# Climate Change: Causes, Consequences and Confrontation

**Haoues Sabah**[1*]

[1] University of Batna 01, Research Laboratory of Multidisciplinary Studies in Law, Heritage, and History

sabah.haoues@univ-batna.dz

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## Abstract:

Climate change stands as the primary global concern of our era, presenting urgent challenges that demand immediate action. According to the Intergovernmental Panel on Climate Change (IPCC), the likelihood of extreme weather events such as heatwaves, droughts, and heavy precipitation has significantly increased since the 1950s. For instance, the frequency of intense rainfall events has risen, leading to a boost in agricultural disruptions and flood-related damages across various regions. This increasing unpredictability of weather patterns poses a threat to food production, while rising sea levels heighten the risk of catastrophic flooding. Confronting these threats head-on and without delay is critical to avoid increased difficulty and cost of future adaptation.

In light of the severe consequences of climate change, it has become imperative for the international community to establish regulations and frameworks to manage this complex issue. Efforts must be made to address it before it worsens, with the global priority being to limit the global average temperature increase to well below 2°C above pre-industrial levels and to pursue efforts to limit the increase to 1.5°C' by 2050, This reflects the language of the Paris Agreement.

**Keywords:** Climate, Climate Change, Global Warming, Environmental Challenges, Adaptation.

## INTRODUCTION:

The issue of climate change has moved beyond scientific curiosity and now stands as the main concern for decision-makers at multiple levels.

Climate change is one of the greatest challenges for humanity in the 21st century, with inherent problems such as global warming, increased energy production, water scarcity, and its impact on agricultural production, environmental pollution, conflicts over resources, extinction and biodiversity loss, deforestation, and challenges in water management and waste disposal. Overall, the impact of climate change negatively affects all economic and social aspects of human life.

* **The Sender Author**

Thus, the general development goals of human society, including their economic, social, environmental, and international cooperation implications, have been adopted by the United Nations agencies in the form of seventeen global sustainable development goals. Their implementation began in 2015 and continues until the end of 2030, including climate action as one of these goals.

Climate change is the defining issue of our time, and we are at a critical moment. From changing weather conditions that affect agricultural and food production to rising sea levels that increase flood risks, the consequences of climate change are global in terms of effects and scale. Without immediate action, it will be much more difficult and costly to adapt to the future consequences of these changes.

This study argues that the evolution of international frameworks for combating climate change, from the Kyoto Protocol to the Paris Agreement, illustrates a fundamental tension between the necessity for concerted global action and the realities of national sovereignties and North-South disparities. Despite increased awareness and attempts at harmonization, this dynamic has often hindered a response commensurate with the challenges posed by global warming.

In light of the above, the research problem has emerged and can be summarized by answering the following main question: **What are the causes of climate change, and how can it be addressed?** The study also aims to answer the following sub-questions:

- What does the concept of climate change mean?
- What are the various negative effects of climate change on the planet?
- What is the link between climate change and sustainable development?
- What solutions are proposed to address climate change?

Climate change is a global phenomenon that affects all countries, both developed and developing, and its impacts vary depending on technological advancements. Its significance lies in its various direct and indirect effects on human life, the environment, and health.

The importance of the current research lies in:

- Understanding the concept of climate change.
- Knowing the causes of this climatic phenomenon, identifying its outcomes, and how to address it.

Our main concern and the proposed objectives for this study would be: Study the causes and consequences of climate change; Understand the efforts of countries in the fight against climate change.

To conduct this research, we employed a descriptive-analytical approach. We will describe the phenomenon of climate change, its causes, and consequences, but more importantly, we will critically analyze the evolution of international efforts to confront this climatic hazard, exploring the underlying shifts in governance paradigms and the inherent tensions within global frameworks.

