planning and management of water resources systems. With access to the Internet, an infinite space of information and science is provided to the user, which can be used to make the most effective decisions. Useful tools that have been significantly expanded include remote sensing and GIS.

Using remote sensing, quantitative and qualitative variables can be identified and effective parameters about them can be measured and the relationships between them can be interpreted. For example, using information from sensors on airplanes and satellites, valuable information such as soil moisture, snow cover, and flood spread can be obtained, which are of great importance in water resources management.

There are always problems in the decision-making process of water resources management due to the existence of different sectors that consume and produce wastewater, because different sectors have different goals, views and priorities, and the final decision should be in such a way that all these differences has been.

Among the most important differences in water resources, we can mention the quantity and quality of water allocated to different sections, the quantity and quality of wastewater and effluents, which will be damaged if the necessary management of the system is not applied. Limited resources and increasing water needs, which is due to population growth and development of cities and new community management policies, cause problems in water allocation. By knowing more and more, the reasons for

the differences and modeling those using different methods and including them in the optimization models, we can be very sure that the results of the developed model are feasible and practical.

The need for proper water consumption in urban society given Iran's position in the Middle East

Regarding the water consumption in Iran, the per capita consumption of each sector should be considered and after extracting the actual consumption, programs should be done to optimize consumption. The priority point in the field of optimal water consumption is to make decisions and chained and interconnected solutions. On the other hand, in some neighboring countries of Iran, which have a higher level of health and well-being, the average consumption has reached 90 liters per day.

On the other hand, the average consumption in the agricultural sector is 15,000 cubic meters per hectare. It should reach 6500 cubic meters. Looking at water should be an interconnected chain along with other factors. Improving the rules and price of water and changing the attitudes towards water can make water an important commodity.

On the other hand, in all developed countries, water is provided to subscribers on a large scale in the agricultural sector, with a supervisory measure and little work, it is possible to invest from the existing network. On the other hand, the pressurized irrigation systems must be developed rapidly. Unfortunately, it can be seen that some people have entered the second phase of modifying the consumption pattern and announce that a large amount of credit should be allocated to modify the consumption pattern, while in the first step one should think about increasing the efficiency of the available facilities. It is now observed that water is extracted from a depth of 400 meters. The cost of electricity for this well is almost universal and no money is received for water, but the farmer produces a product that has no economic justification and logic.

Drought crisis and water scarcity in the world

At present, some people do not take the drought as serious as earthquakes and floods. Although newspapers and magazines cover other natural disasters more than this, drought is a creeping phenomenon with human casualties. The lack of quality water that can be used directly for drinking, personal hygiene, agriculture, industry and development will proceed towards the quality water shortage.

Dehydration Factors

- 1- Increasing population, expanding urbanization, developing industry and increasing

consumption demand: Increasing population increases demand and increases per capita consumption in all its dimensions, including drinking, and sanitary consumption on the one hand and increasing production effluent on the other hand. The population of Iran was 16 million and now it is 70 million; while the amount of water remains constant. Iran is located in the Middle East and is poor in terms of rainfall.

2- Although the amount of rainfall is high in the north of Iran, this rainfall sometimes occurs when it is not needed much. Therefore, even in the rainiest part of the country, have to use groundwater, which has lowered the groundwater level and turned semi-deep wells into deep wells, and also dried up some of the aqueducts, and thus the crisis. Water resources are becoming more intense every year.

2- Climate change and instability in rainfall patterns: Climate change such as global warming, ozone depletion, and increase in greenhouse gases affect the rainfall patterns and cause phenomena such as drought, torrential rains and rain become acidic.

3- Continuation of traditional management in the exploitation and consumption of water in agriculture and industry: Increasing population and consequently increasing demand in various sectors, including industry and agriculture, requires the optimal use of available water resources, especially renewable water resources in most sectors.

4- Environmental pollution: Important pollutants of water resources include municipal wastewater, industrial wastewater and even effluents from industrial agricultural processes. Contamination of the country's water resources with pollutants such as organic chemicals (detergents, fuels, heavy metals, plant toxins and chemical fertilizers).

