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The Effect of Climate Change on the Environment and Sustainable Development

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Abstract

Today's world is living a continuous rise in global temperatures that leads to devastating natural disasters and environmental pollution. This has drained the efforts of governments in addressing the imminent threat to humanity—climate change. The impact is particularly severe in the light of technological advancement which directly affects the environmental, food, health, and water security; thereby it hinders countries' efforts to achieve sustainable development. What are the causes of this phenomenon? And what are its repercussions on economic and social sustainable development?

Keywords: Climate change, Environment, Sustainable development, Effects.

Introduction

The right to a clean environment is a relatively new human right despite its importance in the modern era[1]. As humans live on Earth, breathe its air, depend on its resources, and with the advanced civilization, they discovered nature and adapted to it. Although this scientific and technological progress has several advantages in improving human life, saving effort and time, and shortening distances, it has also had negative effects on the environmental rights due to various forms of pollution, acid rain, water scarcity, depletion of underground resources and water supplies, and the emergence of ecological phenomena such as global warming and climate change. These issues have negatively impacted food quality, the right to health, and have caused a decline in sustainable development rates in many countries.

Dr. Tedros Adhanom, Director-General of the World Health Organization, states in this regard: "The climate crisis is a health crisis that leads to more severe and unpredictable weather events, exacerbates layers of diseases, and contributes to rising rates of non-communicable diseases.

[1]Wakour Fares, Protecting the Right to a Clean Environment: Between Legislation and Implementation, 1st Edition, Baghdadi Publications, Algeria, 2015, p.11.

By working to make high-quality climate services accessible to the health sector, we can help protect the health and well-being of people facing the risks of climate change."[2]

Accordingly, environmental, economic, and legal scientists have raised the alarm about the increasing risks of climate change on today's world. Climate change poses a multifaceted environmental and economic threat to humanity as its manifestations appear on multiple levels. Humanity faces the unprecedented global warming, which warns of ecosystem disruption, inevitably affects environmental, food, economic, and human security in general. This not only hinders sustainable development but also threatens the very existence of humanity.[3]

Climate change is considered the most important environmental issue and a relatively recent long-term global problem resulting from industrial and technological development, as well as the increasing human activities, such as the depletion of natural resources and water. It has political, social, legal, environmental, and economic implications, including global warming, climate change, drought, threats to health and food security, floods and hurricanes (Tsunami and Katrina hurricanes). Additionally, the World Meteorological Organization reports that around seven million people die annually due to air pollution.[4]

Based on what has been mentioned, climate change has strongly captured the attention of the international community for some time, reflecting in intensive global efforts to agree on effective measures to reduce greenhouse gas emissions that contribute to global warming and its impacts. To study the causes of global warming and its effects on sustainable development, we ask the following question: What is climate change? What are its causes and impacts on the social and economic dimensions of sustainable development?

To answer this question, we used the following dual-structured plan, dividing it into two sections:

- **First Section:** The nature of climate change: its definition and causes of its emergence.
- **Second Section:** The effects of climate change on the environment and sustainable development: the concepts of the environment and sustainable development and the impact of climate change on them.

[2] Climate change is harmful to health, but climate services save lives, on the World Meteorological Organization's website at the link:
https://wmo.int/ar/news/media-centre/tghyr-almnakh-dar-balsht-wlkn-alkhdmat-almnakhyt-tnqdh-alarwah

[3] Mohamed Askar, The International Environmental Law: Climate Change, Challenges, and Confrontation – An Analytical and Fundamental Study, New University Publishing House, Egypt, 2013, p.8.

[4] Mohamed Askar, previous reference, p.9.

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Conclusion

We will begin with the nature of climate change.

First Section: The Nature of Climate Change

It is essential to define the phenomenon of climate change both linguistically and terminologically, as well as how the Algerian legislator defines it. As this phenomenon have multiple definitions: linguistic, legal, and economic, the present section will discuss the definition, causes, and effects of climate change as follows:

First Title: Definition of Climate Change

To define climate change, we must first define "climate" linguistically as follows: First **First Subtitle: Definition of Climate (Climat):**

First: The Linguistic Definition of Climate: We will define "climate" both linguistically and terminologically.

The origin of the word "climate" traces back to the verb "nawkha" in Arabic, which means to make something settle or rest. For example, the phrase "nawkha al-ba'ir" means "the camel knelt down," and "nawkha Allah al-ard" means "God made the land stable and level." It is also derived from the Greek word "taxes", which means order and arrangement, and it commonly refers to weather conditions.[5]

Second: The Terminological Definition of Climate

In the field of climate, experts associated with the United Nations Environment Programme emphasize the need to distinguish between weather and climate because the latter is more comprehensive. Climate refers to the state of weather over a long period, which may extend for many years, encompassing the cumulative daily weather conditions. Terminologically, it is the atmospheric state of a specific location over an extended period. This includes phenomena such as solar radiation, clouds, wind strength and direction, and atmospheric pressure, and temperature, which is the most significant characteristic of climate. The recognition of these phenomena may extend up to thirty years.[6]

[5] Mohamed Askar, previous reference, p.8.
[6] Mohamed Askar, previous reference, p.8.

