

# **Egypt's First Biennial Transparency Report**

**17<sup>th</sup> September 2025**

## FOREWARD

In the spirit of our commitment to fostering a sustainable future and addressing the challenges posed by climate change, I am honored to present Egypt's First Biennial Transparency Report (BTR) under the Paris Agreement. This report serves as a cornerstone of our dedication to transparency, accountability, and international cooperation in our efforts to mitigate climate change and adapt to its impacts.

The Paris Agreement represents a pivotal moment in the global fight against climate change, uniting nations in a collective effort to limit the rise in global temperatures and build resilience against environmental challenges. As a signatory to this historic accord, Egypt acknowledges the importance of transparent reporting and information sharing, which enhances trust among nations and strengthens our capacity to implement effective climate policies.

This BTR provides a comprehensive overview of Egypt's climate initiatives, including an updated Greenhouse Gas (GHG) Inventory, progress toward achieving our Nationally Determined Contribution (NDC), mitigation strategies, and Adaptation Communication. Furthermore, it details the support we have received in this critical endeavor. It reaffirms our commitment to the principles of equity and the necessity for climate action that addresses our nation's specific needs and circumstances.

Though we face numerous challenges, including socioeconomic factors and the unique vulnerabilities of our ecosystems, Egypt is committed to pursuing an inclusive and resilient transition to a low-carbon economy. This report outlines our progress, ambitious goals, and the strategies we are implementing to address climate change at national, regional, and global levels.

I would like to take this opportunity to express my heartfelt appreciation to the dedicated team of experts and key players involved whose relentless efforts have been instrumental in preparing this report. Their expertise and commitment have ensured the quality and accuracy of the information it contains.

As we present this report to the international community, I am reminded that our efforts must continue to evolve. We are called to embrace innovation, foster sustainable practices, and collaborate closely with our global partners in pursuit of shared climate goals. Only through cooperation we can achieve the transformative change necessary to ensure a sustainable and prosperous future for generations to come.

We warmly invite all stakeholders, including governments, civil society organizations, and the private sector, to engage with this report and share their invaluable feedback. I invite you to explore this report and join us on our ongoing journey toward environmental sustainability, resilience, and climate-safe practices. Your insights are essential as we work to enhance our climate action strategies and improve future reporting efforts.

Yours sincerely,

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# UNITS OF MEASUREMENT

## FISCAL YEAR (FY)

1<sup>st</sup> July- 30<sup>th</sup> June

## Currency Equivalents

10<sup>th</sup> December 2024

(Central Bank of Egypt)

1 US Dollar (USD) = 50.4094 Egyptian Pound (EGP)

1 Euro (EUR) = 53.0610 Egyptian Pound (EGP)

| Units of Measurement |                                     |
|----------------------|-------------------------------------|
| CO <sub>2</sub> e    | Carbon Dioxide Equivalent           |
| EGP                  | Egyptian Pound                      |
| Gg                   | Giga Gram                           |
| GgCO <sub>2</sub> e  | Giga gram Carbon Dioxide Equivalent |
| gm/kWh               | Grams per kilowatt-hour             |
| GWh                  | Gigawatt-hour                       |
| Km                   | Kilometer                           |
| kWh                  | Kilowatt-hour                       |
| m <sup>3</sup> /day  | Cubic meters per day                |
| MCM                  | Million Cubic Meters                |
| Million SCF/year     | Million Standard Cubic Feet/Year    |
| MJ/ton               | Megajoule per Ton                   |
| Mtoe                 | Million Ton of Oil Equivalent       |
| MW                   | Megawatt                            |
| MWh                  | Megawatt-hour                       |
| tCO <sub>2</sub>     | Tons Carbon Dioxide                 |
| USD                  | United States Dollar                |

## LIST OF ACRONYMS AND ABBREVIATIONS

|        |   |
|--------|---|
| AAI    | African Adaptation Initiative                         |
| AFD    | Agence Française de Développement                     |
| AFOLU  | Agriculture, Forestry, and Other Land Use             |
| AIIB   | Asian Infrastructure Investment Bank                  |
| APG    | Associated Petroleum Gases                            |
| BAU    | Business-as-Usual                                     |
| BRT    | Bus Rapid Transit                                     |
| BTR1   | Egypt's First Biennial Transparency Report            |
| BUR1   | Egypt's First Biennial Update Report                  |
| CAPMAS | Central Agency for Public Mobilization and Statistics |
| CBAM   | Carbon Border Adjustment Mechanism                    |
| CBOs   | Community-Based Organizations                         |
| CFA    | Climate Finance Accelerator                           |
| CIB    | Commercial International Bank                         |
| CNG    | Compressed Natural Gas                                |
| COP    | Conference of the Parties                             |
| CSOs   | Civil Society Organizations                           |
| DAPP   | Danish-Arab Partnership Programme                     |
| DDR    | Disaster Risk Reduction                               |
| EBRD   | European Bank for Reconstruction and Development      |
| EDCs   | Electricity Distribution Companies                    |
| EEAA   | Egyptian Environmental Affairs Agency                 |
| EEHC   | Egyptian Electricity Holding Company                  |
| EEIP   | Energy Efficiency Improvement Programme               |
| EETC   | Egyptian Electricity Transmission Company             |
| EFF    | Extended Fund Facility                                |
| EGGSP  | Egypt Electricity and Green Growth Support Programme  |
| EIB    | European Investment Bank                              |
| EPAP   | Egyptian Pollution Abatement Programme                |
| ESG    | Environmental, Social, and Governance                 |
| EU     | European Union  |
| ESTP   | Egypt's Sustainable Tourism Portal                    |
| EU-NIP | EU-Neighborhood Investment Platform                   |

|       |   |
|-------|---|
| EV    | Electric Vehicle                                    |
| FAST  | Food and Agriculture for Sustainable Transformation |
| FAO   | Food and Agriculture Organization                   |
| FIT   | Feed in Tariff                                      |
| FRA   | Financial Regulatory Authority                      |
| FY    | Fiscal Year   |
| GCF   | Green Climate Fund                                  |
| GDP   | Gross Domestic Product                              |
| GEF   | Global Environment Facility                         |
| GEFF  | Green Economy Financing Facility in Egypt           |
| GFDRR | Global Facility for Disaster Reduction and Recovery |
| GHG   | Greenhouse Gases                                    |
| GHGI  | Greenhouse Gas Inventory                            |
| GIZ   | German Agency for International Cooperation         |
| GSI   | Green Sustainable Industries                        |
| GWP   | Global Warming Potential                            |
| HBRC  | Housing and Building Research Center                |
| HFCs  | Hydrofluorocarbons                                  |
| HFO   | Heavy Fuel Oil                                      |
| HSR   | Electric High-Speed Rails                           |
| HVAC  | Heating, Ventilation, and Air Conditioning          |
| ICZMP | Egypt's Integrated Coastal Zone Management Plan     |
| IFAD  | International Fund for Agricultural Development     |
| IFC   | International Finance Corporation                   |
| IMF   | International Monetary Fund                         |
| IPCC  | Intergovernmental Panel on Climate Change           |
| IPPU  | Industrial Processes and Product Use                |
| IRENA | International Renewable Energy Agency               |
| ISES  | Integrated Sustainable Energy Strategy              |
| ITMOs | Internationally Transferred Mitigation Outcomes     |
| JBIC  | Japan Bank for International Cooperation            |
| JETP  | Just Energy Transition Partnerships                 |
| LECZ  | Low Elevation Coastal Zones                         |
| LED   | Light Emitting Diode                                |
| LFO   | Light Fuel Oil                                      |

|        |   |
|--------|---|
| LRT    | Light Rail Transit                                    |
| LULUCF | Land Use, Land-Use Change, and Forestry               |
| M&E    | Monitoring and Evaluation                             |
| MBT    | Mechanical and Biological Treatment                   |
| MBDT   | Mainstreaming Biodiversity in Egypt's Tourism Project |
| MDF    | Medium Density Fiberboard                             |
| MEPS   | Minimum Energy Performance Standard                   |
| MoERE  | Ministry of Electricity and Renewable Energy          |
| MoPMR  | Ministry of Petroleum and Mineral Resources           |
| MPG    | Modalities, Procedures, and Guidelines                |
| MRV    | Monitoring, Reporting, and Verification               |
| MSW    | Municipal Solid Waste                                 |
| NAC    | New Administrative Capital                            |
| NAP    | Egypt's National Adaptation Plan                      |
| NAT    | National Authority for Tunnels                        |
| NBE    | National Bank of Egypt                                |
| NC4    | Fourth National Communication                         |
| NDCs   | Nationally Determined Contributions                   |
| NEEAP  | National Energy Efficiency Action Plan                |
| NREA   | New and Renewable Energy Authority                    |
| NREAP  | National Renewable Energy Action Plan                 |
| NSWMP  | National Solid Waste Management Programme             |
| NUCA   | New Urban Communities Authority                       |
| NUP    | National Urban Policy                                 |
| ODS    | Ozone Depleting Substances                            |
| OUDA   | Organization for Urban Development and Agriculture    |
| PDP    | Participatory Development Programme in Urban Areas    |
| PFCs   | Perfluorocarbons                                      |
| PPP    | Public Private Partnership                            |
| PV     | Photo Voltaic   |
| QA     | Quality Assurance                                     |
| QC     | Quality Control                                       |
| RCSF   | Regional Center for Sustainable Finance               |
| RDF    | Refuse Derived Fuel                                   |
| RE     | Renewable Energy                                      |

|        |  |
|--------|--|
| RFI    | Rapid Financing Instrument   |
| SADS   | Egypt's Sustainable Agricultural Development Strategy 2030         |
| SAIL   | Sustainable Agriculture Investments and Livelihoods Project        |
| SDGs   | Sustainable Development Goals                                      |
| SESSDS | Sharm El-Sheikh Sustainable Development Strategy                   |
| SFC    | Specific Fuel Consumption  |
| SHIP   | Solar Heating in Industrial Processes                              |
| SMEs   | Small and Medium Enterprises                                       |
| SRAT   | Systematic Risk Assessment and Investment Prioritization Tool      |
| STAR   | Sustainable Transformation for Agricultural Resilience Programme   |
| TACCC  | Transparency, Accuracy, Competence, Comparability, and Consistency |
| T&D    | Transmission & Distribution  |
| TFSC   | Transforming Financial Systems for Climate                         |
| TSFE   | Sovereign Fund of Egypt  |
| UNDP   | United Nations Development Programme                               |
| UNEP   | United Nations Environment Programme                               |
| UNFCCC | United Nations Framework Convention for Climate Change             |
| UNIDO  | United Nations Industrial Development Organization                 |
| USAID  | United States Agency for International Development                 |
| VAT    | Value Added Tax  |
| WMRA   | Waste Management Regulatory Authority                              |
| WWTP   | Wastewater Treatment Plant   |

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## Executive Summary

As the world faces unprecedented challenges posed by climate change, countries are increasingly recognizing the necessity of transparent and accountable reporting mechanisms to assess their climate actions and commitments. In this context, Egypt has taken significant steps to align its national policies with international agreements, particularly the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC). Egypt's First Biennial Transparency Report (BTR1) marks a critical milestone in the nation's journey toward effective climate governance, showcasing its commitment to transparency and climate action.

The BTR1 provides a detailed overview of Egypt's national circumstances and institutional frameworks related to climate change. It includes the national greenhouse gas emissions inventory, progress tracking for the implementation and achievement of Egypt's Nationally Determined Contributions (NDC), adaptation measures to address climate vulnerabilities, and the financial, technological, and capacity-building support required and received. The report highlights Egypt's commitment to fostering an inclusive approach by engaging diverse stakeholders, such as government entities, civil society, and local communities. Through enhanced collaboration, Egypt aims to promote social equity and ensure that climate action strategies are responsive to local needs and contexts.

### National Circumstances

Egypt, spanning one million square kilometers, is bordered by the Mediterranean Sea to the north, Sudan to the south, the Red Sea to the east, and Libya to the west. Egypt's rich biodiversity encompasses deserts, wetlands, and coastal ecosystems, supporting 22 habitat groups and over 2,300 species. However, this biodiversity faces significant threats, including habitat destruction, excessive hunting, pollution, and climate change. Despite these challenges, biodiversity remains vital to Egypt's economy, particularly through ecotourism and natural resource-dependent industries.

Egypt has a hot, arid desert climate, characterized by two main seasons: a mild winter from November to April and a hot summer from May to October. Seasonal temperatures vary with prevailing winds. Along the coast, average winter lows reach 14°C, while summer highs peak at 30°C. In the inland deserts, temperatures fluctuate between 7°C at night and 43°C during the day. Egypt is also subject to *khamsin* winds—hot storms that can cause temperature spikes of up to 20°C within hours. The country receives minimal annual rainfall, mostly concentrated along the Mediterranean coast. Water resources are scarce due to high evaporation rates and the absence of permanent surface water.

Since 2016, Egypt has implemented substantial macroeconomic and structural reforms, yet significant challenges persist. The COVID-19 pandemic, global economic disruptions, and geopolitical tensions have hampered recent progress. Between 2015 and 2024, transformative changes—such as the Egyptian Pound's devaluation in November 2016—triggered short-term economic shocks and inflation surges. To stabilize the economy, Egypt sought additional IMF assistance, including a Rapid Financing Instrument in 2020 and a \$3 billion Extended Fund Facility (EFF) loan in 2022. However, successive currency devaluations in 2022 and 2023 renewed inflationary pressures and expanded public debt. While GDP growth peaked at 6.6%

in 2021/2022, it slowed to 4.2% in 2023/2024. Although a gradual recovery is anticipated, Egypt faces widening budget deficits and substantial external financing needs.

As of January 1, 2024, Egypt's population stands at 105,914,499. This rapid population growth poses challenges for food security, health, education, employment, and overall quality of life. Addressing these pressures requires adaptive policies that promote sustainable resource management and economic resilience. Water scarcity poses a severe and growing challenge for Egypt, as total water demand has exceeded the Nile River's supply since the late 1970s. Rapid population growth and economic development have exacerbated this stress, with the Nile providing 98% of Egypt's renewable water resources. By 2050, Egypt's population is projected to reach 160 million, placing even greater pressure on the country's limited water reserves. The annual per capita renewable water supply is steadily declining, while climate change is expected to intensify these challenges further. Agriculture as a cornerstone of food security and the national economy is particularly vulnerable. Recent global events, such as the coronavirus pandemic, have heightened food insecurity, underscoring the sector's fragility.

Nevertheless, Egypt is implementing a range of mitigation strategies to combat climate change and ensure long-term sustainability. The government is gradually phasing out subsidies and increasing electricity tariffs to promote energy efficiency and sustainability. Significant investments are being made in renewable energy projects, alongside efforts to reduce fuel consumption through energy sector reforms. Egypt is also expanding its public transportation networks and modernizing railway systems to lower emissions and improve urban mobility. Additionally, the country is prioritizing energy efficiency enhancements and transitioning towards renewable fuels to reduce greenhouse gas emissions. Urbanization strategies emphasize sustainable development, improved public transport systems, and the establishment of smart cities. In the tourism sector, Egypt is undergoing a green transformation through initiatives such as: 1) encouraging hotel establishments to obtain environmental sustainability certificates (i.e. Green Star Hotel Certificate), 2) supporting the transition of tourist facilities to solar energy generation through Egypt-PV project, 3) Mainstreaming Biodiversity in Egypt's Tourism project, and 4) the Egyptian Sustainable Tourism Portal, all of which promote environmentally sustainable practices. Moreover, the government has implemented a *Waste Management Regulation Law* to further reduce emissions and manage waste effectively.

## **Institutional Arrangements**

Egypt ratified the UNFCCC in 1994 as a non-Annex I Party and signed the Paris Agreement in April 2015, with parliamentary ratification in June 2017. The Ministry of Environment (MoE), established in 1997, oversees environmental affairs through the Egyptian Environmental Affairs Agency (EEAA). The Climate Change Unit, created in 1996, was upgraded to the Central Department for Climate Change (CCCD) in 2009 to strengthen national climate governance. The National Climate Change Council (NCCC), formed in 2015 to address climate challenges at national and international levels. Additionally, Egypt has established a legal framework comprising laws and regulations aimed at conserving the environment, promoting sustainable development, and addressing climate change.

## **National GHG Inventory**

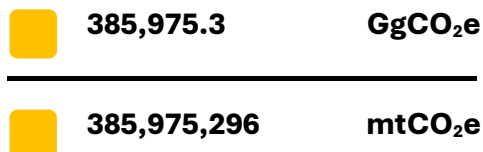
Egypt's National Inventory covers the time-series from 1990 to 2022. The estimates presented here were developed following Annex I guidelines of the decision, using methodologies outlined in the 2006 Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC 2006), and applying Global Warming Potentials (GWPs) as defined in the IPCC Fifth Assessment Report (AR5), specifically from the Contribution of Working Group I. The Common Reporting Format (CRF) tables in this submission were generated by the CRF Reporter [AR5] software and submitted via the UNFCCC submission portal in accordance with Annex II requirements.

The greenhouse gas (GHG) data includes estimated emissions for the primary direct GHGs: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), and sulfur hexafluoride (SF<sub>6</sub>). These emissions are reported across the following sectors: Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry, and Other Land Use (AFOLU), and Waste.

The sum of CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub> emissions converted to CO<sub>2</sub> equivalents multiplied by their respective global warming potential (GWP). The GWP is a coefficient by means of which the greenhouse gas effects of a given gas are made relative to those of an equivalent amount of CO<sub>2</sub>. The coefficients (100-year time horizon) are drawn from the Fifth Assessment Report (2013) issued by the IPCC. Key category analysis was carried out in accordance with the 2006 IPCC Guidelines (Approach 1 and Approach 2 level/trend assessment) for all of the inventory categories.

The chart illustrates Egypt's GHG emissions increased from 143,321 Gg CO<sub>2</sub>e in 1990 to 385,975 Gg CO<sub>2</sub>e in 2022, reflecting overall economic and population growth. The annual growth rate averaged 2.25% between 1990 and 2000 and accelerated to 4.45% from 2000 to 2010. However, it declined to 2.2% during 2010–2015 due mainly to the 2011 revolution and its economic repercussions. A sharp 11% rise occurred between 2014 and 2015, followed by a slower 2.9% annual increase from 2015 to 2018. Between 2018 and 2022, total emissions grew by 5.9% overall, corresponding to an average of 1.5% per year. The slowdown in emissions growth is largely attributed to Egypt's energy policy reforms, improved energy efficiency, greater use of renewable and alternative fuels, and enhanced waste recycling. In addition, the COVID-19 pandemic and nationwide lockdowns in 2020 further dampened economic activity, contributing to the temporary decline in GHG emissions.

## Egypt 2022



| Years | 1990    | 2000    | 2005    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    | 2021    | 2022    |
|-------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Egypt | 143,709 | 179,128 | 233,966 | 334,605 | 348,637 | 357,419 | 365,988 | 344,599 | 337,634 | 363,820 | 386,208 |

The distribution of emissions among gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>) in 2022 continues to highlight the dominance of CO<sub>2</sub>, which accounts for the largest share of emissions (75.53%), driven primarily by energy production, industrial processes, and transportation activities. Methane (CH<sub>4</sub>) remains the second-largest contributor, stemming from the Waste and AFOLU sectors. Nitrous oxide (N<sub>2</sub>O) emissions also show consistent growth, largely associated with agricultural soil management and fertilizer application. Hydrofluorocarbons (HFCs) and other fluorinated gases emerged in later years due to industrial applications and refrigeration technologies, reflecting technological evolution and industrialization. Similar to the total emissions trend, individual gases also exhibit a decline during the pandemic period (2019–2020), aligning with reduced industrial and agricultural activities.

The sectoral contributions to total GHG emissions have evolved over the reporting period. The energy sector's share increased from 57% in 1990 to 66% in 2022, while the IPPU sector rose from 8% to 13%. The waste sector maintained a relatively stable share of 13% to 10%, and the AFOLU sector decreased from 22% to 11%. In 2022, the breakdown of GHG emissions showed the energy sector as the largest contributor at 66%, followed by IPPU at 13%, AFOLU at 11%,

and the waste sector at 10%. This distribution emphasizes the dominance of the energy sector, with significant contributions from industrial and agricultural and waste activities.

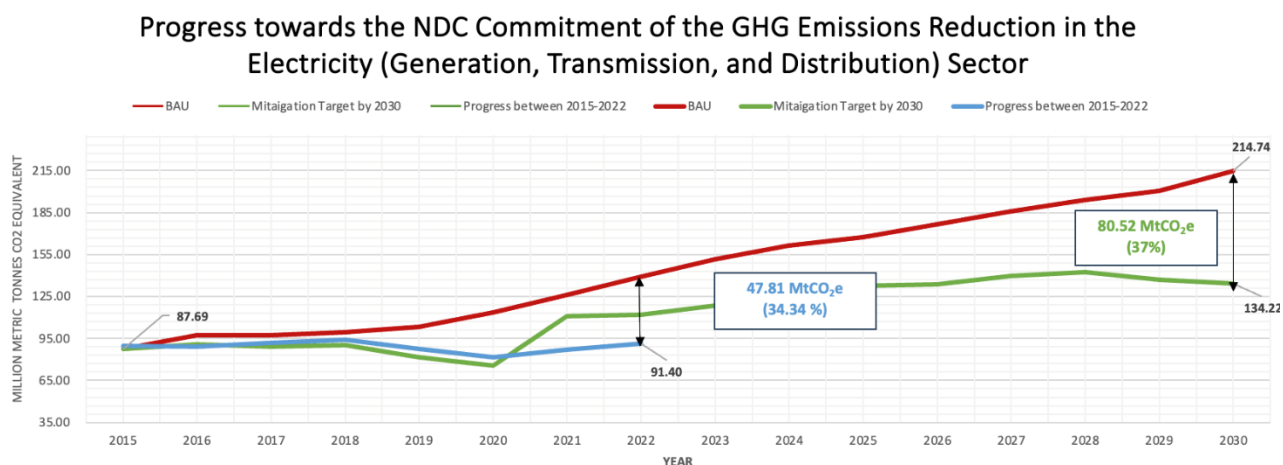
Key category analysis was carried out in accordance with the 2006 IPCC Guidelines (Approach 1 and Approach 2 level/trend assessment), for all of the inventory categories. In the level assessment, key categories are defined as those that, when aggregated in descending order of magnitude, collectively account for 95% of the total contribution from all sources and sink categories to the national inventory level. This approach ensures that the most significant sources and sinks are identified and prioritized, providing a clear focus for inventory efforts.

The Central Agency for Public Mobilization and Statistics (CAPMAS) will remain the primary entity for collecting nationally aggregated data for estimating GHG emissions from all sectors. Data shall be collected using questionnaires that are disseminated directly to all sector classification, both in the public and private sector. Recommendations were provided in order to improve the quality of the current inventory process.

### NDC Progress Tracking

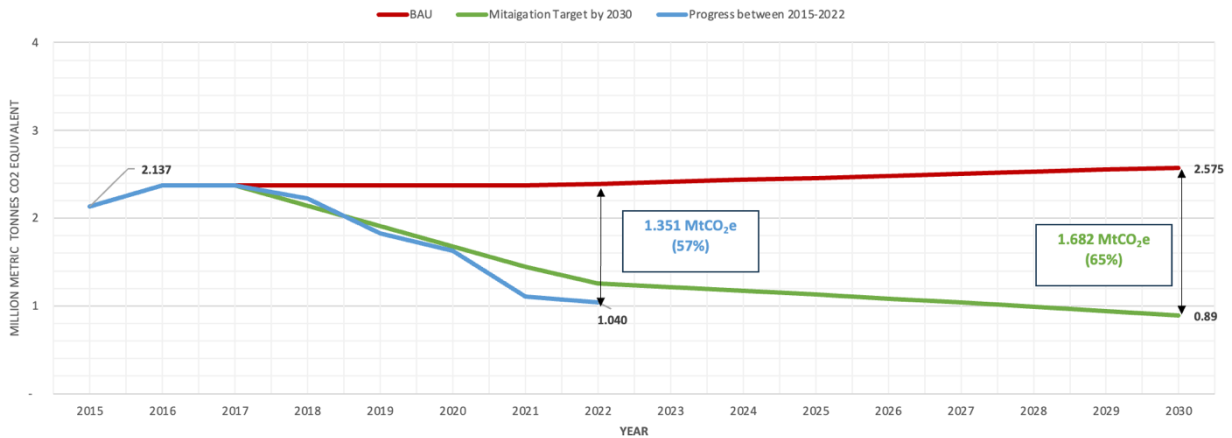
Egypt's GHG emission reduction target is 37% in Electricity Sector, 65% in associated petroleum gases sub-sector within the Oil & Gas Sector, and 7 % in Transport Sector relative to the BAU emission projections in 2030. The reporting period starts in 2015 (BAU reference year) till the end of the year 2030. These targets were submitted to the UNFCCC on 24th June 2023 as the second update of Egypt's Nationally Determined Contribution (NDC). Egypt has made notable advancements towards its NDC target for the latter three sectors, as shown in the graphs below.

Egypt has achieved remarkable success in transitioning to low carbon pathway in the electricity sector (generation, transmission, and distribution) with a substantial GHG emission reduction of **47,810 GgCO<sub>2</sub>e in 2022**, with a **decrease of 34.34% in emissions** compared to BAU levels for that same year. Egypt's electricity sector is advancing steadily towards the **2030 target of 37% overall GHG emission reduction**.

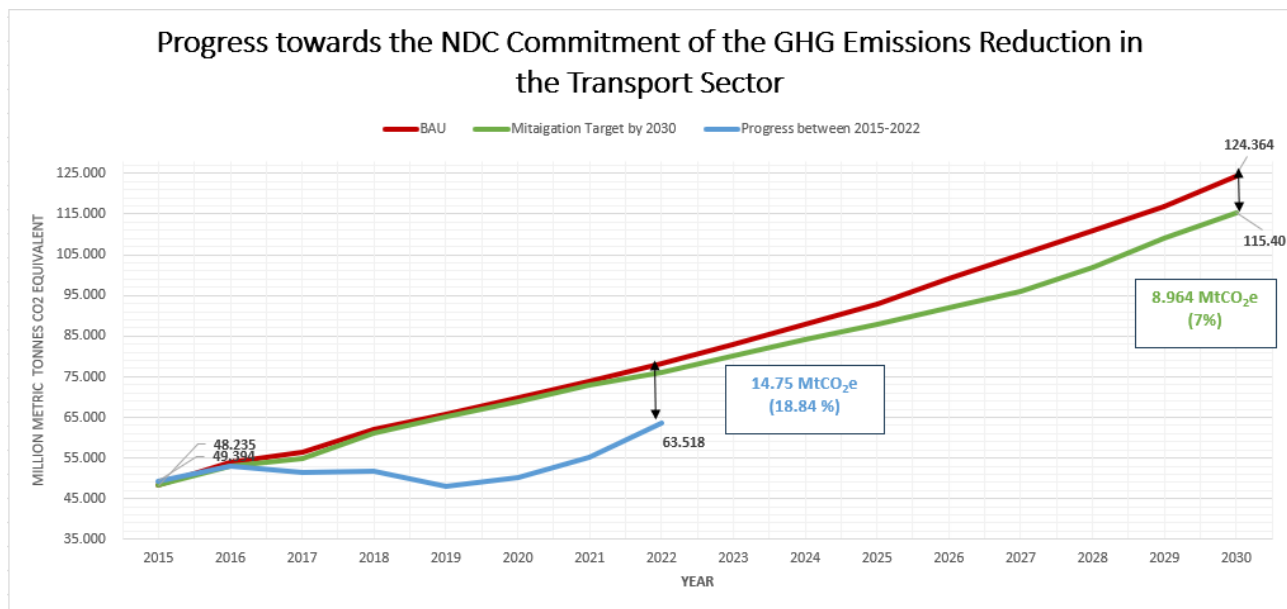


Egypt has made significant progress in the recovery and utilization of associated petroleum gases produced from crude oil fields. Efforts in the oil and gas sector have resulted in a cumulative GHG emission reduction of **1,351 Gg CO<sub>2</sub>e in 2022**, with a **decrease of 57% in emissions** compared to BAU levels for that same year. The associated petroleum gases subsector of Egypt's Oil & Gas industry is on track to achieve the **2030 target of a 65%** overall GHG emission reduction, with significant progress already made.

