

Research Article

Civil Protection of the Environment from Climate Change: A Comparative Study

Ola Farouk Salah Azzam*

Department Social Legislation, Capital (Helwan) University, Cairo, Egypt

Abstract

The purpose of this research was to identify climate change, its causes, and how to address it to achieve a green climate, as well as the pollutants that cause climate change and how to avoid them. Also to identify the preventive and procedural role played by relevant authorities in combating pollution. And to investigate the most important sources of pollution that causes climate change and the factors contributing to its spread. The problem of environmental pollution has become increasingly prominent due to temperature changes. As temperatures rise, the rates of negative climate change also increase. And the research searches the literature on the social, economic and physical to protect under the civil, environmental and labour laws, civil protection of the environment. Also it deals the conditions of health protection for all under one comprehensive law for all, which climate-related environmental damage, compensation. Clarify the type of Securing and protecting the environment in numerous facilities, and addressing this legislatively, remains threatened by numerous risks stemming from the excessive use of technological equipment and tools, among other things. On the other hand, this research traces out the objectives and reasons the civil protection of the environment still raise numerous issues regarding research and regulation, especially concerning climate change. The interest of most positive legal systems in enacting legislation to protect the environment is relatively recent due to the multitude of negative impacts affecting it. These impacts vary according to human activity, particularly those resulting from evolving climate changes. This interest has manifested in attempts to find various solutions for environmental protection and mechanisms for implementing them. Accordingly, it is advisable to keep pace with environmental protection through legislation that includes clear and tangible procedures and guarantees to ensure this protection. All these questions, and others, make the study of civil protection of the environment from climate change a fertile and vital field for research and study. So, this research addresses civil protection of the environment from climate change by explaining and clarifying climate change, its causes, and its mitigation. It also examines the positions of the American and Egyptian systems regarding procedures and measures to address these changes, as well as the rules for safety, security, and civil compensation for environmental damage.

Keywords

Civil Protection of the Environment, Green Climate, Climate Change, Environmental Pollutants, Emissions and Radiation, Rising Temperature, Climate-Related Environmental Incident, Climate-Related Environmental Damage, Compensation

*Correspondence: Ola Farouk Salah Azzam (ofazzam@gmail.com), Ola Farouk Salah Azzam (ola_azzam@law.helwan.edu.eg)

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1. Introduction

The environment represents the general framework encompassing both human and material resources, including those characterized by a certain degree of risk that necessitates a type of legislative protection appropriate to their specific nature. It is the geographical or spatial area where certain essential or hazardous materials, or other technologies required by the nature of these environments, are used. Undoubtedly, the escalation of environmental pollution and the increasing climate change lead to reduced production and ultimately have a negative impact on the economic and social development of the nation.

Therefore, most countries have intervened with specific regulations for protecting the general environment in various legislations. Internal legislators have also intervened to codify these regulations with deterrent texts and procedures for environmental protection. This is coupled with several procedures and measures, such as licensing and inspections entrusted to specific administrative bodies, as a guarantee for monitoring the provision of a safe environment free from risks, or for finding effective means to protect the environment from hazardous pollutants and other threats. However, the legislator stopped at this point, and legislation did not go further. Consequently, legislative measures—particularly in Egypt—have fallen short of protecting the environment from successive and increasing climate changes, especially given the inherent characteristics of these changes, which present legislative challenges in regulating them. Adequate regulation for civil protection of the environment remains far from the focus of legislation, and indeed, from the attention of legal scholars and, consequently, from judicial interpretations. We are referring to the lack of sufficient and adequate legislative attention worthy of this protection, considering the remarkable technological advancements that give rise to new pollutants and risks threatening the environment.

Research Plan: This was based on the following research plan:

2. Section I: Climate Change and the Environment

Chapter I: Definition of Climate Change and its Causes.

Chapter II: Effects of Climate Change on the Environment.

Section II: Legislative Measures to Protect the Environment from Climate Change:

Chapter I: Legislative and Regulatory Measures for Protection from Climate Change.

Chapter II: Climate-Related Environmental Events and Compensation for Them.

Section I Climate Change and the Environment

Chapter I: Definition of Climate Change and its Cause

It has become imperative for legal entities concerned with environmental protection -both national and international- to

intervene to protect the environment from climate change, which is a reflection of the risks threatening the environment due to the increasing and even excessive use of petroleum, chemical, biological, and other materials. While industrial risks are the most prevalent and significant cause of climate change, this does not preclude the possibility of such changes occurring due to natural hazards, most notably abnormally high temperatures.

On the other hand, the climate change is considered a global phenomenon because it transcends national borders, posing a threat to the entire world. It cannot be addressed by any single country but requires concerted international efforts. Generally, this phenomenon has resulted from human activities such as burning fossil fuels for energy production and industrial activities that have increased the concentration of gases in the atmosphere to a degree that has altered the global climate system. Greenhouse gases in the atmosphere are characterized by their ability to absorb infrared radiation. This phenomenon is a natural occurrence; without it, the average temperature of the Earth would drop to a level unsuitable for life. However, negative impacts, whether increasing or decreasing their concentration, result in adverse climate changes [1].

2.1. Definition of Climate and Climate Change

Climate is defined as a complex atmospheric condition resulting from the interaction of several elements, most notably temperature, atmospheric pressure, wind, humidity, and other elements that vary from one region to another. It is also defined as the prevailing weather conditions in a specific location over a long period of time. The 1992 United Nations Framework Convention on Climate Change defined it as: all processes and interactions within the atmosphere, hydrosphere, biosphere, and terrestrial environment. As for climate change (or what is known as climate law), it is the set of legal rules that govern addressing the phenomenon of climate change, which is attributed to greenhouse gas emissions into the atmosphere, by mitigating the effects of rising temperatures, or adapting to them [2].

As for the definition of climate change, it refers to changes resulting from the increasing proportion of carbon emissions, which leads to heat being trapped underground at unprecedented rates. Climate change represents a global emergency that transcends national borders and requires coordinated solutions at all levels and international cooperation to help countries move towards a low-carbon economy and a green climate [3].

