An update on Egypt climate change policies post-coronavirus

A Research Presented To

The Twenty-Second Annual International Conference

Legal and Economic Aspects of Climate Change

March 19-20, 2023 AD

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Abstract

Egypt's climate has changed during the past several decades. Changes in the Mediterranean Sea's sea level, precipitation, and extreme weather events have all been detected. The geographic position of the nation has exacerbated the severity of the effects of climate change. Consequently, the importance of addressing climate change is rapidly growing. The nation makes its commitment and efforts to counteract the effects of climate change a top priority. In its 2030 Vision and sustainable development strategy, Egypt has pledged to incorporate climate change into its national development plans. Nonetheless, the outbreak of the global pandemic and the associated increase in mortality rates posed a major risk to socioeconomic systems. The country adopted a number of fiscal measures and stimulus packages to mitigate the risks posed by the global pandemic. This might, therefore, undermine the country’s efforts to address the impact of climate change. This study intends to critically analyse Egypt's recent climate change policy post-COVID19 in the context of both the Paris agreement and COP27. It argues that despite the COVID19’s

impact on the country's socio-economic conditions, Egypt's climate regulatory framework development is undergoing moderate but steady progress. It further argues that the nation's current legal framework consists of laws and regulations that support climate change governance, but it lacks comprehensive, climate-focused laws to fully address the two dimensions of climate change plans, those are adaptation and mitigation.

KEYWORDS: *Climate change policies; Egypt; COVID19; COP27*

1. Introduction

Anthropogenic climate change has generated extensive negative consequences, losses, and damages to environment and humans (IPCC 2014, 2007). The Intergovernmental Panel on Climate Change (IPCC) 6th Assessment Report demonstrates that climate change will intensify at 2°C of warming and will affect every part of the world. Projections of 1.5°C of global warming indicate increased frequency of heat waves, shorter cold seasons, and prolonged warm seasons (IPCC 2021). Climate change accelerates the water cycle and increases the severity of precipitation, causing more floods. In contrast, several regions, including Northern, Western, and Central Europe, will see more

acute drought conditions (Arias *et al.* 2021). In addition, A continuous rise in sea levels is projected over the 21st century, increasing the likelihood of flooding in low-lying places (Prandi *et al.* 2021).

The climate change crisis is developing in a politically and economically complicated global context. The COVID-19 outbreak and the Russian-Ukrainian war have delayed global economic development and affected global supply networks, leading to a worldwide rise in the cost of food, fertilisers, energy, and commodities, especially in underdeveloped nations (FAO *et al.* 2022). Egypt, like with various other economies, is challenged with the negative consequences of climate change, COVID-19, and conflict.

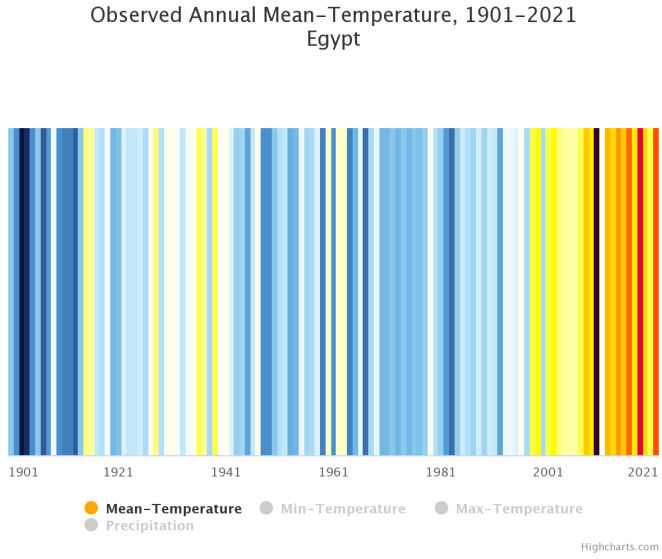
Climate change's effects is witnessed most acutely in Egypt. One of the global hotspots that is highly prone to climate change risks is the Nile Delta (Sušnik *et al.* 2015, Abd-Elhamid *et al.* 2016, El-Nahry and Doluschitz 2010, Elbeltagi *et al.* 2020, Abutaleb *et al.* 2018). With agriculture, manufacturing, and fisheries, this region is responsible for more than fifty percent of Egypt's economic activity. (UN 2023). The Nile Delta produces roughly 20 percent of the country’s GDP and employs approximately 30% of the working force (UN 2023, Ministry of Finance 2022).

Egypt is expected to experience water scarcity, sea-level rise, and more frequent and severe extreme weather events as a result of climate change (Abutaleb, Mohammed, and Ahmed 2018, El-Nahry and Doluschitz 2010). This would jeopardise infrastructure, beaches, and fertile soil in the Nile Delta because of their vulnerability to erosion, saltwater intrusion, and flooding (Elbeltagi *et al.* 2020, Abd-Elhamid *et al.* 2016). Egypt's food security, human health, economy, and ecosystems are thereby threatened (Shalby *et al.* 2021, Sušnik *et al.* 2015).

According to climate projections, present and future climate changes result in a substantial environmental risk that might undermine Egypt's economic development and poverty alleviation (Mahmoud 2019, Mostafa *et al.* 2021). Human settlements would additionally suffer severe damage from climate change hazards. In addition, it would have an impact on food and water access (Mostafa *et al.* 2021). Men and women are anticipated to be equally impacted by the substantial predicted effects on human activities, which would significantly impede the nation’s efforts to attain the sustainable development goals, particularly the seventh goal related to mainstreaming sustainable development into national plans (Bulbul 2022, UNFCCC 2022b).

Egypt is extremely susceptible to climate change risks, which may undermine its sustainable growth. Agriculture, water, energy, tourism, and health are the most sensitive industries to climate hazards owing to rising temperatures, heat stress, irrigation water shortages, and sea level rise (UNDP 2022b). North Coast human communities, massive portions of arable land, and industrial regions will suffer severe harm because of climate change (World Bank 2021). Figure 1 illustrates the country's observed annual mean-temperature between 1901 and 2021.

Figure 1: Egypt's Observed Annual Mean-Temperature (1901-2021)

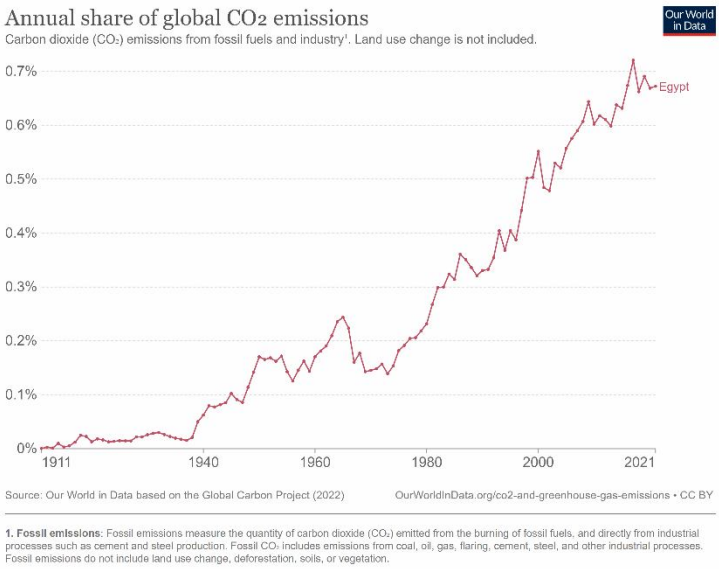


Source: (World Bank 2021)

Egypt contributes more to global CO2 emissions than the rest of Africa, but less than the world average. Around 0.6% of global GHG emissions are produced by Egypt (Ritchie *et al.* 2020). Yet, the government has made a number of steps to reduce these emissions, including a goal to raise the proportion of renewables in its power supply by 42% by 2035 (IRENA 2018). The annual CO_2 emissions were estimated to be 249.62 million tons in 2021, with per capita emissions equivalent to 2.28 tons (Ritchie *et al.* 2020). Since the primary source of energy is oil, the power industry is the largest emitter of $CO_{2,}$ accounting for 32% of the country's emissions, followed by transportation (22.7%) and industry (18.7%) (Worldometers 2022). Figure 2 illustrates Egypt's annual share of global CO_2 emissions.