## 1. The conceptual framework of climate change

The climate refers to the study of successive weather conditions in a given place over a long period of time, which can be a month, a season, a year, or several years. Climatology is concerned with showing the average weather conditions that prevail in a given area, rather than showing the daily changes in weather conditions in the area. The importance of climate science stems from its influence as a natural factor that greatly affects the formation of the

Earth's surface on one hand, and various aspects of human, animal, and plant life on the other (Field C.B., 2012, p. 557)

Meteorology consists of studying weather conditions over a short period, usually one or several days, and predicting them. It involves monitoring, analyzing, and forecasting meteorological elements and associated atmospheric phenomena, such as clouds, fog, dust storms, and others.

## 1.1. Climate Change

Climate Change means a radical shift in a specific direction over a prolonged period, which can span decades. These include variability - fluctuations, which are fluctuating changes from one era to another, such as the alternation of periods of drought and periods of heavy rainfall, and the alternation of cold and warm periods, where the change is long-term and influences the average weather conditions of a specific region. The term climate change, as defined in the United Nations Framework Convention on Climate Change, refers to the climate change that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere, in addition to natural climate variability, over comparable periods (Haut-Commissariat des Nations Unies aux droits de l'homme, 2009, p. 4)

The Intergovernmental Panel on Climate Change (IPCC) has defined climate change as: "A change in the state of the climate that can be described by changes in the rate or variations of its characteristics and that persists over a long period, typically decades or more, and refers to any change in the climate over time, whether due to natural variations or caused by human activity." (National Climate Change Secrétariat).

## 1.2. The causes of climate change

It is clear from the previous definitions that these climate changes can occur due to the dynamic processes of the Earth, including volcanoes, or changes in the intensity of radiation due to human solar activities and the appearance of sunspots, or the fall of large meteorites, and recently greenhouse gases (GHGs). (IPCC, 2014, p. 121).

Scientists have confirmed that the increase in air temperature at the Earth's surface of about 0.60°C during the 20th century is due to the increase in human activity, which exceeds natural changes, The climate system is composed of five main elements: the atmosphere (air), the hydrosphere (water), the cryosphere (ice and permafrost), the lithosphere (Earth's upper rocky layer), the biosphere (living organisms), and the interactions between them (Cristina Serban, 2011, p. 35).

The causes of climate change vary between:

- **Natural causes include:**

- Changes in the Earth's orbit around the Sun, which lead to changes in the amount of solar radiation reaching the Earth, are a major cause of climate change and have occurred throughout history.

- Volcanic eruptions are another environmental cause of natural climate change.

- **Non-natural causes include** various human activities, such as logging, deforestation, and human use of traditional energies like coal, gas, oil, and others, leading to an increase in carbon dioxide in the atmosphere, which in turn increases the temperature of the atmosphere, or what is known as the phenomenon of global warming and changes in the components of the atmosphere.

## 1.3. The manifestations of global climate change

When the subject of global climate change is mentioned, most of us only think of environmental phenomena such as rising temperatures, melting polar ice caps, and rising sea levels. There is no doubt that these environmental manifestations of global climate change are already affecting the daily lives of populations, but it is also certain and firmly established that the planet Earth is gradually warming.

**The most significant manifestations of climate change are as follows:**

- Increase in Earth's temperatures: This is known as the phenomenon of global warming. It is defined as the gradual increase in the temperature of the lower layer of the atmosphere surrounding the Earth, close to the Earth's surface, resulting from the increase in GHG emissions. The increase in GHGs in the atmosphere takes two forms:

  - The increase in the rate and level of emissions.
  - The decrease in the sequestration of GHGs in soils and vegetation. These changes alter the natural balance in the climate system, leading to climate change. It is extremely likely that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by anthropogenic GHG emissions and other combined anthropogenic factors (IPCC, 2014) .