Therefore, climate change is a vital global environmental issue shared by humanity. It reflects the negative aspects of urban development, altering nature and expanding urban areas at the expense of green spaces. These changes have had serious repercussions on the climate, which is the most important element of the natural environment due to its clear impact on

all aspects of life. Unwise human interventions and the corruption of the Earth have contributed to unprecedented temperature increases—which continue to rise—and now threaten life on Earth, leading to the emergence of what is known as the phenomenon of climate change [4].

2.2. Causes of Climate Change

2.2.1. Industrial Risks of Climate Change

The Industrial Revolution had positive effects on the environment in general and the work environment in particular, as it led to the replacement of human labor with machinery. However, it also had enormous negative effects, represented by numerous environmental pollutants that, through the direct and indirect impact of human activities, alter the composition or condition of the environment in a way that disrupts some uses or activities that could be carried out in the natural state of that environment, thus causing negative changes in the climate. The work environment is a magnet for many pollutants, such as chemical, physical, mechanical, and biological pollutants, in addition to other hazards and fire hazards. The risks of workplace hazards increase if the worker is a child, elderly, or female, as these groups are more vulnerable due to their physical weakness and reduced resistance to environmental pollution [5]. Industrial hazards take many forms; we will mention only the most important ones here [6]:

- 1) Chemical Hazards: These are the hazards resulting from handling solid, liquid, and gaseous chemicals. The use of chemicals is one of the most significant threats to the work environment, as they are inherently hazardous. This has led many legislators to define them, regulate their use, and restrict it with numerous procedures and precautions.
- 2) Physical Hazards: Physical hazards are among the most serious risks to the work environment, and their negative impact extends to the surrounding environment. These hazards arise from the following:
 - (a) Heat stress and cold;
 - (b) Noise and vibrations;
 - (c) Lighting;
 - (d) Harmful and dangerous radiation;
 - (e) Changes in atmospheric pressure;
 - (f) Static and dynamic electricity;
 - (g) Explosion hazards. Physical hazards are among the most serious threats to the work environment, and their negative impact extends to the surrounding environment as a whole, given their frequent use and the multitude of risks they generate. Examples of these hazards include heat, noise, vibrations, harmful and dangerous lighting and radiation, changes in atmospheric pressure, and static and dynamic electricity.
- 3) Mechanical Hazards: These are hazards arising from a worker's body colliding with any solid object. They also

include hazards arising from work machinery and equipment, such as lifting and pulling devices, and means of transport, handling, and power transmission. Furthermore, they include any hazard arising from construction, building, excavation, collapse, or falls. Mechanical hazards that affect the work environment and workers' health include hazards related to industrial work (buildings, work equipment, and machinery), hazards related to engineering construction work, and hazards related to loading and unloading operations.

- 4) Biological Hazards: These are the risks of infection with bacteria, viruses, fungi, parasites, and other biological hazards when the nature of the work exposes workers to conditions that could lead to infection, particularly:

Handling infected animals, their products, and waste. (b) Contact with sick individuals and providing them with services such as care, analyses, and medical examinations.

- 5) Negative Risks: These are risks that arise or are exacerbated by the lack of certain resources, such as relief, rescue, and first aid equipment and devices, as well as cleanliness, order, and organization in workplaces. It also includes ensuring that workers in food preparation and consumption areas possess health certificates indicating they are free from epidemic and infectious diseases.
- 6) Fire Risks: Fire risks are related to the nature of the facility's activities and the physical and chemical properties of the materials used and produced. These risks necessitate taking precautions and implementing preventive measures as determined by the relevant authorities, such as the Civil Defense Department.

2.2.2. Technological Risks Threatening the Environment

The eagerness of establishments operating in the labor market to acquire the latest technological equipment in order to increase productivity and profitability and pursue economic development, along with the consequent introduction of new elements into the natural work environment. If technological risks give rise to numerous dangers and threats in the digital age, surrounded by many technological means and with diverse forms and patterns of surveillance, privacy breaches, and security violations, these risks are not the only ones affecting the environment. The use of technological means also results in numerous physical risks, such as occupational injuries and illnesses among workers, and other illnesses affecting civilians. It goes without saying that some technological devices emit radiation that harms environmental safety, damaging the environment and its material and non-material resources.

2.2.3. The Natural Risks of Climate Change

It is well known that no natural hazards alone cause climate changes that negatively impact the environment. Nature itself,

since the beginning of creation—and even before—has not posed risks to the environment. Rather, human intervention through excessive and unjustified alteration of its properties is the primary cause of these changes and the resulting negative effects and risks on the environment. Reliance on coal, oil, and natural gas for heating and cooling leads to the emission of large quantities of greenhouse gases, which severely damage the climate.

Energy generation, which produces electricity and heat through the burning of fossil fuels, is a major cause of climate change. It causes global emissions, as it produces carbon dioxide and nitrous oxide, which are powerful greenhouse gases that cover the earth and trap the sun's heat. Most of the machinery used in the manufacturing process relies on coal, oil, or gas, which emit harmful emissions. Also, some materials, such as plastics, are made from chemicals derived from harmful fossil fuels. The increased demand for energy for heating and cooling, coupled with the growing use of air conditioning and electricity for lighting and related appliances, has contributed to higher energy-related carbon dioxide emissions from buildings. Therefore, manufacturing is one of the largest contributors to greenhouse gas emissions worldwide.

Chapter II: Effects of Climate Change on the Environment

2.3. Defining the Environment and Its Components That Are Affected by Climate Change

2.3.1. The Legal Concept of the Environment

The environment is generally defined—in one of its meanings—as the sum of natural and man-made elements that affect the ecological balance and determine the conditions in which humans live and society develops. The environment is the sum of all living and non-living things on Earth. The Earth's surface, water, and atmosphere are all part of the environment. The word "environment" refers to the physical features of our planet, such as air, land, rivers, oceans, and weather [7].

Egyptian Environmental Law No. 4 of 1994, as amended by Law No. 9 of 2009, defines the environment as: "The biosphere, which includes living organisms and the materials they contain, as well as the surrounding air, water, and soil, and the structures erected by humans. This system aims to regulate and protect natural and biological elements to ensure their balance."

Undoubtedly, the work environment is among the most influential environments on the overall environment. It employs machinery, equipment, and tools that may harm the environment, in addition to industrial waste that negatively impacts various environments and causes harmful climate changes [8].