By improving its energy efficiency and utilising its significant renewable energy potential, Egypt might achieve further reductions of GHG emissions. While the capability for lowering greenhouse gas emissions is not currently being completely utilised, high energy subsidies prevents investing in the energy market. The government has recently implemented a number of policies to boost both the contribution of renewables to the energy supply and the efficient use of energy (Ministry of Finance 2022).

Figure 2: Egypt's Annual Share of CO_2 Emissions



Source: (Ritchie et al. 2020)

Adaptation to current and projected climate change is essential, notwithstanding the necessity of mitigation actions. It is anticipated that climate change would amplify current environmental issues. Various sources, including the successive versions of both the UNDP Global Human Development Report and the Intergovernmental Panel on Climate Change (IPCC), have highlighted the country's extreme vulnerability to climate change, mainly because of its reliance on Nile River water (Pörtner *et al.* 2022, UNDP 2022a).

As a result of the observed and potential effects of climate change, the country is rapidly becoming more aware of the need for both local and global climate change measures. The nation's attempts to counteract the impacts of climate change have reached a critical stage. Egypt has committed in its 2030 Vision to include climate change into its national development goals and to increasingly adopt a green budget (The Egyptian Government 2016).

The regulatory framework of climate change in Egypt incorporates legal, institutional, and policy frameworks. The Egyptian constitution of 2014 along with the Environmental Protection Law (and its executive regulation constitute the legal framework of climate change governance. With regards the climate change policy framework, Egypt published its "First National Communication" in 1999, following the publication of a number of relevant policies, including the First National Environmental Action Plan (NEAP) and the Support for National Action Plan (SNAP) (EEAA 1999). Egypt has subsequently submitted its "Second National Communication" (SNC) and "Third National Communication (TNC) to the UNFCCC (EEAA 2010b, 2016). Agricultural development, water resource management, and irrigation have long been the subject of national policies and

initiatives. Notwithstanding these initiatives, persistent issues have shown that strategies and policies have made minor advances towards effective and efficient implementation (Barakat *et al.* 2022).

In November 2015, Egypt submitted its Intended Nationally Determined Contribution (INDC) in order to fulfil the global targets stated in the Paris Agreement of the UNFCCC (Abdallah 2020, Climate Action Tracker 2020). The INDC was regarded as Egypt's first NDC following the nation's signing of the 2015 Paris agreement on 22 April 2016, followed by its ratification of the agreement on June 29, 2017. Egypt revised its first NDC in 2022, encompassing the period 2015-2030 (UNFCCC 2022b). The updated NDC is consistent with the country's major development, climate change policies, and sectoral policies, including Egypt's Vision 2030, the National Climate Change Strategy 2050 (NCCS), the National Strategy for Adaptation to Climate Change, the Long-Term Low Emission Development Strategy 2050 (LT-LEDS), and the National Strategy for Disaster Risk Reduction 2030 (UNFCCC 2022b).

The main purpose of this paper is to conduct a critical analysis of the existing regulatory framework of climate change governance in Egypt with a particular emphasis on the period

following the outbreak of the global pandemic, COVID19. For this purpose, the paper examines the various aspects of current legal and policy framework, including laws, regulations, and strategies. The Constitution of Egypt and Law No. 4/1994 on Environmental Protection, as well as its executive regulation, comprise the primary components of the legal framework. With regards the current policies and strategies, three strategies were analysed, including Egypt Sustainable Development Strategy 2030, Egypt National Climate Change Strategy 2050. The study further examines the nation's attempts to transition to a green economy.

This paper is subdivided into eight sections. The second section is the paper's methodological framework, which is a critical literature review. Section 3 provides background information on the foundation of Egypt's climate change policies. The fourth section explores Egypt's involvement in international climate change negotiations under the UNFCCC, particularly the Paris Agreement and COP27 in Sharm El Sheikh. Section 5 is devoted to review, based on available research, of the present legal and policy framework of climate change. Section 6 reviews the most recent green economy policies and practises in Egypt. The results and discussion are presented in Section 7, while the conclusion is provided in Section 8.

2. Methodology

This paper represents a critical literature review. It critically analyses the current climate change policies in Egypt. It reflects on the recent policies adopted by the Egyptian government during the period that follows the global outbreak of the COVID-19 pandemic. The study continues by presenting opinions, perspectives and approaches related to such policies with an aim to evaluate their sufficiency and effectiveness. For this purpose, the paper examines the legal and policy framework of climate change in Egypt by reviewing selected legislations, strategies, and plans. This includes the Egyptian Constitution of 2014, the Environment Law, Sustainable Development Strategy, NCCS, and INDC. The paper relies on various data sources, including official websites of the United Nations Convention on Climate Change (UNFCCC), United Nations Environment Programme (UNEP), and United Nations Development Programme (UNDP). Further sources are obtained from websites of relevant local government agencies, including the Egyptian Cabinet, the Ministry of Environment, the Ministry of Planning and Economic Development, the Ministry of Electricity and Renewable Energy, and the Ministry of Finance.

The analysis relied on secondary data extracted from journal publications, conference proceedings, reports, press

announcements, newspaper articles, official websites, and official government documents, such as laws, rules, plans, programmes, and strategies. The study's time frame includes the regulatory framework adopted in the post-coronavirus.

3. Background

Egypt is a prominent participant in international climate change negotiations. It took part in the Earth Summit, which was held in Rio de Janeiro in 1992 and was also referred as the United Nations Conference on Environment and Development. At this conference, it participated in the discussions for the UNFCCC, the United Nations Framework Convention on Climate Change. Egypt signed the UNFCCC in June 1992, followed by its ratification in December 1994 (UNFCCC 2015b).

Additionally, Egypt took part in the Conferences of Parties that followed the UNFCCC. It signed the Kyoto Protocol in March 1999, and it entered into force in April 2005 after being ratified in January 2005 (UNFCCC 2015c). It also took part in the UNFCCC's 15th Conference of the Parties and the Kyoto Protocol's 5th Meeting of the Parties, both of which took place in Copenhagen in December 2009 (UNFCCC 2010) . It further participated in debates about the Kyoto Protocol Amendments, the Report on the Ad Hoc

Working Group on Long-term Cooperative Action, and Nationally Appropriate Mitigation Actions. Finally, the 19th Conference of Parties to the UNFCCC, held in Warsaw, witnessed the participation of Egypt (UNFCCC 2014).

Egypt, as a non-Annex I party to the UNFCCC, developed and filed two national communications, the Initial National Communication and the Second National Communication, based on its commitments under Articles 4 and 12 of the UNFCCC (EEAA 2010b). The First National Communication was filed in 1999, and the Second National Communication in 2010 (EEAA 2010b, El-Ramady *et al.* 2013, Nachmany *et al.* 2015). These communications are in-depth analyses of climate change economic, environmental, and social impacts on Egypt. According to their projections, the primary climate change impacts in Egypt would include rising temperatures, less precipitation, increasing intensity of extreme weather events, sea level rise, and decreased Nile discharge (EEAA 2010b, Nachmany *et al.* 2015). Additionally, they indicated that the most vulnerable sectors to the climate change risks include agriculture, water resources, and coastal regions (El-Ramady *et al.* 2013). As a result, the Millennium Development Goal relating to maintaining environmental sustainability is hindered by climate change. Additionally, these communications offer numerous

adaptation and mitigation plans to deal with the two main dimensions of climate change governance (EEAA 2010b, 1999). They described the economic implications of these strategies, including their cost and funding sources (EEAA 1999, 2010b).