- Smog problem: Smog is a serious issue in most major urban areas. Emissions from vehicles and industries, as well as the burning of wood and, coal and the accumulation of certain weather conditions, are the main agents responsible for smog.
- Acid rain: Acid rain is a catch-all term that refers to several types of wet deposition with abnormally high acidity. Thus, rain, snow, fog, or smog can be considered acid rain. Acid rain causes significant damage to plants, oceans, and rivers, but also to human-built structures, which can be weakened.

While primarily an air pollution issue, smog formation can be exacerbated by the higher temperatures associated with climate change, illustrating a complex interaction between environmental problems. (Revi, 2012)

- Melting glaciers and rising sea levels: In recent years, an acceleration of sea level rise and a global decline in mountain glaciers and snow cover have been observed (Måns Nilsson, 2012, pp. 395-423).
- Changes in rainfall patterns: Climate change is causing changes in precipitation patterns around the world, which could also lead to stronger hurricanes and other tropical storms.

However, not all anthropogenic influences on climate change are negative. Land use change, such as afforestation, can sequester carbon and prevent the release of GHGs, leading to a cooling effect.

## 2. Climate change is a global problem that requires an international response

Even though climate changes have very different local impacts depending on the geography of the affected region, the increase in greenhouse gas concentration reaches, through the mixing of air masses, the entire planet and thus all ecosystems in just a few months. It is therefore a global problem that requires clear and committed responses at the international level. Attention to climate change is due to the results of numerous studies that have proven that a large part of these changes is now the result of human activity, and is no longer solely due to nature, as was the case in the past.

The point of change has now been reached since global CO2 emissions should have reached their maximum between 2015 and 2020, and then decrease sharply. In this regard, several international conferences, conventions, and summits have followed one another, specifying each time, as far as possible, the foreseeable consequences and the measures to be implemented.

## 2.1. History of climate agreements and major events.

**1968:** The WMO launches the Global Atmospheric Research Programme (GARP) with the International Council for Science (ICSU).

**1979:** Organization of the first world climate conference, which allowed the launch of a global research program that is now authoritative: the United Nations Environment Programme (UNEP). The scientific world then mobilized in work related to climate change via the World Climate Research Programme (WCRP). Already, the WMO urged countries around the world to anticipate and prevent the effects of climate change that would be due to human activity and whose effects would be detrimental to the well-being of humanity.

**1986:** The International Council for Science (ICSU) launches the International Geosphere-Biosphere Program to strengthen knowledge in chemistry, biochemistry, ecology, and biology.

**1988:** The seven richest countries in the world (Germany, Canada, the United States, France, Great Britain, Italy, Japan - united in the G7) created the Intergovernmental Panel on Climate Change (IPCC) under the auspices of UNEP and WMO. The IPCC is famous for its authoritative reports and its predictive scenarios on the extent of climate change. International discussions are animated, particularly around the information provided by the IPCC.

**1991:** Creation of the Global Environment Facility (GEF). Financially supplied by voluntary contributions from developed countries, its objective is to help developing countries face environmental, challenges including climate change.

**1992:** Signing of the United Nations Framework Convention on Climate Change (UNFCCC) during the Rio de Janeiro conference, which aims to "anticipate, prevent or mitigate the causes of climate change and limit its negative effects".

**1994:** Entry into force of the UNFCCC. Developed countries, countries in transition to a market economy, and the European Union had committed to stabilize their greenhouse gas emissions at 1990 levels by the year 2000.

**1995:** The second assessment report of the IPCC confirms the responsibility of human activities in climate change and recommends preventive actions, under the precautionary principle. First session of the Conference of the Parties in Berlin.

**1997:** Third session of the Conference of the Parties: adoption of the Kyoto Protocol.

**1998:** Fourth session of the Conference of the Parties: the Buenos Aires Action Plan. Progressive development of the implementation rules of the Kyoto Protocol is planned: the compliance system, the functioning of emission credit trading, information exchange, and North-South cooperation.

**2001:** Third Assessment Report of the IPCC and new ranges of climate change predictions. Bonn and Marrakech negotiations: agreements on the implementation of mechanisms provided for in the Kyoto Protocol.