Progress towards the NDC Commitment of the GHG Emissions Reduction in the Oil and Gas (Associated Gases Subsector)



Egypt has achieved outstanding success in adopting more sustainable low-carbon modes of transport, with a substantial **14.75 GgCO<sub>2</sub>e in 2022** and a **decrease of 18.84% of emissions** compared to BAU levels for that same year. This has surpassed the **2030 target of 7%** overall GHG emission reduction. This positive trend was in 2015 and continued till 2022 due to multiple policy interventions, such as the energy subsidy reform program, and other influencing factors that led to behavioral changes in road transport.



In the **industry sector**, policies and measures to decarbonize cement production, increase energy efficiency, and promote eco-industrial parks are ongoing. The **buildings sector** is focused on energy efficiency enhancements, such as LED lighting, rooftop solar PV, and green building initiatives. Meanwhile, the **tourism sector** has embraced renewable energy and energy efficiency measures in hotels and resorts. Efforts in **waste management** include enhancing infrastructure, increasing recycling rates, and utilizing waste as a renewable energy source. Across these sectors, while many initiatives are ongoing or completed, sustained investment, technical advancements, and policy enforcement remain critical to fully realizing the 2030 NDC goals.

### Climate Change Impacts and Adaptation

Over the past 30 years, temperatures have risen in Egypt, particularly in summer, while annual precipitation has declined by 22%, worsening water scarcity and increasing flash floods. Climate projections indicate significant warming by the end of the century, with temperatures rising by 2.1°C to 5.7°C under high-emission scenarios, alongside longer dry spells and more intense rainfall, posing challenges for water resources, agriculture, and public health.

The Nile Delta is among the world's most vulnerable areas to climate change, driven by the reliance on the Nile River for agriculture, industry, fisheries, and energy. Rising temperatures, water deficits, and reduced rainfall threaten water availability. In 2019, the ND-GAIN Index ranked Egypt 107 out of 181 countries, highlighting its vulnerability. Impacts are evident in water scarcity, agricultural irrigation, and public health, with intensified heat waves and risks to vulnerable populations. Along the Mediterranean coast, rising sea levels and land subsidence increase the risk of inundation and shoreline erosion.

Natural hazards like sea-level rise, flash floods, dust storms, and storm surges threaten human lives and infrastructure, causing nearly 1,500 deaths and \$346.7 million in damage over the past 20 years. Critical infrastructure and key sectors—including agriculture, fisheries, tourism, and health—face disruptions from heat stress, water scarcity, and extreme weather. Socially, low-

income communities, women, children, and the elderly are most affected due to limited adaptive capacity, poor infrastructure, and urban planning. Women in rural areas face food and water insecurity, while the elderly are particularly vulnerable to extreme weather.

To address these risks, Egypt requires adaptation measures such as climate-resilient infrastructure, public health campaigns, and energy-efficient designs to mitigate the impacts of climate change on society and the economy. Priority actions include strengthening cooperation among governmental bodies, local communities, NGOs, and the private sector to develop comprehensive and effective solutions. By leveraging collaboration, Egypt can enhance adaptive capacities across sectors, ensuring that responses are equitable, inclusive, and informed by both local and scientific expertise.

Collaborations with international organizations like the UN Environment Programme and the Global Environment Facility have informed national adaptation strategies, such as the National Adaptation Plan (NAP) and pilot projects focused on sustainable agricultural practices and water resource management. Egypt's efforts in ICZM and disaster risk reduction have highlighted the importance of incorporating adaptation actions at different governance levels. Cooperation across local, national, regional, and international levels has emphasized water conservation, renewable energy projects, and transboundary water management. Egypt has also made significant progress in strengthening scientific research and institutional capacities, improving early warning systems, vulnerability assessments, and developing robust monitoring and evaluation frameworks.

### **Financial, Technology Development and Transfer, and Capacity Building Needed and Received**

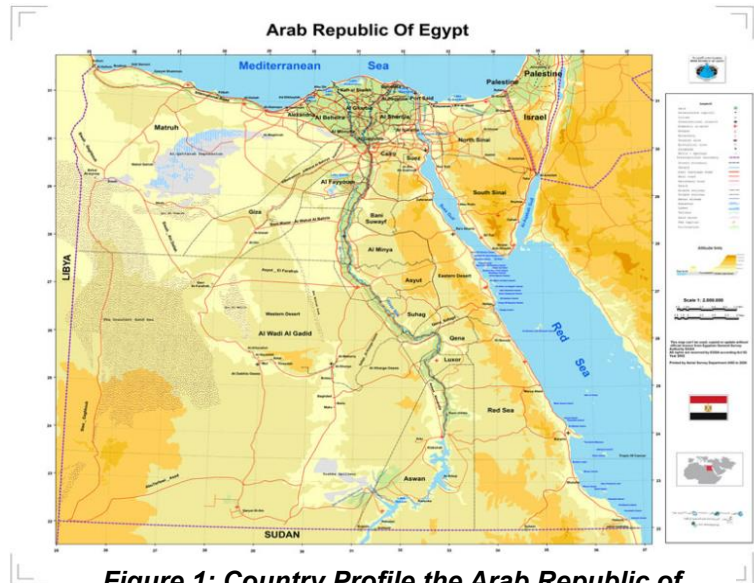
Egypt faces financial, technological, and capacity-building challenges, but international cooperation, technological innovation, and strong governance offer opportunities to advance sustainable development and climate resilience. Egypt recognizes the importance of global partnerships in advancing its climate efforts. Notably, the implementation of NDC is conditional on receiving financial and technical support from the international community. This highlights the critical link between global assistance and Egypt's ability to meet its climate commitments, emphasizing the importance of adequate funding and technology transfer to enhance its climate action.

This BTR1 presents a clear and transparent account of the support received by Egypt in the areas of finance, technology transfer, and capacity building; highlights the impact of international support on Egypt's climate action efforts; and identifies gaps and needs for further support to enhance Egypt's climate change response.

## Chapter 1: National Circumstances and Institutional Arrangements

### 1.1 Geophysical Characteristics

Egypt spans an area of about one million square kilometers and is located between 22° and 32° North and 24° and 37° East. The majority of the country lies within the vast desert belt that stretches eastward from Africa's Atlantic coast across the continent and into Southwest Asia. To the north, Egypt borders the Mediterranean Sea, with Sudan to the south, the Red Sea to the east, and Libya to the west. The Nile Valley and Delta were formed over thousands of years by the sediments and deposits of the Nile River, until the construction of the High Aswan Dam in 1968. Only 35,000 km<sup>2</sup> of the country's total land area is cultivated and permanently settled. Egypt's geological history has shaped four major physical regions: the Nile Valley, Nile Delta, Western Desert, Eastern Desert, and Sinai Peninsula (Ministry of Water Resources & Irrigation, 2013).



**Figure 1: Country Profile the Arab Republic of Egypt (State Information Service, 2023)**

Egypt's biodiversity spans diverse ecosystems, including deserts, wetlands, and coastal areas, supporting twenty-two habitat groups such as the Nile Valley, Red Sea ecosystems, and the Sinai mountains. The country is home to a rich biodiversity, hosting over 2,300 plant species, 111 mammal species, 480 bird species, and a vibrant marine life with more than 1,000 fish species and 200 coral species. Additionally, between 700,000 and one million migratory birds pass through the country twice a year, during their spring and autumn migration between Europe and Africa. However, this biodiversity is under threat from excessive hunting, habitat destruction, pollution, and the impacts of climate change, endangering species such as the Sinai Tiger and coral reefs. Coastal zones, which house 20% of the population and major industries, are facing significant pressures from tourism, overfishing, and rising desertification. Despite these challenges, biodiversity remains vital to Egypt's economy, particularly through ecotourism and natural resource-based industries (UNDP, 2021).

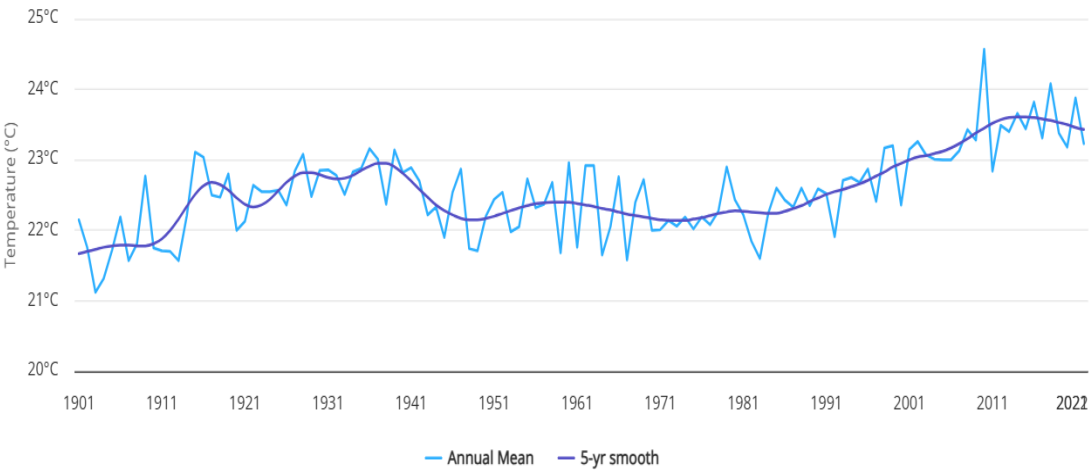
### 1.2 Climate Profile

Egypt has a hot and dry desert climate with two main seasons: a mild winter from November to April and a hot summer from May to October. The primary differences between the seasons are variations in daytime temperatures and the prevailing winds (World Bank, 2021).

#### 1.2.1 Temperature

Egypt's daytime temperatures vary with the seasons and are influenced by prevailing winds. In the coastal regions, winter temperatures average a minimum of 14°C (November to April), while summer maximums reach around 30°C (May to October). In the inland desert areas, temperatures can vary dramatically, especially during the summer, ranging from 7°C at night to 43°C during the day. In winter, desert temperatures fluctuate less but can drop to 0°C at night and rise to 18°C during the day. Between 1901 and 2013, temperatures in Egypt increased by an average of 0.1°C per decade. The rate accelerated between 2000 and 2020 with a temperature increase averaging 0.38°C per decade, which was higher than the world average (0.31°C per decade). As a result, the number of cooling degree days (CDDs) increased dramatically – by around 300 during 2000-2020 – while winter heating needs declined by over 50 heating degree days (HDDs) in the same period. The increasing frequency and intensity of heatwaves in Egypt are driving higher energy demand for cooling, straining the power grid and requiring significant investment in energy infrastructure. Additionally, the reliance on fossil fuels for electricity generation increases greenhouse gas emissions, complicating Egypt's efforts to meet its NDC commitments. Addressing these challenges necessitates strategic planning, emphasizing renewable energy adoption and enhanced energy efficiency. UNEP's recent study shows that 50% of all electricity is already being consumed for air conditioning during the peak summer months in Cairo (IEA, 2023).

Egypt also experiences hot windstorms, known as "khamsin," which carry sand and dust across the northern coast of Africa. These storms typically occur between March and May and can raise temperatures by 20°C in just two hours, lasting for several days (World Bank, 2021).

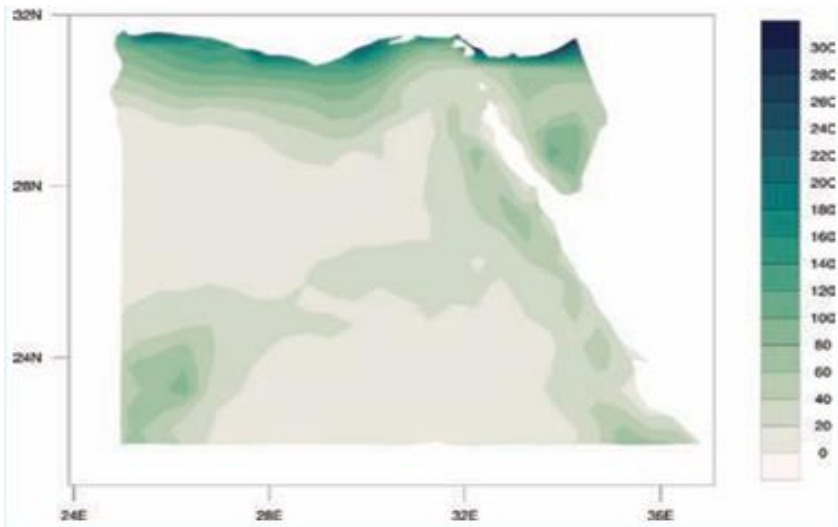
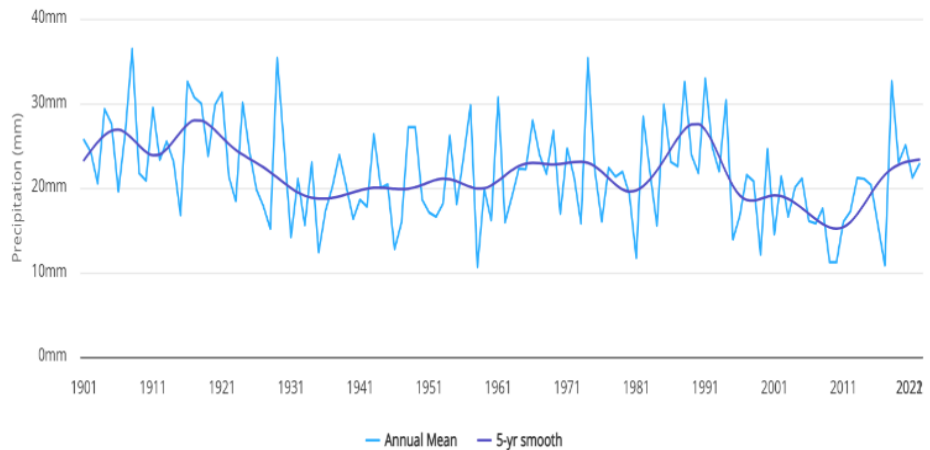


**Figure 2: Observed Annual Average Mean Surface Air Temperature (World Bank, 2021)**

**1.2.2 Precipitation**

Egypt is an extremely arid country, receiving very little annual precipitation. Most of the rainfall occurs along the coast, with Alexandria receiving the highest amount at approximately 200 mm per year. Although Alexandria has relatively high humidity, the sea breeze helps moderate the moisture levels. Precipitation decreases south, with Cairo receiving just over 10 mm of rainfall annually. Although Cairo experiences humidity during the summer months, areas south of the city receive only trace amounts of rainfall. However, these areas can suddenly experience extreme precipitation events, leading to flash floods. Sinai receives more rainfall than other desert areas and is dotted with numerous wells and oases, which support small population centers that were once key focal points on trade routes. Water drains from the main plateau toward the Mediterranean Sea, providing enough moisture to allow some agriculture in the coastal area, particularly near Al Arish. However, the country's high evaporation rate, coupled with the near absence of permanent surface water in large parts of the region, makes water a highly scarce resource. The primary challenges are centered around water resource availability, changing precipitation patterns, and increasing population demands.

**Figure 3: Observed Annual Precipitation of Arab Republic of Egypt for 1901-2022 (World Bank, 2021)**



**Figure 4: Observed Climatology Precipitation of Arab Republic of Egypt for 1901-2020 (World Bank, 2021)**

### 1.3 Socioeconomic Profile

#### 1.3.1 Population and Demographics

As of January 1, 2024, Egypt’s total population is 105,914,499, consisting of 51,472,894 females and 54,441,605 males. The male-to-female ratio is 105.8 males for every 100 females. By 2050, Egypt is projected to be among the countries contributing most significantly to global population growth. The areas along the Nile River and its Delta are among the world’s most densely populated, while the vast desert regions remain sparsely populated or uninhabited (refer to Figure 5 and Figure 6).

This rapid population growth presents significant economic and social challenges, including issues related to food security, health, education, employment, and overall quality of life. National policies must keep pace with both demographic growth and the rising demand driven by higher living standards, which place increasing pressure on Egypt’s natural resources. Addressing the needs of a larger population will require more sustainable management and use of these resources.

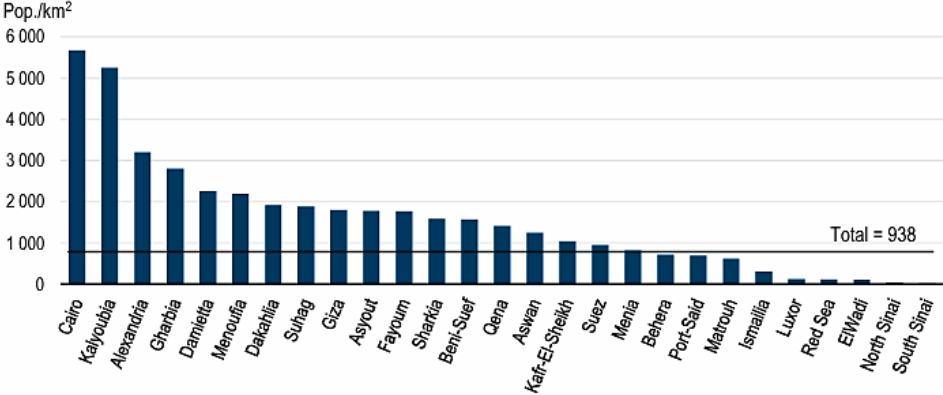


Figure 5: Egypt’s population Density by Governorate (CAPMAS, 2024)

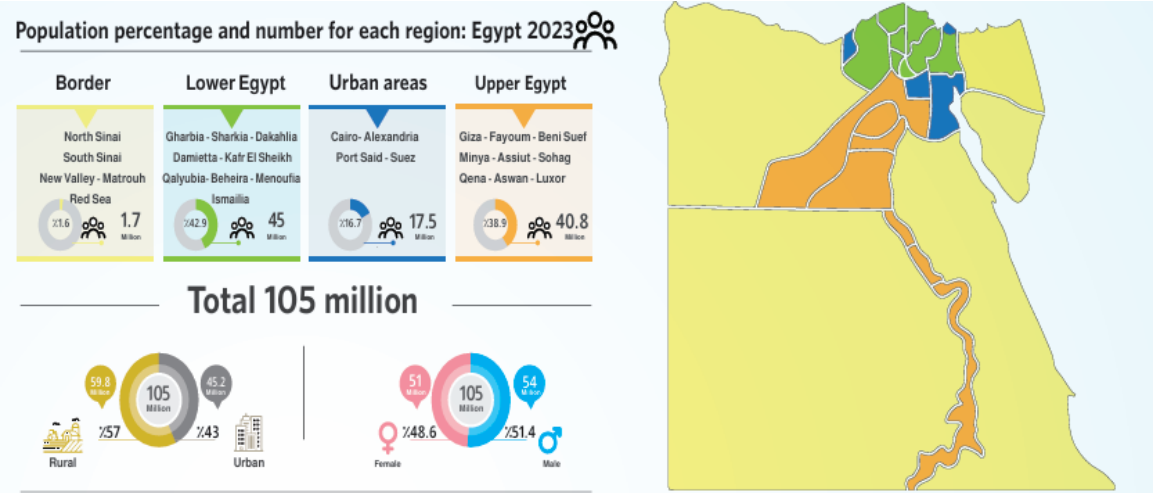


Figure 6: Egypt’s Population Distribution by Region (concentrated along the Nile River and its Delta) (Source: National Population and Development Strategy 2023-2030)

**1.3.2 Economic Profile**

Egypt is a developing country with a fast-growing population. Egypt is currently facing significant economic challenges despite ambitious macroeconomic and structural reforms since 2016 to stabilize the economy. The adverse repercussions of the COVID-19

pandemic, global economic shocks resulting in abrupt increases in food and fuel prices, and geopolitical tensions have undermined recent economic progress.

Between 2015 and 2024, Egypt's economy underwent transformative changes driven by macroeconomic reforms and external pressures. One of the most impactful developments was the devaluation of the Egyptian Pound (EGP) in November 2016, when the currency was floated as part of a \$12 billion Extended Fund Facility (EFF) agreement with the International Monetary Fund (IMF). This decision led to a nearly 50% overnight reduction in the EGP's value. The currency flotation intends to stabilize the economy, addressing foreign currency shortages and attracting foreign investment. While this reform improved Egypt's external competitiveness, increased remittances, and bolstered foreign reserves, it triggered short-term shocks, including a historic inflation spike of 29.5% in 2017 (IMF, 2017).

Beyond 2017, the EGP underwent multiple episodes of devaluation driven by internal economic challenges and external global pressures. In subsequent years, Egypt pursued additional IMF support including a Rapid Financing Instrument (RFI) in 2020 to mitigate the impacts of the COVID-19 pandemic and a \$3 billion EFF loan in 2022 to address vulnerabilities exacerbated by the Russia-Ukraine conflict (IMF, 2022). Despite these efforts, the EGP faced further devaluation in 2022 and 2023. By the end of 2022, the currency further depreciated to approximately EGP 24 per USD, driven by sustained economic pressures, declining foreign reserves, and challenges stemming from global and domestic financial conditions. This led to renewed inflationary pressures and increasing public debt. By 2024, the EGP stabilized, albeit at a weaker level than in 2015, reflecting the need for ongoing structural reforms to enhance resilience and ensure sustainable growth (IMF, 2023).

These currency reforms occurred alongside broader macroeconomic trends. Egypt's Gross Domestic Product (GDP) growth peaked at 6.6% in 2021/2022, recovering from the COVID-19 pandemic, before moderating to 4.2% in 2023/2024. GDP per capita growth followed a similar trajectory, reflecting a slower pace of individual income improvements. Unemployment declined significantly from 12.9% in 2015 to 6.8% in 2024, attributed to targeted labor market initiatives and investments in infrastructure (IMF, 2024). The nominal GDP increased consistently, expanding Egypt's economic base from EGP 2.2 trillion in 2015 to a projected EGP 13.9 trillion in 2024 (World Bank, 2024).

Growth is expected to start a gradual recovery from an estimated 2.5% in FY24 (July 2023-June 2024) to 3.5% and 4.2% in FY25 and FY26, respectively, driven by favorable base effects as well as investment, notably that financed by the UAE deal. The budget deficit is forecast to widen from 3.6% of GDP in FY24 to 7% of GDP in FY25, mainly due to the higher interest payments and the vanishing impact of the Ras Elhekma transaction, before starting to decline thereafter, supported by fiscal consolidation. External financing requirements remain substantial, with maturing external debt and repayment of arrears to international oil companies. Further, the widened current account deficit may put pressure on foreign currency resources, especially if the Middle East conflict continues to cast a shadow on the economy (World Bank, 2024).

**Table 1: Egypt's Macroeconomic Trends (Source: IMF, 2024)**

| Year             | GDP Growth Rate (%) | GDP Per Capita Growth Rate (%) | Inflation Rate (%) | Unemployment Rate (%) | Gross Domestic Savings Rate (%) | Gross Domestic Investment Rate (%) |
|------------------|---------------------|--------------------------------|--------------------|-----------------------|---------------------------------|------------------------------------|
| 2015             | 3.8                 | 0.9                            | 13                 | 13.2                  | 10.6                            | 14.5                               |
| 2016             | 4.2                 | 1.3                            | 14.1               | 12.5                  | 11.7                            | 16.1                               |
| 2017             | 4.2                 | 1.3                            | 14.1               | 12.5                  | 12.2                            | 16.7                               |
| 2018             | 5.6                 | 2.7                            | 13.3               | 11.9                  | 13.9                            | 17.7                               |
| 2019             | 5.6                 | 2.7                            | 13.3               | 11.9                  | 14.3                            | 18.2                               |
| 2020             | 3.6                 | 0.6                            | 5.9                | 8                     | 11.1                            | 15.2                               |
| 2021             | 5.6                 | 2.6                            | 5.7                | 7.8                   | 12.3                            | 16.3                               |
| 2022             | 6.6                 | 3.6                            | 6.6                | 7.2                   | 11.7                            | 15.6                               |
| 2023             | 4.6                 | 1.6                            | 14.6               | 7.6                   | 10.8                            | 14.4                               |
| 2024 (projected) | 2.7                 | -0.8                           | 33.3               | 7.2                   | 9.4                             | 12.1                               |

Egypt's macroeconomic trends from 2015 to the projected values for 2024 highlight several key challenges and shifts in its economic landscape. The GDP growth rate has shown a declining trajectory, dropping from a peak of 6.6% in 2022 to a projected 2.7% in 2024, reflecting slowing economic momentum. Correspondingly, GDP per capita growth has turned negative in 2024 (-0.8%), signaling a reduction in individual economic welfare. Inflation has surged dramatically, increasing by fivefold from 6.6% in 2022 to a staggering 33.3% in 2024, intensifying economic pressures on households and businesses. Unemployment rates have steadily decreased, reaching 7.2% in 2024, which may reflect improved labor market conditions despite other economic headwinds. However, gross domestic savings rates have declined post-COVID, falling to 9.4% in 2024, with no signs of recovery. Similarly, gross domestic investment rates have shrunk significantly, from 18.2% in 2019 to 12.1% in 2024. Together, these indicators paint a picture of economic stress, with inflation and investment challenges likely dampening prospects for sustainable growth and financial resilience.

**Table 2: GDP growth rate for Q4 and FY 2023/2024 million EGP (at constant prices) and (%) (Source: IMF, 2024)**

| <b>Economic Activities</b>              | <b>Q4</b>  | <b>Total Year</b> | <b>(%)</b> |
|---|------------|-------------------|------------|
| <b>AGRICULTURE FORESTRY FISHING</b>     | 427,633.15 | 1,906,346         | 3.78       |
| <b>MINING QUARRYING</b>                 | 299,706.82 | 1,020,734         | -4.69      |
| <b>PETROLEUM</b>                        | 162,274.02 | 517,150           | -1.75      |
| <b>GAS</b>                              | 70,407.07  | 298,081           | -13.12     |
| <b>OTHER EXTRACTION</b>                 | 67,025.73  | 205,502           | 3.71       |
| <b>MANUFACTURING INDUSTRIES</b>         | 449,778.56 | 1,931,558         | -5.4       |
| <b>PETROLEUM REFINING</b>               | 59,133.80  | 362,717           | -6.07      |
| <b>OTHER MANUFACTURING</b>              | 390,644.76 | 1,568,841         | -5.22      |
| <b>ELECTRICITY</b>                      | 50,404.35  | 190,887           | 5.16       |
| <b>WATER SEWERAGE</b>                   | 15,298.06  | 59,640            | 3.49       |
| <b>CONSTRUCTION</b>                     | 360,410.44 | 1,324,225         | 5.66       |
| <b>TRANSPORTATION AND STORAGE</b>       | 178,902.69 | 636,508           | 5.37       |
| <b>SUEZ CANAL</b>                       | 46,031.28  | 225,269           | -30.05     |
| <b>TOURISM (Restaurants and Hotels)</b> | 225,000    | 900,000           | 24.0       |

### **1.3.3 Government Structure**

Egypt, a democratic and modernized state divided into 27 governorates, operates under a constitutional semi-presidential system. The President, as head of state, is elected for a six-year term and holds significant executive powers, including the appointment of 5% of parliamentary members and the authority to dissolve parliament under Article 137. The parliamentary system consists of two legislative chambers: the House of Representatives and the Senate, with the House holding final authority in resolving legislative disputes.