The Third National Communication (TNC) was prepared by Egypt in collaboration with the UNDP and selected government bodies, including the Ministries of Agriculture and Land Reclamation, Environment, Electricity and Energy, Foreign Affairs, Health, Industry and Trade, Petroleum, Tourism, Transportation, Water Resources and Irrigation, and the Supreme Energy Council (EEAA 2016). Through the inclusion of up-to-date information about Egypt's vulnerability to climate change and the alternative solutions for climate change governance, TNC was viewed as an updated version of the Initial National Communication and the Second National Communication (Abdrabo and Hassaan 2020). It also tried to fill in data gaps from earlier communications and included topics like tourism, biodiversity, and ecosystems (Abdrabo and Hassaan 2020, EEAA 2016, Hefny *et al.* 2019).

Egypt also took part in the Kyoto Protocol's Clean Development Mechanism (CDM) (EEAA 2010b, a). The Egyptian Designated National Authority for Clean Development Mechanism registered and filed a number of CDM projects for approval (EEAA

2018, 2010a). Through investments in renewable energy, afforestation, reforestation, organic agriculture, and waste management, these programmes sought to minimise greenhouse gas emissions from agriculture, energy, and transport (EEAA 2018).

The regulatory framework of climate change in Egypt incorporates legal, institutional, and policy frameworks. The Egyptian constitution initially acknowledged the environment in 2007, when Article 59 was added to the constitution of 1971 (Refworld 2014a). According to this article, environmental protection is a national responsibility and actions to guarantee this protection should be governed by law (Refworld 2014a). The constitution of 2012 recognized the right to "a healthy, undamaged environment" and obligated the state to safeguard the nation from pollution, highlighting the Nile, farmlands, and natural resources as the citizens most vital environmental qualities. (Tadamun 2014, Abdel Monem and Lewis 2020). Additionally, article 20 mandates the protection of Egypt's coastlines, oceans, rivers, and lakes, as well as their preservation and elimination of any illegal intrusions (Tadamun 2014).

The legal framework of climate change in Egypt is composed of the laws, regulations, and decrees that address issues related to climate change and environmental protection. The Law

Number 4/1994 for Environmental Protection and its executive regulation were issued in 1994; it revoked the Law Number 72/1968 for Prevention of Pollution of Sea Water by Oil (EEAA 2022b, Sowers 2013, El-Hakim 2001). The subject areas regulated by the Law Number 4/1994 were associated with the protection of air, land, and water from pollution. In addition, the Law specified a number of penalties in case of any act caused pollution of air, land, or water in violation of its provisions (EEAA 2022b).

With regards the institutional framework, Prime Minister Order No. 631 of 1982 created the Egyptian Environmental Affairs Agency (EEAA) as the administrative entity in charge of environmental concerns in Egypt (EEAA 2022a). Law 4/1994 designates the EEAA as the agency in responsibility of environmental affairs.

The Prime Minister's Decree No. 272 established "The National Committee on Climate Change" in 2007, and the Minister of the Environment served as its chair (EEAA 2010a). In addition to the Ministry of Environment, the committee includes officials from relevant ministries, such as the Ministry of Water Resources and Irrigation and the Ministry of Agriculture and Land Reclamation. Furthermore, functional Ministries such as the Ministry of Foreign Affairs, Ministry of Electricity and Energy,

Ministry of Petroleum, Ministry of Commerce and Industry, Ministry of Local Development, and Ministry of Defense were represented. The committee was charged with developing adaptation and mitigation strategies for climate change; the committee was redesigned in 2007 to oversee climate change initiatives (EEAA 2010a).

On the adaptation side, Egypt's National Environmental, Economic and Development Study (NEEDS) for Climate Change was submitted in 2010 (EEAA 2010a). The NEEDS assessment outlines several adaptation strategies designed specifically for agriculture, coastal zones, and freshwater resources, including developing a national strategy for integrated coastal zone management, enhancing irrigation efficiency and current crop patterns, and establishing an adaptation fund (EEAA 2010a).

Additionally, Egypt formulated its "National Strategy for Adaptation to Climate Change and Disaster Risk Reduction" in 2011 (IDSC & UNDP 2011). The objective of the plan is to enhance the ability of Egyptian communities to adapt to the risks and repercussions of climate change on various sectors (IDSC & UNDP 2011).

On the mitigation side, Egypt created the "Low Emission Capacity Building" programme in 2013 (UNDP 2018). This project was funded by the UNDP and aims to improve national capacities to (1) develop a low-carbon emission plan; (2) identify potential for successful mitigation activities; (3) permit the development and execution of mitigation actions by individual industries; and (4) establish MRV mechanisms for mitigation actions (UNDP 2018).

The Egyptian economy was affected by the outbreak of the Corona pandemic, as is the case with the economies of countries around the world. In addition to its impact on public health, the global pandemic has had wide-reaching effects on various economic sectors in Egypt. The Egyptian government has taken a package of measures, whether at the level of the health sector or on the economic side, to confront the repercussions associated with the virus and its rapid spread. At the level of economic policies, a set of monetary and fiscal policies have been taken to revitalize the economy and combat the risk of contraction in economic activity linked to the closure and curfew measures that coincided with the outbreak of the pandemic. Consequently, the Egyptian government has launched a full stimulus package worth at least EGP 100 billion to combat the shocks resulting from the pandemic (Ministry of Finance 2020).

The main objectives of those policies included stabilizing domestic inflation rates, increasing foreign reserves, and improving financial indicators, all in addition to the need to move forward in economic growth to enhance productive sectors and reduce the burden of public debt (Elkhashen *et al.* 2021). The adoption of fiscal stimulus measures during the pandemic was essential, and some of these measures remain enforced even after the outbreak ended.

4. Role of Egypt in International Climate Change Negotiations: The Paris Agreement & Beyond

At the UN Climate Change "COP21" in Paris, Egypt represented Africa. To counteract the effects of climate change, the region requires international assistance on both a technical and financial level (Dröge 2016). Egypt presented the two African initiatives to the UN Climate Change Summit as the continent's representative. The first project aims to boost the adoption of renewables in Africa, while the second endeavours to enhance the continent’s climate change adaptation (Medany 2016, IISD 2015).

Egypt argued that the binding force of the agreement would emerge from establishing clear obligations on the side of developed countries to aid and finance the efforts of developing nations to

tackle climate change, particularly in the areas of technology transfer and capacity building (Medany 2016, IISD 2015). Furthermore, it argued that global warming must be restricted to 1.5°C and to avoid transferring the responsibility of climate change mitigation to poor nations (Zhongming *et al.* 2018, Khater 2015).

In November 2021, Egypt took part in the 26th United Nations Climate Change Conference of the Parties (COP26) in Glasgow (SIS 2021). During the conference, Egypt highlighted issues of relevance to developing nations, especially African nations, including boosting efforts to strengthen international climate action (SIS 2021, Presidency 2021). This is in addition to emphasising the significance of industrial nations' adherence to their obligations under the Paris Agreement and highlighting Egypt's willingness to host the COP27 to be held in 2022 (SIS 2021, Presidency 2021).