**2003 Milan conference**: North-South rapprochement and introduction of carbon sinks in the Clean Development Mechanism. 2005 Entry into force of the Kyoto Protocol.

**2007 Fourth Assessment Report of the IPCC**: increasingly pessimistic forecasts, the need to act becomes urgent. Adoption of the Bali Roadmap, preparing for post-Kyoto negotiations. 2009 The G8 commits to halving its emissions by 2050.

**2009:** The long-awaited Copenhagen conference to finalize post-Kyoto reduction targets is a failure.

**2010:** The 16th edition of the Conference of the Parties (COP) to the United Nations Framework Convention on Climate Change and the 6th Conference of the Parties serving as the Meeting of the Parties to the Kyoto Protocol (CMP) ended with a feeling of helplessness, although the post-Kyoto negotiation cycle was saved.

**2011:** COP17 became bogged down, leaving the challenge of global warming without a clear and vigorous response. However, countries agreed to extend the Kyoto Protocol beyond 2012. This is referred to as the second commitment period of the Kyoto Protocol.

The Kyoto Protocol, with its "top-down" approach and binding commitments for developed countries, faced major challenges, notably the refusal of ratification by the United States and the absence of commitments for major emerging economies. This structure highlighted the difficulty of reaching consensus on rigorous and legally binding emission reductions, particularly when perceived as an impediment to economic development.

2012: COP18 sees the renunciation of highly polluting countries, leaving the European Union and a few countries to share the burden of reducing greenhouse gas emissions; the most vulnerable countries are no longer financially supported: a real debacle.

2013 Greenwashing and withdrawal of NGOs: For the first time, environmental defense NGOs leave the negotiations corrupted by the Polish presidency, which turns it into a commercial fair for multinationals... No commitments are made; the ultimate decision on areal post-Kyoto agreement is postponed to 2015. It is the triumph of irresponsibility.

2014: The World Climate Summit once again highlights the tensions between the "South" and the "North": "greenhouse gas emissions, climate change, and environmental degradation are the consequences of the development model used and imposed by wealthy countries," emphasizes the South. The Global Alliance for "smart" agriculture was launched amid much criticism regarding its collateral damage to the environment.

2015: The much-anticipated COP21 seals the Paris Agreement, adopted by consensus by all parties. Its main objective is to keep the rise in global average temperature to 2°C, or even 1.5°C, above pre-industrial levels. This accord marked a significant shift towards a "bottom-up" approach, where each country defines its own Nationally Determined Contributions (NDCs). This change aimed to maximize participation by offering increased flexibility, but raised questions about collective ambition and accountability mechanisms. The

move from "binding" to "universal" reflects a recognition of complex geopolitical dynamics and the principle of common but differentiated responsibilities.

Like the majority of United Nations Conferences on Climate Change, the tone is one of general self-satisfaction, while the action plans to curb a dangerous increase in global temperature remain vague and non-binding, marking yet again the failure of our leaders, out of step with the challenge.

**2016:** COP22 endorses the Paris Agreement, which is ratified by 111 countries in addition to those of the European Union.

**2017** With the election of D. Trump, the United States withdrew from the Paris Agreement. COP23 marks the exit from coal for an alliance bringing together around twenty countries (including France, Canada, and the United Kingdom).

**2018:** According to the IPCC Special Report on Global Warming of 1.5°C (SR1.5)', it is absolutely necessary to limit warming to 1.5°C in order to reduce risks to human well-being, ecosystems, and the sustainability of human societies. This means that global human-caused carbon dioxide (CO2) emissions will need to be reduced by about 45% from 2010 levels by 2030. COP24 finalizes the rules for implementing the Paris Agreement, notably by enabling a nearly harmonized monitoring of national emissions. However, no responsible and binding decisions are made.