2.3.2. Environmental Components Affected by Climate Change

Undoubtedly, protecting the environment from the dangers

of climate change has become a vital necessity for most of the world's population, following the exacerbation of human-caused pollutants and the unprecedented rise in temperatures, and the negative impact this has had on the natural environment and its components. The environment consists of several elements, including [9]:

- 1) Living organisms: including humans, animals, and plants.
- 2) Air: outdoors, in public places, and inside workplaces.
- 3) Soil: land used for agriculture or all other activities.
- 4) Industrial facilities: all buildings and projects constructed by humans that affect the environment.
- 5) Aquatic environment: including territorial seas, the exclusive economic zone, inland waters, and coastlines.

Since all components of the environment are exposed to risks, they are vulnerable to the negative effects of climate change. The law regulates the protection of the environment from pollution caused by hazardous materials, waste, and industrial activities, and emphasizes waste management, safe disposal, and recycling, in order to avoid the massive rise in temperatures and the atmosphere, leading to a green climate.

2.3.3. The Right to Balance Climate Change Achievement Towards a Green Climate in Accordance with International Agreements and Egypt's First National Climate Change Strategy 2050

Egypt has acceded to numerous bilateral, regional, and international environmental agreements, which have undergone significant development since the Rio Conference in 1992, the Paris Climate Conference in 2015, and the Sharm El-Sheikh Conference in 2025. This development of multiple environmental agreements has led to the inclusion of numerous environmental issues in relevant Egyptian laws, as well as increased attention to climate change issues. It has also gradually expanded the responsibilities of the Ministry of Environment and the Egyptian Environmental Affairs Agency to encompass several issues that were historically under the purview of other executive ministries. These issues include topics such as water quality, environmental health, waste management, industrial pollution, and raising public awareness about achieving balance in climate change and returning to moderation and a green climate.

Egypt is committed to the obligations stipulated in the international agreements it has ratified. As the 1992 United Nations Framework Convention on Climate Change (UNFCCC), whose stated objective was to reduce greenhouse gases in order to prevent dangerous climate change caused by human activity, the treaty also called for continued scientific research, regular meetings, negotiations and future policy agreements designed to allow ecosystems to adapt naturally to climate change to ensure that food production is not threatened and to enable economic development to proceed in a sustainable way [10].

Egypt has addressed the issue of climate change by developing its first National Climate Change Strategy 2050. In May 2022, the Egyptian government announced this first National Climate Change Strategy, emphasizing several key points [11]:

- 1) Addressing climate change is a priority for the Egyptian state, which seeks to protect the environment from negative climate changes to achieve the country's economic and social progress.
- 2) Achieving sustainable economic growth and reducing greenhouse gas emissions across various sectors.
- 3) Building resilience and adaptability to climate change and mitigating its negative impacts.
- 4) Improving the governance and management of climate change initiatives.
- 5) Enhancing the infrastructure for financing climate-related activities.
- 6) Promoting scientific research, technology transfer, knowledge management, and raising awareness to combat climate change.

The negative effects of climate change on the components of the environment:

Egypt is considered one of the countries most affected by climate change. Therefore, the state has focused on implementing policies to mitigate and adapt to the impacts of climate change. The challenges resulting from climate change in Egypt are multifaceted, most notably: rising sea levels, the impact on agricultural crops, water scarcity, health impacts, and effects on the population and tourism. Egypt was among the first Arab countries to address climate change, signing the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 and ratifying it in 1994. Key measures taken include:

- 1) Establishing the Climate Change Unit within the Egyptian Environmental Affairs Agency in 1996.
- 2) Forming the National Committee for Climate Change in 1997.
- 3) Signing the Kyoto Protocol in 1999 and ratifying it in 2005.
- 4) Establishing the National Committee for the Clean Development Mechanism (CDM), which includes the Egyptian Council and Office for the CDM, chaired by the Minister of State for Environmental Affairs, in 2005.

Therefore, what we need is technology that achieves less carbon-intensive economic growth. Financial support for this technology is essential. Regarding mitigation, we can distinguish three sources of funding: 1) carbon markets, 2) other financial flows from the private sector, and 3) expanding public investment. Carbon markets are insufficient for the wider and more affordable deployment of this technology to developing countries. They must be complemented by expanding financial flows from the private sector and public investment.

Also, The Egyptian Environmental Affairs Agency (EEAA), affiliated with the Ministry of Environment, identified nine key climate change risks facing Egypt in its State of

the Environment report [12]:

Temperatures will rise or fall below normal levels. The World Bank recorded in 2017 that 2016 was the hottest year on record, due to the Earth's temperature increasing by 1.2 degrees Celsius above pre-industrial levels. Sea levels are also rising, impacting coastal areas. A further 100 centimeters of sea level is projected to rise by 2100, leading to saltwater intrusion into groundwater, soil salinization, reduced crop quality, and decreased productivity. Extreme weather events, such as dust storms, heat waves, and flash floods, will increase, and rainfall will decrease.

Furthermore, desertification is increasing, agricultural production is declining, food security is being affected, and water scarcity is worsening. The Nile River basin has been observed to be particularly vulnerable to the effects of climate change. Climate change is also impacting rainfall patterns in the Nile Basin and evaporation rates in waterways, especially in wetlands.

2.4. Increased Pollution Rates and Percentages

Pollution, in general, is a quantitative or qualitative change in the living and non-living elements of the environment that affects its natural characteristics and components to a degree that impacts human resources and other aspects. Legally, the Egyptian Environmental Protection Law No. 4 of 1994, in Article 1, Paragraph 7, defines it as: "Changes in the properties of the environment that directly or indirectly lead to harm to human health and affect the practice of normal life, or harm natural habitats, living organisms, or biodiversity." Paragraph (8) of Article 1 also stipulates that: "Environmental degradation: Affecting the environment in a way that reduces its value, distorts its natural state, depletes its resources, or harms living organisms or archaeological sites. Pollution causes damage to or changes in the properties of life in the natural environment."