The 27th annual Conference of Parties (COP27) of the United Nations Framework Convention on Climate Change (UNFCCC) took place in Sharm El-Sheikh, Egypt in November 2022 (Rummukainen 2022). The COP27 talks were centred on advancing the strategy for carrying out the objectives, commitments, and pledges made at COP26, which included an agreement on the global temperature goal in addition to pledges

regarding climate finance, forest protection, and net-zero commitments (Manning 2022).

A consensus was established on the Sharm el-Sheikh Implementation Plan following a year of diplomatic efforts by the Egyptian presidency, extensive informal work prior COP27, weeks of political and technical negotiations, and attempts at resolving negotiating deadlocks. (Latham & Watkins 2022). Based on this plan, decisions regarding the creation of a Loss and Damage Fund, a mitigation work programme, the Global Goal on Adaptation, additional guidance regarding the implementation of Sixth article of the Paris Agreement on global carbon markets, and the overarching "cover decisions" were reached (Rummukainen 2022, Latham & Watkins 2022).

Arguably one of the most significant consequences of COP27 was the formation of the Loss and Damage Fund, which attempts to assist poor nations that are most exposed to the risks of climate change (Latham & Watkins 2022, UNFCCC 2022a). This includes damages resulting from extreme weather events, sea-level rise, and other severe and ongoing effects of climate change causing losses in underdeveloped nations (UNFCCC 2022a). In the final COP27 declaration, the necessity of financial assistance from a variety of sources was highlighted. However, no decisions have

been taken regarding the contributions to the fund, their sources, or the beneficiaries (Al Amer 2022). A Transitional Committee has been formed to offer suggestions for the effective implementation of the new financial arrangements, which will be taken into consideration and decided upon at COP28 the following year (Al Amer 2022).

5. Legal and Policy Framework of Climate Change in Egypt

5.1 The Egyptian Constitution and the Environment Law

Key economic sectors of Egypt, such as agriculture, manufacturing, energy, transport, and water, are strongly linked to climate change. In addition to being heavily influenced by climate change, these sectors are also major contributors to the nation's greenhouse gas emissions. The formulation of an environmental strategy that recognises the exposure of different sectors to climate change and regulates their GHG emissions is a major obstacle. Egypt has, therefore, prioritised environmental legal framework in response to this challenge.

Article 46 of the constitution of 2014 asserts the right of the people to a healthy environment and commits the state to its conservation and exploitation of natural resources in a way that promotes sustainable development and safeguards the rights of

future generations (Refworld 2014b). In addition, the constitution safeguards inhabitants' freedom to enjoy lakes, beaches, streams, and other natural areas and prohibits their usage in a manner incompatible with their nature (Tadamun 2014It also requires the state to protect endangered species and to treat animals with caring, as well as to permit fishing operations that do not impair the marine ecosystem (Refworld 2014b, Tadamun 2014). Finally, The state should support scientific research on water security and renewable energy sources, according to articles 44 and 32 of the 2014 Constitution (Refworld 2014b, Tadamun 2014).

In addition to the Egyptian constitution, Law number 4/1994 is regarded as the country's first environmental protection statute, outlining the responsibilities of the Ministry of Environment and the Egyptian Environmental Affairs Agency (EEAA) (EEAA 2022b, Abdel Monem and Lewis 2020). The Law lays out regulations regarding land, air, and water pollution (IEA 2022a). The Law was revised and amended by laws number 9/2009 and 105/2015, respectively (IEA 2022a); Changing terminology and adding new articles constituted the majority of the updates (IEA 2022a). In addition, the executive regulation of the Law was amended by a number of prime minister’s decrees, including the Prime Minister's Decrees Number 1741/2005, 1095/2011,

964/2015, 544/2016, 618/2017, and 1963/2017 (EEAA 2022b, IEA 2022a).

This law, composed of 65 articles grouped into 4 Parts and 10 Annexes, is intended to safeguard the environment, including water, land, and air, against pollution. The main subject matters of the law include (Abdel Monem and Lewis 2020, EEAA 2022b, IEA 2022a, UNEP 2022c):

- Establishing and implementing environmental protection policies, strategies, and standards;
- Conducting pilot projects and providing economic incentives to promote better environmental sustainability;
- Conducting environmental research, monitoring, and assisting other organisations with their monitoring responsibilities;
- Developing an environmental contingency plan to address environmental crises and developing a nationwide system of environmental impact assessment
- Coordination and oversight of international environmental commitments and development of environmental education initiatives.

In accordance with the law and its executive regulations, and for the purposes of safeguarding air from pollution, using pesticides or other chemical compounds for agricultural, public health, or other goals must be done so as to not directly or indirectly expose people, animals, plants, waterways, and other environmental elements, either now or in the future (EEAA 2022b, UNEP 2022c). In addition, the law indicates that other than in specific locations authorised for this purpose, garbage and solid waste should not be treated or incinerated (UNEP 2022c).

With regards protection of water from pollution, this legislation is intended to protect ports, coasts, the territorial sea, and the exclusive economic zone, as well as their specific ecosystems, against all forms of pollution (UNEP 2022c). The Law addresses all forms of pollution from land-based sources and that resulting from ships, procedures for polluted wastewater discharge from ships and offshore platforms, and conditions for works that may adversely impact the beach's natural coastline (EEAA 2022b).

The Law was subject to two major amendments. The first amendment took place in 2009 via Law number 9/2009. This Amendment, which consists of five articles, highlights the connection between environmental preservation and development. It addresses coastal protection via integrated environmental

management of coastal zones (UNEP 2022a). Articles 19–22 require development projects to conduct an Environmental Impact Assessment as a prerequisite for receiving a licence (EEAA 2022b). The law also regulates air emissions, noise emissions, and management hazardous and non-hazardous waste. The amendment forbids the illegal trade, use, import, and possession of ozone-depleting substances (EEAA 2022b). In addition, the Supreme Council for the Protection of the River Nile and Waterways is established under Article 47 Bis (UNEP 2022a). Finally, those who breach the terms of the law face harsher punishments.

The second amendment was conducted in 2015 via Law Number 105/2015 in addition to the amendment of the executive regulation via Prime Minister Decree Number 964/2015 (EEAA 2022c). The amendments included rules concerning the environmental protection fund and coal handling guidelines, such as methane emissions (ILO 2022, UNEP 2022d). This amendment specifies the various sources of funds for the environmental protection fund as well as the conditions under which they are distributed. Different sorts of environmental initiatives in Egypt are funded by the fund; these include pilot programmes for sustainable development, pollution reduction, environmental protection, and the promotion of technology transfer to alleviate environmental

risks (UNEP 2022d, ILO 2022, IEA 2022b). Provincial governments and non-government organisations are the primary recipients of the resources. Nevertheless, if a private project is eligible for the fund and the fund board has given its permission, the project may receive support from the fund (IEA 2022b).

The latest amendments of the executive regulation occurred in 2017 by the Prime Ministerial Decrees Number 618/2017 and 1963/2017. The amendments aimed at addressing the various processes related to solid and hazardous waste management, starting from collection and ending by disposal (EEAA 2022e, d). Any solid waste must only be disposed of in locations established for this purpose, according to the Prime Ministerial Decree Number 1963/2017 (EEAA 2022e). In addition, any establishment engaged in generating hazardous waste of any form is committed to handle such waste in disposal locations that are already planned for this purpose by local governments in coordination with the competent authorities and the EEAA (EEAA 2022e).