## 1.4 Key Mitigation Sectors

### 1.4.1 Electricity Sector

As part of broader energy sector reforms, Egypt is gradually removing electricity subsidies. This process includes incremental increases in electricity tariffs designed to reduce fiscal burdens and promote efficient energy use. While the government acknowledges the social challenges posed by these tariff increases, it considers them essential for achieving long-term energy sustainability, accompanied by robust social protection measures to mitigate their impact. The adopted policies focus on increasing clean energy sources, diversifying Egypt's energy mix, and ensuring that renewables play a central role in meeting the country's future energy needs. In 2023, Egypt's total energy demand was approximately 93.5 Mtoe, with the industrial sector accounting for 37% of consumption, primarily driven by heavy industries such as cement, steel, and petrochemicals. The transport sector represented 25% of demand, dominated by oil products like diesel and gasoline. Residential and commercial usage constituted 29%, mainly for electricity used in lighting, cooling, and appliances. Agriculture accounted for 5%, primarily for water pumping and irrigation, while public services made up the remaining 4%. (Source: *IEA Egypt Energy Profile, 2023; Egypt Energy Strategy Report 2022-2023*).

#### Renewable Energy Projects:

Egypt is heavily investing in solar and wind energy, supported by the Integrated Sustainable Energy Strategy (ISES) 2035 and the National Renewable Energy Action Plan (NREAP). The Benban Solar Park (1465 MW), located in Aswan, is one of the largest solar energy complexes globally and significantly contributes to Egypt's renewable energy capacity. The Gabal El-Zeit Wind Farm (580 MW) is another key project contributing to wind energy expansion, and the Assiut hydropower plant (32 MW). These projects are part of Egypt's broader strategy to generate 42% of its electricity from clean energy sources by 2030. To achieve this, the government continues to focus on large-scale solar and wind energy projects supported by favorable regulatory frameworks and public-private partnerships (PPP) (International Trade Administration, 2022).

Despite its vast potential for solar energy, Egypt faces several challenges in expanding large-scale solar projects, with administrative holdups, financing issues, land acquisition, and inadequate infrastructure being the primary barriers. The government has responded by streamlining the approval process for renewable energy projects and enhancing the investment climate through regulatory reforms and financial incentives like the Sovereign Wealth Fund for Renewable Energy.

#### Energy Efficiency Improvements:

Alongside renewable energy expansion, Egypt has focused on improving energy efficiency across power generation and distribution. Key initiatives include the upgrade of aging power plants and the construction of combined-cycle plants in collaboration with major international companies such as Siemens. These plants improve operational efficiency and increase power generation capacity, contributing to more reliable electricity production.

#### Expansion of the Power Grid:

The expansion and modernization of Egypt's power grid is crucial for integrating renewable energy sources. The government is investing in the development of a smart grid that can accommodate the growing share of solar and wind energy. This initiative is part of the Electricity Sector Modernization Programme, designed to enhance grid stability, efficiency, and resilience, particularly as the generation of renewable energy scales up. Modernizing the grid also ensures that energy produced from renewable sources can be distributed efficiently across the country (IRENA, 2018). However, financial constraints are impeding the expansion of the power grid, thereby limiting the integration of renewable energy at the planned capacities.

**Frequent Load Shedding:**

Despite considerable advancements in renewable energy installed capacity, Egypt has experienced frequent load shedding, primarily attributed to natural gas shortages in FY 2022/2023, which supply a significant portion of the country's power plants. Starting in September 2024, the load-shedding program was suspended after the government began importing the necessary natural gas to fulfill electricity demand. These shortages affect the country's ability to meet peak demand, highlighting the urgent need to expand renewable energy infrastructure. Current initiatives aim to decrease reliance on natural gas and enhance the grid's capability to handle peak loads more efficiently.

**1.4.2 Oil & Gas Sector**

Similar to the electricity sector, part of the energy reforms involved the gradual removal of subsidies on petroleum products. By phasing out these subsidies, the government aims to reduce fuel consumption, promote energy efficiency, and reallocate resources toward cleaner energy sources. While this reform has faced social challenges, the government has implemented social protection measures, such as expanding the Takaful and Karama programmes, to support vulnerable populations and mitigate any potential social impacts.

The Egyptian oil and gas sector adopted its first Energy Efficiency Strategy 2022-2035. Another cornerstone of Egypt's mitigation strategy is the Global Gas Recovery 'Zero Routine Flaring Project'. This initiative focuses on capturing associated petroleum gases that are flared at oil production sites. The recovered gases will be routed to gas processing facilities for the production of LPG, natural gas, and condensates or used for on-site electricity generation. In the Western Desert, advanced gas recovery projects have reduced flaring rates by 40%, converting what was once wasted gas into a valuable energy source (World Bank, 2020).

### **1.4.3 Transport Sector**

Major initiatives include expanding public transport networks such as the Cairo metro and the Light Rail Transit (LRT) system, as well as implementing a monorail project to connect urban and peri-urban areas. Additionally, efforts are directed toward modernizing and electrifying railway systems, reducing dependence on diesel.

Low-emission vehicle transition is another cornerstone, with plans to introduce electric buses through the BRT project and the expansion of electric vehicles. The National Authority for Tunnels (NAT) has been instrumental in driving metro and monorail expansions, which significantly contribute to sustainable urban mobility.

Egypt's transport sector faces challenges in implementing climate change mitigation measures due to financial constraints, public resistance to pay higher tariffs, and high investment costs for electric vehicles and their related infrastructure. Egypt's Ministry of Planning, Economic Development, and International Cooperation outlined ambitious plans for the transport sector in 2022/2023 (Ministry of Planning and Economic Development, 2023). The sector is seen as a crucial driver of economic and social development, with a focus on sustainability and efficiency. Key objectives include increased investment, enhanced production, the development of an integrated multimodal transport system, and institutional and human capacity building. By investing in infrastructure, technology, and human capital, Egypt aims to improve the quality of transport services, reduce travel times, and enhance the overall efficiency of the transportation system, contributing to the country's economic growth and social development.

### **1.4.4 Industry Sector**

The sector's mitigation actions primarily focus on reducing greenhouse gas emissions by enhancing energy efficiency, adopting low-carbon technologies, and transitioning towards renewable and alternative fuels. Key sectors such as cement, steel, iron, and fertilizers are targeted for emission reductions through the implementation of cleaner production methods and technological upgrades. A potential solution in this transition is the development of green hydrogen, which is considered a promising aspect in the decarbonization process of energy-intensive industries in Egypt. The Egyptian government is working to promote green hydrogen production as part of its broader energy strategy (Egypt Oil & Gas, 2023). The National Strategy for Low-Carbon Hydrogen was issued in 2024. The strategy aims to reduce emissions in sectors such as industry by substituting conventional fuels with cleaner hydrogen alternatives and positioning Egypt as a global leader in the low-carbon hydrogen economy.

Despite these ambitious plans, Egypt faces significant challenges, including rising prices for electricity and petroleum products. These price increases, driven by ongoing subsidy reforms, aim to reduce fiscal burdens and promote energy efficiency. However, they may also undermine the competitiveness of energy-intensive industries. The gradual removal of subsidies, while essential for Egypt's long-term sustainability, could negatively affect industrial productivity, especially in sectors already burdened by high energy costs.

Additionally, natural gas shortages are disrupting industries that rely on it as both a fuel and feedstock. For instance, in June 2024, four major fertilizer producers in Egypt suspended

operations due to a severe gas supply shortage exacerbated by ongoing regional tensions and an unprecedented summer heatwave that significantly increased the demand for gas to power electricity grids.

Additionally, external pressures, such as the European Union's Carbon Border Adjustment Mechanism (CBAM), are further challenging Egypt's industrial competitiveness. The CBAM, which imposes carbon tariffs on certain exported goods, threatens Egypt's key export sectors, including cement, fertilizers, aluminum, and steel, all of which are high greenhouse gas (GHG) emitters.

#### **1.4.5 Buildings and Urban Cities**

Egypt's urbanization strategy includes sustainable development practices, improving public transport, and integrating smart city initiatives. New cities, like the New Administrative Capital, are designed with energy-efficient infrastructure and green building standards, contributing to economic growth and social development. Moreover, in 2023, the government approved a National Urban Policy (NUP) to develop people-centered smart cities. Facilitated by UN-Habitat, Egypt's NUP proposes a new urban system based on six clusters of cities, acknowledging different paces of urbanization (UN-Habitat, 2023). Also, the Egyptian government, in cooperation with the World Bank, will launch the *Atlas of Sustainable Egyptian Cities*, showcasing Egypt's commitment to sustainable urban development and climate resilience (World Urban Forum, 2024).

However, several challenges must be overcome to meet the NDC targets. One significant hurdle is the increase in electricity tariffs, which has raised operational costs for both the residential and commercial sectors. The gradual removal of subsidies has particularly impacted energy-intensive industries, such as construction, and contributed to a higher cost of living for urban populations, making the transition to energy-efficient buildings more challenging. Additionally, while the rapid expansion of new cities is crucial to accommodate Egypt's growing population, it presents logistical and financial obstacles in ensuring these cities meet green building standards and sustainability goals. Achieving these targets will also require addressing resistance from stakeholders who are wary of the upfront costs associated with green technologies and retrofitting existing infrastructure.

#### **1.4.6 Tourism Sector**

Greening the tourism industry requires incorporating eco-friendly practices across various facets of the sector. Notable initiatives include reducing the carbon footprint of hotels, resorts, and attractions through energy-efficient technologies and renewable energy adoption, such as PV panels and solar water heaters (SWHs). Moreover, tourism hubs like Sharm El-Sheikh have embraced sustainability, with most hotels obtaining eco-certificates, in addition to relying on eco-friendly means of transportation for tourists, applying waste management systems that reduce environmental impact, and aligning with Egypt's broader climate targets.

One such initiative is the Green Star Hotel Program (GSHP), which is an eco-certification and capacity-building program designed to distinguish hotels dedicated to implementing green tourism practices. The programme's primary objectives are to reduce operational costs for these hotels, enhance the competitiveness of Egypt's tourism sector, and meet the

increasing demand for sustainable tourism. Additionally, it aims to build local capacity to address the challenges posed by climate change.

Also, Egypt's tourism sector has made significant progress in adopting renewable energy technologies to reduce reliance on fossil fuels through initiatives like the Egypt-PV project, which is implemented by the UNDP and aims at the development of decentralized, grid-connected small-scale PV systems and catalyzing its installation over various establishments, including hotels.

Another initiative is the *Mainstreaming Biodiversity in Egypt's Tourism (MBDT)* project, funded by the Global Environment Facility (GEF) and implemented by the UNDP and Egypt's Ministry of Environment. This project supports eco-certified tourism businesses, helping them adopt sustainable practices and minimize the negative impacts of tourism development. Among the project's achievements is the launch of *ECO EGYPT*, Egypt's first-ever Green List (GL), which recognizes tourism businesses (such as hotels, ecolodges, and diving centers) for their commitment to sustainability (UNDP, 2024).

Additionally, *ECO EGYPT* offers tools like the Egyptian Sustainable Tourism Portal (ESTP), which provides hospitality professionals with guidelines for implementing sustainable, cost-effective measures. The project also collaborates with local authorities to establish ecolodge guidelines, helping promote nature-based, biodiversity-friendly tourism. Egypt's tourism sector, particularly areas like Sharm El-Sheikh, is undergoing a green transformation, positioning itself as a global leader in sustainable coastal tourism, which achieved a substantial contribution to climate change action and biodiversity conservation during COP27 (ECO Egypt, 2023).

The tourism sector in Egypt faces several challenges despite ongoing efforts to promote sustainability. Regional geopolitical tensions in the Middle East and broader economic instability can significantly impact tourism flows, causing financial strain on the sector. Additionally, rising electricity tariffs and petroleum price increases further burden tourism businesses, leading to higher operational costs that could deter both operators and visitors. While green initiatives, such as the Green Star Hotel Program, Egypt-PV, the ECO EGYPT campaign, and Sharm El Sheikh's green transformation, offer promising solutions, the widespread adoption of sustainable tourism practices is still limited. The lack of resources among many tourism operators to invest in eco-friendly infrastructure, coupled with the need for more robust training and regulatory enforcement, makes the transition challenging. These challenges underline the importance of continued policy alignment, international collaboration, and capacity-building to promote a more resilient and sustainable tourism industry in Egypt.

### **1.4.7 Waste Sector**

Egypt generates 26 million tons of municipal waste annually, with 90% of it being collected. Out of the collected waste, 8.5 million tons undergo treatment, while 15.5 million tons are sent to landfills. The treated waste is utilized to produce 4.3 million tons of organic fertilizer and 1.7 million tons of refuse-derived fuel.

The sector aims to reduce GHG emissions through improved waste management practices, including waste minimization, recycling, and composting. A key milestone is the issuance of Egypt's new Waste Management Regulation Law 202/2020, which seeks to address challenges related to waste collection, disposal, and recycling. This law encourages the private sector's involvement in waste management and emphasizes the importance of adopting sustainable practices across urban and rural areas. Under the law, the Waste Management Regulatory Authority (WMRA) is the key national entity for waste management in coordination with the EEAA and other line ministries. WMRA has been actively developing strategies to enhance waste recycling and promote circular economy principles to reduce the volume of waste sent to landfills, thereby mitigating methane emissions (EEAA, 2020).

In addition to the provisions of Egypt's Waste Law 202/2020 and strategies from the EEAA, several key actions are being taken to address waste management challenges and mitigate emissions. One important initiative is the expansion of waste-to-energy projects, which convert non-recyclable waste into electricity, helping to reduce both waste volumes in landfills and the reliance on fossil fuels. These projects are aligned with the country's goal to reduce emissions and provide a renewable energy source. Furthermore, Egypt is working to improve waste segregation at the household level, expand recycling programmes, and promote Extended Producer Responsibility (ERP) targeting both urban centers and rural areas (GIZ, 2024).

WMRA has finalized the regulations and conditions required for licensing collection and recycling facilities in accordance with the law. Additionally, WMRA is in the process of reviewing market practices and refining governance frameworks for waste handling and the management of materials destined for final disposal after treatment. Additionally, Egypt plans to manage hazardous waste and reduce the environmental impacts of e-waste, which has been a growing concern with increasing electronic consumption. The government has been collaborating with international partners and the private sector to implement sustainable solutions for hazardous waste disposal, waste and wastewater treatment, including improving waste collection, recycling, and treatment technologies. While progress is being made, Egypt still faces considerable challenges in enforcing these regulations and in securing the necessary funding for large-scale projects to meet its NDC goals.

## **1.5 Effect of National Circumstances on Greenhouse Gas Emissions**

Egypt's national circumstances have a profound impact on its greenhouse gas emissions. The interplay of geographical, economic, and social factors is crucial in determining the trajectory of emissions in the country. Nestled in an overwhelmingly arid region, Egypt grapples with significant challenges related to water scarcity, a situation worsened by climate variability coupled with a rapidly growing population that has surpassed 105 million. This demographic shift drives increased demands for energy and resources, primarily met through the combustion of fossil fuels. Such reliance not only escalates greenhouse gas emissions but also highlights the urgent need for a transition toward sustainable energy practices that can effectively mitigate environmental impacts and enhance resilience. The Egyptian economy is intricately linked to several industries that have historically contributed to high levels of GHG emissions, especially in the oil and gas extraction and processing. While these industries are essential for national economic stability and growth, they present substantial challenges in the pursuit of a lower carbon footprint. Analysis of Egypt's GHG inventory reveals a complex narrative regarding emissions trends from 1990 to 2022, indicating a persistent rise in GHG emissions driven by industrial activity, urbanization, and the growing energy demand.

Egypt has achieved significant progress in the reduction of GHG emissions through various mitigation efforts. In particular through the establishment of ambitious renewable energy targets, efficiency improvement programmes, and mass transit projects. This has contributed to a deceleration in the growth rate of GHG emissions in recent years. Investments in solar and wind projects not only contribute to lower emissions but also enhance national energy security and economic resilience. Furthermore, the gradual removal of energy subsidies has led to behavioral changes in energy consumption and increased the feasibility of energy-efficient technologies. This transition is expected to significantly reduce emissions associated with the combustion of traditional fossil fuels.

On the other hand, the domestic economic challenges, exacerbated by the surrounding geopolitical conflicts, pose significant hurdles to Egypt's transition to a low-carbon pathway. These challenges include rising inflation, increasing public debt, and strained foreign currency reserves, which limit the government's capacity to invest in clean energy infrastructure and green projects. Additionally, geopolitical tensions in the region have disrupted trade routes, increased energy costs, and diverted attention and resources to addressing immediate economic and security concerns, further slowing progress on long-term climate goals. Adequate international assistance in the form of funding, capacity building, and technology transfer is essential to offset the financial and technical barriers that hinder the country's climate action. Without such support, achieving a low-carbon future in the context of these compounded challenges will remain a significant struggle, potentially impacting Egypt's contribution to global climate goals.

## **1.6 Key Adaptation Sectors**

### **1.6.1 Water Resources**

The water sector in Egypt faces significant challenges that are exacerbated by climate change and population growth, in addition to economic development, which further intensifies the demand for water resources. With over 98% of the country's freshwater supply sourced from the Nile River, the increasing demand for water due to agricultural, industrial, and domestic needs places immense pressure on this vital resource. To combat water scarcity, the Egyptian government is implementing a range of adaptation strategies that aimed at enhancing the efficiency of water management. These strategies include modernizing irrigation systems to reduce water wastage, promoting the use of drought-resistant crops, and adopting innovative technologies such as precision agriculture. Additionally, there is a strong focus on improving the overall water infrastructure, with investments directed towards the rehabilitation of existing reservoirs, canals, and treatment plants. Egypt is also exploring alternatives to freshwater sources, such as desalination and wastewater recycling, to diversify its water supply and ensure sustainability in the face of increasing demand and climate variability. Furthermore, integrated water resource management practices are being developed to coordinate efforts among various stakeholders and ensure equitable water distribution across different sectors. These initiatives aim to not only address current water scarcity issues but also build resilience against future climate impacts (Al-Mailam et al., 2023).

Egypt's coastal population, accounting for 40-45% of the nation's total, faces significant risks from climate change. The Nile Delta, home to over 40 million people, is especially susceptible to sea-level rise and storm surges, potentially displacing 6-8 million individuals by 2050. Rising sea levels also threaten freshwater sources through saltwater intrusion, negatively impacting agriculture and water supplies. These challenges heighten the risk of displacement, potentially triggering migration and increasing pressure on inland regions. The Egyptian government is implementing adaptation measures, such as constructing sea defenses, initiating reclamation projects, and improving water management. However, without effective mitigation of sea-level rise, displaced populations could migrate to urban areas, intensifying strain on housing, infrastructure, and essential resources.

To complement these efforts, several significant and successful water projects have been launched across the country, illustrating Egypt's commitment to enhancing water security and sustainability. One of the most notable projects is the New Delta Irrigation Water Treatment Plant or El Hammam Wastewater Treatment Plant, recognized as the largest of its kind in the world, with a capacity of processing 7.5 million cubic meters of agricultural drainage water daily. This ambitious initiative aims to reclaim approximately two million acres of land in the New Delta region, significantly boosting agricultural productivity while sustainably managing water resources. This facility has not only reduced pollution levels in local water bodies, such as Lake Mariout but also exemplifies Egypt's innovative approach to utilizing treated wastewater, thereby alleviating pressure on freshwater sources.

Additionally, the country is making strides in expanding its desalination infrastructure, with plants like the Ain Sokhna facility, which has a capacity of purifying 136,000 cubic meters of seawater daily (Arab Republic of Egypt Presidency, 2019). The ongoing development of new desalination projects reflects Egypt's determination to diversify its water supply in

response to the growing challenges of climate variability and water scarcity. Moreover, the implementation of Integrated Water Resources Management (IWRM) approaches underscores the need for a coordinated strategy involving various stakeholders to optimize water resource use across agricultural, industrial, and domestic sectors.

### **1.6.2 Agriculture and Livestock**

Egypt's agriculture plays a vital role in regional food security and the national economy. With 55% of the labor force engaged in agricultural activities, the sector employs 21% of the workforce and accounted for 11.3% of Egypt's GDP in 2021. It provides income for citizens and revenue for the state. Domestically, agriculture meets 30% of the country's dietary needs while also exporting food both regionally and internationally. However, Egypt cannot achieve food security on its own, particularly in terms of strategic agricultural commodities like cereal grains. Recent events, such as the coronavirus pandemic, have worsened food insecurity, leaving over a quarter of the population facing mild to acute levels of food insecurity.

Egypt's per capita caloric supply is high, but a third of this intake, along with over 38% of daily protein consumption, comes from wheat products alone. Despite producing 9 million metric tons of wheat annually, Egypt imports an additional 12 to 13 million metric tons to meet demand, creating a significant wheat import gap. This results in a \$5.2 billion expenditure on wheat imports. Even so, Egypt's per capita wheat consumption is among the highest in the world, more than double the country's combined daily consumption of meat, seafood, eggs, milk, butter, and rice. The adverse impacts of climate change on wheat yields are a major concern, as they could increase Egypt's dependence on cereal imports and threaten both nutrition and domestic food security. Projections show that wheat and maize yields could decline by 10 to 12% and 13 to 15%, respectively, by 2030. Additionally, agriculture accounts for about 80% of Egypt's freshwater consumption.

Agriculture in Egypt is predominantly concentrated in the Nile Delta and Nile Valley, which together account for about 80% of the country's agricultural land (FAO, 2023). However, these areas face significant challenges from water scarcity, saltwater intrusion, and land degradation. The Nile Delta, home to around 60% of Egypt's agricultural production, is particularly vulnerable to sea-level rise, with projections suggesting that up to 200,000 hectares of farmland could be lost by 2050 due to saltwater intrusion (UNEP, 2022). Egypt's water scarcity, with an availability of less than 600 cubic meters per capita per year, further exacerbates these challenges, particularly given the reliance on the Nile for irrigation (FAO, 2023). Prolonged droughts and irregular rainfall patterns due to climate change threaten the sustainability of agricultural productivity and food security.

In response to these challenges, Egypt has initiated several projects aimed at expanding agricultural land and rehabilitating degraded areas. These include the New Valley Project and the Toshka Project, which focus on reclaiming desert land for agriculture, and efforts to use treated wastewater for irrigation to reduce pressure on freshwater resources (FAO, 2023). Additionally, soil improvement initiatives and the use of salt-tolerant crops in coastal regions impacted by sea-level rise are part of the government's strategy to maintain agricultural productivity (UNEP, 2022). Despite these efforts, the country's agricultural

sector remains under significant stress due to environmental factors and water-related challenges, underscoring the need for sustainable land and water management to ensure long-term food security.

## **1.7 Climate Change Vulnerabilities and Adaptive Capacity**

Egypt is a developing country characterized by its arid and semi-arid climate, experiences hot, dry summers and mild winters. Most rainfall is concentrated along the Mediterranean coast, leaving other regions with little precipitation. Over the past 25 years, Egypt has witnessed rising temperatures and frequent extreme weather events, causing economic losses. In 2022, the highest temperature recorded was 42.6°C in Aswan.

Egypt depends on the Nile River, which provides 55.5 billion cubic meters (BCM) of water annually, based on international treaties. However, Egypt's water needs exceed 114 BCM. The water deficit is managed through various methods: agricultural reuse, treated wastewater, desalination, and the extraction of non-renewable groundwater. The Nile Delta is particularly vulnerable to climate change, rising sea levels, and salinization pose serious threats to agriculture and water security.

By 2024, Egypt's population reached over 105 million, with 95% concentrated in the Nile Valley and Delta. Rapid population growth and urbanization strain natural resources and infrastructure, exacerbating climate challenges. Cairo alone houses over 10 million people, putting additional pressure on housing, employment, and public services.

Climate change poses significant risks to Egypt's critical infrastructure and essential systems. In the Nile Delta, sea-level rise and salinity intrusion threaten coastal areas, affecting residential, industrial, and agricultural infrastructure. Extreme weather events, including heatwaves, floods, and droughts, place additional stress on inland infrastructure, disrupting energy networks, transportation systems, water supply, and telecommunications. The health sector is also vulnerable, as extreme temperatures and floods can overwhelm healthcare facilities and compromise service delivery. Similarly, energy and transport systems face operational disruptions, while water infrastructure—including dams, irrigation networks, and treatment facilities—may be impacted by changing rainfall patterns and river flows. Telecommunications networks, critical for emergency response and early warning systems, are likewise at risk during climate extremes.

### **1.7.1 Adaptive Capacity**

Adaptive capacity represents a country's ability to adjust to environmental changes and prepare for the effects of climate change. There are different factors that can affect it, such as risk communication, supporting institutions, and overall resource management. Rapid population growth increases pressure on natural resources, further complicating adaptation efforts.

In Egypt, adaptive capacity varies significantly across regions. While some areas have developed strong adaptive measures, others face limited capacity to respond to climate events. National policies, such as Egypt Vision 2030 and the National Climate Change Strategy 2050, emphasize adaptation and resilience, integrating them across sectors. However, continued efforts are needed to address regional capacity gaps and strengthen national resilience strategies.

### 1.7.2 Informational Capacity

Informational capacity is critical to Egypt's adaptive capacity, as it refers to the availability, quality, and utilization of climate-related data and information, as well as assuring the availability and use of climate-related data for informed decision-making. Key systems that improve climate data availability include:

- **Meteorological and Hydrological Monitoring System:** Managed by the Egyptian Meteorological Authority (EMA) and the Ministry of Water Resources and Irrigation (MWRI), these systems monitor weather, river flows, and sea-level changes.
- **Statistical Data Collection:** The Central Agency for Public Mobilization and Statistics (CAPMAS), which collects and analyzes the climate data to support the planning initiatives in various sectors.
- **Information Dissemination:** The Egyptian Environmental Affairs Agency (EEAA) shares climate and environmental reports and updates to the policymakers and stakeholders so that they are guided on the decisions they make.
- **Electronic Platform for Environmental and Climate Investment:** Launched in 2023 through collaboration with the United Nations Industrial Development Organization (UNIDO) and the Green Growth Project. This platform gives information on green investments, market data, finance facilities, and feasibility studies.
- **Public Awareness and Communication:** Educational campaigns and media outreach improve public knowledge of climate risks and adaptation strategies.
- **International Collaboration:** Egypt's participation in global climate networks and conferences, like COP 27, facilitates knowledge exchange and best practices in climate data management.