Climate is also defined as: “the average state of weather and its variation over a specific period and within a particular geographical area. The classical classification of climate divides the Earth into distinct climatic regions. The climate varies from one region to another based on latitude, distance from the sea, vegetation cover, the presence of mountains, and other geographical elements. It also differs from one season, year, and decade to another, or over longer time spans like the Ice Age. Moreover, climate is the statistical description of weather in terms of variations in quantities, such as rainfalls, temperature, and others across different regions and specific periods”.[7]

Climate is defined as: “the average weather pattern that a region experiences over a long period of years. It primarily depends on the average temperature and rainfalls levels.”[8] The climate is also described as the sequence of typical weather conditions, commonly referred to as the weather average.[9]

Third: The Legal Definition of the Climate Phenomenon

The traditional definitions of climate were somewhat distant from the legal one. However, the shift in perspective and global change began with the emergence of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, which came into effect in 1994. From that point, the phenomenon started being viewed from a legal perspective. Referring to the provisions of this convention, we find that it does not precisely define the term "climate change." Instead, it merely points to it in Article 1, Paragraph 2, stating:"Climate change refers to a noticeable change in the global atmospheric composition that is directly or indirectly attributed to human activity. This can be observed alongside the fluctuations that may occur in this climate due to natural factors."[10]

We can say that the convention points to changes in weather conditions due to the increase in human activities which inevitably affects atmospheric environmental elements. This identifies the primary cause of climate change—humankind. Since the atmospheric, marine, and terrestrial environments are interconnected to form an integral ecological system, this inevitably results in unnatural changes in the chemical composition and physical properties of any environmental element.

[7]Bousbaine Tesaadit, The Effects of Climate Change on Sustainable Development in Algeria, PhD Thesis, University of M'hamed Bougara Boumerdes, 2014-2015, p.3

[8]Abdel Moneim Mostafa Al-Maqmar, Population Explosion and Global Warming, World of Knowledge Series, Issue 391, National Council for Culture, Arts, and Letters, Kuwait, 2012, p.58.

[9]Ministère de l’Aménagement du territoire de l’environnement et du tourisme, Rapport 5d’étude : Evaluation du risque climatique en Algérie, Juillet 2009, p.7.

[10] Mohamed Askar, previous reference, p.37.

Referring to the reports of the Intergovernmental Panel on Climate Change (IPCC) upon which the Framework Convention on "Climate Change based its provisions, we find that it has been interpreted in two ways: narrow and broad definitions. In its narrow sense, the climate is defined as the average weather or the statistical description of the mean and variability of relevant quantities over a time period ranging from months to thousands or even millions of years."[11] The standard period for measuring these fluctuations is 30 years. In its broad sense, it refers to a state of the climate system that includes a mathematical and accounting description. In addition, the Framework Convention on Climate Change defines the climate system in Article 1, Paragraph 3, as "the atmosphere, hydrosphere, biosphere, and geosphere and their interactions."[12] This means that the climate system encompasses terrestrial, marine, and atmospheric environments.

Section Two: Definition of Climate Change

In this section, we will discuss both the terminological and legal definitions of climate change as follows:

First: The Terminological Definition of Climate Change

The United Nations, as the primary global organization responsible for developing international environmental law, defines the climate change as: "Long-term shifts in temperatures and weather patterns. These shifts may be natural due to variations in solar activity or volcanic eruptions. However, the organization indicates that since the 19th century, human activities have been the main cause of climate change because of excessive reliance on traditional energy sources such as fossil fuels, gas, and oil."[13]

Thus, the continuous drive for heating, industrial operations, and machine usage because of the Industrial Revolution and the growing global demand for energy has negatively impacted the climate. It has triggered unprecedented disruptions that pose an imminent threat to Earth. Climate change refers to any significant and long-term alteration in weather conditions, including temperature averages, rainfall levels, and wind patterns. These changes can result from Earth's dynamic processes

[11] Mohamed Askar, previous reference, p.37.
[12] Zakia Belhoul, Climate Refugees from the Perspective of Human Rights, Security, and International Law, PhD Thesis in Human Rights and Fundamental Freedoms, Faculty of Law, University of Batna, 2018-2019, pp.15-16.
[13] Visit the official United Nations website at www.un.org/ar/

like volcanic activity, external forces as variations in solar radiation or meteor impacts, and more recently due to the increasing impact of human industrial activities.[14]