**2019:** The IPCC report on soils and climate change reaffirms the close relationship between our agriculture, the state of soils, food security, and greenhouse gas emissions. Furthermore, it questions our diet and production systems. For the first time, hundreds of civil society representatives were excluded from climate negotiations during COP25, a 25th summit that was disappointing and marked the profound gap between the issues and political will.

**2020:** For the first time, the COVID-19 pandemic causes CO2 emissions to fall. What man has been unable to do in over 50 years, a virus does in a few weeks.

**2021:** IPCC publishes its 6th report on climate change. Human influence has warmed the climate at a rate unprecedented in at least the last 2,000 years, warns the Intergovernmental Panel on Climate Change (IPCC), which has published its new climate assessments and forecasts. Rise in global temperature, intensification of extreme events, and the responsibility of human activities. This report from Working Group 1 of the IPCC, a body integrated into the United Nations, constitutes the most up-to-date assessment of knowledge on the physical basis of climate change.

This first section will be supplemented by two others, on the vulnerability of our societies and on solutions to reduce greenhouse gas emissions, which will be published in February and March 2022, before a summary of the 6th report scheduled for September 2022.

**2022:** COP27 was held from November 6 to 20, 2022, in Sharm el-Sheikh (Egypt), in the presence of more than 92 heads of state and approximately 35,000 representatives, or delegates, from 190 countries. This was the fifth climate summit organized in Africa, and the first since 2016.

**2023:** The United Nations Climate Change Conference COP28 in Dubai (United Arab Emirates) was the largest of its kind. Some 85,000 participants, including over 150 heads of state and government, were among the representatives of national delegations, civil society, businesses, indigenous peoples, youth, philanthropy, and international organizations present at the Conference from November 30 to December 13, 2023. COP28 was particularly important because it marked the conclusion of the first Global Stocktake of the world's efforts to combat

**2024:** The United Nations Climate Change Conference (COP29) was held in Baku, Azerbaijan, from November 11 to 22, 2024. The conference concluded with a new financial goal aimed at helping countries protect their populations and economies from climate disasters and benefit from the immense benefits of the rise of clean energy. At the heart of the debates on climate finance, COP 29 brought together nearly 200 countries and reached a decisive agreement that will:

- Triple the financing for developing countries, increasing from $100 billion per year to $300 billion per year by 2035;
- Ensure that all actors work together to increase financing for developing countries, both public and private, to reach $1,300 billion per year by 2035.

### 2.2. Impacts of climate change and links to sustainable development

Sustainable development, defined as development that meets the needs of the present without compromising the ability of future generations to meet their own needs (WCED, 1987) implies the harmonious integration of a rational and viable economy, responsible governance, the empowerment of populations, social cohesion, and ecological integrity.

Sustainable development does not mean economic stagnation or renunciation of economic growth in favor of the environment; it should include the promotion of economic development as a prerequisite for maintaining environmental quality. Such development allows for better addressing environmental and social problems. Maintaining environmental quality is, in turn, an essential factor for sustainable development.

The link between climate change and sustainable development arises from the fact that these changes hinder development and that sustainable development is essential for strengthening mitigation and adaptation capacities.

It follows that the strategies for achieving this development and adapting to climate change have many points in common, so that their combination gives rise to synergies. It also follows that managing climate change in isolation could prove very costly, and that is why it must be incorporated into the development program.

## 3. Responses to Climate Change: Navigating Struggle and Adaptation

In its 2007 report, the IPCC defines climate change vulnerability as a measure of the extent to which a system is sensitive or unable to cope with the adverse effects of climate change, including climate variability and extreme phenomena. Vulnerability is a function of the nature, magnitude, and pace of climate evolution and variation to which the considered system is exposed, its sensitivity, and its adaptive capacity.

It defines adaptation to climate change as initiatives and measures taken to reduce the vulnerability of natural and human systems to the effects of actual or expected climate change. According to the IPCC, adaptive capacity means the overall abilities, resources, and institutions of a country or region that enable it to implement effective adaptation measures.