The Egyptian Senate considered amendments to the Environment Law (4/1994) and a new automobile manufacturing bill that the government proposed in October 2022 (Essam El-Din 2022, Abdelaziz 2022, Ali 2022, Youssef 2022). The main objective of the amendments to Egypt's Environment Law (4/1994)

is to encourage the use of environmentally friendly modes of transportation on a larger scale, thereby enhancing the quality of life in Egypt (Essam El-Din 2022). The amendments embody the state's new strategy for transitioning to a green economy, which is centred on lowering air pollution and emissions from transportation by promoting and sponsoring the operation of environmentally friendly automobiles (Ali 2022). The amendments will levy a 2.5% "green fee" on newly imported and domestically produced vehicles equipped with harmful emissions-producing engines (Abdelaziz 2022, Youssef 2022). Included in this are automobiles with solely diesel-powered or gasoline-powered engines or a combination of both (Essam El-Din 2022). The revenues from the new "green charge" will be distributed equally between the Environment Protection Fund and the Automotive Industry Development Fund (Ali 2022). However, the negotiations resulted in a modification of the green charge to a fixed amount between EGP 1,000 and EGP 50,000 to be paid once (Abdelaziz 2022). In addition, and regarding the distribution of the proceeds, the environment-friendly electric car assembly sector would receive 80% of the green fee's earnings, while the Environment Protection Fund would receive 10% and the State Budget would receive 10% (Essam El-Din 2022).

5.2 Egypt Sustainable Development Strategy 2030

The Sustainable Development Strategy: Egypt's Vision 2030, adopted in 2015, is regarded as a road map to accomplish the country's goals for sustainable development (Mouneer 2021, Ministry of Finance 2022). The vision uses social, economic, and environmental sustainability as its three primary benchmarks (Moghaieb 2019, Khawaga 2021). This plan encourages the optimal utilisation of available resources and the improvement of Egypt's competitiveness (The Egyptian Government 2016, Abdel Monem and Lewis 2020). In addition, this plan attempts to achieve an improved standard of living. The strategy's objectives are consistent with the global sustainable development goals (SDGs) (Abdel Monem and Lewis 2020).

As a result of Egypt's success in implementing its economic reform programme and the effects of the current coronavirus (COVID-19) outbreak, the government revised Vision 2030 in light of recent social and economic circumstances (A.Moneim 2020, Egypt Today 2021).

By 2030, the nation aims to have a knowledge-based economy that is efficient, sustainable, diverse, and characterised by equity, community engagement, and participation (The Egyptian Government 2016, Khawaga 2021). It will additionally possess a

healthy and diverse ecology and utilise its unique location and human resources to accomplish sustainable development for a higher standard of living for all Egyptians (Abdel Monem and Lewis 2020).

The ninth pillar, included in the environmental dimension of the strategy indicates that environment is incorporated into all economic sectors in order to preserve natural resources, promote their sustainable and efficient use, and protect the rights of future generations (The Egyptian Government 2016, Ghonim *et al.* 2022, Abdel-Hameed *et al.* 2021, Abdel Latif *et al.* 2018). It further suggests that a clean, safe, and healthy environment that facilitates the diversification of resources and economic activities, bolstering competitiveness, creating new employment opportunities, eradicating poverty, and attaining social justice (The Egyptian Government 2016, Hussein 2022, Abdel Latif *et al.* 2018).

Key performance indicators established to achieve the ninth pillar include reduction of GHG emissions from various sectors, enhancing the sustainability of waste management systems, and increased progress towards implementing the commitments of international conventions (The Egyptian Government 2016). The goal is to reduce greenhouse emissions (GHGs) from the energy sector, which includes oil and gas, by 10% from 2016 levels by 2030 (IEA 2022c).

In addition, the second pillar of the economic dimension related to energy targets maximising the efficient use of renewable energy, hence promoting economic growth, competitiveness, social justice, and environmental protection (The Egyptian Government 2016, Abdel Latif *et al.* 2018). To address the environmental dimension of the strategy, several programs are proposed, including the establishment of the infrastructure necessary to minimise air pollution and adapt to climate change, improving the sustainability of waste management systems, developing policies to mitigate air pollution, adapt to climate change, and safeguard the environment, and tracking the compliance of international environmental conventions (The Egyptian Government 2016).

Consequently, the Sustainable Development Strategy promotes sustainable and resilient ecosystems that can endure the risks of climate change. The strategy aims to address the various implications of climate change through boosting ecosystem resilience and preparedness for extreme weather events, increasing dependence on renewable energy, and implementing sustainable consumption and production practises (SIS 2022a). Within the context of the 2030 plan, projects to minimise air pollution and eliminate its numerous sources have been established. As per an agreement with the Green Climate Fund to construct infrastructure

in the Nile Delta, climate change abatement must be connected to water resources in the Nile Delta and coastal regions (SIS 2022a).

5.3 Egypt National Climate Change Strategy 2050

In 2022, Egypt has started implementing its National Climate Change Strategy (NCCS) 2050 in accordance with the environmental dimension of Egypt Vision 2030 Strategy's in order to address the risks brought on by climate change (Bakr 2022, IMF 2022, Barakat *et al.* 2022). The NCCS is designed to assist Egypt in coping with the effects of the effects of climate change in a way that accomplishes sustainable development goals through the use of a flexible, low-emissions strategy (Bakr 2022, SIS 2022c, Ministry of Finance 2022).

The NCCS constitutes a comprehensive plan that targets a low-carbon economy while adapting to the impacts of climate change, in addition to establishing responsibilities for institutions in charge of mitigation and adaptation (Climate-laws 2023). The main objective of the strategy is to boost energy efficiency, promote sustainable consumption and production, reduce GHG emissions, and increase the number of projects that employ renewable energy (IMF 2022).

The plan comprises five primary objectives and outlines the means necessary to achieve each objective (Ministry of Environment 2022, Climate-laws 2023):

1. Securing long-term economic growth and zero-carbon development across a all industries;
2. Increasing adaptability and endurance to climate change and mitigating the resulting negative impacts;
3. Improving climate change governance;
4. Building facilities for climate funding; and
5. Expanding climate change research, innovation, knowledge, and public awareness.

On the basis of the NCCS, the Egyptian government must adopt a variety of broad steps to support the attainment of the aforementioned goals and objectives. This is owing to the potential for climate action to enhance the state's position, thereby enhancing the nation's efforts in minimizing GHG emissions and adapting to the impacts of climate change. These directions include (Ministry of Environment 2022):

1. Promoting coordinated and harmonized planning of the major national and sectoral strategies;
2. Incorporating climate change policies into national governance;
3. Incorporating sustainability and greening standards into national budgeting and planning;
4. Incorporating climate change adaptation and resilience into infrastructure projects;
5. Using the financing alternatives offered by the UNFCCC, the Paris Agreement, and other climate-related mechanisms;
6. Using current facilities to implement new climate change programs;
7. Promoting green job creation, economic diversity, and market competition;
8. Enhancing bilateral and multilateral collaboration with other nations and relevant international institutions.

Both foreign and domestic sources are included in the list of prospective financing sources for the recently released strategy (IMF 2022, Ministry of Environment 2022, SIS 2022c). Local

resources comprise the national budget and private sector investments in the relevant sectors (SIS 2022c). The major international sources of funding include (Ministry of Environment 2022):

- Multilateral institutions operating under the UNFCCC, including the Green Climate Fund, the Adaptation Fund, Global Environment Facility, Climate Investment Funds, and Special Climate Change Fund;
- UN Organizations, including IFAD and UN Joint SDG Fund;
- Multilateral Development Banks, including the World Bank, and the African Development Bank, and Nationally Appropriate Mitigation Actions Facility; and
- Countries, including the EU, Japan, and USA.