Climate change is defined as a disruption in the usual climatic conditions as temperature, wind patterns, and rainfall specific to different regions. The effects of this change are evident in the rise of carbon dioxide levels by over 54%, beyond the acceptable threshold. Furthermore, the emission rate of heat-trapping gases in the Middle East and North Africa has tripled compared to the global average.[15]

The World Meteorological Organization defines climate change as the "average weather conditions of a specific area over a long period of time, and it includes seasonal variations".[16]

Second: The Legal Definition of Climate Change

The early 1990s marked the birth of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 which has rightfully become the global legal reference and framework for all matters related to climate protection. It defines climate as a change in the climate attributed directly or indirectly to human activity that alters the composition of the global atmosphere and leads to the natural climate variability over comparable time periods.[17]

The Intergovernmental Panel on Climate Change defines it as a change in the state of the climate that can be identified by changes in its mean and/or variability and persists for an extended period, typically decades or longer. It refers to any change in the climate that occurs due to natural variability or human activity.[18]

Second Section: The Causes of Climate Change

Undoubtedly, the Earth was stable with clean air, green forests, and a beautiful coastal landscape. However, after humans discovered industry and the industrial revolution began in Europe and spread across the globe, climate changes started; earthquakes and volcanic eruptions increased, greenhouse gases released, global temperatures rose, and levels of environmental, food, health, and water pollution increased to unprecedented levels. These changes have caused respiratory difficulties

[14] Sawsan Skai, Media Coverage of Climate Change Through Environmental Blogs: The World Organization for Environmental Protection (OMPE) Blog – An Analytical Study, Journal of Letters and Social Sciences, Vol. 17, Issue 2, 2020, p.313.
[15]Boutheldja Aicha, The Importance of Smart Agriculture in the Context of Climate Change, North African Economics Journal, Vol. 16, Issue 23, 2020, p.214.
[16] Achachi Mohamed, Climate Change and Its Effects on Development in Algeria, Journal of Intellectual Dialogue, Vol. 11, Issue 11, p.233. The official website of the organization: www.wmo.int.
[17] United Nations Framework Convention on Climate Change UNFCCC, art1, para2.
[18]Zakia Belhoul, Climate Refugees from the Perspective of Human Rights, Security, and International Law, previous reference, p.16.

for living creatures, including humans, and have negatively affected life on Earth in many ways. Furthermore, the rise in industrial activities has caused an increase in the concentration of carbon dioxide in the atmosphere, particularly from industrialized developed countries.[19] There are also several natural and human-made reasons that have contributed to the spread of climate change, rising global temperatures and its related phenomena, which will be discussed as follows:

First Subtitle: The Natural Causes of Climate Change

As there are many reasons for climate change, we will address here the natural or non-human causes that take the form of natural geological phenomena:

1. Ozone Layer Depletion, Astronomical Phenomena, and Solar Radiation

Environmental scientists emphasize the significant role of the ozone gas in sustaining life on Earth because it is the only gas can reduce the harmful effects of ultraviolet radiation from the sun. Due to natural interactions between the components of the atmosphere and various astronomical phenomena, ozone can be naturally depleted and replenished through chemical reactions between sunlight and air over the polar region. Scientists have confirmed that chlorofluorocarbons (CFCs) have damaged the ozone layer, mainly due to excessive human use.[20] Additionally, the Earth's movement around its axis, which is slightly tilted from the centre, leads to changes in the amount of solar radiation reaching Earth and causes significant climate changes.

According to NASA, the reduction in radiation intensity from 1400 to 1800 was the cause of the brief ice age in North America and Europe. Therefore, any change in the Earth's radiation balance leads to an increase in greenhouse gases and a rise in new weather patterns that affect temperatures, rainfall, and precipitation in various parts of the world.[21]

2. Volcanic Activities

There is a strong geophysical connection between climate change and volcanic eruptions. Volcanic activity significantly impacts the energy balance between the climate and the Earth. Volcanic eruptions are one of the causes for climate change since they directly affects it. A volcano is a large opening in the Earth's crust due to natural phenomena; it releases high-temperature rocks and magma, along with various gases such as sulfur dioxide. Experts confirm that volcanic eruptions occur due to high pressure caused by tectonic plate movements beneath the Earth's surface, which directly leads to

[19] Alexandre Kiss et jean pierre BEURIER, Droit international de lénvironment, Ed Apedon, paris, 2004, p.267 .
[20] Bachir Djumaa Abd Al-Djabbar Al-Kubaici, International Protection of the Atmosphere, Al-Halabi Legal Publications, Beirut, Lebanon, 2013, pp.112-113.