5 - Lack of development of water extraction technology: Lack of development of water extraction technology causes the loss of water resources from rainfall in the form of stray water, which itself leads to water loss and pollution of various pollutants and in practice causes the conversion of these quality resources. It becomes valuable to non-quality effluents. The development of water extraction technology means the possibility of maximizing water storage to prevent its pollution and maintaining water quality for optimal use in the future.

6- Lack of development of water recycling technology: Water recycling for reuse directly or by changing the use such as the use of safe and treated wastewater in agriculture, industry and health, is

another way to deal with water shortage and optimal use of water. The development of wastewater treatment in the city and industries for recycling and reuse is an inevitable necessity today.

7- Lack of development of popular culture in conservation, exploitation and consumption of water resources: Culture has a major role in the optimal use of water and conservation of water resources, especially in small towns and villages.

Regarding the solution of the water problem, since the last 50 years, many large projects for dam construction have been done or are being done in Iran to enable irrigation for agriculture with sufficient water, and thus the power of electricity from water as well as irrigation water. Produced for drinking and agriculture. The issue of irrational use of water resources in Iranian agriculture is an indisputable fact that finds various forms, at the top of which is the non-optimal use and in some cases of destructive use of equipped resources. Soil erosion in the country by 1.5 to 2 billion cubic meters of water through the construction of small earth farm dams and not large dams should be considered because such dams are more economical in terms of efficiency. Another problem of Iran's agricultural sector is the traditional methods Production, the main part of which is due to the lack of agricultural technical knowledge. Therefore, the Department of Agricultural Extension and Research should pay more attention to this issue and play its role more actively, because the only way to enable traditional agriculture to economic trade is only through Use of new technology (biotechnology and chemistry) in the development of training stations and t Surveying and research is at the level of rural areas of the country. Because the optimal utilization of soil water resources and manpower and technology in the agricultural sector is possible when the exploitation units are sufficiently trained and at the same time these units are in appropriate size. And it is desirable, therefore, before designing any system of land use in the country, the necessary measures should be taken for cooperation of farmers among themselves by means of a lack of motivation for land ownership and providing the ground for accepting cooperative production work.

Another thing is that due to the increase in population, the situation of global food supply and demand will undoubtedly become critical. It is necessary for agricultural policy makers to remove basic obstacles to develop this important irrigation and drainage network. Finally, in the long run, the following recommendations for the program Planning and implementing water consumption management plans in the agricultural sector is suggested:

- A- Development of new methods of drip and sprinkler irrigation in order to use the available water resources.
- B- Construction of irrigation and drainage networks of dams under construction and under construction.
- C- Execution of watershed management programs upstream of dams.
- D- Establishment of irrigation cooperative networks in the agricultural sector.

Solutions to deal with the water crisis:

- 1- Increasing irrigation efficiency.
- 2- Using appropriate irrigation methods.
- 3- Covering irrigation canals.
- 4- Reforming the water allocation system based on agricultural needs and drinking consumption.
- 5- Reforming the pricing system.
- 6- Using treated effluents.
- 7- Using salt water.
- 8- Evaluating the economic value of water.
- 9- Protection of water resources against pollution.
- 10- Continuous monitoring and supervision of the optimal consumption of drinking water and minimizing water losses in water supply facilities

Ways to increase irrigation efficiency in agriculture

Climate in Iran is diverse and has different climates in different parts. So that in dry and hot places - which forms a large area of the country - in summer the temperature varies from 34 to 50 degrees Celsius (93 to 122 degrees Fahrenheit) and rainfall in most parts of the country which is part of the arid.

Semi-arid regions. It is dry, limited to the short period of winter and early spring, it is also low in other places, such as the northern part of the Alborz Mountains, has relatively sufficient rainfall for agriculture. In the northern part of the central plateau of Iran, the average annual rainfall is about 220 mm. While this amount is reduced to about 120 mm in the southern and southeastern part. For example, of the total area of the country, about 13% less than 100 mm of rainfall, 61% between 100 to 250 mm, 17% between 250 to 500 mm, 8% between 500 to 1000 mm and one percent more than 1000 mm. Meters of rainfall. So in our country there are almost three dominant climates, most of which is 74%, ie three quarters of the area has an arid and semi-arid climate with less than 250 mm of rainfall and the other part with an area of 17% with rainfall. Relatively average between 250 to 500 mm is one of the temperate regions and the rest of its area is about 9% with rainfall of more than 500 mm in the humid regions of Iran. Therefore, weather conditions and rainfall require that in a large part of the country, for Cultivation of irrigated crops should be done and due

to this difference in climatic climates, cultivation methods and their types as well as the type of irrigation are different from each other.