### 1.7.3 Human Capacity

Human capacity, in the form of trained and skilled personnel, is needed for the implementation of adaptation actions in Egypt. Key efforts include:

- **Education and Training:** Universities and research centers offer courses and training on climate science and adaptation strategies to equip future professionals.
- **Community Engagement:** Awareness campaigns and capacity-building workshops empower local communities to take informed action on climate adaptation.
- **Professional Expertise:** Collaboration with climate experts, both local and international, enhances Egypt's ability to address climate challenges effectively.

### 1.7.4 Institutional Capacity

Institutional capacity is the ability of organizations and institutions to plan, implement, and manage climate adaptation strategies. Egypt's institutional capacity for climate adaptation has been strengthened through coordinated efforts across key entities:

- **Ministry of Environment (MOE):** The MOE serves as the lead institution for environmental and climate policy, overseeing national adaptation plans and ensuring alignment with international commitments under the United Nations Framework Convention on Climate Change (UNFCCC).
- **Egyptian Environmental Affairs Agency (EEAA):** It is the executive arm of the MOE, implements environmental policies and adaptation measures, focusing on biodiversity, pollution control, and sustainable land management.
- **Inter-Ministerial Coordination:** Key ministries collaborate to implement sector-specific strategies. The National Committee for Climate Change (NCCC) monitors adaptation progress.

## 1.8 Institutional Arrangement

### 1.8.1 National Climate Governance

Egypt's institutional framework integrates climate actions into national development through cross-sectoral coordination. The National Climate Change Council (NCCC), its organizational structure, and the roles of the Ministry of Environment (MoE) remain central to advancing national climate priorities and coordinating efforts across sectors.

#### National Council for Climate Change

The National Climate Change Council (NCCC) is an inter-ministerial committee and the key decision body responsible for coordinating climate policy development and implementation across ministries and agencies. The NCCC was established by Prime Minister Decree No. 1912 in 2015 and amended by Decree No. 1129 in 2019 which serves as the highest climate governance body. The Prime Minister chairs the Council, which consists of representatives from sector ministries and engages stakeholders from national experts (scientists,

practitioners, academic researchers), civil society (non-governmental organizations, union representatives), the private sector, and international donors.

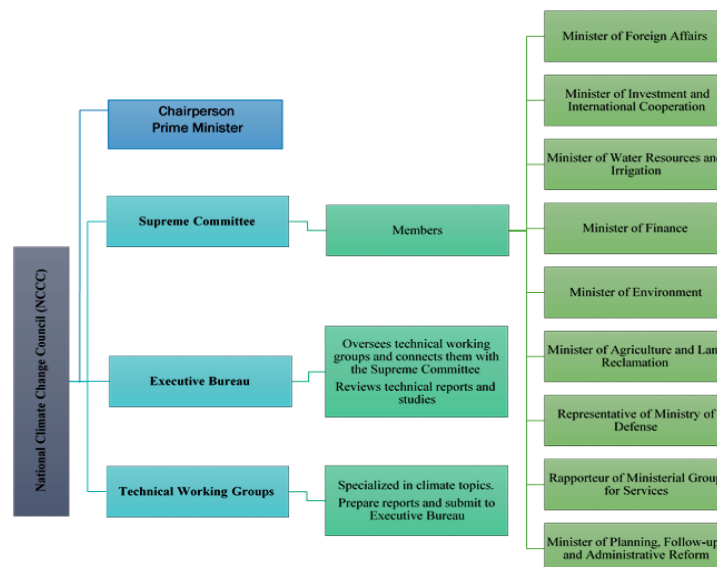
The NCCC plays a central role in overseeing climate change activities, integrating them into national development planning, and formulating policies that align with Egypt's Vision 2030. The Council ensures that national climate change policies, strategies, and plans are linked to Egypt's sustainable development strategy. It is tasked with drafting, updating, and developing the state's general policies related to climate change and monitoring budget allocations for ministries involved in climate action.

The NCCC is also responsible for raising awareness among officials and decision-makers about the implications of climate change and its relevance to their areas of responsibility.

These efforts contribute to building both institutional and individual capacities to address climate challenges effectively. Additionally, the Council facilitates interministerial coordination, promoting knowledge sharing, data collection, policy alignment, project implementation, and financing for climate-related initiatives.

The NCCC's organizational structure (Figure 7) includes:

- **Supreme Committee:** This committee is formed with the membership of ministers from key sectors to ensure cross-ministerial collaboration.
- **Executive Bureau:** Oversees technical working groups and ensures coordination with national priorities.
- **Technical Working Groups:** Conduct climate-related studies and report to the Executive Bureau.



**Figure 7: National Climate Change Council (NCCC) Organizational Structure**

*Ministry of Environment and the Egyptian Environmental Affairs Agency (EEAA)*

The Ministry of Environment, through its executive arm, the Egyptian Environmental Affairs Agency (EEAA), plays a key role in environmental protection and climate reporting. The

EAAA coordinates governmental activities related to environmental management and ensures Egypt meets its national and international climate obligations, particularly under frameworks such as the Paris Agreement. The Climate Change Central Department (CCCD) within the EAAA is pivotal in driving climate-related reporting and managing data collection. The key roles of the Climate Change Central Department include:

- **Climate Reporting:**
  - Serves as Egypt's Action for Climate Empowerment (ACE) focal point, responsible for leading the country's climate-related reporting efforts.
  - Prepares and submits essential national reports such as National Communications and Biennial Update/Transparency Reports (BUR/BTRs), which highlight Egypt's progress in reducing greenhouse gas emissions, climate adaptation strategies, and technology transfer initiatives.
- **Data Collection:**
  - Oversee the collection of comprehensive climate-related data from various stakeholders, including government ministries, private sector entities, and international organizations.
  - Ensure all environmental and climate impacts are represented in both national and international reports.
- **Capacity Building:**
  - Collaborates with international bodies such as the United Nations and regional organizations to monitor and evaluate the impact of capacity-building programs.
  - Documents and tracks initiatives such as training workshops, technical assistance, and knowledge-sharing platforms aimed at building climate resilience.
- **Technology Transfer:**
  - Coordinates with relevant partners to ensure accurate data collection and reporting on incoming technology transfers.
  - Highlights the contributions of these technologies to reducing emissions and improving climate resilience.
- **Enhancing Monitoring, Reporting, and Verification (MRV) System:**
  - Supports the ongoing development and enhancement of Egypt's national MRV system by aligning with the proposed MRV structure, which includes pathways for tracking GHG emissions, mitigation actions, adaptation efforts, and support received.
  - Works to ensure that the MRV system evolves into a comprehensive framework to improve climate reporting, transparency, and accountability across sectors.
- **Finance Tracking:**
  - Collaborates with the Ministry of International Cooperation, Ministry of Finance, international donors, and multilateral institutions to report on financial support received and assess its impact on achieving Egypt's climate goals.

- Ensure climate finance tracking is integrated into national reporting systems, highlighting gaps, needs, and opportunities for enhanced climate finance mobilization, particularly for vulnerable sectors and communities.
- **Collaboration with the National Council for Climate Change (NCCC):**
  - Works closely with the NCCC to ensure effective coordination among all relevant stakeholders, including government ministries, the private sector, civil society, and international partners.
  - Assists in the alignment of national climate policies with international commitments and facilitates cross-sectoral engagement to support climate action.

#### Ministry of International Cooperation (MoIC)

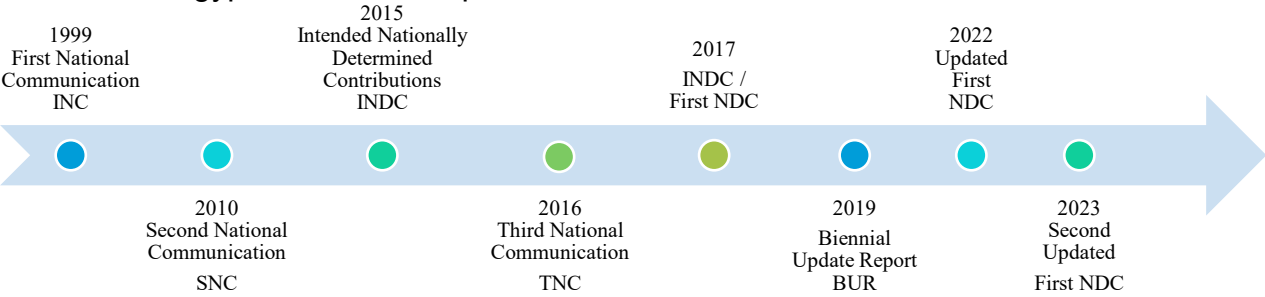
The Ministry of International Cooperation plays a pivotal role in monitoring and managing funds received from international climate finance institutions, such as the Green Climate Fund and the Global Environment Facility. By collaborating closely with the Ministry of Environment, the ministry ensures the effective allocation and transparent reporting of financial resources. This partnership supports accountability and aligns funding with Egypt's climate priorities, facilitating progress toward national and international climate commitments.

### **1.8.2 International Climate Change Commitments**

Egypt has been proactive in addressing climate change through its commitments under international frameworks. In 1994, Egypt ratified the United Nations Framework Convention on Climate Change (UNFCCC), becoming one of the first nations to respond to the threats of climate change under the equity principle of common but differentiated responsibilities, aligned with its national capabilities.

In November 2015, Egypt submitted its Intended Nationally Determined Contribution (INDC), outlining its climate action goals to align with the global targets of the Paris Agreement. After signing the Paris Agreement on April 22, 2016, and ratifying it on June 29, 2017, Egypt's INDC was adopted as its first Nationally Determined Contribution (NDC). Since then, Egypt has submitted a first (2022) and second (2023) updates to its first NDC, covering the period between 2015 till 2030. These updates emphasize the country's mitigation and adaptation plans within the context of its national priorities and development challenges.

Egypt has also submitted three national communications to the UNFCCC, with the initial communication in 1999, followed by the second in 2010 and the third in 2016. These reports have detailed Egypt's greenhouse gas inventories, adaptation strategies, climate policies, and vulnerabilities across various sectors. The fourth national communication is currently underway and is expected to be submitted in 2025, building on the insights from previous reports and reflecting Egypt's evolving climate action framework. Additionally, Egypt submitted its first Biennial Update Report (BUR) in 2019, summarizing recent developments in its climate policies, emissions, and mitigation actions. The following figure presents a timeline of Egypt's submitted reports.



**Figure 8: Timeline of Egypt's Document Submission to UNFCCC**

Egypt's climate action efforts are based on a comprehensive and structured process designed to identify, track, and report support. This includes systematic data collection on financial resources, technology transfers, and capacity-building initiatives. Transparency and accountability are prioritized, with data aligned to meet the reporting requirements of the Paris Agreement. At the same time, adaptation and mitigation strategies are emphasized, focusing on reducing greenhouse gas emissions and addressing vulnerabilities in key sectors.

Through its national communications, BURs, and updated NDCs, Egypt has consistently demonstrated its commitment to tackling climate change while balancing its development priorities. This proactive approach highlights Egypt's leadership in climate diplomacy and its efforts to enhance its capacity for mitigation and adaptation, ensuring alignment with international obligations and contributing to global climate action.

### 1.8.3 National Monitoring, Reporting, and Verification

Egypt’s institutional arrangements include the establishment of a Monitoring, Reporting, and Verification (MRV) system as a critical component for tracking progress in implementing climate actions. As a nation highly vulnerable to climate change impacts, Egypt recognizes the critical role of robust MRV systems in ensuring transparency, accountability, and effective implementation of climate policies. An MRV system enables the country to accurately measure greenhouse gas (GHG) emissions, track mitigation and adaptation actions, and monitor the financial and technical support received.

The national MRV system, formalized under Minister of Environment Decree No. 415/2023, aligns with international requirements under the UNFCCC and the Paris Agreement’s Enhanced Transparency Framework (ETF) (EEAA, 2019). The launch of the domestic MRV system remains contingent on funding. In the interim, Egypt is building on partial MRV activities that have already been implemented, providing a solid foundation for the evolution into a fully comprehensive national MRV system.

The national Climate MRV system was proposed based on extensive consultations with representatives from all relevant national entities, ensuring a coordinated and inclusive approach. The structure envisions the National Council for Climate Change (NCCC) as the supervisory body responsible for overseeing and guiding the entire MRV process. The Climate Change Central Department (CCCD), operating within the Ministry of Environment, would serve as the coordinating entity, collaborating with various ministries, governmental agencies, and stakeholders to streamline data collection and reporting.

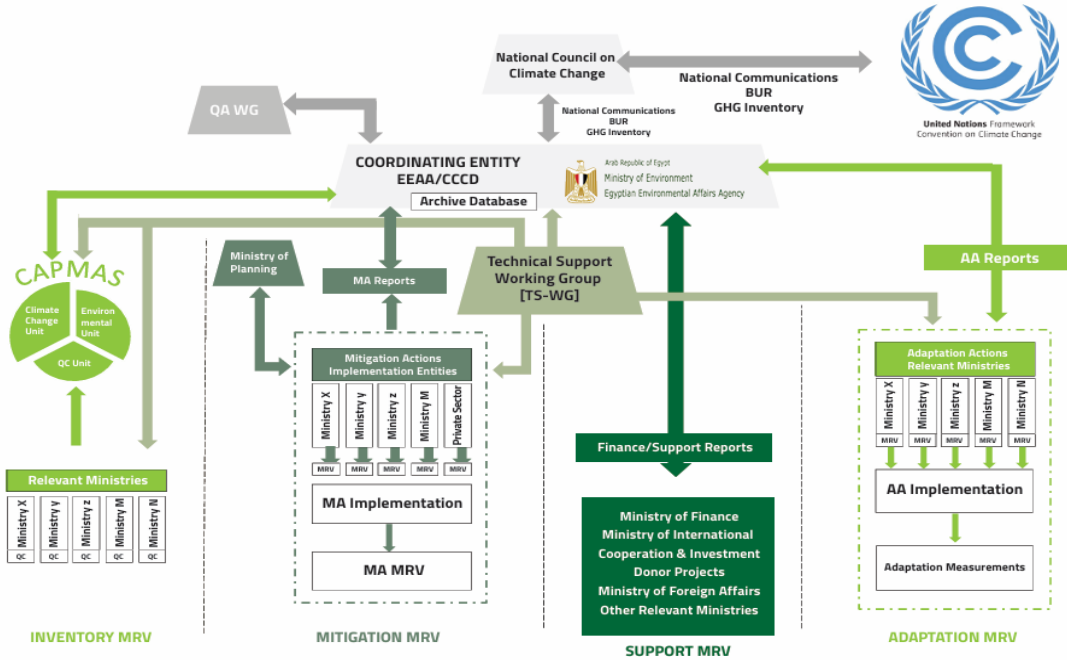


Figure 9: National MRV structure (BUR1, 2019)

The CCCD, represented by the NCCC, has two arms: the quality assurance working group (QA-WG) and the technical support working group (TS-WG). CAPMAS would act as the central data coordinating entity. Egypt's MRV system is designed to function across four key pathways, or tracks: i) GHG Inventory MRV, which will systematically track and quantify the country's emissions and removals; ii) Mitigation Policies and Actions MRV, which will assess the effectiveness of climate actions aimed at reducing emissions; iii) Support Received MRV, which will monitor and verify the financial, technical, and capacity-building support received from international sources; iv) Adaptation Policies and Actions MRV, which will evaluate the effectiveness of national efforts to adapt to climate change impacts and build resilience. Another key feature of the MRV system is the establishment of a centralized database that collects, analyzes, and reports climate data. This enables Egypt to assess the effectiveness of its climate policies and actions in a transparent manner.

The Oil and Gas sector is actively working on enhancing a MRV system to track NDC commitments. Additionally, the Ministry of Petroleum and Mineral Resources (MoPMR) has developed a preliminary electronic platform that connects the ministry with its affiliated companies. This platform is designed to collect initial data on energy consumption and mitigation projects. The Energy Efficiency and Climate Department (EECD) at the MoPMR conducts internal checks on the reported data to ensure its accuracy, identify any discrepancies, and verify that all values are realistic and project specific. This verification process includes technical assessments, such as mass and energy balance validation.

The electricity sector is also actively working on enhancing its MRV system to monitor the progress of Egypt's NDCs. Additionally, several ongoing donor-funded programmes are supporting the establishment of these systems, including national electronic data collection and reporting mechanisms.

A centralized climate database will collect, analyze, and report information across all tracks, enabling transparent assessment of the effectiveness of policies and actions. The MRV system will also incorporate mechanisms to monitor the use and transfer of Internationally Transferred Mitigation Outcomes (ITMOs) in line with Article 6 of the Paris Agreement. It will feature robust data-archiving capabilities to preserve historical records, ensuring consistency and comparability over time.

*Key Challenges in Identifying, Tracking, and Reporting*

Egypt faces several technical challenges in its efforts to collect and report climate data as part of its international obligations. These challenges arise from limitations in data infrastructure, human capacity, and financial resources, as well as difficulties in coordination across sectors and stakeholders. In addition, gaps in monitoring systems, technological capacity, and public engagement further complicate the collection and verification of accurate data. The following table outlines the key challenges that impact Egypt's ability to ensure comprehensive and reliable climate reporting, which is critical for advancing its climate action goals and meeting international transparency requirements.

**Table 3: Key challenges in identifying, tracking, and reporting**

| Challenge | Description |
|-----------|-------------|
|-----------|-------------|

|  |  |
|--|--|
| <b>Insufficient Data Infrastructure</b>                        | Lack of integrated digital systems for data management and real-time data collection, leading to delays and inaccurate information gathering. Furthermore, shortage of measurement devices.  |
| <b>Limited Human Resources and Capacity</b>                    | A shortage of skilled personnel to manage data collection, reporting, and analysis, especially in specialized areas.   |
| <b>Challenges in Coordinating Across Multiple Stakeholders</b> | Inefficiencies in coordinating between government ministries, the private sector, and international partners lead to data gaps.  |
| <b>Data Gaps in Key Sectors</b>                                | Key sectors such as agriculture and coastal zones lack comprehensive data due to technical and resource constraints.   |
| <b>Inadequate Monitoring and Verification Systems</b>          | Underdeveloped systems for monitoring and verifying data quality, leading to inconsistent data reliability. MRV institutional barriers, such as the absence of an inventory for achieved development projects and programs, are the main barriers to scaling up the implementation of mitigation and adaptation measures across Egypt. The MRV system should be put in place to track the progress of achievements and the associated development impact of each project.  |
| <b>Financial Constraints</b>                                   | Limited financial resources hinder the expansion of data collection systems and investment in technology. Substantial resources are required to implement capacity-building programs and establish robust information systems to address the challenges of climate change. This requires financial support from international organizations. Competent personnel capable of preparing bankable funding proposals acceptable to donors and aligned with their development objectives are needed. Although the NCCC has formally adopted the domestic MRV framework, full institutionalization is still pending, as the launch of the national MRV system requires additional funding and resources. |
| <b>Lack of Harmonized Data Collection Protocols</b>            | Different protocols and indicators are used across sectors, creating difficulties in data harmonization and integration.   |
| <b>Underdeveloped Data Integration Across Sectors</b>          | Fragmented information across sectors hinders a holistic view of climate impacts and actions.  |
| <b>Delays in Data Availability</b>                             | Significant delays in collecting and processing data due to resource and bureaucratic constraints, impacting report timelines.   |
| <b>Challenges in Financial Data Tracking</b>                   | Challenges in accurately capturing financial flows from private sector and international funding and distinguishing between adaptation and mitigation funds.   |
| <b>Insufficient Collaboration with the Private Sector</b>      | Limited collaboration with the private sector results in underreporting of climate activities, particularly emissions and technology use.  |

#### **1.8.4 Legal Framework and Regulations**

Egypt has adopted legislation to conserve the environment, promote climate adaptation, and support sustainable development. These include:

- **Environmental Protection Law No. 4/1994 (amended by Laws No. 9/2009 and No. 105/2015):** This foundational law integrates environmental considerations into national policies, including Environmental Impact Assessments (EIAs) and pollution control. It mandates resource and biodiversity protection, supported by regulations such as Prime Ministerial Decree No. 338 of 1995 and subsequent amendments.
- **Prime Ministerial Decree No. 1912/2015:** Established the National Council for Climate Change to coordinate policies across ministries.
- **Presidential Decree No. 566/2016:** This obligates ministries to comply with the Paris Agreement, emphasizing national adaptation and mitigation strategies.
- **Waste Management Law No. 202/2020:** Provides a framework for waste management and promotes recycling and waste-to-energy technologies.
- **PM Decree No. 1129/2019:** Climate change units' establishment in relevant ministries/authorities. Climate change units formed in the Ministry of Electricity &

Renewable Energy (MoERE), Ministry of Petroleum and Mineral Resources (MoPMR), Ministry of Transport (MoT), Ministry of Agriculture & Land Reclamation (MALR), and Ministry of Water Resources & Irrigation (MWRI).

- **Ministerial Decrees No. 415 and No. 34/2023:** Established the MRV working group and the Environmental and Climate Investment Unit, supporting national transparency efforts and investment in environmental projects. Members of the working group: EEAA and CCCD, CAPMAS, MoERE, MoPMR, MoT, MWRI, and MoIC.

**Table 4: Summary of key laws and regulations across the various sectors**

| Sector                | Law/Regulation   | Description and Adaptation Relevance  |
|-----------------------|--|---|
| <b>Water</b>          | Water Resources Law No. 147 of 2021  | Governs the management of Egypt's water resources, addressing the allocation, protection, and sustainable use of water. Given Egypt's dependence on the Nile River, this law is crucial for adaptation strategies related to water security and drought management. |
|                       | Law No. 93 of 1962 (Wastewater Discharge) and its Executive Regulations No. 44 of 2000 | Regulates wastewater treatment and discharge, crucial for water quality protection and preventing resource depletion.   |
|                       | Law No. 48 of 1982 (Protection of the Nile River and Waterways)                        | Provides rules for protecting the Nile River and coastal environment from pollution.  |
| <b>Energy</b>         | Law on Renewable Energy No. 203 of 2014  | Promotes renewable energy development, aiding in energy resilience and adaptation to supply disruptions.  |
|                       | Electricity Law No. 87 of 2015 (Amended by Law No. 192 of 2020 and Law No. 70 of 2021) | Governs electricity production and distribution, ensuring energy systems are resilient to climate-related challenges.   |
| <b>Industry</b>       | Ministerial Decree 49/2021 (Alternative Fuels in Cement)                               | Supports partial replacement of fuels in the cement sector, contributing to sustainability and emission reductions.   |
| <b>Transport</b>      | Presidential Decree No. 549/2020 amending No.419 of 2018                               | Customs tariffs on EV set-up equipment, charging stations & parts for EV conversion   |
|                       | Presidential Decree No. 419 of 2018  | Exemption on import tariffs & permit to import used EVs (max 3 years old)   |
|                       | Ministerial Decree of MoERE No. 14/2022  | EVs charging tariffs  |
|                       | Ministerial Decree of Ministry of Interior (No. 1945/2022)                             | Gas & diesel cars conversions to EVs  |
|                       | Ministerial Decree of Ministry of Trade and Industry                                   | EV imports' customs clearance conditions  |
|                       | Ministerial Decree of Ministry of Finance  | Customs tax discount on electric/dual motor (electric and gasoline) cars  |
|                       | Law No. 162/2022   | Establish Supreme Council for Automotive Industry (AI) and Environmentally Friendly AI Fund   |
| <b>Agriculture</b>    | Circular No. 5/2022  | Charging of EVs in Egypt  |
|                       | Agriculture Law No. 53 of 1966 (Amended by Law No. 116 of 1983)                        | Manages irrigation, crop rotation, and pest control, with amendments addressing climate-related risks like water scarcity and soil degradation.   |
| <b>Infrastructure</b> | Building Code Law No. 119 of 2008  | Sets climate-resilient building standards, including provisions for extreme weather resistance and adaptation guidelines.   |
| <b>Fisheries</b>      | Law No. 146 of 2021 (Protection and Development of Lakes and Fish Resources)           | Protects and develops lakes, waterways, and fish resources, contributing to the conservation of aquatic ecosystems.   |
| <b>Biodiversity</b>   | Law No. 102 of 1983 (Nature Reserves)  | Establishes protected areas, crucial for biodiversity conservation and climate resilience.  |

The table below summarizes key international agreements signed by Egypt, demonstrating its commitment to global environmental and climate initiatives.

**Table 5: Key International environmental agreements that Egypt signed**

| International Agreement  | Description   | Focus Areas  | Signature Date | Ratification Date | Entry into Force Date |
|--|---|--|----------------|-------------------|-----------------------|
| <b>United Nations Framework Convention on Climate Change (UNFCCC)</b>                                    | Global treaty addressing climate change, focuses on mitigation, adaptation, and transparency.                                     | Climate change, adaptation, resilience, transparency.                                      | 09/06/1992     | 05/12/1994        | 21/03/1994            |
| <b>Kyoto Protocol</b>  | Protocol to the UNFCCC setting legally binding targets for reducing greenhouse gas emissions for developed countries.             | Greenhouse gas emissions reduction, climate change mitigation.                             | 15/03/1999     | 12/01/2005        | 12/04/2005            |
| <b>Paris Agreement</b>   | Global climate agreement aims to limit global warming and enhance climate resilience through nationally determined contributions. | Climate change mitigation, adaptation, finance, transparency.                              | 22/04/2016     | 29/06/2017        | 4/11/2016             |
| <b>Convention on Biological Diversity (CBD)</b>  | International agreement promoting the conservation of biodiversity and the sustainable use of biological resources.               | Biodiversity conservation, sustainable use, ecosystem services.                            | 09/06/1992     | 02/06/1994        | 08/09/1994            |
| <b>United Nations Convention to Combat Desertification (UNCCD)</b>                                       | Global initiative to combat desertification and promote sustainable land management.  | Land degradation, desertification, resilience, ecosystem restoration.                      | 14/10/1994     | 07/07/1995        | 26/12/1996            |
| <b>Montreal Protocol on Substances that Deplete the Ozone Layer</b>                                      | The treaty is designed to protect the ozone layer by phasing out the production of substances responsible for ozone depletion.    | Ozone layer protection, reduction of ozone-depleting substances, atmospheric preservation. | 16/09/1987     | 02/08/1988        | 11/02/1993            |
| <b>Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal</b> | Treaty focusing on the control and reduction of hazardous waste movement and disposal.  | Hazardous waste management, environmental health, pollution control.                       | 22/03/1989     | 08/01/1993        | 08/07/1993            |

## 1.8.5 Key Sectoral Policies, Action Plans, and Strategies

The table below summarizes Egypt's key national policies, action plans, and strategies by sector.