[21] Bousbaine Tesaadit, previous reference, pp.6-7.

the explosion of this stored energy, thus increasing the Earth's temperature. Furthermore, volcanic eruptions release large quantities of gases like sulfur dioxide, methane, and solid debris, which can contribute to short-term cooling of the climate. Finally, they form the volcanic ash, gases, landslides, lava flows, and mass displacement of populations, and threats to food safety.[22] This has an impact on global weather and the marine environment.[23]

The volcanologist, Dr. Benjamin Black and his team at Rutgers University-New Brunswick demonstrated the formation of a hidden source of carbon dioxide which explains heat-waves. Additionally, climate change has caused four of the five major mass extinction events on Earth that leads to the extinction of more than 90% of marine species and 70% of terrestrial species as well as an increase in ocean acidity and Earth's temperatures.[24] However, volcanic activity can also have ecological benefits such as the formation of fertile soil, geothermal energy, and valuable minerals.

Second Subtitle: Human Causes of Climate Change

There are several key human-induced factors that contribute to climate change, including the following:

1. The Excessive Use of Traditional Energy Sources as Fossil Fuels

Humans have long relied on traditional energy sources to meet their industrial needs. Fossil fuels, particularly coal, oil, and gas, are burned to generate energy for transportation and other uses, so it produces greenhouse gases like carbon dioxide (CO_2) that are released into the atmosphere. This leads to global warming, which causes climate change.[25] The over-exploitation of these fuels results in environmental changes that directly threaten the elements of the environment.[26] Moreover, human lifestyle changes and excessive consumption are linked to this problem. Burning fossil fuels account for over 75% of global greenhouse gas emissions and 90% of carbon dioxide emissions.[27]

2. Human Misbehaviour in Forests and Green Spaces

Forests are considered the lungs of the world; they provide fresh air as they absorb the toxic gas carbon dioxide. Throughout history, humans have excessively cut down millions of mature trees, either intentionally or accidentally, leading to impacts on air and forest security. This increase in CO_2

[22] https://www.ifrc.org/ar.
[23] Bousbaine Tesaadit, previous reference, p.7.
[24] https://jusoorpost.com/ar/posts/48086/dras-albrakyn-toasl-anbaaathat-alkrbon-lmlayyn-alsnyn-baad-tokfha.
[25] Zakia Belhoul, previous reference, p.17.
[26] Bousbaine Tesaadit, previous reference, p.8.
[27] Causes of Climate Dister at https://www.naqla-initiative.com/dictionary-

concentration in the atmosphere has reached 414 parts per million by 2020 and contributed to global warming and climate change.[28] Deforestation and forest fires lead to the destruction of these natural resources, threatening many species with extinction and disrupting ecological balance due to climate change.[29]

3. Global Warming and Melting Ice due to the Increased Industrial Activities

Human lifestyle changes and their industrial activities have continuously increased and the temperature rises in unreasonable way. Some of the resulting phenomena are as follows:

1-Rising Global Temperatures: Due to the increase in human industrial activities which rely on converting different forms of energy into heat energy, so Earth's temperatures are rising. This leads to increased heat all over the world, especially during the summer months, which can cause severe thirsts, agricultural land degradation, and a shortage of water resources.

2-Melting Ice in Polar Regions and Rising Sea Levels: Due to the rise in global temperatures, scientists and geologists have observed that the ice in the Polar Regions and glaciers is melting either partially or completely. Ice reflects 80% to 85% of the solar radiation falling on it, and its melting accelerates the rise in air temperature.[30] As a result, sea levels have risen by about 303 mm per year between 1993 and 2020, threatening coastal areas and increasing the risk of flooding.

3-Changes in Global Weather Patterns: The effects of rising global temperatures are leading to new geophysical phenomena such as increased winds and rainfall at unusual times of the year, as well as the emergence of varying intensities of storms in specific regions. These occurrences account for about 40% of natural disasters since 1970. They affect groundwater flow due to hydro-graphic and hydrological factors.[31] They cause severe droughts and evaporation in some areas over extended periods that result in devastating floods. This is known as extreme climate change which exacerbates economic losses and threatens global food and water security.[32] According to economic experts, the catastrophic wildfires that broke out in California in December 2024 caused material and human losses

[28] Brichi Belkacem, International Protection to Confront the Phenomenon of Global Warming, Doctoral Thesis in Sciences, specializing in International Relations Law, University of Djilali Liabes, Sidi Bel Abbès, 2017-2018, p. 23.
[29] Bousbaine Tesaadit, previous reference, p.9.

[30] Bachir Djumaa Abd Al-Djabbar Al-Kubaici, previous reference, p.141.
[31] Alaa Houcine Djassim Al-Samarrai, Legal Regulation of the Use of International Watercourses for Non-Navigational Purposes, New University Publishing House, Alexandria, Egypt, 2019, pp.178-179.
[32] Abidi Mohamed, The Effects of Climate Change on Human Security and Human Rights, Journal of Law and Political Sciences, Vol. 9, Issue 1, p.197.

exceeding $275 billion.[33] Experts also confirm that droughts have affected 2 billion people globally due to water scarcity and inconsistent rainfall.