General environmental hazards in the workplace typically affect its characteristics and performance levels. For example, noise pollution from heavy traffic or machinery in facilities, radioactive pollution from proximity to certain materials, and air pollution from factory fumes, among other hazards, all combine to cause permanent or temporary physical and psychological harm to workers and those who interact with these facilities, such as nervous system disorders, mental breakdowns, and violence. Furthermore, while workplace hazards affect the human resources of the environment- specifically its workers- they also impact its material resources, such as tools and equipment that may deteriorate or break down completely. This can also lead to damage to goods, resulting in decreased productivity and economic instability [13].

Section II: Legislative Measures to Protect the Environment from Climate Change

Chapter I: Legislative and Regulatory Measures for Protection from Climate Change

3. Legislative Measures for Protection: Legislative Treatment of Climate Change Risks to the Environment Through General Principles in Several Laws

The regulation of environmental protection from its associated risks is addressed in several laws, most notably the Environmental Law, which established the mechanisms and methods for this protection. Other laws, such as the Labor Law in Egypt and occupational safety and health laws in some other legal systems, also address this. Despite the numerous laws protecting the environment from the risks it faces, these laws do not specifically address protecting the environment from the negative effects of climate change. This indicates a legislative deficiency in this area. Consequently, the general principles in these laws apply to protecting the environment from the negative effects of climate change.

Environmental and labor laws have already provided effective protection for the work environment and, consequently, the worker's right to a healthy environment. This, in turn, reflects on the overall safety of the environment from risks. This is regulated by the American and Egyptian systems. In these systems, the legislator's treatment of environmental protection is not limited to the general environment but also specifically addresses the work environment. This involves focusing on the workplace and providing the necessary protection to safeguard those present, such as workers, employers, clients, and other citizens, from potential hazards.

For example, the US legislature has established numerous regulations and restrictions to protect the environment from all hazards that establishments may face, whether chemical, mechanical, physical, negative, or fire hazards. This includes Article 208/3, which mandates securing the work environment from physical hazards, requiring establishments and their branches to provide occupational safety and health measures and ensure a safe working environment in workplaces to prevent such hazards. Regarding addressing chemical hazards resulting from handling solid, liquid, and gaseous chemicals [14].

It is worth noting that while the American legislature has established several regulations to protect the general environment and the work environment from all hazards that may threaten facilities and institutions—whether chemical, mechanical, physical, negative, or fire hazards—it has not addressed protection from the negative effects of climate change that may arise from extreme temperature increases or escalating pollution levels.

The Egyptian legislature has followed a similar approach, regulating general rules for protecting the environment in general and the work environment in particular from all hazards. Consequently, these general rules apply to protecting the environment from the negative effects of climate change. We find that the legislature has established several regulations to

ensure the protection of the general environment and the work environment from chemical hazards, mandating the observance of certain precautions, including:

- 1) Not exceeding the maximum permissible concentration of chemicals and carcinogenic substances to which workers are exposed.
- 2) Not exceeding the threshold quantities of hazardous chemicals, unlike non-hazardous chemicals, which may exceed their respective threshold quantities.
3. Taking the necessary precautions to protect the facility and workers when transporting, storing, handling, and using hazardous chemicals, as well as disposing of their waste safely.
- 3) Maintaining a register of all hazardous chemicals in use, containing data for each substance, and recording workplace environment and worker exposure to chemical hazards.
- 4) Affixing an identification card to each chemical used in the workplace, including its scientific and trade name, composition, and degree of hazard, along with warning signs, safety precautions, and related emergency procedures. The employer can obtain this information from the supplier.
- 5) Training workers on the safe handling of hazardous chemicals and carcinogens, informing them of their various health and environmental risks, and educating them on first aid and methods of prevention and safety from these hazards.

The Egyptian legislator also addressed biological hazards by obligating the employer to provide the necessary protective equipment for workers against these hazards. This includes livestock farms, whether for dairy or meat production, as well as other farms... The Egyptian legislator also obligated the establishment and its branches to conduct an assessment and analysis of expected industrial and natural risks and disasters and to prepare an emergency plan to protect the establishment and its workers in the event of a disaster, provided that the effectiveness of this plan is tested and practical data is carried out on it to ensure its efficiency and to train workers to meet its requirements.

3.1. Protecting the Work Environment Through Labour Law and Other Laws

The American legislature has long regulated the obligation to provide a healthy and safe work environment, whether the employer is a private or public entity. This obligation is burdened with several requirements, most notably the provision of a safe and healthy work environment, and the associated commitment to occupational safety and health measures, particularly in hazardous facilities, including nuclear facilities [15].

Regarding the internal regulation of workplace protection in Egypt, this protection is distributed between two laws: the Environment Law No. 4 of 1994 and the Labour Law No. 14

of 2025. The Egyptian Environment Protection Law No. 4 of 1994 stipulates in Article (A/9) that: "Environmental protection: Preserving and improving the components of the environment, preventing their degradation or pollution, or reducing the severity of pollution. These components include air, seas, inland waters, including the Nile River, lakes, groundwater, land, nature reserves, and other natural resources." Egypt has incorporated numerous provisions and concepts into its legislation protecting the environment, both directly and indirectly, or those with environmental implications, through additions, amendments, or deletions, to address crimes against the environment in general and the climate in particular.

Meanwhile, the Labour Law imposes numerous and varied obligations on employers regarding the protection of the work environment and the provision of a safe, healthy, and sound working environment. Employers are also obligated to protect workers from hazards. Furthermore, the law dedicates a specific section to occupational safety and health, as exemplified by Article 208, which states: "The establishment and its branches are obligated to provide occupational safety and health measures and to secure the work environment in workplaces in a manner that ensures protection from physical hazards..."

Law No. 15 of 2017, concerning the facilitation of licensing procedures for industrial establishments, authorized the General Authority for Industrial Development to grant industrial establishments a unified license that takes into account environmental requirements. The law also empowers this authority to receive and review environmental impact assessment studies for industrial establishments, conduct inspections of licensed industries to ensure compliance with licensing requirements, including environmental aspects, and carry out periodic inspections during the license period.

3.2. Inadequate Legislative Treatment of Climate Change Risks to the Environment

Egyptian law lacks explicit provisions regulating adaptation to climate change and its limited contribution to environmental pollution and greenhouse gas emissions, particularly industrial ones. Adaptation remains a crucial area requiring regulatory and legislative action, alongside the development of incentive-based legislative policies that contribute to mitigating and reducing the causes of climate change. Furthermore, the law is deficient in allocating and monitoring financial resources for efforts to mitigate greenhouse gas emissions and adapt to the negative impacts of climate change. A clearly defined institutional framework with specific tasks, powers, and responsibilities (as a central body) is also needed to coordinate among the various relevant authorities.