Adaptation focuses on reducing the risks and impacts associated with the harmful effects of climate change, such as storms, floods, and droughts. Similar to mitigation, adaptation strategies may utilize natural systems or technical and technological solutions (Benhassine N., 2019, pp. 797,780).

The growing interest in the problem of climate change is justified in view of the catastrophic consequences that inaction can generate. To provoke a rapid reaction from decision-makers and to adopt preventive action policies now, aimed at limiting greenhouse gas emissions, or adaptation policies, to best respond to climate variation, as with the example of the website to help European economies reduce the financial costs of climate change, launched by the European Environment Agency (EEA) in Copenhagen. This site, called Climate-adapt, will concentrate all the knowledge at the municipal, regional, and national levels, as well as the solutions proposed by the researchers and the companies.

The objective of this site is to pool all the solutions tested in Europe in order to increase the effectiveness of public policies, as it is necessary to highlight the future economic costs for countries. This is the main objective of the economic studies carried out in recent years on this theme. This new approach involves integrating physical, climatic, and economic considerations within the same analysis; a study conducted by the Carbon Disclosure Project (CDP) organization among 215 of the world's largest companies found that, the cost of climate-related risks could approach $1 trillion in five years. But the potential value of climate opportunities far exceeds the investment costs in the transition (Catnat, 2019).

Adaptation strategies, or even mitigation, are important steps for reducing emissions from human activities, GHGs, and adaptation, to limit the potential impacts of these changes and their subsequent negative environmental effects; among these international mechanisms:

### 3.1. International Cooperation Frameworks

The shift from the Kyoto Protocol to the Paris Agreement reflects an evolution in international climate governance, moving from a legally binding, top-down approach to a more flexible, bottom-up framework.

#### 3.1.1. The Kyoto Protocol Era and its Mechanisms

The Kyoto Protocol introduced several mechanisms to help countries achieve their greenhouse gas (GHG) emission reduction targets, particularly for industrialized nations with binding commitments. These early mechanisms provided flexibility but also highlighted the challenges of rigid international targets.

- Clean Development Mechanism (CDM): This mechanism allowed industrialized countries to finance and implement emission reduction projects in developing countries, earning emission credits in return. It aimed to foster sustainable development while facilitating cost-effective emission reductions.
- Joint Implementation (JI): JI allowed developed countries to implement emission reduction projects in other developed countries (particularly economies in transition), generating emission credits.
- International System of Tradable Emissions Permits (ETP): This market-based mechanism allowed countries to trade emission allowances, enabling a more economically efficient way to meet reduction targets (Cros, 1998). Unused emission rights could be sold and bought within a global exchange (Thevenot, 1986, pp. 21-71).

These mechanisms, while historically significant, faced challenges related to their design, implementation, and political acceptance, ultimately leading to the search for a new international climate architecture.

#### 3.1.2. Nationally Determined Contributions (NDCs)

The cornerstone of the Paris Agreement is the concept of Nationally Determined Contributions (NDCs). Each country voluntarily sets its own climate action targets, encompassing emission reductions, adaptation efforts, and means of implementation. The NDCs aim to drive global climate action through a flexible and inclusive approach, with a built-in mechanism for increasing ambition over time. Countries are expected to submit updated NDCs every five years, demonstrating progression towards higher ambition.

#### 3.1.3. The Global Stock take (GST)

A critical feature of the Paris Agreement is the Global Stock take, a periodic review of the world's collective progress towards achieving the agreement's long-term goals. The first Global Stock take concluded at COP28 in 2023, assessing global efforts in mitigation, adaptation, and means of implementation. It identified significant gaps in current climate action and provided recommendations for countries to enhance their NDCs and accelerate climate action. This mechanism is designed to inform and encourage greater ambition in subsequent NDCs.