**Table 6: Summary of key national policies, action plans, and strategies by sector**

| Strategy/ Plan   | Issuance Year     | Description  | Objective   |
|--|-------------------|--|---|
| <b>Climate Change</b>  |                   |  |   |
| <b>Egypt's National Climate Change Strategy 2050</b>   | 2022              | The National Climate Change Strategy 2050 (NCCS) was adopted in May 2022 under Prime Ministerial Decree No. 1860/2022. The NCCS sets targets for both mitigation and adaptation, and its policy framework aligns with Egypt's Updated Vision 2023.   | Aims to enhance the country's resilience, adaptability, and capacity to mitigate greenhouse gas emissions, aligning with international climate commitments and sustainable development goals. |
| <b>Sustainable Development Strategy (SDS) 2030 – Updated</b>   | 2016; Update 2023 | Egypt's roadmap for sustainable development aligned with SDGs, including climate resilience, social inclusion, and economic growth.  | Integrates climate adaptation and mitigation into national development planning, supports sectoral and cross-cutting policies.  |
| <b>National Adaptation Plan (NAP)</b>  | 2011              | Egypt's framework for climate adaptation across sectors such as water, agriculture, and coastal management.  | Provides actionable adaptation measures, reduces vulnerability of communities and ecosystems, strengthens disaster risk reduction and long-term planning.                                     |
| <b>Water Resources</b>   |                   |  |   |
| <b>Egypt's Strategy for Development and Management of Water Resources 2050</b>                       | 2016              | The strategy focuses on sustainable water management through integrated approaches. It includes rehabilitating water infrastructure, improving sewage networks, developing groundwater resources, raising awareness, and employing advanced water technologies. The four main axes aim to develop resources, rationalize usage, improve water quality, and create an enabling environment for integrated water management. | Achieve water security through sustainable management of water resources.   |
| <b>National Water Resources Plan (NWRP) 2017-2037</b>  | 2005              | The plan emphasizes sustainable water use considering socio-economic and environmental factors. It includes strategies to reduce water demand, optimize supply, and control pollution, while also developing new water sources like deep groundwater and desalination.   | Increase water use efficiency.<br>Protect water quality.<br>Control pollution and augment water supply.   |
| <b>Agriculture</b>   |                   |  |   |
| <b>Sustainable Agricultural Development Strategy 2030 (SADS) (Arab Republic of Egypt (ARE, 2009)</b> | 2009              | Focuses on modernizing Egyptian agriculture to enhance resilience against climate change. Key initiatives include increasing land productivity, utilizing high-yield crops, enhancing irrigation efficiency to 80%, and boosting livestock production.   | Achieve food security<br>Enhance agricultural productivity<br>Improve rural livelihoods<br>Enhance the sustainable use of natural resources.  |
| <b>Energy</b>  |                   |  |   |
| <b>Integrated Sustainable Energy Strategy (ISES) 2035</b>  | 2016              | Targets a 42% renewable energy share by 2035, promotes energy efficiency measures, and supports private sector investments. Includes four main pillars: securing energy supply, ensuring industry sustainability, developing institutional governance, and enhancing energy market competitiveness.  | Increase renewable energy share<br>Improve energy efficiency<br>Enhance sector sustainability   |
| <b>National Energy Efficiency Action Plan (NEEAP) 2012-2015</b>                                      | 2012              | Focuses on energy efficiency improvements in the electricity sector by 5% through measures such as energy audits and efficiency upgrades. Adaptation involves setting up systems for energy management and monitoring to ensure effective implementation.  | Achieve a cumulative energy efficiency improvement of 5%.   |

| Strategy/ Plan  | Issuance Year      | Description   | Objective  |
|---|--------------------|---|--|
| <b>National Energy Efficiency Action Plan (NEEAP) II 2018/2019 – 2021/2022</b>        | 2018               | Enhances the previous plan, NEEAP includes policies merging energy efficiency with environmental strategies, promoting energy managers and auditors, energy efficiency tracking systems, improving energy efficiency tools, verification mechanisms, accreditation processes and compliance with Electricity Law No. 87 of 2015, focusing on adaptation to rising energy demands. | Align with Integrated Sustainable Energy Strategy (ISES) to 2035. Improve energy efficiency without affecting growth, production, or consumer well-being in key sectors.   |
| <b>Egyptian Petroleum Sector Energy Efficiency Strategy 2022-2035</b>                 | 2022               | The EE Strategy provides a comprehensive framework for implementing the most effective energy efficiency measures. It outlines a clear pathway to enhance the sector's productivity and competitiveness while reducing GHG emissions. Aligned with Egypt's Vision 2030, the strategy supports sustainable economic growth and environmental stewardship.                          | The Energy Efficiency (EE) Strategy aims to enhance energy efficiency across the petroleum sector through a structured, phased approach. <b>Stage I (2022-2027)</b> focuses on overcoming EE barriers, strengthening capacities, and creating an enabling environment to support EE projects, targeting a 10% energy savings by 2027 from the 2021 level. <b>Stage II (2025-2035)</b> builds on a mature EE market, a developed legal and institutional framework, and enhanced capacities to maximize energy savings, targeting an 18% reduction in energy consumption by 2035. |
| <b>Low Carbon Hydrogen Strategy</b>   | 2024               | Egypt's National Low-Carbon Hydrogen Strategy, launched in August 2024, aims to position the country as a leading player in the global hydrogen economy, targeting up to 8% of the tradable hydrogen market by 2040.  | The strategy envisions producing approximately 1.4 million tonnes of low-carbon hydrogen annually by 2030, with plans to scale up to meet global demand centers such as the European Union.  |
| <b>Biodiversity</b>   |                    |   |  |
| <b>National Biodiversity Strategy and Action Plan (NBSAP) 2015– 2030 (EEAA, 2016)</b> | 2016               | Focuses on the importance of conserving and sustainable use of biodiversity, it addresses numerous challenges, such as habitat degradation, climate change and overexploitation. It integrated biodiversity conservation into various sectors including agriculture and tourism; however, it also encompasses preparatory actions aimed at combating desertification.             | Set the basis of the rational use and sustainable development of the national natural resources to meet present and futures' generation needs.   |
| <b>Cross-Cutting Policies and Strategies</b>  |                    |   |  |
| <b>Egypt's Disaster Risk Reduction Strategy</b>                                       | 2014; Updated 2020 | National framework to reduce risks from natural hazards including floods and droughts.  | Improves preparedness and adaptive capacity; strengthens early warning systems and emergency response.   |
| <b>Gender Strategy in Climate Action</b>  | 2018               | Framework to integrate gender equality into climate policies and programs.  | Ensures equitable adaptation benefits; addresses vulnerabilities of women and marginalized groups under climate stress.  |
| <b>National Environmental Action Plan (NEAP)</b>                                      | 2002; Updated 2021 | Sets environmental priorities including pollution control, resource management, and climate resilience.   | Supports adaptation through ecosystem protection, sustainable land use, and mitigation of climate-related hazards.   |

## 1.9 Use of Flexibility Provisions

In this BTR, Egypt utilizes the flexibility provisions provided under the Modalities, Procedures, and Guidelines (MPGs). Flexibility has been applied in specific areas, as outlined in the table below. The use of these flexibility provisions was to accommodate limitations in data availability, time constraints, or methodological challenges.

There was the use of flexibility provisions in the NDC Progress Tracking (Chapter 3) and Emissions Projections. However, very few flexibility options were utilized in the greenhouse gas (GHG) inventory (Chapter 2) as detailed below. For most of the sectors, the inventory adhered strictly to the full requirements of the MPG. This included comprehensive reporting of all categories, gases, and time periods, ensuring the inventory's completeness and integrity. No omissions or simplifications were made, reflecting a commitment to maintaining the highest standards of transparency, consistency, and accuracy in the reporting process. All data and methodologies were aligned with established guidelines to provide a detailed and reliable account of emissions.

**Table 7: Use of flexibility provisions in Egypt's BTR**

| Flexibility Provision                                      | MPG Paragraph | Flexibility used? | Application   |
|--|---------------|-------------------|---|
| <b>GHG Inventory</b>                                       |               |                   |   |
| Key Category Analysis                                      | 25            | No                | Did not utilize the flexibility provision that allows for the identification of fewer key categories or the use of less complex methodologies for non-key categories. Instead, the inventory maintained a rigorous approach, considering and reporting all categories comprehensively in line with the full IPCC guidelines. This ensured a robust and detailed estimation of greenhouse gas (GHG) emissions and removals, irrespective of whether a category was classified as key or non-key. The adherence to the full guidelines underscores a commitment to the completeness, accuracy, and transparency of the inventory process. |
| Uncertainty Assessment                                     | 29            | No                | The option to omit reporting quantitative uncertainty information was not utilized. Despite the challenges related to data availability, every effort was made to collect the most accurate data possible, and uncertainty was assessed and reported wherever feasible, in line with the full requirements of the MPG.  |
| Completeness   | 32            | No                | The flexibility to omit the estimation of more insignificant categories was not applied. All relevant categories, regardless of their perceived insignificance, were included in the inventory, ensuring a complete and thorough representation of GHG emissions and removals for all sectors.  |
| Quality Assurance/Quality Control (QA/QC)                  | 34 and 35     | Yes               | Flexibility was applied regarding the development of a QA/QC plan. A formal QA/QC plan has not been reported. However, quality control procedures were adopted by the inventory team and a third-party QA was implemented to ensure the accuracy and consistency of the data throughout the reporting process, as required by the MPG.  |
| Gases  | 48            | Yes               | The option to report fewer GHGs was used. All relevant gases were reported as per the IPCC guidelines except for NF <sub>3</sub> gas which was not estimated.   |
| Time Series  | 57 and 58     | No                | The flexibility provision to report a shorter time series and an earlier "latest reporting year" was not applied. A full time series was reported, with data provided for the entire period required by the MPG, ensuring consistency and transparency in the inventory's temporal coverage.  |
| <b>Mitigation Policies and Measures, Actions and Plans</b> |               |                   |   |

|   |                 |     |  |
|---|-----------------|-----|--|
| Estimates of GHG emissions reductions     | 85              | Yes | The flexibility provision to omit reporting the estimates of expected and achieved GHG emissions reductions was applied. Due to data availability limitations, it is challenging to collect granular data for PaMs. In future BTRs, Egypt will aim to address some of these challenges following improvements to the national MRV system. However, certain limitations will remain, preventing the full reporting of GHG emissions reductions. |
| <b>Emissions Projection</b>               |                 |     |  |
| Projections of GHG emissions and removals | 92, 95, and 102 | Yes | The flexibility provision to report projections was applied. No projections were made due to time constraints (not technical capacities). Projections should have been made from the most recent year in the Party's national inventory report and extended at least 15 years beyond the next year ending in zero or five. Egypt will report projections in future BTRs.   |

## Chapter 2: National Inventory Report of Anthropogenic Emissions by Sources and Removals by Sinks of Greenhouse Gases

### 2.1 Background Information on the GHG Inventory

In this chapter, Egypt presents its GHG inventory for the period 1990–2022. The inventory has been developed using the methodologies outlined in the 2006 IPCC Guidelines for National GHG Inventories. Additionally, updated emission factors from the 2019 Refinement to the 2006 IPCC Guidelines have been incorporated where applicable. This comprehensive inventory spans 33 years, beginning with the starting year of 1990 and concluding with the inventory year of 2022. It covers the four key sectors specified in the 2006 IPCC Guidelines: energy, industrial processes and product use (IPPU), agriculture, forestry, and other land use (AFOLU), and waste.

National GHG inventories serve as a detailed account of annual GHG emissions by sources and removals by sinks within a country's jurisdiction over a specified period. The time series refers to the consistent annual accounting of emissions and removals from the starting year (1990) to the inventory year (2022).

Egypt has previously reported the following GHG inventory time series:

- **Initial National Communication (INC):** Submitted in 1999, covering the period 1990–1999. This report established the baseline for Egypt's greenhouse gas (GHG) emissions and highlighted initial measures to address climate change.
- **Second National Communication (SNC):** Submitted in 2010, covering the year 2000. It updated the GHG inventory and introduced vulnerability assessments and adaptation strategies.
- **Third National Communication (TNC):** Submitted in 2016, covering 2000–2005. It provided updated GHG data, mitigation actions, and detailed sectoral vulnerability analyses.
- **First Biennial Update Report (BUR1)** Submitted in 2019, including GHG data from 1990 to 2015. It focused on mitigation actions and measurable, reportable, and verifiable (MRV) frameworks.
- **Fourth National Communication (NC4)** Submitted for the period 2016–2017, maintaining the time series from 1990 and further updating the emissions included in Egypt's BUR1

#### HISTORICAL INVENTORY

|   |            |                  |
|---|------------|------------------|
| ■ | <b>INC</b> | <b>1990-1999</b> |
| ■ | <b>SNC</b> | <b>2000</b>      |
| ■ | <b>TNC</b> | <b>2001-2005</b> |
| ■ | <b>BUR</b> | <b>2005-2015</b> |
| ■ | <b>NC4</b> | <b>2016-2017</b> |

#### CURRENT

|   |              |                  |
|---|--------------|------------------|
| ■ | <b>BTR-1</b> | <b>2018-2022</b> |
|---|--------------|------------------|

This BTR marks a step forward by consolidating and extending the national GHG inventory to 2022. Like the previous national GHG inventory reports, this inventory builds upon the starting year of 1990, ensuring consistency across all submissions. It provides a more

complete picture of Egypt's contributions to global greenhouse gas emissions and removals over the past three decades.

This report was prepared following the guidelines set forth in the Modalities, Procedures, and Guidelines (MPGs) for the transparency framework established under the Paris Agreement (Decision 18/CMA.1). Egypt's methodologies adhere to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories developed by the Intergovernmental Panel on Climate Change (IPCC). To further ensure accuracy, transparency, and completeness, the inventory also incorporates elements from the 2013 Supplement to the 2006 IPCC Guidelines: Wetlands, the 2013 Revised Supplementary Methods and Good Practice Guidance Arising from the Kyoto Protocol, and the 2019 Refinement to the 2006 IPCC Guidelines.

Egypt's national inventory reporting reflects its commitment to the MPGs, ensuring alignment with international standards and supporting the country's efforts to provide a transparent and robust account of its GHG emissions and removals over the reporting period. Egypt's national GHG inventory is composed of GHG emissions and removals for the following gases: CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>. These emissions are estimated in the four IPCC sectors (Energy, IPPU, AFOLU and Waste). The inventory covered all relevant GHGs except for NF<sub>3</sub>, which has not been estimated, and the data related to manufacturing of flat-panel displays, photovoltaics and LEDs will be collected and included in the next reporting cycle.

## **2.2 Overview of the GHG Inventory Process**

### **2.2.1 Reporting Framework**

Egypt has been actively participating in climate change initiatives under the UNFCCC since the 1990s, demonstrating a commitment to global environmental challenges. Egypt has submitted three NCs to the UNFCCC, providing an overview of its greenhouse gas emissions inventory, mitigation measures, and adaptation efforts. In 2019, Egypt submitted its BUR1, a requirement under the UNFCCC for non-Annex I countries. The country's Intended Nationally Determined Contribution (INDC) was submitted in 2015 (Egypt's First NDC), and updated NDCs were submitted in 2022 and 2023. Egypt is finalizing its NC4 which will include a standalone National Inventory Report (NIR). The country also developed its inaugural Biennial Transparency Report (BTR-1) under the Paris Agreement's Enhanced Transparency Framework.

### **2.2.2 Institutional Arrangements for Inventory Preparation**

Egypt has been working in the previous years on developing and enhancing its national MRV system. An MRV working group comprising representatives from various ministries has been established in 2023. Its responsibilities include but are not limited to supporting the data collection, conducting quality assurance and quality control measures for the documents submitted under the UNFCCC and the Paris Agreement, and supporting the digitalization of the system. In the previous period, Egypt has focused on establishing MRV system for 3 key sectors; namely, electricity, oil and gas, and transport where data collection templates and detailed procedural guidelines for the GHG inventory have been developed, and the institutional arrangements identified. Similar work is currently being developed for

the waste sector. Moreover, a digital system has been developed under CAPMAS to develop an annual “energy balance”, and 2 reports have been published accordingly.

In addition, Egypt is taking significant strides to enhance its national GHG inventory system by developing a centralized digital MRV platform for data collection and reporting. This initiative, spearheaded by the Ministry of Environment (MoE), aims to streamline the processes involved in preparing future BTRs, starting with BTR2. The platform is currently being designed to serve as a centralized tool that ensures comprehensive and consistent data collection across all relevant sectors while avoiding double counting or omissions.

The current BTR in Egypt used a sector-based approach for data collection, with each sector contributing emissions and removals data using standardized forms. The sectoral data providers mainly include ministries and national entities. The new digital platform is being developed to institutionalize this process, enabling efficient data recording, processing, and emission estimation. This will enhance Egypt's adherence to transparency, accuracy, completeness, consistency, and comparability (TACCC) principles. The platform will strengthen the national inventory system, ensuring Egypt's GHG inventories meet international standards and are delivered on time. The institutional framework for preparing Egypt's Greenhouse Gas Inventory (GHGI) under the NIR ensures comprehensive collaboration, efficient data collection, and accurate reporting across key sectors.

Developing the GHG inventory for the first BTR was conducted under the supervision of the EEAA CEO and the CCCD Director. The GHG inventory team comprised of GHGI Team Leader who supervised the entire inventory process, ensuring consistency and quality across the sectors, which include Energy, Industrial Processes and Product Use (IPPU), Agriculture, Forestry, and Other Land Use (AFOLU), and Waste. The Team Leader oversees sectoral experts, each of whom is responsible for conducting emissions and removals calculations specific to their sector. Sectoral experts also validate the data, document methodologies, and adhere to the IPCC guidelines for inventory preparation. An additional technical assistance and coordination team assisted the key experts throughout the project. Finally, quality assurance step has been applied by having an independent review from national experts.

### **2.2.3 Data Collection Processes**

The data collection process for the GHGI involves meticulous planning and coordination between the experts, team leader and designated ministry focal points. Sectoral experts begin by preparing data collection sheets tailored to the specific requirements of their sectors, ensuring alignment with IPCC methodologies. These templates, created in both English and Arabic, are designed to streamline communication with stakeholders and capture the necessary activity data, emission factors, and other parameters for accurate calculations.

Each ministry appoints a focal point to manage data collection efforts within their respective sectors. These focal points liaise with stakeholders such as government departments, industrial facilities, and agricultural bodies to gather the required information. Once the data is collected, it is submitted to the sectoral experts for review. The experts validate the data,

addressing any discrepancies or gaps through follow-ups with the focal points, before incorporating it into the inventory.

## 2.2.4 Definitions and Scope for Egypt’s National GHG Inventory

The scope of Egypt's national GHG inventory is defined by three primary components:

1. **GHG Coverage:** The inventory accounts for all relevant greenhouse gases emitted or removed within Egypt's national boundaries except for NF<sub>3</sub>, which has not been estimated as previously clarified. Hence, the covered GHGs are:
  - Carbon dioxide (CO<sub>2</sub>)
  - Methane (CH<sub>4</sub>)
  - Nitrous oxide (N<sub>2</sub>O)
  - Hydrofluorocarbons (HFCs)
  - Perfluorocarbons (PFCs)
  - Sulphur hexafluoride (SF<sub>6</sub>)
  
2. **Sectoral Coverage:** The inventory encompasses emissions and removals across four key sectors as outlined in the 2006 IPCC Guidelines:
  - **Energy:** Includes emissions from fuel combustion and fugitive emissions from fuels.
  - **Industrial Processes and Product Use (IPPU):** Covers emissions from chemical reactions during production and the use of products containing greenhouse gases.
  - **Agriculture, Forestry, and Other Land Use (AFOLU):** Accounts for emissions from livestock, agricultural soils, and changes in forest carbon stocks.
  - **Waste:** Encompasses emissions from solid waste disposal, wastewater treatment, and other waste-related activities.

Each sector is further subdivided into categories, subcategories, and specific emission sources, ensuring detailed reporting.

3. **Geographical Scope:** The inventory covers all emissions and removals occurring within Egypt’s national territory, as defined under international boundaries.

Considering the coverage of the six GHGs and the four sectors, the following table presents the specific GHGs covered under each of the sectors within Egypt’s national GHG inventory.

**Table 8: GHG Coverage by Gas and Sector**

| Sector/ Category | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs | PFCs | SF <sub>6</sub> | NF <sub>3</sub> |
|------------------|-----------------|-----------------|------------------|------|------|-----------------|-----------------|
| 1. Energy        | ✓               | ✓               | ✓                | N.O. | N.O. | N.O.            | N.O.            |
| 2. IPPU          | ✓               | ✓               | ✓                | ✓    | ✓    | ✓               | N.E.            |

| Sector/ Category | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs | PFCs | SF <sub>6</sub> | NF <sub>3</sub> |
|------------------|-----------------|-----------------|------------------|------|------|-----------------|-----------------|
| 3. AFOLU         | ✓               | ✓               | ✓                | N.O. | N.O. | N.O.            | N.O.            |
| 4. Waste         | ✓               | ✓               | ✓                | N.O. | N.O. | N.O.            | N.O.            |

(N.O.: Not Occurring, N.E.: Not Estimated)

## 2.2.5 Description of Methodologies

The national GHG inventory of Egypt adheres to the methodologies recommended in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and updated emission factors from the 2019 Refinement to the 2006 IPCC Guidelines have been incorporated where applicable. These guidelines define a tiered approach to calculating emissions and removals, with the tiers representing varying levels of complexity and accuracy; mostly with the following features:

- **Tier 1:** Utilizes a default methodology, relying on global averages for emission factors (EF) and basic activity data (AD).
- **Tier 2:** Involves country-specific data for EFs or AD, providing higher accuracy.
- **Tier 3:** Employs advanced modeling or detailed measurements specific to the sector or activity.
- **Activity Data (AD):** Represents the annual level of a specific activity, such as fuel consumption or livestock population.
- **Emission Factor (EF):** Denotes the rate of emissions per unit of activity, such as CO<sub>2</sub> released per liter of fuel burned.

The inventory estimates emissions and removals by multiplying the AD by the EF for each source or sink. For example:

$$\text{GHG Emissions} = \text{Activity Data} \times \text{Emission Factor}$$

The choice of Tier and justification is provided for the different source categories under each sector. Egypt's national GHG inventory for the reporting period includes comprehensive overview of emissions while identifying areas for improvement in future reporting cycles as the country moves toward adopting higher-tier approaches.

## 2.2.6 Data and Emission Factors Sources

To the extent possible, official country-specific activity data was used for inventory development, first from official published statistics and secondly from published peer-reviewed or other official publications. The following table presents the entities/sources that have provided national data for the development of the GHGI; categorized by sector. When such data was not available, default values were sourced primarily from the 2019 IPCC Refinement and secondly from the 2006 IPCC Guidelines.

Country-specific emission factors were used, when available, to develop Egypt's national GHG inventory. Otherwise, default values were adopted primarily from the 2019 IPCC Refinement and secondly from the 2006 IPCC Guidelines.

**Table 9: Data Sources by Sector**

| Sector | Data Sources  |
|--------|---|
| Energy | <ul style="list-style-type: none"> <li>• Ministry of Electricity and Renewable Energy (MoERE) and affiliated entities</li> <li>• Egyptian Electricity Holding Company (EEHC)</li> <li>• Egyptian Electricity Transmission Company (EETC)</li> <li>• New and Renewable Energy Authority (NREA)</li> <li>• Ministry of Petroleum and Mineral Resources (MoPMR) and affiliated entities</li> <li>• Egyptian General Petroleum Corporation (EGPC)</li> <li>• Egyptian Natural Gas Holding Company (EGAS)</li> <li>• Egyptian Petrochemicals Holding Company (ECHEM)</li> <li>• Ganop ElWady Holding Petroleum Company (GANOPE)</li> <li>• International Energy Agency (IEA)</li> <li>• Ministry of Transport (MoT) and affiliated entities</li> <li>• General Authority for Roads and Bridges and Land Transport (GARBLT)</li> <li>• Maritime Transport Sector (MTS)</li> <li>• Egyptian National Railways (ENR)</li> <li>• River Transport Authority (RTA)</li> <li>• Traffic Sector under Ministry of Interior (MoI)</li> <li>• Ministry of Civil Aviation (MCA)</li> <li>• Industrial Development Authority (IDA) under the Ministry of Trade and Industry (MoTI)</li> <li>• Central Agency for Public Mobilization and Statistics (CAPMAS)</li> </ul> |
| IPPU   | <ul style="list-style-type: none"> <li>• Central Agency for Public Mobilization and Statistics (CAPMAS) – Collects data through questionnaires from industries.</li> <li>• Ministry of Petroleum and Mineral Resources (MoPMR)</li> <li>• Industrial Development Authority (IDA) – Provides information on production capacity and raw materials.</li> <li>• Federation of Egyptian Industries – Offers insights through its various industrial chambers.</li> <li>• National Ozone Unit (NOU) – Supplies data on ODS substitutes.</li> <li>• US Geological Survey (USGS) Mineral Yearbook – Provides comprehensive information on mineral production and trends.</li> <li>• Donor-funded projects (e.g., UNIDO, World Bank) – Collect data on specific industries.</li> <li>• International publications – Such as the “Steel Statistical Yearbook” and reports from the Egyptian Petrochemicals Holding Company (ECHEM).</li> </ul>   |

| Sector | Data Sources  |
|--------|---|
| AFOLU  | <ul style="list-style-type: none"> <li>• Ministry of Agriculture and Land Reclamation (MALR)</li> <li>• Agricultural Research Centre (ARC)</li> <li>• The Agricultural Economic Affairs Sector (EAS)</li> <li>• Central Agency for Public Mobilization and Statistic (CAPMAS), central source of GHG data</li> <li>• The Central Administration for Agricultural Economics (CAAE)</li> <li>• The Central Administration for Agricultural Planning (CAAP)</li> <li>• Food and Agriculture Organization (FAO)</li> <li>• World Bank database</li> <li>• International Fertilizer Association (IFASTAT)</li> <li>• National Authority for Remote Sensing &amp; Space Sciences</li> </ul> |
| Waste  | <ul style="list-style-type: none"> <li>• Egyptian Environmental Affairs Agency (EEAA)</li> <li>• National Solid Waste Management Program (NSWMP)</li> <li>• Central Agency for Public Mobilization and Statistics (CAPMAS)</li> <li>• Industrial Development Authority (IDA)</li> <li>• Ministry of Health</li> <li>• Ministry of Petroleum and mineral resources (MoPMR)</li> <li>• Ministry of Industry</li> <li>• Ministry of Housing , Utilities and Urban communities</li> <li>• Waste Management Regulatory Authority (WMRA)</li> <li>• United Nations Food and Agriculture Organization (FAO)</li> </ul>   |

### **2.2.7 Quality Control and Quality Assurance**

Quality Assurance (QA) and Quality Control (QC) measures are integral to ensure the accuracy, reliability, and compliance of data throughout the greenhouse gas inventory preparation process. These measures are meticulously applied at each stage of data collection and processing, adhering to the TACCC principles.

A National Consultant was chosen as the agency responsible for compiling the inventory. The general QA/QC framework for the greenhouse gas inventory covers all source categories, though no source-specific measures have been applied.

Data collection involved collaboration with various ministries, affiliated entities, and CAPMAS. Once collected, activity data undergoes QC measures including rigorous validation by comparison with relevant publications and other sources. In the subsequent stages, the data is entered into the IPCC Software, where activity data tables are generated and reviewed for consistency against the original datasets.