According to the NCCS, different initiatives in the fields of energy, transport, agriculture, and water have been allocated $211 billion for climate change mitigation and $113 billion for climate change adaptation through 2050 (Bakr 2022). According to Ministry of Environment (2022), there is $57.6 billion in financing for mitigation projects out of a total of approximately $211 billion, hence the financial shortfall is approximately $153.6 billion; for the

adaptation projects, the available funding is $18.3 billion, and therefore, the funding deficit is roughly $94.7 billion.

The Ministry of Electricity and Renewable Energy has implemented a variety of measures to enhance the proportion of new and renewable energy, which is projected to reach 42 percent of the total electrical energy generated in 2035 (Climate-laws 2023). In addition, with contributions from the World Bank, the European Union, the European Investment Bank, and the French Development Agency, the Ministry of International Cooperation has secured a total of 260 million dollars for the implementation of four projects in accordance with the NCCS in selected sectors, including solid waste management and reduction of industrial pollution (Ministry of Environment 2022). Table 1 represents a summary of the cost of climate change adaptation and mitigation in various sectors based on the NCCS.

Table 1: Cost of Adaptation and Mitigation Projects Based on the NCCS

Sector	Cost of Adaptation (Million $)	Cost of Mitigation (Million $)
Electricity	—	144153
Transportation	1273	57477.45
Industry	—	130.3
Agriculture	52400	—
Irrigation and Water Resources	59108.3	—
Electricity	—	144153
Petroleum	—	1688.51
Civil Aviation	9.1	25
Housing & Utilities	—	31
Waste	—	7627.4
Biodiversity	199.1	—

Source: (Ministry of Environment 2022)

In 2015, the Egyptian Prime Minister formed the National Council on Climate Change (NCCC) via the Prime Minister Decree 1912/2015 to fulfill the institutional aspect of climate change governance (Elewa 2019, Climate-laws 2023). The council substituted the National Committee on Climate Change, which was formed in 2007 (Hefny *et al.* 2019). With members from national specialists (scientists, practitioners, and university researchers), civil society (NGOs and union leaders), and the private sector, the NCCC was reorganised in 2019 to be led by the Prime Minister and comprise nine members representing sector ministries instead of seven members of the previous national committee (Abdallah 2020, Elewa 2019). The nine ministries represented in the council include, Foreign Affairs, Investment and International Cooperation, Water Resources and Irrigation, Finance, Environmental Affairs, Agriculture and Land Reclamation, Defense, Planning, Monitoring and Administrative Reform, and Ministerial Group for Services (Climate Action Tracker 2022). The Supreme Committee, Executive Office, and Technical Working Group are the three main components of the organisational structure of the council (Abdelaziz 2022).

The main objective of NCCC is the designation a nationwide climate change plan in addition to provision of proposals for the

necessary initiatives and policies relating to climate change and sustainable development, and achieving a nationwide coordination to address climate change in terms of both adaptation and mitigation. The main functions of NCCC, include (Climate-laws 2023, AhramOnline 2022a, Barakat *et al.* 2022):

1. Determining the state's climate change policy in light of international conventions and treaties;
2. Integrating concepts of climate change with Egypt's 2030 SDS;
3. Adhering to the UNFCCC's protocols and agreements in relation thereto;
4. Conduct scientific studies, publications, and follow-up reports on climate change;
5. Raising the level of climate change awareness among all stakeholders;
6. Building institutional and individual capacity for stakeholders; and
7. Adding the duties and expertise of the Egyptian Council for Clean Development to the National Council for Climate Change's mandate.

The Climate Change Information Centre and Renewable Energy (CCICRE) was founded to conduct research on climate change and the agricultural sector, to remove barriers to data exchange and to supply the research community with accurate data, as well as to assist neighbouring nations in their adaptation and mitigation efforts (Agricultural Research Centre 2023). It is in charge of researching how climate change affects the production of the primary crops, irrigation, and the agricultural communities in Egypt (Agricultural Research Centre 2023).

5.4 Egypt Intended Nationally Determined Contributions

Nationally Determined Contributions (NDCs) are goals that each nation has designed to combat climate change, including lowering GHG emissions and adapting to the risks posed by a changing climate (UNDP 2022b, Pauw *et al.* 2018). These goals were formed as a result of the Paris Agreement on Climate Change, which was approved in December 2015 as the world's first worldwide climate accord (UNFCCC 2015a). The Agreement outlines a strategy to prevent severe climate change, with the long-term objective of limiting the increase in the global average temperature to 1.5°C (UNFCCC 2015a, Pauw and Klein 2020). Countries are required to update their NDCs every five years to contribute to the achievement of the global temperature goal (UNDP 2022b).

Egypt's initial INDC was filed in 2015 in accordance with Articles 2 and 3 of the Paris Agreement (SouthSouthNorth 2019, Ministry of Finance 2022). The main components of the report include the socio-economic and political conditions, including population growth rate, SDGs, and major macroeconomic indicators (The Egyptian Government 2015, CTCN 2023, Abdallah 2020). In addition, the report incorporates the current mitigation and adaptation strategies adopted in various sectors, including energy, agriculture, coastal protection, etc (The Egyptian Government 2015, Abdallah 2020). Finally, the INDC includes the necessary procedures to accomplish the plan's objectives in terms of capacity building, technology transfer, and funding (The Egyptian Government 2015, CTCN 2023).

According to the The Egyptian Government (2015), agriculture, coastal regions, tourism, health care, and energy are the sectors most negatively impacted by climate change. Consequently, the INDC proposes a number of sector-specific strategies to promote resilience (UNEP 2022b). For instance, to address the risks posed by climate change on water resources and irrigation, the INDC proposed expanding water storage, enhancing drainage and irrigation methods, recycling of wastewater, desalination, and harvesting of rainwater (The Egyptian Government 2015). In agriculture, the report proposed modifying the crop patterns and

switching to heat-, salinity-, and pest-resistant crop varieties (The Egyptian Government 2015). Finally, the essential adaptation strategies to reduce the risks of sea-level rise on coastal zones include proactive coastal zone protection and integrated coastal zone management (The Egyptian Government 2015).

On the climate change mitigation side, the INDC focuses on establishing a low-carbon economic system and reduce GHG emissions from various sectors. This could be achieved through the adoption of low-carbon energy generation technologies, the various efforts to mitigate emissions from all significant sources, and obtain funding and technology transfer from developed nations will promote carbon emission reduction in accordance with the principles of UNFCCC (UNEP 2022b, The Egyptian Government 2015, Abdallah 2020). This could be achieved through various policies that focus on greater utilisation of renewable energy, promoting energy efficiency, and restructuring of energy subsidy programmes (UNEP 2022b, The Egyptian Government 2015). The INDC discussed the possibility of establishing a national emissions trading system that could be expanded to a regional one (The Egyptian Government 2015).

Egypt has filed an updated version of its NDCs document to the UNFCCC secretariat in 2022, detailing its obligations to reduce climate effects in accordance with the Paris Agreement

(AhramOnline 2022a, CCPI 2022). The updated NDCs emphasise Egypt's initiatives in climate change mitigation, including green financing and changes to energy policies, to manage solid waste, boost dependence on renewable energy sources, cut emissions, and enhance energy efficiency. It further outlines the state's objectives for reducing GHG emissions from major contributors, including energy, oil and gas, and transportation (AhramOnline 2022a, Enterprise 2022b).