Three proposals exist for enacting modern legislation to address climate change risks and ensure climate neutrality:

1) Enacting a specific law to regulate climate change, en-

compassing all aspects mentioned previously. This proposal is perhaps the most suitable in terms of its comprehensiveness, precision, and clarity.

- 2) Amend the aforementioned main ordinary laws to incorporate new rules regarding climate change mitigation and adaptation. These amendments can be consolidated into a single law that addresses specific amendments to each law.
- 3) Amend the current Environmental Law and other relevant laws to regulate emission standards and limits as stipulated therein, modifying them to reflect climate change-related emissions. Mandate relevant authorities to operate within their respective jurisdictions. Furthermore, draft new secondary legislation as required by the proposed amendments to the Environmental Law to elaborate on the technical aspects of the general provisions introduced.

3.3. Regulatory Measures for Protection: The Role of the Environmental Affairs Agency and Relevant Bodies in Protecting Against Climate Change

Egypt pursued an institutional plan by establishing bodies concerned with addressing the phenomenon of climate change and its evolving negative impacts. Prior to this, the Environmental Affairs Agency was established, which heads the bodies concerned with protecting the environment in general from all harmful negative phenomena, whether they existed before or after its establishment.

The Establishment of the Environmental Affairs Agency and its Role in Addressing Climate Change:

Since its establishment – by Presidential Decree No. 631 of 1982, and subsequently re-established under the Prime Minister's Office pursuant to Law No. 4 of 1994 concerning Environmental Protection – the Environmental Affairs Agency has become the national body responsible for supporting environmental relations between the Arab Republic of Egypt and international and regional countries and organizations. It submits recommendations regarding the necessary legal procedures for joining international and regional environmental agreements. It also prepares draft laws and decrees necessary for implementing these agreements and is responsible for monitoring their implementation. Egyptian Environmental Law No. 6 of 1994 established the Environmental Affairs Agency. A fund called the "Environmental Protection Fund" was established, its functions and mechanisms were organized, and it was stipulated that the fund has a legal personality and reports to the Minister of Environment. The fund's resources are allocated to achieve its objectives.

To protect the public environment from pollution, the Environmental Law obligates every natural or legal person to submit an Environmental Impact Assessment (EIA) study for any facility or project before commencing its implementation to ensure that it does not harm the environment and that it is

protected. The law stipulates that: "Every natural or legal person, public or private, is obligated to submit an EIA study for any facility or project to the competent administrative authority or the licensing authority before commencing project implementation. The study shall be conducted in accordance with the elements, designs, specifications, principles, and specific loads issued by the Environmental Affairs Agency in coordination with the competent administrative authorities. The competent administrative authorities are obligated to provide maps of industrial zones that clarify the types of industries permitted according to their environmental loads. The executive regulations of this law shall specify the facilities and projects to which the provisions of this article apply." (Replaced by Law No. 9 of 2009 – Official Gazette – Issue 9 bis, 1) (3/2009).

3.4. Establishment of Other Bodies Concerned with Addressing the Phenomenon of Climate Change

Egypt has established several bodies concerned with addressing the phenomenon of climate change and protecting the environment from its negative effects. The following is a list of these bodies and their establishment dates:

- 1) The National Council for Climate Change was established by Prime Ministerial Decree No. 1912 of 2015.
- 2) Prime Ministerial Decree No. 1129 of 2019 designated the National Council for Climate Change, established by Prime Ministerial Decree No. 1912 of 2015, as the national body responsible for climate change issues. The Sovereign Fund of Egypt for Investment and Development was established by Law No. 177 of 2018, and some provisions of Law No. 177 of 2017, which established the Sovereign Fund of Egypt (the Sovereign Fund of Egypt for Investment and Development), were amended by Law No. 197 of 2020. The establishment of the Sovereign Fund of Egypt was one of the mechanisms to enhance partnership with the private sector, representing the government's investment arm. It was established in 2018 within the framework of the Egyptian state's plan to achieve sustainable development, Egypt Vision 2030.

The Sovereign Fund of Egypt targets high-growth and sustainable development sectors, as well as sectors that serve Egypt's future economy. It sets its investment strategy based on the government's vision and its short-, medium-, and long-term needs. The Sovereign Fund has invested in numerous projects in the field of climate change, supporting the state's drive towards green projects. Among the projects established by the Fund are: a green hydrogen and ammonia production project, in partnership with a number of specialized international companies, and water desalination projects [16].

Chapter II: Climate-Related Environmental Events and Compensation for Them

3.5. Climate-Related Environmental Incidents: Definition and Types of Incidents, Climate-Related Environmental Damage

A climate-related environmental incident is defined as a sudden and violent natural or atmospheric disturbance or phenomenon, such as floods, hurricanes, droughts, or fires, and incidents resulting from climate change or human activities. These incidents lead to serious and direct damage to ecosystems, human health, natural resources, and livelihoods, and their consequences are often long-lasting. Therefore, climate-related environmental incidents or disasters are physical processes, variables, or water or atmospheric phenomena that can cause harm to human health or natural resources, or have negative impacts on the general environment.

Thus, climate-related environmental incidents are considered environmental disasters, which are incidents with catastrophic effects on the environment due to human activity that is harmful to the environment and its resources, such as incidents resulting from oil spills, nuclear accidents, and others. The increasing intensity of natural disasters is not a natural occurrence; One of the negative effects of climate change, caused by human activities, is that the Earth's temperature has risen by 1.2 degrees Celsius compared to pre-industrial levels. This increase is expected to continue over time, leading to a rise in the intensity of natural disasters.

Climate-related environmental disasters occur as a result of a combination of natural phenomena (changes in solar activity, volcanic eruptions) and human activities (emissions, deforestation), as well as technological, chemical, or other accidents caused by pollution that severely damages the environment. Therefore, human actions and activities are the true cause of these disasters, even if they are initially attributed to natural phenomena; human activity is what triggers them. Examples include hurricanes, floods, severe droughts, forest fires, landslides, air pollution resulting from global warming, soil degradation, water scarcity, and the increase and spread of diseases.