The following QC measures are conducted in accordance with the IPCC guidelines to ensure the robustness of the estimates:

- **Guidelines Compliance:** The estimates are verified against the 2006 IPCC Guidelines for National Greenhouse Gas Inventories to ensure full compliance with the methodologies and reporting requirements outlined by the IPCC.
- **IPCC Compatibility:** Data requirements are reviewed in line with the 2006 IPCC Guidelines for National Greenhouse Gas Inventories and its software specifications.

- **Primary Data Collection:** Tailored questionnaires are used to gather data directly from primary sources, supplemented by information from national and sectoral reports.
- **Data Tabulation and Comparison:** Collected data is systematically tabulated by year, unit, and source. This is followed by comparing and adapting the data to match the needs of the inventory process.
- **Cross-Verification:** Key activity data and parameters are cross-checked across multiple sources, and sources with significant variations are carefully excluded from use.
- **Emission Factor Validation:** The correctness of emission factors employed in calculations is verified to maintain calculation integrity.
- **Time-series and Trend Analysis:** Emission trends are analyzed across the time series to ensure consistency and identify any anomalies or deviations from previous greenhouse gas inventories. Explanations are provided to justify significant differences and assess alignment with sectoral developments.
- **Parameter Confirmation:** Parameters and assumptions from earlier inventories are reviewed and updated to maintain time-series consistency.
- **Unit and Database Checks:** Proper usage of units is confirmed, and completeness checks are undertaken for all entries in the database.
- **Error Prevention and Data Accuracy:** All data inputs and references are carefully checked for transcription errors. Units of parameters and emissions are verified to ensure they are correctly recorded, and appropriate conversion factors are applied as needed.
- **Consistency in Methods and Data Selection:** The activity data, emission factors, and methodologies chosen are reviewed for correctness and uniformity across the entire time series. Any inconsistencies are addressed to maintain methodological alignment.
- **Data Quality Assurance and Recalibration:** The quality of existing data is rigorously assured, with recalculations performed when necessary. This includes review, modification, and potential re-entry of data for specific years or subsectors.
- **Verification of Methodological Descriptions:** Methods applied in the calculations are thoroughly reviewed to confirm their accuracy and proper application. Descriptions of these methods are checked for consistency with IPCC guidelines.
- **Key Category Analysis:** The persistence of key categories over the time series is assessed to ensure their accurate representation and analysis.
- **IPCC Software Validation:** Year-by-year checks are conducted to identify and correct bugs or data misplacement issues within the IPCC software.
- **Uncertainty Analysis:** The expertise of individuals providing judgments on uncertainty estimates is verified. Proper documentation of qualifications and judgments is archived to ensure transparency. Uncertainties entered into the IPCC 2006 software are reviewed and updated to reflect the most accurate estimates.

Additionally, QA procedures were adopted and carried out to thoroughly review and validate the overall quality of the inventory. These procedures were designed to ensure that the processes followed align with established guidelines, as well as to identify any areas where improvements could be made. As shown in the following table, the QA was implemented at different levels. These levels included a peer review conducted by third-party experts and a quality assessment performed at the national level by all participating ministries. This multi-level approach ensures that the inventory meets both global standards and national requirements, thereby enhancing its credibility and transparency.

**Table 10: Level of Quality Assurance Process**

| Level                                       | Description  |
|---|--|
| <b>Third-Party Review Level</b>             | <p>In Egypt’s inventory preparation process, third-party expert reviews were conducted through a dedicated team of national consultants. An expert agency was assigned by EEAA as a peer reviewer. Integral Consult was assigned to perform detailed checks, recommend improvements, and ensure the quality and integrity of the inventory. These expert reviewers focused on the five key quality principles throughout the data compilation and reporting processes. They assessed, among other factors, whether each chapter and section of the inventory provided clear activity data and emission factors with well-documented sources, explained the methodologies applied, and summarized the data sets comprehensively.</p>  |
| <b>Quality Assessment at National Level</b> | <p>Additionally, the reviewers examined whether consistent methods and data sources were applied throughout the entire time-series. They also ensured that the same IPCC guidelines were followed for methodologies and reporting templates across the entire inventory and for all relevant gases. Furthermore, the review process included checking if estimates were made for all greenhouse gases and source categories present within Egypt’s national territory. Finally, the expert reviewers assessed the inclusion of uncertainty analysis and proposed any necessary improvement plans to enhance the robustness and accuracy of the inventory.</p> <p>Validation was carried out at the national level by all participating ministries through a series of structured meetings and exchanges that occurred throughout the inventory preparation process. These sessions provided a platform for in-depth discussions and collaborative assessments, which played a crucial role in ensuring that the inventory's methodologies, accuracy, and overall quality were rigorously examined. This collaborative approach helped identify potential areas for improvement and facilitated the refinement of the inventory before finalizing the report.</p> |

### **2.2.8 Key Categories**

A key category in Egypt's national GHG inventory is a source or sink category prioritized for its significant impact on total emissions and removals, either through absolute levels, trends, or uncertainties. Identifying these categories enables a systematic approach to refining methodologies, improving estimate accuracy, and prioritizing resources for inventory preparation.

The key category analysis follows the 2006 IPCC Approach 1, focusing on level and trend assessments. This methodology identifies impactful categories by applying cumulative emissions thresholds. Both analyses include and exclude emissions and removals from sectors such as Forestry and Other Land Use to ensure comprehensive coverage. The assessments align with the IPCC Guidelines to maintain transparency and consistency in Egypt's inventory reporting.

Level assessments measure each category's contribution to total emissions, while trend assessments identify categories with trends that deviate significantly from overall inventory trends, even if their absolute emissions are relatively small. These analyses help target areas requiring detailed attention and support the transition to Tier 2 methodologies for more accurate estimations in future submissions. Both assessments were completed using emission estimates from the current GHG inventory and are fully compliant with IPCC 2006 guidelines.

In the level assessment, key categories are defined as those that, when aggregated in descending order of magnitude, collectively account for 95% of the total contribution from all sources and sink categories to the national inventory level. This approach ensures that the most significant sources and sinks are identified and prioritized, providing a clear focus for inventory efforts. The following tables present the results of the key category analysis conducted.

The key category analysis for Egypt's GHG inventory (2022) identifies the most significant emission sources contributing to the country's total emissions. The analysis indicates that **Energy Industries – Gaseous Fuels (1.A.1)** is the dominant category, with **86,562.27 GgCO<sub>2e</sub>** and a relative contribution of **22.43%**. This is primarily attributed to natural gas combustion in power plants, reflecting Egypt's reliance on natural gas for electricity generation. **The Road Transportation – Liquid Fuels (1.A.3.b)** category follows, contributing **59,728.11 GgCO<sub>2e</sub> (15.47%)**. Additionally, **Manufacturing Industries and Construction – Gaseous Fuels (1.A.2)** ranks third, emitting **39,049.95 GgCO<sub>2e</sub> (10.12%)**, highlighting the significance of energy consumption in Egypt's industrial sector.

Industrial process emissions also play a critical role, with **Cement Production (2.A.1)** contributing **25,276.12 GgCO<sub>2e</sub> (6.55%)**, primarily from clinker production. Waste sector emissions are notable as well, particularly **Solid Waste Disposal (4.A)** and **Wastewater Treatment and Discharge (4.D)**, which together contribute **34,900.64 Gg CO<sub>2e</sub> (9.04%)**, largely from methane emissions generated through anaerobic decomposition. The cumulative share of the top five categories exceeds **59.42%** of total emissions, underscoring

the importance of energy-related activities as primary GHG sources in Egypt. For further details on the key categories please refer to Annex II: Key Categories Analysis.

On the other hand, the trend assessment (see Table 12) confirms the significance of the **Energy Industries – Gaseous Fuels (1.A.1)**, **Manufacturing Industries and Construction – Gaseous Fuels (1.A.2)**, **Road Transportation – Liquid Fuels (1.A.3.b)** as key categories. It also shows the significance of further categories including **Manufacturing Industries and Construction – Liquid Fuels (1.A.2)** and **Direct N2O Emissions from managed soils (3.C.4)**.

**Table 11: Level Assessment of Key Categories (2022)**

| Category Code | IPCC Category   | GHG              | Ex.t <sup>1</sup><br>Gg CO <sub>2</sub> e | Ex.t  <sup>2</sup><br>Gg CO <sub>2</sub> e | Lx,t <sup>3</sup> |
|---------------|---|------------------|---|--|-------------------|
| 1.A.1         | Energy Industries - Gaseous Fuels                         | CO <sub>2</sub>  | 86,562.27                                 | 86,562.27                                  | 0.2243            |
| 1.A.3.b       | Road Transportation - Liquid Fuels                        | CO <sub>2</sub>  | 59,728.11                                 | 59,728.11                                  | 0.1547            |
| 1.A.2         | Manufacturing Industries and Construction - Gaseous Fuels | CO <sub>2</sub>  | 39,049.95                                 | 39,049.95                                  | 0.1012            |
| 2.A.1         | Cement production   | CO <sub>2</sub>  | 25,276.12                                 | 25,276.12                                  | 0.0655            |
| 4.A           | Solid Waste Disposal                                      | CH <sub>4</sub>  | 18,730.22                                 | 18,730.22                                  | 0.0485            |
| 1.A.1         | Energy Industries - Liquid Fuels                          | CO <sub>2</sub>  | 18,663.81                                 | 18,663.81                                  | 0.0484            |
| 4.D           | Wastewater Treatment and Discharge                        | CH <sub>4</sub>  | 16,170.42                                 | 16,170.42                                  | 0.0419            |
| 3.C.4         | Direct N2O Emissions from managed soils                   | N <sub>2</sub> O | 12,819.17                                 | 12,819.17                                  | 0.0332            |
| 1.A.4         | Other Sectors - Liquid Fuels                              | CO <sub>2</sub>  | 11,863.79                                 | 11,863.79                                  | 0.0307            |
| 1.A.2         | Manufacturing Industries and Construction - Solid Fuels   | CO <sub>2</sub>  | 10,762.38                                 | 10,762.38                                  | 0.0279            |
| 3.A.1         | Enteric Fermentation                                      | CH <sub>4</sub>  | 10,290.67                                 | 10,290.67                                  | 0.0267            |
| 1.A.4         | Other Sectors - Gaseous Fuels                             | CO <sub>2</sub>  | 7,204.41                                  | 7,204.41                                   | 0.0187            |
| 1.B.2.b       | Natural Gas   | CO <sub>2</sub>  | 7,033.89                                  | 7,033.89                                   | 0.0182            |
| 3.A.2         | Manure Management   | N <sub>2</sub> O | 6,937.06                                  | 6,937.06                                   | 0.0180            |
| 2.F.1         | Refrigeration and Air Conditioning                        | HFCs, PFCs       | 6,731.06                                  | 6,731.06                                   | 0.0174            |
| 1.A.2         | Manufacturing Industries and Construction - Liquid Fuels  | CO <sub>2</sub>  | 5,968.75                                  | 5,968.75                                   | 0.0155            |
| 2.B.1         | Ammonia Production  | CO <sub>2</sub>  | 5,340.58                                  | 5,340.58                                   | 0.0138            |
| 2.C.1         | Iron and Steel Production                                 | CO <sub>2</sub>  | 4,984.00                                  | 4,984.00                                   | 0.0129            |
| 3.C.7         | Rice cultivation  | CH <sub>4</sub>  | 4,506.56                                  | 4,506.56                                   | 0.0117            |
| 2.C.3         | Aluminium production                                      | PFCs             | 4,213.44                                  | 4,213.44                                   | 0.0109            |
| 3.C.6         | Indirect N2O Emissions from manure management             | N <sub>2</sub> O | 2,899.73                                  | 2,899.73                                   | 0.0075            |
| 1.A.3.b       | Road Transportation - Gaseous Fuels                       | CO <sub>2</sub>  | 2,465.82                                  | 2,465.82                                   | 0.0064            |
| <b>Total</b>  |   |                  | <b>368,202.20</b>                         | <b>368,202.20</b>                          | <b>0.9539</b>     |

<sup>1</sup> Ex,t refers to the **emissions (or removals)** from a specific category x in a given year t.

<sup>2</sup> |Ex,t| refers to the **absolute value** of emissions (or removals) for a specific category x in a given year t.

<sup>3</sup> Lx,t : The relative contribution of category x in year t

**Table 12: Trend Assessment of Key Categories (2022)**

| Category Code | IPCC Category   | GHG              | 1990                         | 2022                         | Trend Assessment<br>Txt | Contribution to trend<br>% |
|---------------|---|------------------|------------------------------|------------------------------|-------------------------|----------------------------|
|               |   |                  | Ex.t<br>Gg CO <sub>2</sub> e | Ex.t<br>Gg CO <sub>2</sub> e |                         |                            |
| 1.A.1         | Energy Industries - Gaseous Fuels                         | CO <sub>2</sub>  | 9,329.54                     | 86,562.27                    | 0.4275                  | 0.1826                     |
| 1.A.2         | Manufacturing Industries and Construction - Liquid Fuels  | CO <sub>2</sub>  | 20,311.94                    | 5,968.75                     | 0.3391                  | 0.1448                     |
| 1.A.2         | Manufacturing Industries and Construction - Gaseous Fuels | CO <sub>2</sub>  | 3,100.48                     | 39,049.95                    | 0.2136                  | 0.0912                     |
| 3.C.4         | Direct N <sub>2</sub> O Emissions from managed soils      | N <sub>2</sub> O | 13,700.60                    | 12,819.17                    | 0.1675                  | 0.0716                     |
| 1.A.1         | Energy Industries - Liquid Fuels                          | CO <sub>2</sub>  | 15,113.62                    | 18,663.81                    | 0.1533                  | 0.0655                     |
| 1.A.3.b       | Road Transportation - Liquid Fuels                        | CO <sub>2</sub>  | 15,098.97                    | 59,728.11                    | 0.1327                  | 0.0567                     |
| 3.A.1         | Enteric Fermentation                                      | CH <sub>4</sub>  | 8,812.04                     | 10,290.67                    | 0.0935                  | 0.0399                     |
| 2.A.1         | Cement production   | CO <sub>2</sub>  | 4,433.20                     | 25,276.12                    | 0.0928                  | 0.0396                     |
| 1.A.4         | Other Sectors - Liquid Fuels                              | CO <sub>2</sub>  | 9,325.74                     | 11,863.79                    | 0.0922                  | 0.0394                     |
| 4.A           | Solid Waste Disposal                                      | CH <sub>4</sub>  | 9,556.50                     | 18,730.22                    | 0.0487                  | 0.0208                     |
| 1.A.4         | Other Sectors - Gaseous Fuels                             | CO <sub>2</sub>  | 151.47                       | 7,204.41                     | 0.0473                  | 0.0202                     |
| 2.F.1         | Refrigeration and Air Conditioning                        | HFCs, PFCs       | -                            | 6,731.06                     | 0.0468                  | 0.0200                     |
| 1.B.2.b       | Natural Gas   | CO <sub>2</sub>  | 533.59                       | 7,033.89                     | 0.0389                  | 0.0166                     |
| 1.B.2.a       | Oil   | CO <sub>2</sub>  | 2,530.82                     | 1,575.87                     | 0.0365                  | 0.0156                     |
| 2.B.1         | Ammonia Production  | CO <sub>2</sub>  | (202.77)                     | 5,340.58                     | 0.0362                  | 0.0155                     |
| 3.A.2         | Manure Management   | N <sub>2</sub> O | 677.76                       | 6,937.06                     | 0.0356                  | 0.0152                     |
| 3.C.7         | Rice cultivation  | CH <sub>4</sub>  | 3,469.28                     | 4,506.56                     | 0.0337                  | 0.0144                     |
| 3.C.3         | Urea application  | CO <sub>2</sub>  | 2,317.34                     | 1,475.18                     | 0.0332                  | 0.0142                     |
| 2.C.1         | Iron and Steel Production                                 | CO <sub>2</sub>  | 3,579.66                     | 4,984.00                     | 0.0324                  | 0.0138                     |
| 4.D           | Wastewater Treatment and Discharge                        | CH <sub>4</sub>  | 7,419.14                     | 16,170.42                    | 0.0265                  | 0.0113                     |
| 1.A.2         | Manufacturing Industries and Construction - Solid Fuels   | CO <sub>2</sub>  | 2,763.25                     | 10,762.38                    | 0.0231                  | 0.0099                     |
| 2.C.3         | Aluminium production                                      | PFCs             | 2,674.03                     | 4,213.44                     | 0.0208                  | 0.0089                     |
| 1.B.2.a       | Oil   | CH <sub>4</sub>  | 1,289.34                     | 802.84                       | 0.0186                  | 0.0079                     |
| 1.A.1         | Energy Industries - Biomass - solid                       | CH <sub>4</sub>  | 980.97                       | -                            | 0.0184                  | 0.0079                     |
| 1.A.3.b       | Road Transportation - Gaseous Fuels                       | CO <sub>2</sub>  | -                            | 2,465.82                     | 0.0172                  | 0.0073                     |
| <b>Total</b>  |   |                  | <b>136,966.50</b>            | <b>369,156.36</b>            | <b>2.2259</b>           | <b>0.9508</b>              |

## **2.2.9 General Uncertainty Assessment**

Uncertainty represents the degree of incomplete knowledge that can affect the accuracy of data or results, stemming from limited information or disagreements about the extent of knowledge. It is inversely tied to accuracy and plays a critical role in refining Egypt's national GHG inventory.

### **Importance of Uncertainty Assessment**

Uncertainty assessments are vital for:

- Identifying major sources of uncertainty to focus on improving data collection efforts.
- Guiding the selection of appropriate methodologies for more reliable estimations.

### **Sources of Uncertainty**

Despite efforts to achieve the highest accuracy using available country-specific data, some uncertainties persist in Egypt's GHG inventory due to:

- **Data Limitations:** Lack of complete, high-quality, and recent country-specific data often necessitates the use of assumptions, default data, or splicing techniques.
- **Measurement Errors:** Random errors arising from studies, statistics, and measurement inaccuracies.
- **Model Simplifications:** Approximation methods that simplify real-world systems introduce variability.

The uncertainty analysis was conducted using the IPCC Software Approach 1 (Propagation of Error). This decision was made because the IPCC software version used in the BTR-1 GHG assessment (version 2.93) exhibited inconsistencies in uncertainty values, which compromised the accuracy of the results. The uncertainty analysis revealed a total inventory uncertainty of  $\pm 3.5\%$  and a trend uncertainty of 13.3% over the period from 1990 to 2022. The uncertainty values for emission factors and activity data were determined based on default values provided in the IPCC guidelines, supplemented by expert judgment. For further details please refer to annex III: Uncertainty Assessment.

**Table 13: Uncertainty assessment (2022)**

| Uncertainty Summary            | 2022    |
|--------------------------------|---------|
| Uncertainty in Total Inventory | 3.4635  |
| Trend Uncertainty              | 13.2804 |

#### **2.2.10 Assessment of Completeness:**

To ensure completeness, the national GHG inventory of Egypt uses notation keys where numerical data are not available. These notation keys include the following and are reported in the CRTs:








- “N.O.” (not occurring): Used for categories or processes under a particular source or sink category that do not occur within a Party.
- “N.E.” (not estimated): Used for activity data and/or emissions by sources and removals by sinks of GHGs that have not been estimated but for which a corresponding activity may occur within a Party.
- “N.A.” (not applicable): Used for activities under a given source/sink category that do occur within the Party but do not result in emissions or removals of a specific gas.
- “I.E.” (included elsewhere): Used for emissions by sources and removals by sinks of GHGs estimated but included elsewhere in the inventory instead of under the expected source/sink category.
- “C.” (confidential): Used for emissions by sources and removals by sinks of GHGs where the reporting would involve the disclosure of confidential information.

### 2.2.11 Description of Metrics:

Greenhouse gases exhibit differences in their ability to trap heat, referred to as radiative efficiency, as well as the duration they remain active in the atmosphere, known as their atmospheric lifetime. To quantify and compare their climate impacts, the Global Warming Potential (GWP) metric was introduced. GWP measures the cumulative radiative forcing of 1 metric ton of a greenhouse gas over a specified time frame—typically 100 years—relative to 1 ton of carbon dioxide (CO<sub>2</sub>). This enables the comparison of the warming effects of different gases on a common scale.



The GWP value represents the ratio of the integrated radiative forcing caused by the release of 1 kilogram of a particular gas to that caused by 1 kilogram of CO<sub>2</sub>. Consequently, GWP-weighted emissions are expressed in terms of carbon dioxide equivalent (CO<sub>2</sub>e). Gas with a higher GWP has a more significant warming effect compared to CO<sub>2</sub> over the same time period.

In Egypt's National Greenhouse Gas Inventory (GHGI), the GWP values adopted are based on the IPCC Fifth Assessment Report (AR5) for a 100-year time horizon in accordance with the ETF MPGs. Previously, the entire time series used GWP values from the Second Assessment Report (SAR), but it has been recalculated using AR5 values to ensure consistency with IPCC Guidelines and facilitate a more accurate assessment of the nation's contributions to global warming.

| <b>GHG</b>   | <b>AR5-GWP</b> |
|--|----------------|
|  <b>CO<sub>2</sub></b>   | <b>1</b>       |
|  <b>CH<sub>4</sub></b>   | <b>28</b>      |
|  <b>N<sub>2</sub>O</b>   | <b>265</b>     |
|  <b>SF<sub>6</sub></b>   | <b>23,500</b>  |
|  <b>HFCs</b>             | <b>various</b> |
|  <b>PFCs</b>             | <b>various</b> |
|  <b>NF<sub>3</sub></b> | <b>N.E.</b>    |

## 2.3 National Total GHG Emissions (1990–2022)

The chart illustrates Egypt's GHG emissions, measured in GgCO<sub>2</sub>e, over the period from 1990 to 2022. The country emissions increased from 143,321.11 Gg CO<sub>2</sub>e (in 1990) to 385,975.3 Gg CO<sub>2</sub>e (in 2022). The average annual growth rate (AAGR) has been 2.25% between 1990 and 2000, and 4.45% over the period between 2000 and 2010. The rate of growth decreased to 2.2% from 2010 to 2015 mostly due to the economic disruption resulting from the Egyptian revolution in 2011. A sharp increase of 11% in emissions is observed between 2014 and 2015 followed by an annual rate down to 2.9% between 2015 and 2018. The total emissions in 2022 were 5.9% higher than the 2018 levels, with a relatively low annual growth rate of 1.5%

| Egypt 2022   |  |
|--|--|
|  | <b>385,975.3</b> GgCO <sub>2</sub> e   |
|  | <b>385,975,296</b> mtCO <sub>2</sub> e |

There are several reasons for the decline in the rate of growth, mostly associated with the energy policy reform, energy efficiency, increased thermal efficiency and alternative fuels, switching to renewable sources of energy, and increased rate of waste recycling. Detailed analysis is provided under each sector. The spread of Corona disease and lockdown during the year 2020 could also have affected the rate of growth as it has negatively affected the economic growth in Egypt and consequently led to a decline in the economic activities combined with an associated decrease in GHG emissions.



Figure 10: National total Greenhouse Gas emission 1990-2022 (GgCO<sub>2</sub>e)

### 2.3.1 GHG Emissions by Gas (1990–2022)

The distribution of emissions among gases (CO<sub>2</sub>, CH<sub>4</sub>, N<sub>2</sub>O, HFCs, PFCs, and SF<sub>6</sub>) in 2022 continues to highlight the dominance of CO<sub>2</sub>, which accounts for the largest share of emissions (75.53%), driven primarily by energy production, industrial processes, and transportation activities. Methane (CH<sub>4</sub>) remains the second-largest contributor, stemming from the Waste and AFOLU sectors. Nitrous oxide (N<sub>2</sub>O) emissions also show consistent

growth, largely associated with agricultural soil management and fertilizer application. The contribution of hydrofluorocarbons (HFCs) and other fluorinated gases has grown over time, reflecting increased use in refrigeration, air conditioning, and certain industrial applications. The chart indicates notable fluctuations across different gases, particularly around the period from 2019 to 2020, which corresponds with the COVID-19 pandemic and the associated reduction in energy and industrial activities. However, post-pandemic data show a sharp rebound in emissions across all gas categories, with CO<sub>2</sub> emissions exhibiting the most significant recovery.