For example, in Mazandaran, most types of paddy cultivation are used and most of the extractable water resources in this area are used to irrigate paddy fields. The only irrigation method for paddy is a plot with permanent submergence. Evaporation from the free surface, the rate of plant immersion and water inflow from the field, deep subsidence of water in the soil of vertical infiltration and horizontal infiltration, and finally the losses of water transfer to the farm reservoir and its distribution network were determined. The following is required:

- 1- Plotting and leveling lands and improving the slope of lands with machines and leveling equipment's, also it is necessary to cultivate paddy in sloping lands and mountain slopes as well as sea shores due to high water drop as long as there are good arable lands to be cultivated in the plains. To be prevented.
- 2- Covering water supply canals and streams in areas where there is a decrease in the water supply route.
- 3- Reducing the permeability of the bed soil if the soil type is light and coarse-grained by increasing the clay and consolidating it, if the possibility of concrete covering is not possible due to high cost.
- 4- Eliminating the twists and turns of traditional and dredging canals and clearing the slow-moving factors such as: thorns and weeds, as well as dredging and improving the drainage network and improving the seals by increasing their storage volume.
- 5- Construction of division joints and valves and gabion joints by installing valves, dividers and measuring scale.
- 6- Creating motivation to increase irrigation efficiency in farmers and modifying and changing traditional irrigation methods to pressurized irrigation system for other agricultural products.
- 7- Developing a plan and implementing a comprehensive plan for agricultural education and extension.

The need for integrated water resources management

The 21st century is called the century of water war. In different parts of the world, especially in developing countries, there are water-related issues such as water scarcity, water pollution and increasing flood damage. These issues will lead to food shortages and the subsequent spread of disease. Therefore, in countries

such as Iran, which is facing a shortage of water resources, attention to all water resources is of great importance, which can be implemented in the form of integrated water resources management. Integrated water resources management is a systematic process for sustainable development, allocation and monitoring of water resources used for social, economic and environmental purposes.

Increasing population growth, development of agricultural lands in arid and semi-arid regions of the world, expansion of industries, distribution the temporal and spatial heterogeneity of freshwater in terms of quantity and the limitations and increasing quality problems of water resources in many countries, has made the supply of safe water one of the major challenges of this century. Integrated water resources management, while compensating for some shortcomings, increases the availability of available water resources, and minimizes the negative effects of separate use of resources and effective and optimal water management.

Involvement of various organizations in the supply and consumption of drinking water, agriculture, industry, green space, as well as wastewater treatment and use of treated wastewater, the need for greater coordination between all stakeholders in water issues to participate and minimize the adverse effects of responsibilities and Operations and, ultimately, integrated management of water resources are inevitable.

Separate use of water resources leads to problems such as water shortage in droughts due to lack of surface water resources, instability in crop production, damage to the environment and declining water table level and mixing of salt and fresh water in coastal areas. In integrated operation, water needs are met by both surface and groundwater sources. In this classification, treated effluent, as a water source in the integrated management of water resources, especially in the water-scarce country of Iran, has a special place. Development of groundwater exploitation has several advantages compared to dam construction and has far fewer problems.

Among these can be less cost, no sedimentation and evaporation problems, less quality problems and no environmental, social and cultural problems. However, rising costs of water supply and wastewater disposal have increased economic incentives to use technologies that are more environmentally friendly and can ensure the efficiency of the natural resource use. Many cities in the developing countries have high population growth that develops without planning. One of the consequences of this development is the reduction of accessible lands for agriculture, pollution of surface and groundwater resources and change of use of

agricultural water resources around cities to meet urban needs.

Therefore, the reuse of raw and treated wastewater is increasing in the developing countries located in arid and semi-arid regions. The main criteria that should be considered in achieving the goals of integrated water resources management are:

- 1- Economic efficiency in use: which is due to water shortage and increased demand to achieve the maximum possible efficiency.
- 2- Ecological and environmental sustainability: which is the protection of ecosystems and the environment for future generations.
- 3- Equality: that every person has secure access to water resources.