On the other hand, climatic-related environmental damage is a fundamental pillar in determining civil liability for climate-related environmental incidents. It represents an event or act that negatively impacts natural resources or ecosystems, with repercussions extending to neighboring countries. This element is crucial because it defines the obligations of individuals, institutions, and nations towards the environment and its protection from harm [17].

Climatic-related environmental damage can be defined as losses suffered by individuals or any loss or damage to property arising from climate-related environmental incidents, such as exposure to explosions, radiation, toxic disasters, explosive materials, toxic waste, or extreme temperature increases. Climate-related environmental damage represents a negative change in natural resources or ecosystems resulting from human activities that exacerbate climate change, such as

greenhouse gas emissions causing global warming and environmental degradation leading to decreased water and soil quality, threats to biodiversity, deteriorating health, and negative impacts on living organisms. It is also defined as the damage caused by pollution and rising temperatures, which applies to all human-caused harm affecting various natural elements; that is, any damage that harms environmental elements. It is not personal harm but rather impersonal harm, as the right to compensation for environmental damage ultimately belongs to the environment itself. It also includes the damage inflicted on the environment and its components, resulting from climate change due to rising global temperatures and altered weather patterns [18].

3.6. The Principle of Protecting the Environment from the Harm Resulting from Climate Change

States are committed to protecting the environment from the harm caused by climate change. This principle has become one of the fundamental principles recognized by international law. It is an application and reflection of the international principle of the right of ownership without harming others. According to this principle, a state has the right to use its territory as it sees fit and to conduct its various activities therein, provided that it does not harm others. Thus, its right to use its territory and exploit its natural resources is restricted by the condition of not harming others, whether by harming the environment of another state or areas of common heritage of humanity, including the atmosphere. This principle aims to achieve a balance between economic growth, which is an inevitable necessity given the high population density of a state, and the obligation to protect the environment, which is one of the consequences of this economic growth, in order to preserve and develop available resources to meet the needs of both current and future generations. The 1992 United Nations Framework Convention on Climate Change (COP3) adopted this principle. When it expressed the principles of climate justice, it affirmed the commitment of the States Parties to protect the climate system for the benefit of present and future generations of humanity [19].

3.7. Characteristics of Climatic Environmental Damage

Climatic environmental damage is characterized by its unique nature, most notably the following [20]:

- 1) Its severity, which manifests itself in individuals (workers in facilities and their dependents, customers, and citizens). This reflects the severity and widespread nature of the incidents themselves. Climatic environmental damage is distinguished by the fact that it is rarely personal; it is generally considered impersonal. For example, when the effects of a harmful act impact environ-

mental resources owned by an individual, such as agricultural land, animals, tools, and private facilities, the matter does not present a difficulty because the individual has the right to sue and seek compensation for these damages. The difficulty then lies in not identifying the perpetrator.

- 2) Its general nature and severity, affecting facilities, the environment in general, and its material resources, as well as the general environment. Climatic damage resulting from explosions or fires of materials or waste poses a threat to the work environment, the general environment, and even neighboring countries. In most cases, the harmful act results in effects on environmental elements in general, which represent common property for all. In such cases, the damage is characterized as general or collective. It did not harm a specific person or group of people, but rather damaged the environment and its elements and resources.
- 3) Environmental and climatic damage is indirect; several factors contribute to it, such as rising temperatures, water and air pollution, toxic factory gases, and other pollutants. This makes it difficult to establish a direct causal link between pollution processes and the resulting damage to the environment. Furthermore, it is difficult to determine the role of each of these sources in causing environmental and climatic damage when multiple sources are involved.
- 4) It is also potential damage with delayed or gradual effects. Environmental and climatic damage may not have immediate effects; rather, its effects may be delayed for several years. However, this does not preclude compensation, given the possibility of delayed damage. For example, a worker in a facility may be injured by a flame, and the effects may not be immediately apparent but may later affect their reproductive health, for instance. Furthermore, it is not present at the time of the incident; rather, its occurrence is merely probable—a scenario more likely in reality given the specific nature of this type of damage. It often does not manifest immediately upon the occurrence of environmental pollution, a rise in the temperature of its resources, or any other damage to them. Instead, its effects are delayed, and its consequences and impacts only become apparent after a period of time that may extend for years or even generations.
- 5) Climatic environmental damage is severe and geographically widespread. The severity of the damage lies in its danger to environmental elements, manifested through the loss or damage of physical environmental resources, or the illness or other injuries suffered by individuals. It is also widespread and transmissible; it does not stop at the boundaries of the facility or country where the incident occurred. Any climatic incident will not only affect those working there, but will extend to other individuals and even entire populations. In favorable weather conditions, its impact may even expand further. No matter

how stringent environmental safety measures are, the occurrence of a climatic environmental incident remains a possibility. Therefore, this damage is not limited to specific areas but extends far beyond its point of origin, reaching thousands of kilometers. Pollutants circulate within the atmospheres of different regions, and open seas facilitate their transfer. This widespread nature of climate-related environmental damage is one of the reasons why nations act in the name of common interest to mitigate its negative effects, in accordance with international agreements and conferences, and in recognition of our shared responsibility towards climate-related environmental problems.

Perhaps the aforementioned characteristics of climate-related environmental damage are what make it difficult to establish a causal relationship between the damage and its source, given the long period between the occurrence of the damage and the emergence of its effects, coupled with the possibility of other contributing factors alongside the original cause. For example, air pollution from emissions and gases released by a factory does not show its effects immediately. It takes a long time for these effects to manifest, leading to increased temperatures, atmospheric pollution, and consequently, negative climate changes. The same applies to radioactive pollution, whose effects only appear after a long period of time in the form of general symptoms affecting individuals, whether they are workers in facilities or citizens, not to mention the damage to the physical resources of the environment itself! This makes legal claims for compensation difficult, as we again find ourselves facing the challenge of proving causation, given that the act causing the environmental and climatic damage occurs in a specific area, and its effects and consequences extend far and wide across multiple regions [21]!