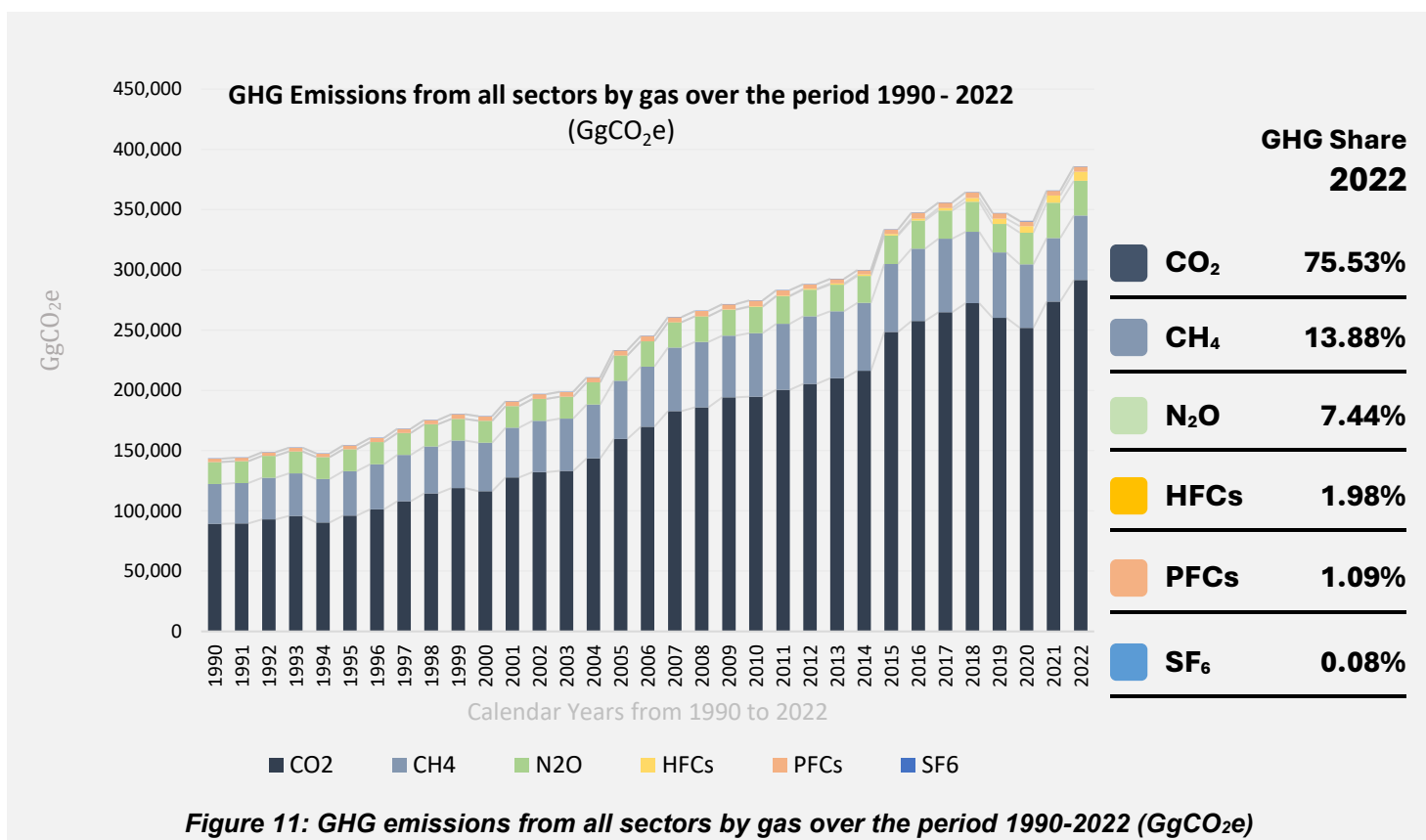


Figure 11: GHG emissions from all sectors by gas over the period 1990-2022 (GgCO<sub>2</sub>e)

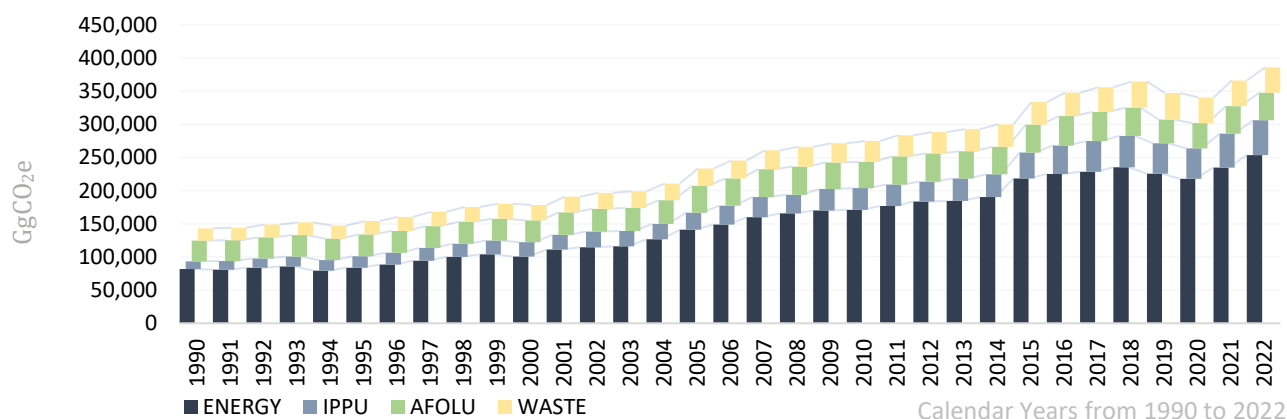
Table 14: GHG Emissions from all Sectors by Gas over the Period 1990-2022 (GgCO<sub>2</sub>e)

| Emissions by Gas (GgCO <sub>2</sub> e) | 1990           | 2000           | 2005           | 2015           | 2016           | 2017           | 2018           | 2019           | 2020           | 2021           | 2022           |
|--|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| CO <sub>2</sub>                        | 89,259         | 116,394        | 159,657        | 248,465        | 257,698        | 264,826        | 272,467        | 260,295        | 251,978        | 273,641        | 291,527        |
| CH <sub>4</sub>                        | 33,010         | 40,186         | 48,232         | 56,390         | 59,955         | 61,091         | 59,240         | 54,138         | 52,524         | 52,707         | 53,568         |
| N <sub>2</sub> O                       | 18,306         | 18,107         | 21,179         | 23,548         | 23,200         | 23,368         | 24,722         | 23,733         | 26,379         | 29,398         | 28,720         |
| HFCs                                   | -              | -              | 3              | 1,462          | 1,750          | 1,973          | 3,272          | 4,280          | 5,455          | 5,986          | 7,632          |
| PFCs                                   | 2,674          | 3,762          | 4,137          | 3,612          | 4,725          | 4,484          | 4,514          | 4,514          | 3,913          | 3,913          | 4,214          |
| SF <sub>6</sub>                        | 72             | 132            | 183            | 291            | 291            | 291            | 308            | 315            | 311            | 316            | 314            |
| <b>Total (Gg CO<sub>2</sub>e)</b>      | <b>143,321</b> | <b>178,581</b> | <b>233,391</b> | <b>333,768</b> | <b>347,619</b> | <b>356,033</b> | <b>364,524</b> | <b>347,275</b> | <b>340,560</b> | <b>365,960</b> | <b>385,975</b> |

### 2.3.2 Emissions and Removal Trends by Sector

The sectoral contributions to total GHG emissions have evolved over the reporting period. The energy sector's share increased from 57% in 1990 to 66% in 2022, while the IPPU sector rose from 8% to 13%. The waste sector maintained a relatively stable share of 13% till 2000, and has then decreased to 10%. On the other hand, the AFOLU sector gradually decreased from 22% to 11%.

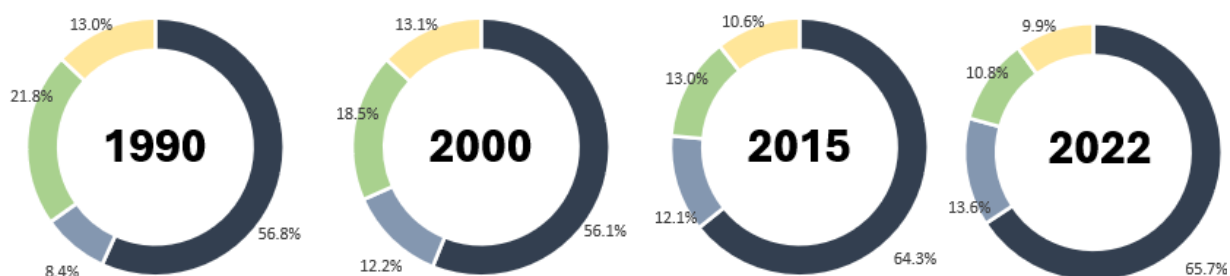
In 2022, the breakdown of GHG emissions showed the energy sector as the largest contributor at 66%, followed by IPPU at 13%, AFOLU at 11%, and the waste sector at 10%. This distribution emphasizes the dominance of the energy sector, with significant and comparable contributions from industrial and agricultural and waste activities.



**Figure 12: National total Greenhouse Gas emissions per sector 1990 - 2022**

**Table 15: GHG Emissions by Sector Period 1990-2022 (GgCO<sub>2</sub>e)**

| Sector                            | 1990           | 2000           | 2005           | 2015           | 2016           | 2017           | 2018           | 2019           | 2020           | 2021           | 2022           |
|-----------------------------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Energy                            | 81,611         | 100,561        | 141,077        | 218,635        | 225,345        | 228,476        | 235,540        | 225,493        | 218,015        | 234,702        | 253,661        |
| IPPU                              | 11,920         | 21,660         | 25,777         | 38,882         | 42,580         | 46,581         | 47,262         | 46,061         | 45,668         | 51,263         | 52,376         |
| AFOLU                             | 31,386         | 33,179         | 40,439         | 42,057         | 44,601         | 43,575         | 42,361         | 35,867         | 38,342         | 41,684         | 41,561         |
| Waste                             | 18,404         | 23,180         | 26,099         | 34,194         | 35,094         | 37,401         | 39,361         | 39,854         | 38,535         | 38,311         | 38,378         |
| <b>Total (Gg CO<sub>2</sub>e)</b> | <b>143,321</b> | <b>178,580</b> | <b>233,392</b> | <b>333,768</b> | <b>347,620</b> | <b>356,034</b> | <b>364,524</b> | <b>347,275</b> | <b>340,560</b> | <b>365,960</b> | <b>385,975</b> |



**Figure 13: GHG Emissions by Sector Period 1990-2022 (GgCO<sub>2</sub>e)**

### 2.3.3 Emissions and Removal Trends by Gases

#### Trends in CO<sub>2</sub> emissions (GgCO<sub>2</sub>)

CO<sub>2</sub> emissions in 2022 were 291,527 GgCO<sub>2</sub>, accounting for 76% of total GHG emissions. They increased from 62% in 1990. The breakdown of CO<sub>2</sub> emissions in 2022 shows that the energy sector accounts for 86% of the net CO<sub>2</sub> emissions and is followed by industrial processes and product use 13% and the AFOLU sector 1% and finally with almost 0.02% in the waste sector.

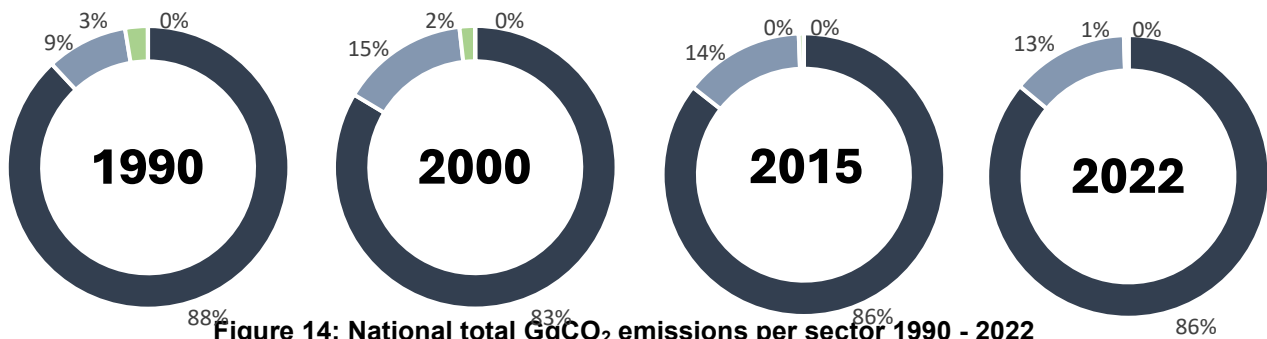
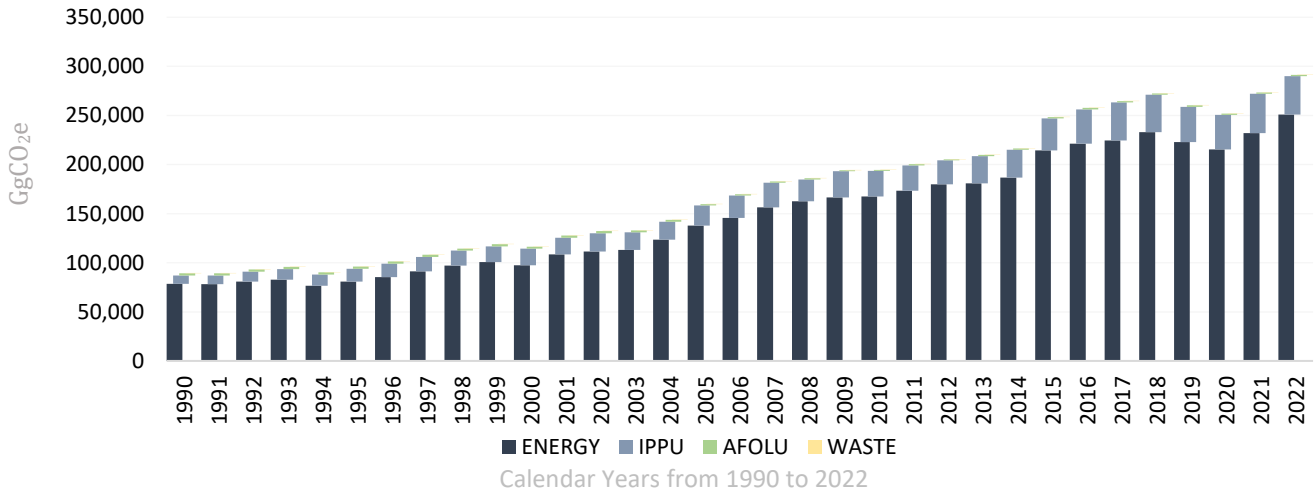


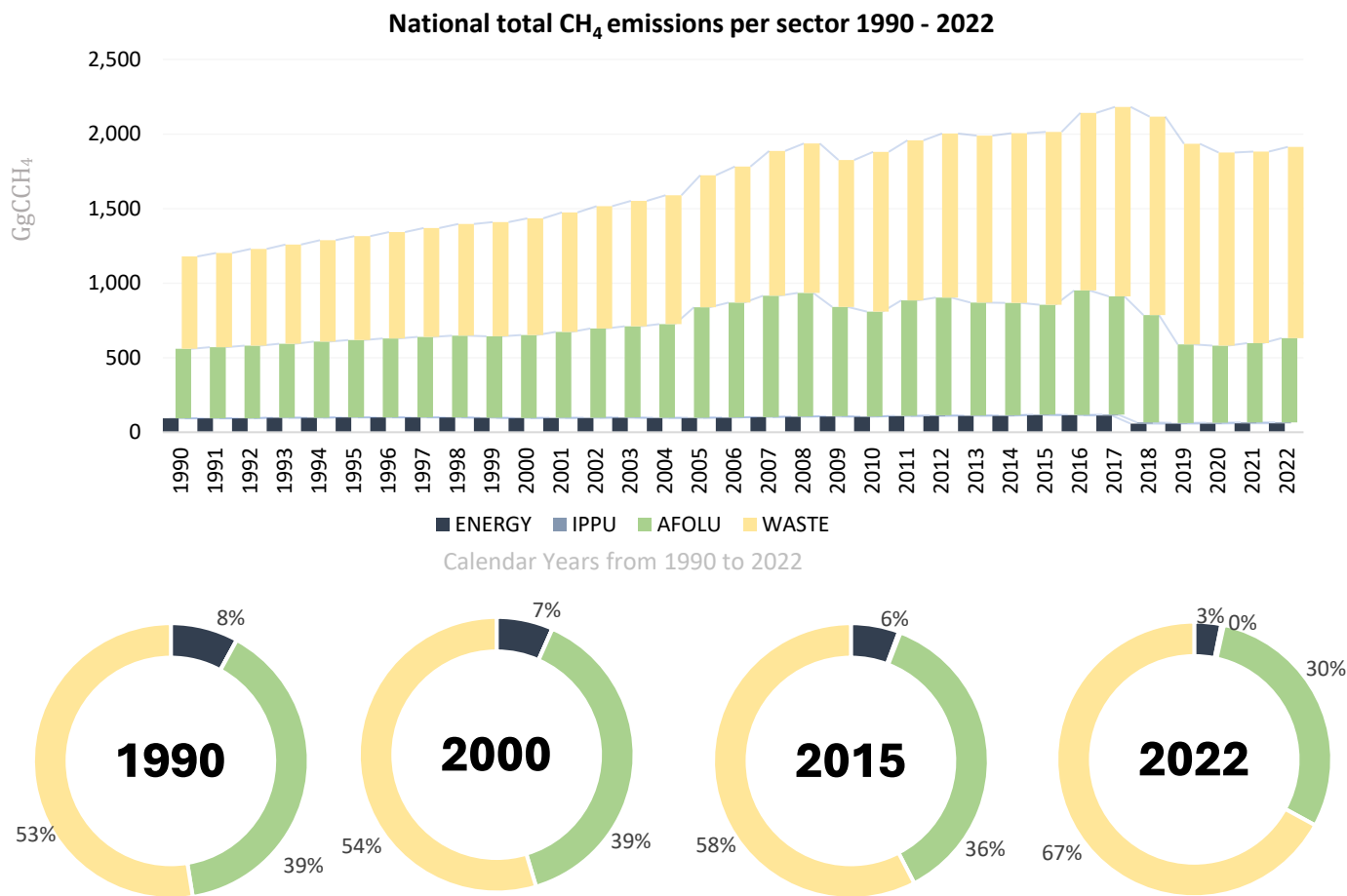
Figure 14: National total GgCO<sub>2</sub> emissions per sector 1990 - 2022

Table 16: National total GgCO<sub>2</sub> emissions per sector 1990 - 2022

| Gg CO <sub>2</sub>            | 1990          | 2000           | 2005           | 2015           | 2016           | 2017           | 2018           | 2019           | 2020           | 2021           | 2022           |
|-------------------------------|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Energy                        | 78,675        | 97,463         | 137,896        | 214,585        | 221,257        | 224,466        | 232,991        | 223,062        | 215,569        | 232,112        | 250,879        |
| IPPU                          | 8,242         | 16,834         | 20,474         | 32,474         | 34,806         | 38,732         | 38,062         | 35,856         | 34,894         | 39,959         | 39,121         |
| AFOLU                         | 2,317         | 2,068          | 1,255          | 1,356          | 1,583          | 1,573          | 1,346          | 1,314          | 1,454          | 1,513          | 1,473          |
| Waste                         | 24.89         | 28.88          | 31.60          | 49.83          | 52.35          | 54.14          | 68.00          | 64.05          | 60.50          | 57.30          | 54.43          |
| <b>Total (CO<sub>2</sub>)</b> | <b>89,259</b> | <b>116,394</b> | <b>159,657</b> | <b>248,465</b> | <b>257,698</b> | <b>264,826</b> | <b>272,467</b> | <b>260,295</b> | <b>251,978</b> | <b>273,641</b> | <b>291,527</b> |

#### Trends in CH<sub>4</sub> emissions (GgCH<sub>4</sub>)

CH<sub>4</sub> emissions in 2022 were 1,913.15 Gg CH<sub>4</sub>, accounting for 13.88% of total GHG emissions. They increased by 62% compared to 1990 and decreased by 5% compared to 2015. The breakdown of CH<sub>4</sub> emissions in 2022 shows that the waste sector accounts for 66% of the CH<sub>4</sub> emissions and is followed by the AFOLU sector 30% and the energy sector 4% and finally the IPPU sector with around 0.3%.



**Figure 15: National Total CH<sub>4</sub> Emissions per Sector 1990 – 2022**

**Table 17: National Total CH<sub>4</sub> Emissions per Sector 1990 – 2022**

| Gg CH <sub>4</sub>            | 1990            | 2000            | 2005            | 2015            | 2016            | 2017            | 2018            | 2019            | 2020            | 2021            | 2022            |
|-------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Energy                        | 93.57           | 95.12           | 95.99           | 113.92          | 113.52          | 112.16          | 58.69           | 56.80           | 57.18           | 59.41           | 68.51           |
| IPPU                          | 0.17            | 0.18            | 1.86            | 4.13            | 2.83            | 6.16            | 6.23            | 5.98            | 5.92            | 5.74            | 5.92            |
| AFOLU                         | 465.77          | 556.31          | 740.74          | 834.46          | 579.21          | 793.80          | 721.78          | 526.50          | 517.77          | 533.19          | 563.87          |
| Waste                         | 619.44          | 783.89          | 883.98          | 1,160.15        | 1,190.70        | 1,269.60        | 1,328.99        | 1,344.22        | 1,294.57        | 1,283.93        | 1,282.88        |
| <b>Total (CH<sub>4</sub>)</b> | <b>1,178.94</b> | <b>1,435.20</b> | <b>1,722.57</b> | <b>2,013.93</b> | <b>2,141.27</b> | <b>2,181.81</b> | <b>2,115.70</b> | <b>1,933.51</b> | <b>1,875.85</b> | <b>1,882.39</b> | <b>1,913.15</b> |

**Trends in N<sub>2</sub>O emissions (GgN<sub>2</sub>O)**

N<sub>2</sub>O emissions in 2022 were 108.38 Gg N<sub>2</sub>O, accounting for 7.44% of total GHG emissions. They increased by 57% compared to 1990 and increased by 22% compared to 2015. The breakdown of N<sub>2</sub>O emissions in 2022 shows that the AFOLU sector accounts for 85% and is followed by the waste sector 8% and energy sector 4% and finally the IPPU sector 3%.

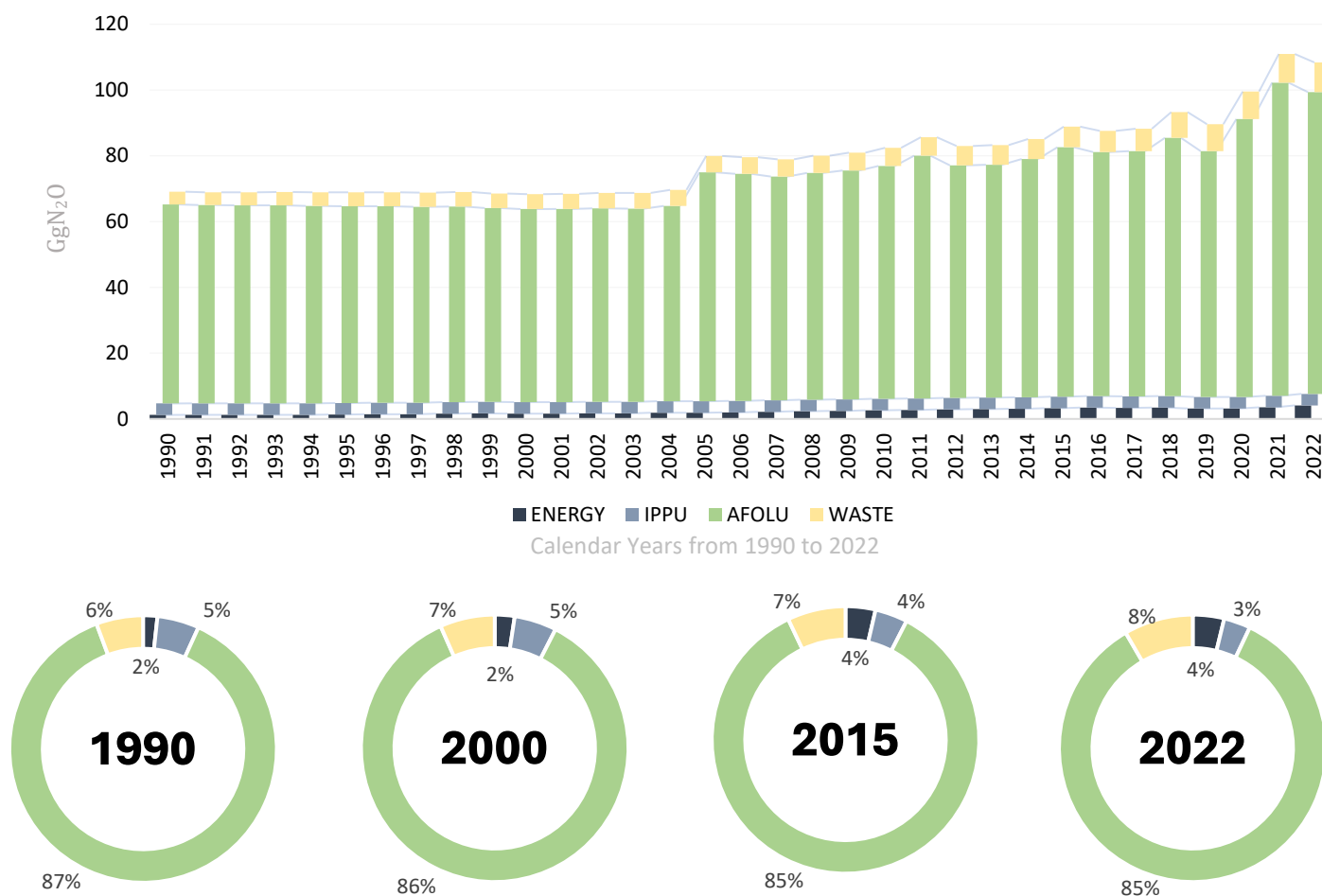


Figure 16: National total N<sub>2</sub>O emissions per sector 1990 – 2022

Table 18: National total N<sub>2</sub>O emissions per sector 1990 – 2022

| Gg N <sub>2</sub> O           | 1990         | 2000         | 2005         | 2015         | 2016         | 2017         | 2018         | 2019         | 2020         | 2021          | 2022          |
|-------------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|---------------|
| Energy                        | 1.19         | 1.64         | 1.86         | 3.22         | 3.46         | 3.33         | 3.43         | 3.18         | 3.15         | 3.49          | 4.12          |
| IPPU                          | 3.50         | 3.50         | 3.50         | 3.50         | 3.50         | 3.50         | 3.50         | 3.50         | 3.50         | 3.50          | 3.50          |
| AFOLU                         | 60.48        | 58.65        | 69.60        | 75.88        | 74.17        | 74.57        | 78.51        | 74.76        | 84.49        | 95.25         | 91.70         |
| Waste                         | 3.91         | 4.54         | 4.96         | 6.26         | 6.42         | 6.78         | 7.85         | 8.12         | 8.40         | 8.69          | 9.07          |
| <b>Total (N<sub>2</sub>O)</b> | <b>69.08</b> | <b>68.33</b> | <b>79.92</b> | <b>88.86</b> | <b>87.55</b> | <b>88.18</b> | <b>93.29</b> | <b>89.56</b> | <b>99.54</b> | <b>110.93</b> | <b>108.38</b> |

## 2.4 Energy

### 2.4.1 Overview of the Sector

Emissions from the Energy sector represented around 65.72% of the total national inventory in 2022. The Energy sector covers all GHG emissions arising from combustion of fuels or as fugitive releases from the handling of those fuels. Emissions from the non-energy uses of fuels are generally not included under the Energy sector but reported under the Industrial Processes and Product Use (IPPU) sector.

- **1.A Fuel combustion**

This category includes emissions released when fossil fuels are combusted. It is divided into the following main sources:

- 1.A.1 - Energy Industries
- 1.A.2 - Manufacturing Industries and Construction
- 1.A.3 - Transport
- 1.A.4 - Other Sectors
- 1.A.5 - Non-specified

- **1.B Fugitive Emissions**

The Fugitive Emissions category encompasses all intentional and unintentional emissions from the extraction, processing, storage and transport of fuel to the point of final use.