The updated NDCs aim to cut carbon dioxide emissions by 33%, or 70 $MtCO_2eq$ by 2030 as compared to business-as-usual emissions; this will reduce the country's emissions in this sector from 215 $MtCO_2eq$ in 2030 to 145 $MtCO_2eq$ instead (Enerdata 2022, Enterprise 2022b, CCPI 2022, Ellahamy 2022). The objective will be achieved by a number of actions, such as leveraging smart grids to increase the share of renewable energy in power generation to 40% by 2030 and to 42% by 2035 (The Egyptian Government 2022, Enterprise 2022b). Additional strategies comprise the development of electricity transmission and distribution networks, the expansion of regional power interconnection, the enhancement of the efficiency of power generation at power plants, the promotion of decentralised renewable energy systems for users, and the improvement of power generation efficiency at power plants (The Egyptian Government 2022, CCPI 2022).

The updated NDCs also addresses emissions reduction from the oil and gas industry as the country aims to cut emissions originating from this sector by 65% by 2030, which amounts to roughly 1.6 $MtCO_2eq$ (Enerdata 2022, The Egyptian Government 2022, Enterprise 2022b, Ellahamy 2022). The mitigated scenario's emissions nevertheless indicate a 65% increase above the emissions from the base year of 2015, which is equivalent to 88 $MtCO_2eq$ (Enerdata 2022). The strategies required to achieve such goal include providing more residences with natural gas, implementing energy saving measures in petroleum firms, turning plastic waste to oil as a manufacturing intermediary for polyethylene, and Algae oil extraction for biofuel production and bioethanol generation (The Egyptian Government 2022).

In addition, Egypt expects to cut emissions from transportation by 7% (equivalent to 9 $MtCO_2eq$) from the BAU scenario to 115 $MtCO_2eq$ in 2030, which remains 140% higher than in 2015 (Enerdata 2022, The Egyptian Government 2022, Ellahamy 2022). This goal will be accomplished by developing and rehabilitation of major transit networks, including the Cairo metro network, monorail, bus rapid transit, Alexandria Metro, and Tramway network in Alexandria (Enerdata 2022, The Egyptian Government 2022).

The government's strategy also calls for a carbon free industrial sector, although the report does not indicate any concrete objectives for reducing emissions (Enterprise 2022b). In order to reduce average thermal energy consumption in the energy-intensive iron and steel, fertiliser, and ceramic tile industries by 10%, the strategy calls for increasing energy efficiency across all industries (The Egyptian Government 2022). Cement is a significant element of the decarbonized industrial aim, and the government is working to implement a low carbon roadmap that will increase energy efficiency, offer a partial transition to alternative fuels, and reduce cement's clinker content by as much as 80% (Enterprise 2022b). In addition to the aforementioned sectors, the updated INDC includes decarbonisation of selected sectors, including urbanisation, irrigation, tourism, and solid waste management (Enterprise 2022b, The Egyptian Government 2022).

In addition to climate change mitigation, the paper includes adaptation measures for vulnerable sectors, including irrigation and water resources, agriculture, coastal zones, tourism, and urbanisation. Table 2 illustrates a number of sector-specific adaptation measures.

Table 2: Planned Adaptation Measures for Selected Sectors

Sector	Adaptation measures
Irrigation & Water Resources	- Water conservation - exploitation of unconventional water sources - Reuse and treatment of wastewater
Agriculture	- Improving surface irrigation methods - Maintaining biodiversity - Protection of livestock, poultry, and fisheries - Examination of new and existing land use policies and agricultural growth schemes - Developing an efficient crisis and disaster management infrastructure for rural areas - Support the adaptation of small farmers to climate change via multi-stakeholder involvement.
Coastal Zones	- Establish an Integrated Coastal Zone Management Strategy for the North Coast - Structural and architectural adjustments for both traditional and unconventional coastal protection projects - Strengthening naturally based coastal protection strategies such as sand dunes - To safeguard marine life and its ecosystems through improving the use of good fishing methods in both the Mediterranean and the Red Sea.

Sector	Adaptation measures
Urbanisation & Tourism	- Directing urban planning and architectural design to adhere to green building and construction standards - Determining the vulnerability of tourist attractions, marine and wildlife preserves, and archaeological sites to climate change - Preserve the protectorates in place and expand them to include 17% of the country's marine and wildlife regions, with at least 5% of them being coastal.

Source: (Compiled by author)

These objectives are subject to a $246 billion international finance, including US$196 billion for mitigation efforts and US$50 billion for adaptation interventions (Enerdata 2022, Enterprise 2022b, The Egyptian Government 2022). The report stresses on the fact that the availability of enough, suitable international financing through highly concessional financing and grants, if applicable, is a requirement for the actual execution of these mitigation and adaption measures (Enterprise 2022b). Tables 3 and 4 illustrate the cost of mitigation and adaptation of various sectors, respectively.

Table 3: Cost of Mitigation Projects Based on the Updated INDC

Sector	Cost of Mitigation (Million $)
Electricity	93686
Oil & Gas	3290
Transportation	40319
Industry	11920
Construction & Urban Planning	250
Tourism	345
Waste Management	5601

Source: (The Egyptian Government 2022)

Table 4: Cost of Adaptation Projects Based on the Updated INDC

Sector	Cost of Adaptation (Million $)
Agriculture	15000
Irrigation and Water Resources	11295
Transportation	108

Source: (The Egyptian Government 2022)

6. Transformation to Green Economy

Egypt's plan for the transition to a green economy, overseen by the Ministry of Environment, seeks to expand the range of sector-specific objectives. The main aim is to guarantee that future generations have better access to these resources so that they can take advantage of growth and safeguard public health. This would significantly contribute to achieve Egypt's national goal of sustainable development, of which the green economy is regarded one of the mechanisms.

The Ministry of Environment plays a major role in moving forward towards the promotion of green economy in Egypt. Various mechanisms are put in place for this purpose, including the commencement of a nationwide program to enhance the environmental sustainability of industrial zones. In addition, the ministry enforces pecuniary penalties in case of breach of environmental legislations (Ahmed 2021).

Additionally, to reduce GHG emissions, and therefore, enable the shift to a green economy, the ministry has adopted an initiative to substitute older taxis in Greater Cairo (Moneim 2022, The World Bank 2018, El Madany 2011). The initiative is implemented in collaboration with both the Ministry of Social

Solidarity and Nasser Social Bank, and it is expected to yield annual reductions in carbon emissions amounting to roughly 264,000 tonnes (The World Bank 2018). The Ministry of Finance expanded the scope of "old vehicle replacement initiative" recipients in 2021 to include "taxi and personal cars." (Ministry of Finance 2021). Citizens may exchange their outdated vehicles for new dual-fuel vehicles that run on fuel and natural gas under the Initiative. According to the Ministry of Finance (2021), EGP 2.1 billion from the 2021/2022 fiscal year budget were allocated to finance the Initiative, which aims to replace 250,000 outdated vehicles in the governorates of Cairo, Giza, Qalyoubia, Alexandria, Suez, Port Said, and the Red Sea.

On corporate level, and in order to comply with environmental regulations and standards, the Ministry of Investment has created the Egyptian Index of Social Responsibility for the 100 corporations listed on the stock market (Mowafy and Eltaher 2019, Arafa and Hawary 2017). This index considers social and environmental factors (Ahmed 2021, Esaam *et al.* 2019).

In terms of sustainable finance, the $750 million issuance of sovereign green bonds, which would encourage environmentally beneficial projects, is one of the government's most significant efforts (Bakr 2022). Housing, sustainable transportation, renewable

energy, and pollution reduction are the primary industries covered by green bonds (Samak 2021). These bonds also target initiatives addressing climate change adaptation, energy efficiency, and sustainable water management (Barbuscia and Ramnarayan 2020, Samak 2021). The 500-million-dollar green bond with a 5.75% interest rate was previously launched with a five-year maturity (Samak 2021). The increased demand on the bond, nevertheless, prompted the government to boost its size to $750 million and cut the interest rate to 5.25%, which is lower than Egypt's benchmark conventional bonds (World Bank 2022). Additionally, a record-breaking 16 new investors participated in the bond's offering of dollars-denominated bonds (World Bank 2022).