3.8. Compensation for Climate-Related Environmental Damage in International Agreements and Internal Laws

Civil liability plays a crucial role in providing civil protection for the environment from the negative effects of climate change. Undoubtedly, environmental protection cannot be effective without establishing a liability system that achieves both deterrence and remediation. Although civil liability law primarily aims to compensate for damage, it also contributes to remediating the negative effects of climate-related damage when such damage can be proven.

However, civil liability for climate-related environmental damage, like other forms of environmental damage, is characterized by the inherent nature of the damage for which compensation is sought, the difficulties in determining who has standing to claim compensation, and the specific nature of the penalty appropriate to the damage. The most significant challenges of civil liability for climate-related damage lie in several difficulties, most notably [22].

- 1) How to determine responsibility for climate-related environmental damage, especially when there are multiple parties involved? Are they individuals or states?
- 2) Most climate-related environmental damage is invisible; how can it be assessed? 3) Determining the legal basis for this liability: Is it based on fault, or does it rely on the harm itself, which is considered sufficient for its establishment?
- 3) Identifying the elements necessary for establishing liability and the means of avoiding this liability.
- 4) Climate-related environmental damage is often indirect; how can the party responsible for the damage be identified and compensated?
- 5) The multiplicity of pollutants and responsible parties makes it very difficult to distinguish between them, which prevents holding one person solely responsible.
- 6) The difficulty of estimating the monetary value of long-term or irreversible climate-related environmental damage.
- 7) The difficulty of demanding compensation from wealthy countries for emissions and pollutants, despite international courts' affirmations of countries' climate obligations.

Shared Responsibility for Climate-Related Environmental Damage (Between Developed and Developing Countries/Between the State, Establishments, and Individuals):

Pollution, global warming, and other negative effects of climate change do not discriminate between countries, societies, and individuals, nor are they confined to specific geographical boundaries. Therefore, the responsibility for addressing its effects must be borne by all countries and societies. According to climate justice, environmental costs and burdens should be shared among all countries and communities, given the presence of polluting facilities and the sources of pollution. The global nature of climate change's environmental impacts necessitates comprehensive, collective solutions involving both contributing and affected nations. All countries and communities must share the responsibility for addressing climate change and repairing its damage.

However, compensating for climate-related environmental damage faces significant challenges, particularly since responsibility for this damage is shared and complex. Implementing the principle of shared responsibility among nations in addressing climate change requires an exchange of environmental debt owed by developed countries to developing countries—through investment in nature within the latter. While Western industrialized nations are responsible for global warming, aid programs and the transfer of clean technologies to developing countries absolve them of responsibility. Furthermore, developing countries are home to facilities responsible for toxic and harmful emissions. The problem doesn't end there; it extends to the responsibility of these facilities and the individuals who cause pollution. Therefore, addressing the phenomenon of climate change and repairing the resulting damage requires concerted efforts and measures, given that

responsibility is shared between states, and between the state, institutions, and individuals.

Principles of the International Court of Justice on Compensation for Climate-Related Environmental Damage

In the cases of *Costa Rica v. Nicaragua* (2018) and the *Democratic Republic of the Congo v. Uganda* (2022), the International Court of Justice affirmed the need to protect the environment from climate change and identified relevant conventions, customary standards, and legal obligations. The Court also emphasized the dispersed nature of climate change and that multiple causes do not preclude establishing state responsibility and the payment of compensation. Through the cases before it, the Court affirmed several important principles and obligations regarding compensation for climate-related environmental damage, which rightly serve as foundational principles for such compensation cases, such as:

- 1) Establishing climate responsibility as a legal issue; This establishes climate responsibility as a legal issue—not merely a moral or political obligation—opening the door to legal claims, lawsuits, and compensation claims. Countries can now sue each other for responsibility for greenhouse gas emissions, radiation, rising temperatures, pollution, and climate change. This landmark decision could pave the way for compensation claims from the largest fossil fuel consumers.
- 2) The Court affirmed that developing countries have the right to claim compensation for climate change damages, such as damage to buildings and infrastructure, and losses to property or persons. This may include compensation if the damage cannot be repaired.
- 3) The Court affirmed that international climate treaties, such as the Paris Agreement and the United Nations Framework Convention on Climate Change, impose legally binding obligations on countries regarding emissions reduction, technological and financial cooperation, and the development of ambitious plans to combat the negative impacts of climate change.

Second: Mechanisms and Cases of Compensation for Climate-Related Environmental Damage:

Compensation for Climate-Related Environmental Damage According to the Rules of Strict Liability:

The objective approach to determining strict liability for climate-related environmental damage represents a qualitative shift in legal thought. It is based on holding the perpetrator of the damage accountable—whether a state, an establishment, or an individual—once the environmental damage has occurred and a causal link with the harmful activity has been established, without requiring proof of fault or negligence, as follows [23].

This shift came as a reaction to the inadequacy of the risk theory in covering environmental damage, and in light of the complexities of transboundary environmental issues and the increasing number of high-risk industrial and technological activities such as nuclear energy, oil extraction, chemical industries, and atmospheric pollution. This approach is based on

legal and practical foundations, most notably: enabling those affected to easily obtain compensation, strengthening the principle of prevention, and ensuring the fair distribution of burdens by holding those who benefit from hazardous activities responsible. The principle of strict liability, which holds a state or other actor responsible for environmental and climatic damage, requires a causal link between the activity and the damage, without needing to prove fault or negligence. A state that engages in hazardous activities is considered responsible for the resulting risks, even if it has taken all necessary precautions and measures. This is in accordance with the principles of justice and equity: whoever engages in activities—even for legitimate purposes—must bear the consequences of any resulting environmental and climatic damage.

The United Nations International Law Commission (ILC), in its 2001 draft on "International Responsibility for Wrongful Acts," adopted the principle of strict liability for environmental damage. This principle states that liability for certain environmental activities arises without needing to prove fault or negligence, provided a direct causal link between the activity and the environmental damage is established. Thus, strict liability has been adopted in the field of international environmental protection to compensate for environmental damage and to deter states or other actors from engaging in hazardous activities without adequately considering their environmental consequences. The International Law Commission (ILC) also emphasized the importance of the "risk theory" within its environmental protection projects, stating that "activities involving high risk require responsibility based on results rather than intentions, in order to ensure justice for those affected and prevent evasion of responsibility under the guise of not proving fault."