4. Forced Migration and Population Displacement Due to Climate Change

It is certain that climate change has caused alterations in human nature across many regions of the world. Statistics suggest that it will lead to the migration of about 200 million people by 2050. It may render certain regions uninhabitable due to extreme heat or water scarcity, leading to mass displacement of people from the most affected areas. This, in turn, increases pressure on neighbouring areas in terms of resources and services.[34]

5. Wars and Armed Conflicts

Wars and armed conflicts are a direct cause of climate change and the deterioration of ecosystems which lead to severe shortage or complete lack of food security. These conflicts increase the areas of strife and destroy essential water resources for populations. The Sahel and West Africa are the most affected regions, particularly with the excessive use of weapons of mass destruction and white phosphorus, which was used heavily in the 2024 Gaza conflict, causing widespread destruction, civilian casualties, and acts of genocide. Moreover, the use of nuclear and chemical weapons alters the environment by releasing toxic radiation, as happened in Hiroshima and Nagasaki, as well as Algeria's Sahara, where nuclear tests conducted by French colonial forces in 1960. Furthermore, underwater nuclear explosions and the ongoing debate over nuclear weapon usage highlight the global dilemma regarding these weapons, as well as the non-implementation of the Comprehensive Nuclear-Test-Ban Treaty.

The International humanitarian law, which is specialized in protecting humans, natural and artificial environments, and vulnerable parties during conflicts, prohibits environmental technologies that cause widespread harm and destructive damage to ecosystems.[35] This is in accordance with the four Geneva Conventions of 1949 and Articles 35 and 55 of the Additional Protocols I and II. The International Court of Justice's advisory opinion in 1996 declared the illegality of nuclear weapons due to their indiscriminate nature, which does not differentiate between civilian and military targets and

[33] https://www.aljazeera.net/ebusiness/2025/1/18.
[34] Zakia Belhoul, Climate Refugees from the Perspective of Human Rights, Security, and International Law, previous reference, p.17.
[35] Toufik Attallah, Environmental Protection during Wars and Armed Conflicts: A Study in Light of the Law of Armed Conflicts, Journal of Global Politics, Boumerdes, Issue 1, Vol. 6, 2022, pp.1105-1106.

cause pain to both the environment and humans alike.[36] According to the International Committee of the Red Cross's report titled "When It Rains Dust," there is a close connection between war-torn regions and their capacity to deal with climate change because of the interplay between social and environmental conditions associated with armed conflict. The report concluded that both the environment and people are victims of conflict.[37]

Second Section: Impacts of Climate Change on the Environment and Sustainable Development

Climate change has complex impacts on natural and industrial environmental elements, human communities, and sustainable development in all its social, economic, legal, political, and cultural dimensions. These impacts affect both natural ecosystems and economic and social activities, impacting all developmental dimensions and ecological aspects globally to varying extents. We will outline the conceptual framework for the environment and sustainable development, followed by an explanation of the effects of climate change.

First Title: Conceptual Framework of the Environment and Sustainable Development

The term "environment" has various definitions, including scientific, legal, social-economic, political, historical, and technological meanings. Here, we will focus on the legal and socio-economic definitions.

First Subtitle: The Definition of Environment Linguistically and Terminologically

1-Linguistic Definition: The term "environment" is derived from the Greek word "oikos," which means house, home, or habitation. It is associated with ecology, which focuses on the balance between living and non-living elements, chemical and physical aspects of air, and the surroundings. Environmental imbalance leads to pollution, from which the term "ecosystem" is derived.[38]

2-The Terminological Definition: The founding conference of the Environmental Law, held in Stockholm, Sweden, under the United Nations in 1972, defined the environment as "the stock of

[36] https://international-review.icrc.org/ar/articles/international-humanitarian-law-and-advisory-opinion international -court-justice-legality.
[37] The official web of the International Committee of the Red Cross: https://blogs.icrc.org/alinsani/2021/07/15/4563./
[38] Khaled Mustafa Qasim, Environmental Management and Sustainable Development in the Light of Contemporary Globalization, University Publishing House, Egypt, 2007, pp.19-20.

physical and social resources available at a specific time and place to meet human needs and aspirations."[39]

The Algerian Environmental Law No. 03-10, Article 04, defines the environment as "consisting of non-living and living natural resources such as air, water, land, and the earth's interior, plants, animals, including genetic heritage, and interactions between these resources and landscapes."[40] It refers to the habitat where humans and other living beings coexist with surrounding elements such as water, air, soil, resources, and natural landscapes like coasts, mountains, and plains. The essential environmental elements are water, air, and soil.

Second Subtitle: The Definition of Sustainable Development and Its Relation to the Environment

We will define sustainable development and find out its relationship to the environment as these two terms are closely linked and often identical in many cases. There can be no sustainable development without the protection of the environment.