#### 3.1.4. Loss and Damage

The issue of Loss and Damage has gained increasing prominence, recognizing the unavoidable and irreversible impacts of climate change that go beyond what can be addressed through mitigation and adaptation. These include both economic losses (e.g., infrastructure damage, agricultural losses) and non-economic losses (e.g., cultural heritage, displacement). At COP27, an agreement was reached to establish a fund for responding to loss and damage, which was operationalized at COP28, signifying a critical step towards climate justice and supporting vulnerable countries.

### 3.2. The REDD+ Program

Deforestation and forest degradation are caused by agricultural expansion, infrastructure development, logging, and fires. This accounts for nearly 20% of global GHG emissions, more than the transportation sector (Solecki, 2024, pp. 685-691).

Reducing Emissions from Deforestation and Forest Degradation (REDD), established in September 2008, aims to give a financial value to carbon stored in forests by encouraging developing countries to reduce emissions from deforestation and invest in a low-carbon economy. REDD+ goes beyond deforestation and forest degradation, and takes into account conservation, sustainable forest management, and enhancement of forest carbon stocks.

According to the United Nations REDD+ program, the financial flows from this mechanism could reach up to $30 billion per year. This significant North-South financial flow could, in addition to significantly reducing carbon emissions, support the sustainable development of countries with forest wealth.

To achieve these multiple benefits, REDD+ requires the full commitment and respect for the rights of indigenous peoples and other forest-dependent communities.

In addition, political power has often called upon the scientific community to address major challenges, particularly during periods of conflict. Today, the challenge of climate change confronts countries around the world. And the IPCC report, made public in October 2018, shows that the objective of limiting global warming to 1.5°C is achievable, but requires rapid, profound, and unprecedented changes across all sectors.

Faced with such an emergency, everything would suggest that the scientific community is once again mobilized. This is, in fact, only partially true. Scientific institutions, like states and most socio-economic actors, are more concerned with preserving models that are now threatened than with global changes (Swiss, 2021).

The policies implemented to reduce GHG emissions are relatively costly, but much more affordable than our indecision, which would make the cost of repairs insurmountable.

## Conclusion:

The world's attention is turning towards the ability to make new progress towards achieving the Sustainable Development Goals by 2030. In this regard, achieving sustainable development faces numerous challenges that have recently emerged, including climate change. The latter is one of the environmental challenges facing humanity as it affects all aspects of life on Earth.

This phenomenon is now a growing challenge in the fields of economics, health, security, food production, safety, and other dimensions. Unstable weather conditions threaten food production due to increased distrust of precipitation, sea-level rise that pollutes coastal freshwater reserves, an increased risk of catastrophic floods, and an environment that is warming and favoring the spread of pests and diseases towards the poles, although previously confined to the tropics. The causes of hazards vary between natural and human causes, in addition to the difference between climate change and global warming.

**Recommendations:**

Many solutions to climate change can bring economic benefits while improving our lives and protecting the environment. Global agreements have been established to guide and direct the global effort to combat climate change, such as the UNFCCC and the Paris Agreement.

Converting energy systems from fossil fuels to renewable energy sources, such as solar or wind power, will reduce the emissions that cause climate change.

There are three main categories of measures to be taken: reducing emissions, adapting to climate impacts, and financing the necessary adjustments.

Given the voluntary nature of NDCs and the divergence between national ambition and the 1.5°C pathway, it is imperative to establish more robust mechanisms for strengthening NDC ambition and stricter transparency and accountability frameworks.

Considering the persistent North-South divide and the need for climate justice, the effective and equitable implementation of the Loss and Damage Fund is crucial to build trust and international solidarity, fundamental elements for effective collective climate action.

Future research should focus on developing innovative diplomatic strategies to overcome obstacles to international cooperation and encourage a more equitable distribution of emission reduction efforts and adaptation costs between developed and developing countries. Fossil fuel production should decrease by about 6% per year during the 2020-2030 period.

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