With the introduction of Egypt's Environmental Sustainability Criteria Guidelines in 2021, green investments in Egypt have increased from 15% in FY2019/20 to 30% in FY2020/21 and are expected to reach 50% of total investments in FY2024/25; this growth has been induced by the issuance of the sovereign green bonds (The Egyptian Government 2022, Ministry of Finance 2022). This was supplemented by rules and guidelines put in place by Egypt's Financial Regulatory Authority (FRA), including the Green Bond Guidelines introduced in 2018 and the Decrees 107 and 108 issued in 2021 that mandate non-banking

enterprises and corporations listed on the Egyptian Stock Exchange to publish environmental, social, and governance disclosure reports regarding sustainability and the financial effects of climate change (Ministry of Finance 2022).

Egypt amended its Green Financing Framework in November 2022 to incorporate new Green and Social projects as part of a Sustainable Financing Framework (Ministry of Finance 2022). By adding more categories for green and social projects, the Framework is better aligned with the three main pillars of Egypt's Sustainable Development Strategy, or Egypt Vision 2030, allowing Egypt to achieve a sustainable and inclusive development that eliminates poverty and secures prosperity for future generations (Ministry of Finance 2022).

Finally, based on collaboration between a number of ministries in 2022, including the Ministry of Planning and Economic Development, the Ministry of Communications and Information Technology, the Ministry of Environment, the Ministry of Local Development, the Ministry of International Cooperation, and the National Council for Women have launched the "National Initiative for Green Smart Projects in Governorates" (MCIT 2022). The initiative is meant to achieve smart, sustainable growth while also tackling the environmental impact and consequences of

climate change. It operates within the framework of both Egypt's Vision 2030 and the NCCS (AhramOnline 2022b). The main goal of the initiative is to focus on implementing green projects. Additionally, the initiative is focused on developing a governorate-level blueprint for green and smart projects, linking them with financing organisations, and drawing both domestic and foreign investors (Enterprise 2022a). It also focuses on leveraging ICT to advance the national digital transformation strategy (SIS 2022b). The initiative targets six categories of green smart projects, including large projects, small and medium-sized projects, startups, non-profit community initiatives, and projects focusing on gender, sustainability, and climate change (Mohieldin 2022). Table 5 summarises a number of green economy initiatives executed in Egypt.

Table 5: Selected Green Economy Projects in Egypt

Sector	Institution(s)	Project
Energy	Ministry of Electricity Ministry of Investment	Renewable energy; solar energy; biofuels
Transportation	Ministry of Environment Ministry of Finance Ministry of Trade & Industry Nasser Bank	Emissions reduction from transportation; sustainable transportation
Industry	Ministry of Environment	Industrial pollution control; environmental protection programs; circular economy strategies
Agriculture	Ministry of Agriculture Ministry of Environment	Sustainable agriculture
Information Technology	Ministry of Planning & Economic Development Ministry of Communications & Information Technology Ministry of Local Development Ministry of Environment Ministry of International Cooperation National Council for Women	Green smart projects

Source: (Compiled by author)

7. Results and Discussion

It is evident that environmental legislations and regulations are continuously modified. In addition, environmental management systems have been developed, and attention is focused on developing a green economy with a low carbon dependency. The completion the institutional framework for managing national efforts to adapt to the impacts of climate change, environmental aspects have been mainstreamed into all development projects alongside the adoption of green fiscal policy. A green fiscal policy in this regard would aim to promote and encourage eco-friendly establishments and to enforce penalties in case of any environmental violation.

There are several policy initiatives being implemented and numerous government entities tasked with incorporating climate change into the national policy agenda, despite the fact that Egypt lacks a comprehensive legislative framework for adaptation and mitigation actions related to climate change.

Despite the existence of a variety of climate change adaptation and mitigation policies, programs, and initiatives, a number of institutional obstacles remain. Several barriers still stand in the way of the country's efforts, making them currently

ineffective. These constraints pertain not just to foreign finance, but also to domestic activities in growing measure. A significant challenge in the nation's effort to address climate change and enhance its frameworks for climate governance is the availability and accuracy of data, combined with a lack of funding and cross-sectoral cooperation.

Several criticisms of the current adaption policies still exist. For instance, not all of the development initiatives in Vision 2030 include the environmental pillar as a cross-cutting element. It lacks defined monitoring and implementation methods, while being one of the major foundations of sustainability. In addition, based on Elewa (2019) and Hefny *et al.* (2019), there is a difficulty in integrating the National Adaptation Plan into the National Development Plan. The Paris Agreement was incompatible with aligning locally enforced laws on polluters with Egypt's Intended Nationally Determined Contributions. Consequently, neither international nor local regulations are aligned with a concrete enforcement strategy by the local law or international community.

With regards agriculture, the current adaptation policies do not incorporate a coherent approach to deal with the loss of livelihoods of farmers caused by degradation of the agricultural production as a result of sea-level rise or reduced Nile flow. In

addition, the current insurance policies do not include climate risk insurance. Therefore, farmers who might experience crop losses induced by climate change cannot be compensated through insurance. The current Egyptian legal system does not additionally recognise damages caused by climate change as basis for compensation.

Despite the existence of a wide variety of climate change adaptation programs, Existing implementation framework limitations remain. These limitations are related to transparency, accountability, monitoring, level of preparedness of stakeholders, and timeframes and methodologies of implementation. Capacity building lacks definite implementation structure with a deadline; the same applies with governance.

After reviewing Egypt's NDCs submitted to the UN in accordance with Paris Agreement on Climate Change, it is evident that the initial version of the INDC prioritised climate change adaptation over mitigation. This is reflected in the lack of quantification and data required to cut GHG emissions. The updated INDC, nevertheless, represents a comprehensive approach to adapt to and mitigate climate change. It defined quantitative GHG emission reduction goals below BAU GHG Emissions by 2030 for the three largest emitters of greenhouse gases, including

electricity, oil and gas, and transportation, which are responsible for 43% of the country's total emissions. The absence of mitigation targets for other sources of GHG emissions is, however, observed. In addition, it does not provide Egypt's overall projected GHG emissions reduction in 2030 relative to the base year of 2015. Finally, one of the major limitations of the updated INDC is its indication that the implementation of adaptation and mitigation measures is conditional upon getting technological and financial assistance from external sources.

In terms of transformation to green economy, The Egyptian government has begun to prioritise the green economy as a vital component of its overall growth objectives. This has been accomplished by implementing multiple initiatives corresponding with the State's economic and environmental interests. In addition, the country has established a regulatory framework for green financing instruments. Among the milestones achieved in this regard is the establishment of Green Financing Framework in September 2020 and the issuance of the sovereign green bonds, which is regarded as the first of its type in the MENA region.

8. Conclusion

This study critically reviewed the climate change legal and policy framework adopted in Egypt with particular focus on the post-coronavirus period to assess their effectiveness and sufficiency in addressing the impacts of climate change. The study concluded that environmental legislations and regulations are continuously modified. In addition, environmental management systems have been developed, and attention is focused on developing a green economy with a low carbon dependency. There are several policy initiatives being implemented and numerous government entities tasked with incorporating climate change into the national policy agenda. Several barriers still stand in the way of the country's efforts, making them currently ineffective. These constraints pertain not just to foreign finance, but also to domestic activities in growing measure. A significant challenge in the nation's effort to address climate change and enhance its frameworks for climate governance is the availability and accuracy of data, combined with a lack of funding and cross-sectoral cooperation.

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