1-Definition of Sustainable Development

Sustainable development refers to "development that meets the needs of the present without compromising the rights of future generations. It is a process of continuous production and development that involves interaction between the biological, economic, and social systems through modern strategies. It emphasizes the interdependence of these systems in a sustainable manner."[41] Sustainable development involves policies aimed at meeting the economic, social, and cultural needs of society by optimally exploiting available natural resources without depleting the environmental elements. It focuses on the use of renewable energy and ensuring human security in its various environmental, security, economic, and social dimensions to achieve water, food, health, and environmental security.[42]

2- The Relationship between the Environment and Sustainable Development

There is no doubt that environmental problems are intertwined with sustainable development issues. In terms of the environment, sustainable development means the wise use of natural resources and their efficient exploitation without causing depletion to achieve environmental protection,

[39] Abd Al-Madjid Al-Samlali**,** The Concise Guide to Environmental Law, 1st Edition, Al-Qalam Printing and Publishing House, Damascus, Syria, 2006, p.13.
[40] Article 04 of Environmental Law No. 03-10.
[41] Khaled Mustafa Qasim, the previous reference, pp.20-21.
[42]Ben Naoui Aicha, Global Environmental Governance as a Mechanism for Achieving Environmental Security, Professor Researcher Journal of Legal and Political Studies, Issue 02, Vol. 7, University of M'sila, 2022, p.283.

expanding green spaces, realizing sustainable development dimensions ecologically by clean air, economic growth through investment and market expansion via high-quality and abundant products, and reliance on renewable energy to reach a green and blue economy. Socially, sustainable development should aim for social justice, ensuring that water and other resources are not depleted, while technologically, it promotes the use of modern technologies such as nanotechnology which fosters environmental governance at national and international levels.

Second Title: The Effects of Climate Change on the Environment

The environment is the most vulnerable to the negative effects of climate change because it is an integral part of the ecological system in human societies. Among the major effects of climate change are the following:

First Subtitle: Global Temperature Rise

One of the most dangerous climatic changes is the rise in temperatures which undoubtedly impacts all elements of the environment, especially humans. High temperatures can lead to various health issues such as heart diseases and diabetes, thereby threatening health, environmental, and food security.[43] Over the past century (from 1925 to 2024), the increase in the Earth's temperature indicates substantial human impact on the climate system that necessitates urgent actions to combat this phenomenon, reduce greenhouse gas emissions,[44] and mitigate effects like ice melt and reduced water levels in rivers and plains, and the disruption of air mass distribution and precipitation amounts which inevitably lead to desertification.[45]

Second Subtitle: Water and Soil Pollution (Threat to Water Security)

Climate change directly affects water levels, both underground and in seas and oceans. This leads to soil pollution which affects plants and, in turn, harms humans and animals. In this case, a shortage of water supply occurs, which is called a threat to global water security, exacerbating wars and conflicts over water resources.[46]

[43] Bachir Djumaa Abd Al-Djabbar Al-Kubaici, previous reference, pp.117-118.
[44] Bousbaine Tesaadit, previous reference, p.66.
[45]Nermin El-Saadany, The Kyoto Protocol and the Climate Change Crisis, Egyptian Journal of International Politics, Issue 45, July 2001, p.205.
[46]Abdelkader Belakhder, The Economic Impacts and Future Options for Global Climate Change Scenarios, Economic Notebooks Journal, Vol. 11, Issue 01, 2019, p.311.

Third Subtitle: Changes in Ecosystems, Agriculture, and Biodiversity

These phenomena cause destructive damage to infrastructure and property and lead to loss of lives and severe economic impacts, particularly in agriculture and industry.[47] It also affects all aspects of life as the world has long been experiencing ecological deterioration due to disruptions in ecosystems. Temperature and climatic change affect animal and plant species, some of which may fail to adapt, negatively impact agriculture and lead to food shortage and rising prices.

Fourth Subtitle: Pollution and Deterioration of Health and Water Security

Climate change leads to increased pollution levels in the air due to forest fires and industrial activities. It starts with air pollution that eventually leads to soil contamination. This has made the international community sign the Framework Convention on Climate Change[48] on 9/5/1992 as a reaction to the growing concern about atmospheric gas changes. This agreement established a subsidiary body for scientific and technological advice, which assists the Conference of the Parties by providing scientific information and advice. It consists of representatives from governments with expertise in issues related to climate change.[49] Likewise, the Kyoto Protocol includes several strict commitments regarding gas emissions in developed countries. These commitments are legally binding in some countries and entail international responsibility.[50] Particularly, those gases responsible for global warming from coal, oil, and gas combustion and this is what the Copenhagen Conference aimed for regarding climate change.[51] Moreover, marine pollution could eliminate fishery resources and spread respiratory and heart diseases.

Third Title: The Impacts of Climate Change on Social and Economic Sustainability

The effects of climate change are not only limited to natural and environmental phenomena and the rest of the ecosystems; they also impact human social life and other living organisms. Increasing temperature and air pollution contribute to health issues such as heat stress and respiratory

[47] Zakia Belhoul, Climate Justice, Journal of Studies and Research, Issue 28, September 2017, p.366.