3.9. Forms of Compensation for Climate-Related Environmental Damage

The system of redress and compensation within the framework of civil liability has proven effective in repairing damages to persons and property. However, this effectiveness is not as pronounced with regard to repairing climate-related environmental damage. In some cases, it can be described as ineffective and unattainable, necessitating the adoption of new rules and the adaptation of traditional rules to align with the nature and specific characteristics of environmental damage, in order to protect the human right to a healthy environment.

According to Article (1/8) of the Egyptian Environmental Law, compensation for environmental damage means: "Compensation for all damages resulting from pollution incidents stemming from violations of the provisions of laws and international agreements to which the Arab Republic of Egypt is a party, or from pollution incidents involving toxic and other harmful substances, or resulting from air pollution, or from ship groundings or collisions, or incidents occurring during loading and unloading, or from any other incidents. Compensation includes redress for conventional and environmental

damages and the costs of restoring the situation to its previous state or rehabilitating the environment."

Compensation for climate-related environmental damage involves obligating polluters (countries, companies, or individuals) to redress the harm caused by climate change, either by restoring the environment to its previous state or by paying monetary compensation if implementation is impossible. This is based on the well-established international principle of "the polluter pays," and includes environmental restoration, repair of ongoing damage, and compensation for climate-related incidents and losses resulting from emissions, harmful gases, and other factors. Legal mechanisms vary depending on national policies and procedures, but the common thread is the attempt to achieve environmental justice by redressing damage in the fairest and most effective way. While monetary compensation is the most common form, in-kind compensation remains an important legal tool in environmental cases, as losses are difficult to assess in monetary terms and require environmental rebalancing, as follows [24].

In-Kind Compensation: Compensation for environmental damage is not limited to repairing the damage by granting financial sums to those affected. It also includes other means of redress, primarily restoring the environment to its previous state; that is, restoring environmental balance and addressing the effects of the harmful action. This type of compensation is usually preferred for environmental damages, such as reforestation, water cleanup, or the restoration of damaged ecosystems to prevent further damage.

Monetary Compensation: When in-kind compensation is impossible, it is used to compensate those affected. This is employed when in-kind compensation is impossible or difficult, to cover the cost of environmental restoration or to compensate individuals for their personal or economic losses.

Monetary compensation for climate-related environmental damage is considered a backup option. The primary method is in-kind compensation for such damages, but this is difficult to achieve in most cases, making monetary compensation an alternative and backup method for repairing the damage.

Fines and Taxes: Environmental taxes include taxes on emissions trading systems and accident compensation funds, such as the Loss and Damage Fund for dealing with climate change. As for fines – as a means of repairing the environmental and climatic damage and deterring establishments from doing the same again – we find that the Egyptian Environmental Law stipulated several penalties in this regard, including what it stipulated in (Article 84/1) that: "Without prejudice to any more severe penalty stipulated by another law, anyone who violates the provisions of Article (28) of this law shall be punished by imprisonment, and by a fine of not less than five thousand pounds and not more than fifty thousand pounds, or by one of these two penalties."

4. Results

1) Climate change is a global phenomenon; it transcends

national borders, posing a threat to the entire world. It cannot be addressed by any single country but requires concerted international efforts.

- 2) Climate change is caused by the increasing proportion of carbon emissions, which trap heat in the Earth's interior at unprecedented rates.
- 3) Egypt has joined numerous bilateral, regional, and international environmental agreements, which have undergone significant development since the Rio Conference in 1992, up to the Paris Climate Change Conference in 2015, and the Sharm El-Sheikh Conference in 2022.
- 4) Egypt has acquired technologies suitable for its goal of achieving a green climate.
- 5) The 1997 Kyoto Protocol represents a qualitative leap towards the globalization of environmental issues and the creation of the necessary mechanisms for its implementation. This protocol also represents the first executive step of the 1992 United Nations Framework Convention on Climate Change.
- 6) The National Council for Climate Change was established by Prime Ministerial Decree No. 1912 of 2015. Prime Ministerial Decree No. 1129 of 2019 designated the National Council for Climate Change, established by Prime Ministerial Decree No. 1912 of 2015, as the national body responsible for climate change issues.
- 7) Civil liability for climate-related environmental damage, like other types of environmental damage, is characterized by the specific nature of the damage for which compensation is sought, the difficulties in determining the party entitled to claim compensation, and the specific nature of the penalty that is commensurate with the damage.
- 8) The Recommendations:
- 9) To strive for a global agreement on how to translate this principle of common but differentiated responsibilities into a fair and equitable distribution of the benefits and burdens associated with climate change among nations.
- 10) To establish climate responsibility as a legal issue; that is, to establish states' climate responsibility as a legal issue—not merely a moral or political obligation—thus opening the door to legal claims, litigation, and compensation claims.
- 11) Adherence to the Paris Agreement on climate change requires international cooperation to protect the environment and mitigate emissions that cause climate change. 4) Strengthening international cooperation to mobilize the means of implementation for achieving the Sustainable Development Goals, and enhancing international relations to transfer expertise, innovations, and (clean) technologies.
- 12) Addressing legal shortcomings regarding the provision and monitoring of financial allocations for greenhouse gas emission mitigation and adaptation efforts to the negative impacts of climate change, as well as designing a clear institutional framework with defined tasks,

powers, and responsibilities (as a central body) to coordinate among various stakeholders.

- 13) Implementing integrated legislative and executive measures and comprehensive legal protection to address the environmental and social repercussions of climate change and its negative impacts on citizens, their families, and their dependents, as well as their livelihoods, places of residence, and employment opportunities.
- 14) We need to adopt technologies that achieve less carbon-dependent economic growth. Financial support for these technologies is essential.
- 15) A legal amendment to establish a special fund to address climate change, called the "Climate Neutrality Fund," as a direct national point of contact for activating financing mechanisms, grants, and technical assistance from the Green Climate Fund at the international and regional levels.

Abbreviations

EEAA	The Egyptian Environmental Affairs Agency
CDM	Clean Development Mechanism.
UNFCCC	United Nations Framework Convention on Climate Change
EIA	Environmental Impact Assessment

Author Contributions

Ola Farouk Salah Azzam: Conceptualization, Formal Analysis, Methodology, Visualization

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Conflicts of Interest

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