Usable water resources include surface and groundwater resources. Limited water resources have led to saline and brackish water as well as water from wastewater treatment as water resources. In this regard, integrated water resources management will be of particular importance. Another water resource that should be considered, especially in water-scarce countries, is virtual water. Virtual water is water that is not actually, but virtually embedded in the product, and that is the amount of water needed to produce the product. For example, to produce one kilogram of wheat, about 1000 liters of water are needed, so the virtual water of one kilogram of wheat is about 1000 liters. This amount is 5 to 10 times per kilogram of meat. Water resources management and drought management in agriculture. Water is now a trace element. Asymmetric distribution of rainfall in different regions has led to the emergence of arid and semi-arid climates in different regions. Despite having potential capabilities, these areas face limiting factors in unemployment in their development and progress. Roads to growth and development in these areas should not be seen as closed, but with careful planning and comprehensive management in these areas, we can witness economic, cultural and social prosperity. Today, water is not considered an infinite and abundant blessing, but governments and scientists have realized that water resources should be used to the maximum with the least loss and waste. Water resources management is considered as a part of countries' development planning and each country implements a special strategy and program based on the amount of available water resources for the optimal use of existing water resources.

Due to the direct relationship between agriculture and water and nature, it is strongly affected by water stresses. In general, arid areas that suffer from water shortage and low rainfall have different agricultural conditions compared to rainy areas. Agriculture in arid regions due to drought, flood and desertification in

different years requires strategies and programs compatible with this type of climate.

Conclusion

Providing the best solutions to promote the culture of correct and optimal water consumption in the agricultural sector requires a correct and safe cultural infrastructure and culture building in the agricultural community. In this regard, two governmental and non-governmental sectors including, the farmers and experts in this sector should be aware of and perform their duties. Also it has a continuous and coordinated relationship in the development of agriculture, especially water, and as in the field of cultivation and production of land management projects.

The national management of water resources and regional balance should be developed and implemented. This is not possible without promotion, education and information to farmers by the government and the relevant ministry of research and education. The creation of a culture to save agricultural water consumption is not possible only by one ministry or government agency and the need for National and coherent determination by all governmental and non-governmental organizations (NGOs).

Planning and implementing water consumption management projects in agriculture requires an economic security, executive guarantee of justice in water distribution and countless other cases. Another way is to create a culture and promote correct and optimal water usage. Implement incentive plans by government agencies such as paying the right subsidies to modern and new irrigation schemes, cultivating crops that do not just need flooded and high-consumption irrigation, and reforming tariffs for high-consumption subscribers, both in terms of uncontrolled groundwater extraction and surface water abstraction. In this method of water resources management, the functions and the effect of actions are more transparent and the effect on all components can be evaluated and judged. In this system, although the whole system is more integrated, more voluminous and slower in moving, the effect of actions and the way of planning and operation will be equally effective and efficient.

One of the worrying consequences of climate change is the emergence of conflicts and wars for the seizure of natural and environmental resources.

For example, regional conflicts over access to water are predicted in many parts of the world, especially in the Middle East. To investigate this issue, issues are first raised in order to familiarize the audience with climatic phenomena such as greenhouse gases and global warming, and then the effects.

Provide a Solution

The solutions presented in this section are: Prevention of negative climate change, first of all, requires the establishment of an organization such as the United Nations to form and continue the cooperation of countries in this field, an organization that has a binding commitment to non-harm to medicine. Develop and consider executive and even criminal guarantees for it.

The suggestions of this work are not my mental exudations, but are presented and can be cited using the opinions of experts and available sources. The Kyoto Protocol is only valid until 2012, which would cause member states to fall short of their commitments, which is why the world today needs a new environmental treaty that limits the CO₂ emissions, especially the largest producers. The Kyoto Protocol, on the other hand, was not a full-fledged treaty because its results only led to the stabilization of greenhouse gases. The world now needs a treaty that poses a serious challenge to reducing greenhouse gas emissions. The main problem in the implementation of international treaties is the lack of a competent authority to oblige all governments to accept and adhere to international treaties on the environment, and said: There is no treaty and the only effective factor in this regard is the moral considerations and public opinion of the world.

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