[48] Alexandre Kiss, les traités cadre,une technique juridique caractéristique du droit international de l'environnement, in AFDI 1993, v 39, n 1, pp792-797.

[49] Elli Louka , International Environmental Law Fairness, Effectiveness, and World Order, United States ; Cambridge university press , 2006,p364.

[50] Khaled Mustafa Fahmy, Legal Aspects of Environmental Protection from Pollution in Light of National Legislations and International Agreements – A Comparative Study, University Thought House, Alexandria, Egypt, 1st Edition, 2011, pp.282-283.

[51] Souhir Ibrahim Hadjim Al-Haythi, International Legal Mechanisms for Environmental Protection within the Framework of Sustainable Development, Al-Halabi Legal Publications, Lebanon, 1st Edition, 2014, pp.544-545.

diseases. Furthermore, the number of environmental refugees and mass displacement due to harsh climatic conditions is increasing. We summarize the discussion as follows:

Fist Subtitle: Impacts of Climate Change on Social Sustainability

This section will discuss the effects of climate change on human life and health, as well as on other living organisms. Additionally, we will tackle its effects on human security, the escalation of wars and armed conflicts, the increase in migration, and changes in population density.

1-Impacts on Human Life and Health and Other Living Organisms: Climate change directly affects human right to health. It severely limits their rights in health, food, clean water, and sanitation services. This leads to various diseases such as cancer, anemia, heart diseases, and many other health problems. The World Health Organization reports that climate change, particularly ozone depletion caused by industrial activities, leads to severe health risks, as evidenced by the Vienna Convention for the Protection of the Ozone Layer (article 1, 1985). The depletion of the ozone layer also impacts ecosystems and other living organisms.[52]

Scientific research confirms that ultraviolet rays can cause skin cancer (melanoma) and cataracts. Climate change also leads to weakened human immunity due to insufficient exposure to sunlight, resulting in severe health issues such as breathing difficulties, allergies, and the spread of various infectious diseases like malaria, which is transmitted by mosquitoes that thrive under specific climatic conditions like heat and humidity. Plants are also not spared from numerous diseases. Several studies have confirmed the extinction of many species and the destruction of algae and seaweed, which has negatively impacted global fish stocks.[53]

2. Impacts on Human Security and the Increase in Wars

The world today is living armed conflicts in various regions and water dispute is one of these conflicts. This includes the tension between Jordan, Israel, and Palestine, as well as the dispute between Egypt and Ethiopia over the Renaissance Dam and others. Such conflicts exacerbate human crises, alongside the environmental, food, and health security threats that governments struggle with. The decline in potable water levels and irrigation resources has negatively impacted food quality and led to various diseases, as confirmed by the WHO consecutive reports. Consequently, food, health, economy, and water all constitute key dimensions of human security. Furthermore, the competition

[52] Bachir Djumaa Abd Al-Djabbar Al-Kubaici, previous reference, p.115.
[53] Bachir Djumaa Abd Al-Djabbar Al-Kubaici, previous reference, p.117.

over energy resources inevitably contributes to climate change and affects military security where countries can not secure their borders and protect their territories. This is due to its impact on infrastructure, which hampers relief efforts and worsens international security by escalating conflicts over borders and resources.[54]

3. Increased Migration and Changes in Population Density

Migration is an ancient phenomenon as old as humankind, especially in times of deteriorating living conditions. The emergence of severe climate changes has led to environmental degradation, including earthquakes, volcanic eruptions, global warming, resource shortages, and widespread wildfires, and extreme natural disasters. These factors are forcing people to migrate due to environmental hardships and from which the term "environmental refugee" is appeared. Climate change has significantly influenced global migration patterns where it compels many individuals to leave their original regions. As a result, it has become a key driver of migration worldwide, forcing millions to relocate. This migration poses huge challenges for host countries and requires coordinated international solutions to provide necessary support for those affected and mitigate the impact of climate change on migration.[55]

Second Subtitle: The Effects of Climate Change on Sustainable Economic Development

There is no doubt that the most significant impacts of climate change on sustainable development is on the economy. This is evident in the financial sector through reduced funding and capital shortages, declining exports, and the enormous financial losses incurred by governments in repairing environmental damage, combating pollution, and protecting infrastructure. Additionally, climate change affects energy and agriculture. We will provide details on that as follows:

1. Effects on the Instability of the Financial and Banking Sector

The financial sector is the backbone of any economic system worldwide. Without it, the economy becomes paralyzed, with no development, economic projects, or investments in sight. This leads to a sharp decline in the trade balance and a lack of exports both in quantity and quality. The financial impact on economic development manifests through slowed economic growth or what is called economic stagnation. The efforts of developing countries that heavily rely on agriculture, natural resources like oil, minerals, and other wealth, are often wasted due to climate-related disruptions. Additionally, climate change threatens investments by increasing climate risks since

[54] Bousbaine Tesaadit, previous reference, p.69.
[55] Zakia Belhoul, Climate Justice, previous reference, p.366.

investors avoid areas prone to environmental disasters. This results in capital flight and a reluctance to invest in industries highly affected by climate change, ultimately slowing economic growth and negatively impacting the financial sector.

2. Effects on the Agricultural Sector

Agriculture is the most vital sector related to both human and animal life. It is closely linked to food security which is a key dimension of human security. Experts have recorded a decline in agricultural production in both quantity and quality due to the effects of climate change. Unstable weather patterns such as rising temperatures, reduced rainfall, prolonged droughts in many countries, and flooding in others, have impacted food storage levels and quality. This has directly led to increased prices of agricultural products and meats of all kinds, worsening food insecurity, especially in developing countries where agriculture is the primary source of livelihood. This crisis places significant economic pressure on poor populations, governments, and states, as they struggle to meet the growing demand for food, whether in times of peace or war.[56] In 2018, the Fifth Climate Change Assessment Report concluded with a definitive finding that global warming will reach 1.5°C and this will negatively affect wetlands.[57]

3. The Impact of Climate Change on the Energy Sector

The energy sector is directly linked to climate which explains the increased demand for gas and oil during winter, particularly in Europe and America. This indicates the rising crude Brent oil prices and the cost of different oil types. Similarly, during summer, the increased prices of air conditioning systems are because of the higher electricity consumption. Moreover, the disruption of energy supplies due to the growing frequency of natural disasters such as hurricanes and floods can damage critical energy infrastructure, including electricity grids, gas pipelines, and energy facilities. These disruptions raise repair costs and halt production for extended periods.[58] Similarly, renewable energies play a role in achieving environmental security and reducing greenhouse gas emissions, thereby impacting the quality of the ecosystem and life in general.

[56] Belaq Mohamed, The Issue of Climate Change and Its Implications for Environmental Security in Algeria: What Comes After the Paris Summit?, Journal of Scientific Research in Environmental Legislation, Issue 7, 2016, pp.277-278.
[57] Malaoui Halima, Climate Change and Wetlands of International Importance: Prospects of International Law, Journal of Studies and Research, Vol. 12, Issue 3, July 2020, p.387.

[58] Belaq Mohamed, previous reference, p.278.

Experts and economists assert that climate change directly threatens energy security, particularly for renewable energy supplies. According to a new multi-agency report by the World Meteorological Organization (WMO), the shift to renewable energies is essential instead of the traditional ones that pollute the environment. Additionally, the United Nations Secretary-General emphasizes that bold climate action could generate economic benefits worth $26 trillion by 2030. This aligns with Sustainable Development Goal 7, which aims to achieve affordable, reliable, sustainable, and modern energy for all by 2030.[59]

On the other hand, there are significant risks in the event of climate change, earthquakes, and volcanic eruptions in nuclear-powered countries, as there is concern about the spread of nuclear radiation from nuclear power plants. This was evident in the Fukushima plant disaster in Japan in 2011, as well as the Chernobyl nuclear disaster and others.

Conclusion

Climate change is a global issue, particularly in terms of global warming, wildfires, environmental disasters, and the spread of toxic greenhouse gases. It has legal, security, political, economic, social, and cultural dimensions, as it affects countries' financial capabilities to combat it, depletes their energy, agricultural, and security resources, and halts the progress of sustainable development.

Key Findings:

1. Climate change is a scientific, economic, legal, political, security, and social phenomenon with profound effects on the environment. It is one of the human rights on various aspects of sustainable development and human security, particularly health security.
2. Global warming, rising Earth temperatures, the expansion of the ozone hole, and the spread of pollutants in land, sea, and air are among the most critical manifestations of climate change, primarily driven by human and industrial activities.
3. Traditional energy sources, such as oil and gas, have severe environmental and sustainability impacts.
4. The environment and sustainable development are interconnected on a global scale, as the environment is shared by all nations, and their relationship is directly proportional.

[59] https://wmo.int/ar/media/tghyr-almnakh-yrd-amn-altaqt-llkhtr .

Recommendations and Suggestions:

- Encouraging the adaptation of national environmental laws in all countries to align with international environmental law and promoting compliance at all times.
- Enhancing international cooperation, especially during wars, by preventing the use of nuclear and environmentally destructive weapons. It is essential to hold individuals, states, and international corporations accountable for environmental pollution and to enforce environmental law principles to reduce greenhouse gas emissions and contain pollution to prevent its spread to other countries.
- Implementing environmental governance, promoting environmental awareness to highlight the severity of climate change, and investing in renewable energy sources as an alternative to fossil fuels, is crucial for mitigating climate change.

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