- 1.B.1 - Solid Fuels
- 1.B.2 - Oil and Natural Gas
- 1.B.3 - Other emissions from Energy Production

- **1.C Carbon dioxide Transport and Storage (not occurring)**

Emissions from Fuel Combustion accounts for nearly 96% of the Energy sector's emissions in 2022. The main activities covered for the estimation and development of the GHGI for the Energy sector comprised the following relevant source categories<sup>4</sup> (based on the IPCC GHGI Guidelines and sectors classifications):

#### Relevant source categories:

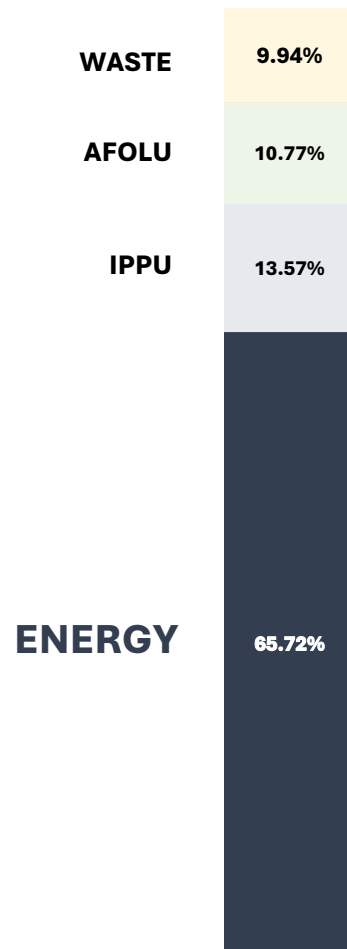
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1.A.1.a.i Electricity Generation

[Energy industries]

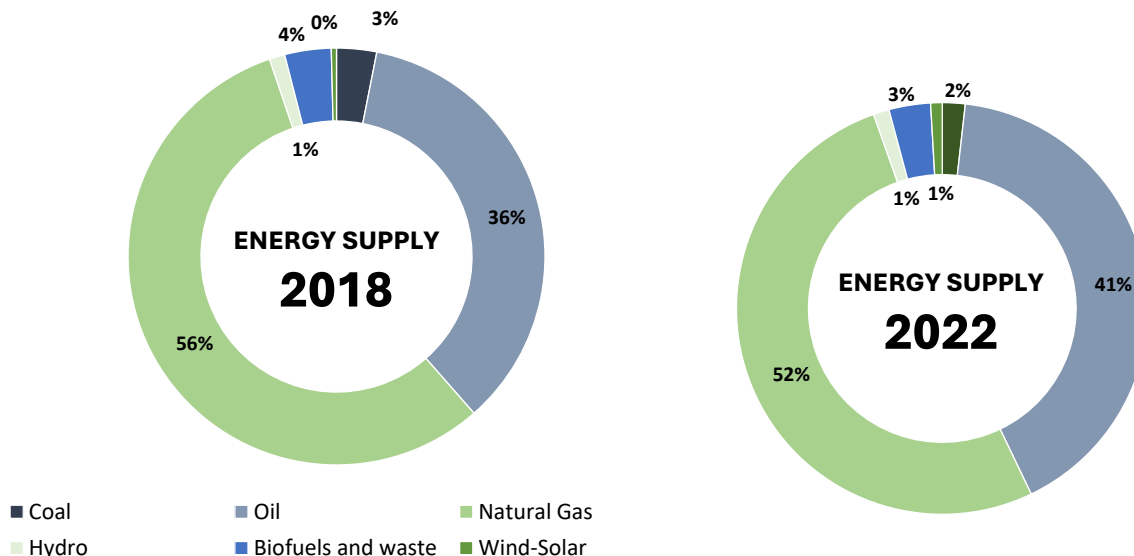
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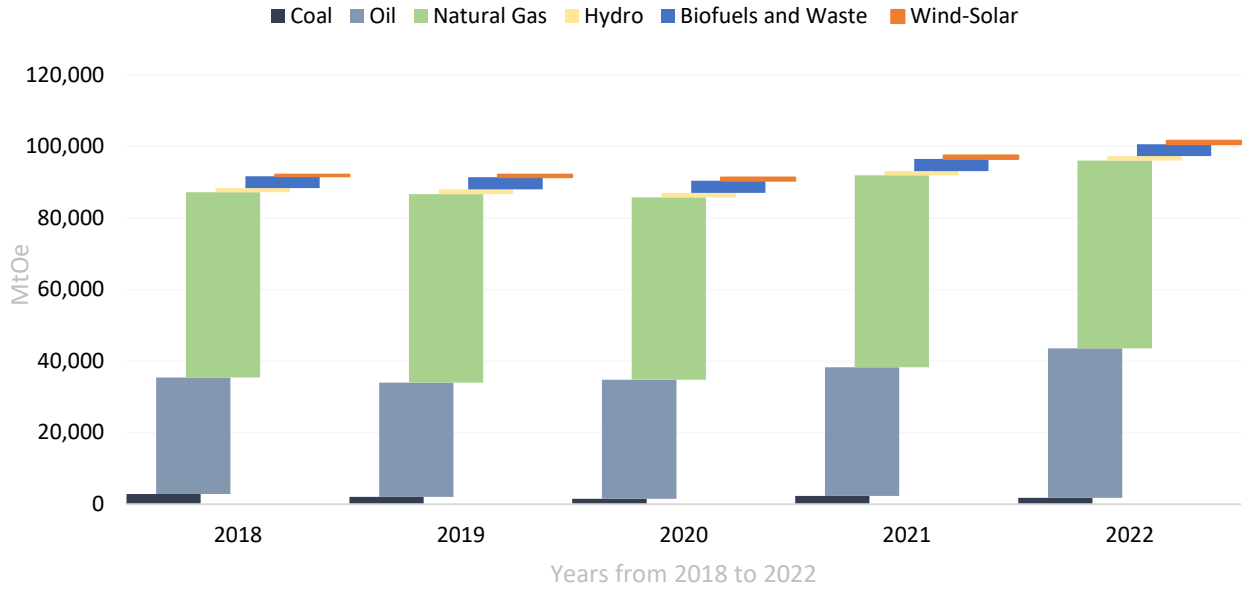
<sup>4</sup> All charts are constructed using only the relevant source categories (i.e. the source categories for which emissions were occurring).



|            |   |   |
|------------|---|---|
| 1.A.1.b    | Petroleum Refining                      | [Energy industries]                         |
| 1.A.1.c.i  | Manufacture of Solid Fuels              | [Energy industries]                         |
| 1.A.1.c.ii | Other Energy Industries                 | [Energy industries]                         |
| 1.A.2.m    | Non-specified Industry                  | [Manufacturing Industries and Construction] |
| 1.A.3.b    | Road Transportation                     | [Transport]                                 |
| 1.A.4.a    | Commercial/Institutional                | [Other Sectors]                             |
| 1.A.4.b    | Residential                             | [Other Sectors]                             |
| 1.A.4.c    | Agriculture/Forestry/Fishing/Fish Farms | [Other Sectors]                             |
| 1.B.2.a.i  | Oil Venting                             | [Fugitive emissions from fuels]             |
| 1.B.2.a.ii | Oil Flaring                             | [Fugitive emissions from fuels]             |
| 1.B.2.b.i  | NG Venting                              | [Fugitive emissions from fuels]             |
| 1.B.2.b.ii | NG Flaring                              | [Fugitive emissions from fuels]             |

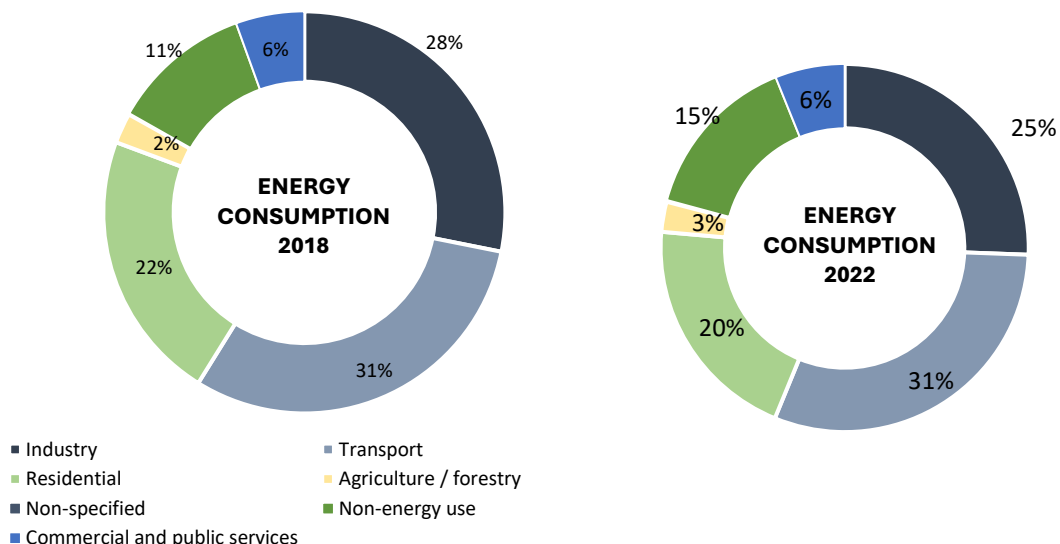
Egypt's total energy supply was about 101.5 MtOe in 2022 and 92.1 MtOe in 2018, with an annual average growth rate of about 2% during that period. The chart below shows the evolution of primary energy supply by fuel type from 2018 up to 2022. It is clear that NG has the highest fuel supply share in Egypt's primary energy over the years. NG and oil's shares of total Egypt' energy supply during the year 2022 accounted for about 92.8% collectively and 51.7% and 41.4% separately while coal accounted for 1.8 %.





**Figure 17: Evolution of Egypt's Primary Energy Supply (MtOe) 2018 – 2022**

Total final energy consumption of primary resources has witnessed a slight increase over the last five years from about 61.1 MtOe in the year 2018 to about 61.7 MtOe in 2022 with an average annual growth rate of only 0.2% during that period. This is compared with a growth rate of 2.9% between 2015 and 2017. The chart below shows the evolution of final energy consumption from 2018 to 2022 by sector. Both the industrial and residential sectors achieved negative growth rates of 1.7% (from about 17.2 to about 15.8 MTOE) and 1.3% (from about 13.3 to about 12.5 MTOE) respectively. On the other hand, although other sectors, mainly agriculture and commercial & public services, achieved positive growth rates, the growth was very small or moderate (1.9% and 2.3% respectively).

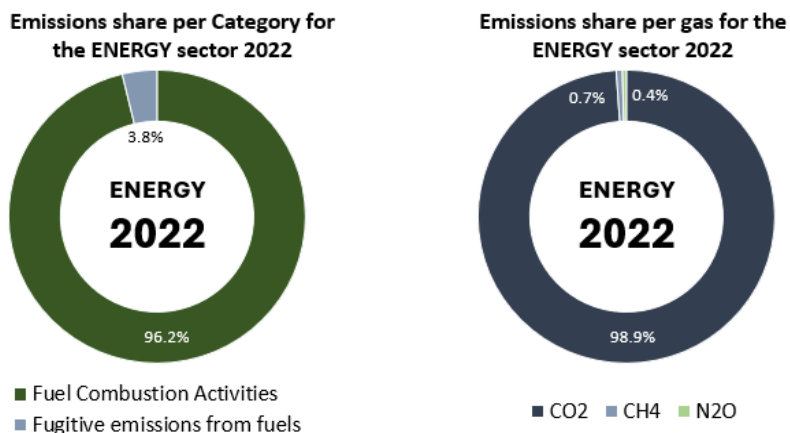


**Figure 18: Evolution of Egypt's Final Energy Supply (MtOe) 2018 - 2022**

## 2.4.2 Energy Sector Emissions Trend

### Sector Overall Emissions

In 2022, the Energy sector's emissions were **253,661 GgCO<sub>2</sub>e**, with CO<sub>2</sub> as the major contributor with a share of 98.9% compared to 0.66% for CH<sub>4</sub> and 0.43% for N<sub>2</sub>O. The breakdown of 2022 showed that fuel combustion accounted for 96.2% compared to 3.76% for oil and natural gas venting and flaring activities.



GHG trends over the period from 1990 up to 2022 have been generated using the IPCC software. The figure below presents the evolution of GHG emissions of the energy sector (Gg CO<sub>2</sub>eq). This encompasses the current GHG inventory (2018-2022); NC4 (2016 and 2017); and BUR1(1990-2015). The Energy sector's emissions increased from 81,611 Gg CO<sub>2</sub>e (in 1990) to 253,661Gg CO<sub>2</sub>e (in 2022). The average annual growth rate (AAGR) has been 2.2% between 1990 and 2000, and 5.5% over the period between 2000 and 2010. The rate of growth decreased to 2.8% from 2010 to 2015 mostly due to the disruption resulting from the Egyptian revolution in 2011. A sharp increase of 15% in the emissions is observed between 2014 and 2015 followed by a drop in the annual rate down to 2.5% followed by a decline in the total emissions from 235,540 GgCO<sub>2</sub>e in 2018 to 225,493 and 218,015 GgCO<sub>2</sub>e in 2019 and 2020, respectively with a negative growth rate of -1.5%. The energy sector total GHG emissions increased from 218,015 GgCO<sub>2</sub>e in 2020 to 253,661 GgCO<sub>2</sub>e in 2022 with an average annual growth rate of about 7.9% and an increase of 16.4% during that period. The high increase in the GHG emissions of the energy sector from the year 2020 to 2022 could be attributed to the diminishing of the corona pandemic and the recovery of the Egyptian economy to return back to its normal situation of growth.

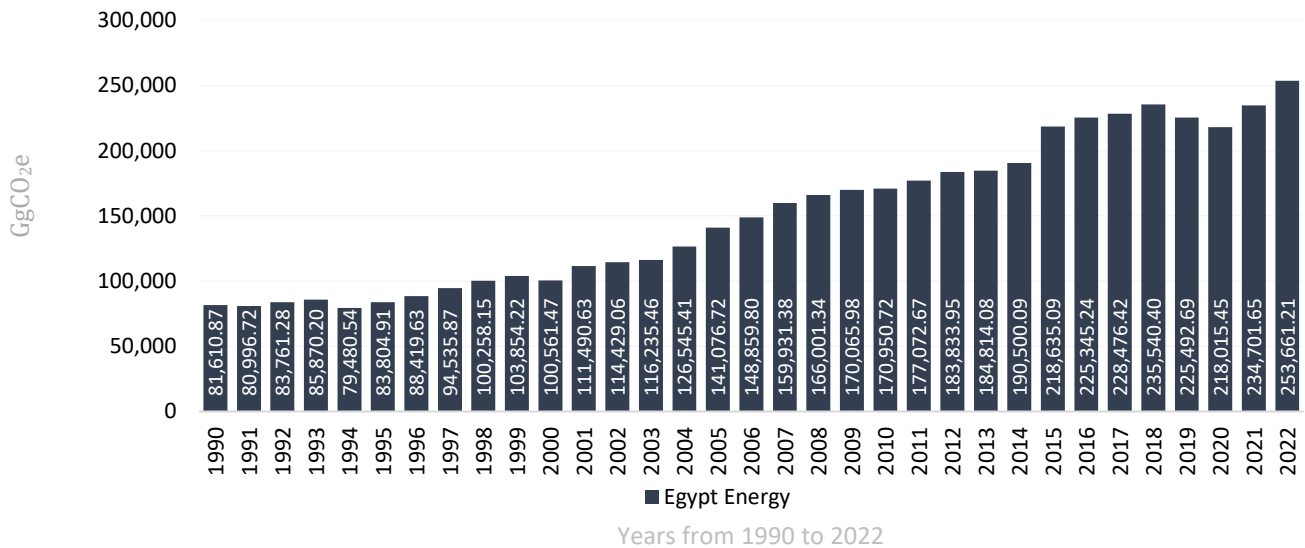
There are several reasons for the decline in the Energy sector's emissions including:

- The Egyptian power sector has largely shifted towards the use of Combined Cycle Gas Turbine (CCGT) stations rather than conventional steam stations with the operation of the three Siemens combined cycle mega power plants with a total

capacity of nearly 14.5 GW hence increasing the thermal efficiency for the power generation. Those 3 power plants among the most efficient ones worldwide.

- The shift in fuel mix away from more carbon-intensive fuels such as coal and oils, to less carbon-intensive fuels such as natural gas;
- There has been an increase in electricity generated from non-fossil fuel energy sources, due to increased use of wastes mainly RDF in the cement industries and renewable energy sources such as solar and wind
- Improvements in energy efficiency on national level as a result of implementing energy policy reforms.

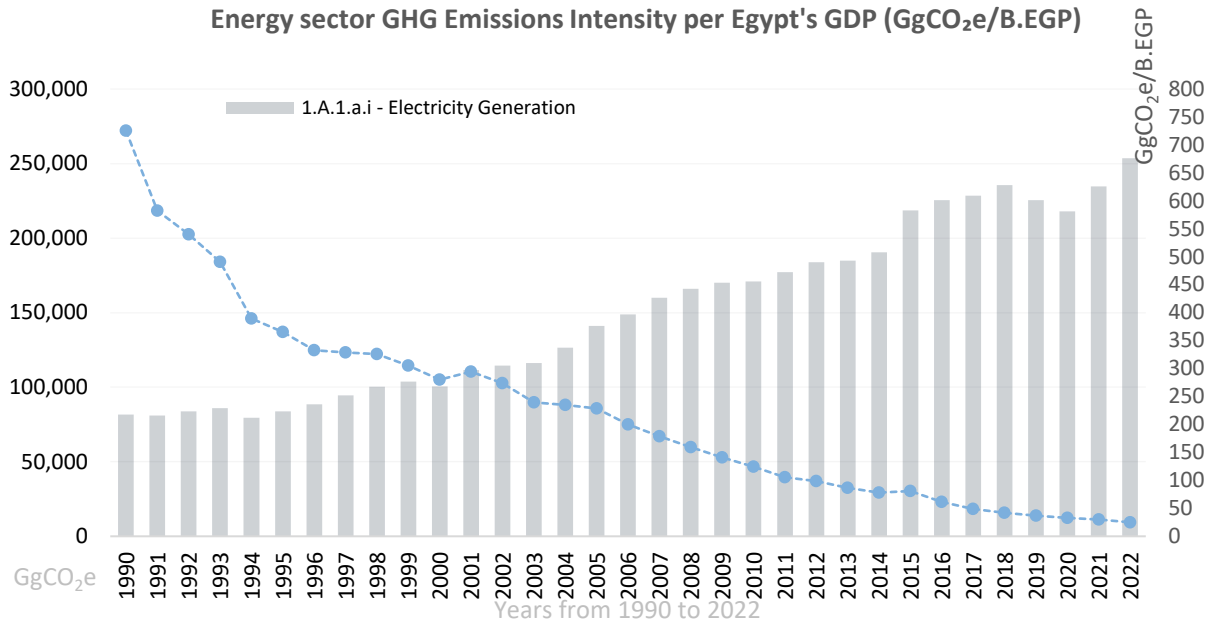
The spread of Corona disease and lockdown during the year 2020 could also have affected the rate of growth as it has negatively affected the economic growth in Egypt and consequently led to a decline in the energy consumption combined with an associated decrease in GHG emissions.



**Figure 19: Energy Sector Greenhouse Gas Emissions 1990 - 2022**

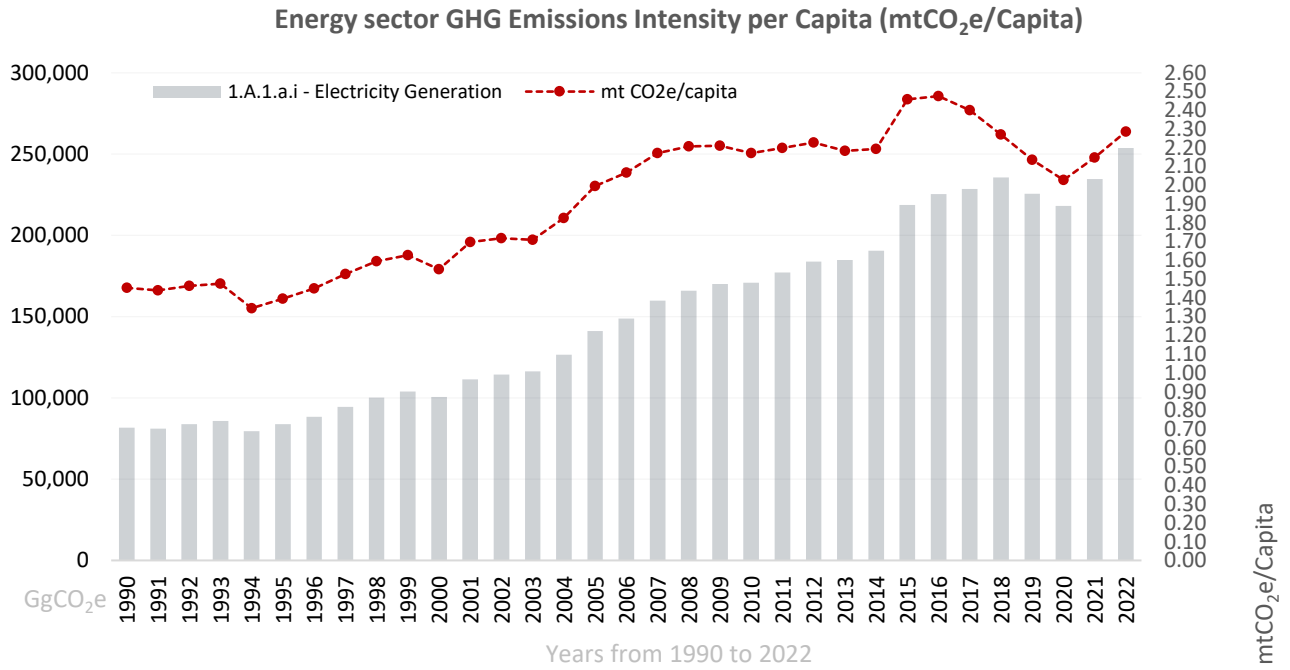
**Table 19: Energy Sector Greenhouse Gas Emissions 1990 - 2022**

| Sector | 1990   | 2000    | 2005    | 2015    | 2016    | 2017    | 2018    | 2019    | 2020    | 2021    | 2022    |
|--------|--------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Energy | 81,610 | 100,561 | 141,077 | 218,635 | 225,345 | 228,476 | 235,540 | 225,493 | 218,015 | 234,702 | 253,661 |



**Figure 20: Energy Sector Greenhouse Gas Emissions Intensity per Egypt's GDP (GgCO<sub>2</sub>e/B.EGP) 1990 - 2022**

The rate of change in the energy sector GHG emissions intensity per Egypt's GDP (Figure 20) confirms that decoupling between economic development is steadily taking place. Starting 2005 for example, the intensity dropped from 228 GgCO<sub>2</sub>e/B.GDP down to 25 GgCO<sub>2</sub>e/B.GDP in 2022 representing a 90% total reduction and an average annual rate of decrease around 5%. The intensity per capita shows that decoupling between population growth and emissions started around 2016 where the intensity (2.47mtCO<sub>2</sub>e/capita in 2016) dropped at a steady rate of around 5.5% until 2020 reaching a minimum for that period of 2mtCO<sub>2</sub>e/capita before starting to increase at a rate of 6% reaching 2.29 mtCO<sub>2</sub>e/capita in 2022. The average annual rate of growth between 2016 and 2022 remains however negative (- 1.1%). This highlights Egypt's commitment towards mitigation since its Paris Agreement ratification.



**Figure 21: Energy Sector Greenhouse Gas Emissions Intensity per Capita (mtCO<sub>2</sub>e/capita) 1990 - 2022**

## Sector Emissions by Gas

As shown in the figure below, the CO<sub>2</sub> remains the dominant gas for the energy sector over the time series, with close to 99% of the total emissions

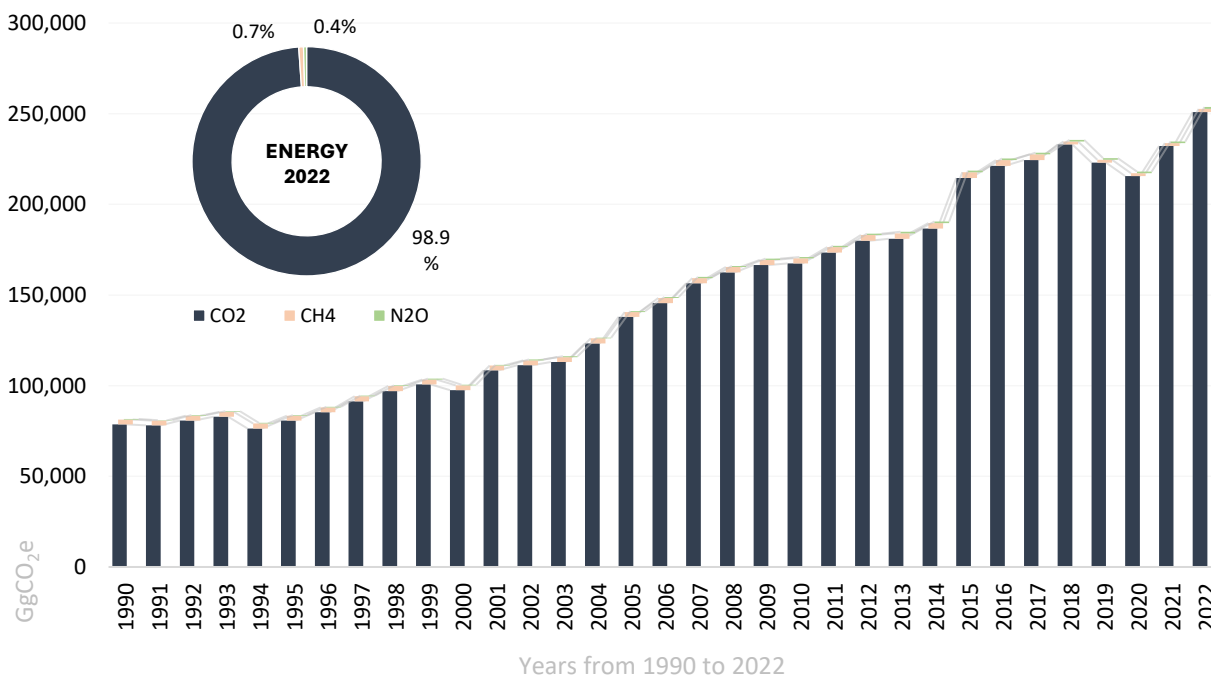


Figure 22: GHG Emissions from Energy Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)

Table 20: GHG Emissions from Energy Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)

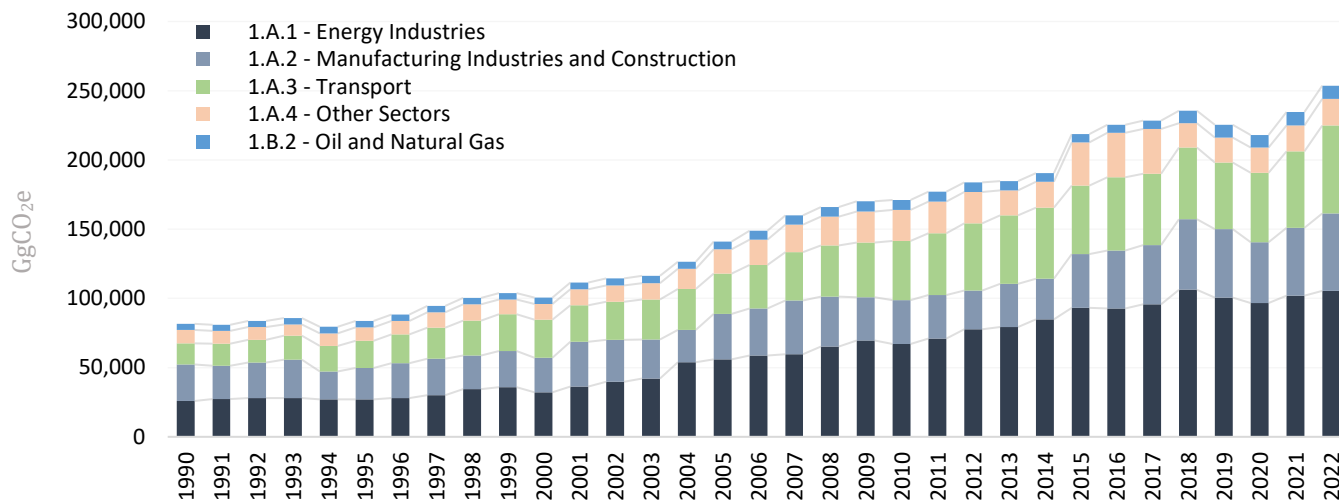
| Energy Emissions by Gas (GgCO <sub>2</sub> e) | 1990          | 2000           | 2005           | 2015           | 2016           | 2017           | 2018           | 2019           | 2020           | 2021           | 2022           |
|---|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| CO <sub>2</sub>                               | 78,675        | 97,463         | 137,896        | 214,585        | 221,257        | 224,466        | 232,991        | 223,062        | 215,569        | 232,112        | 250,879        |
| CH <sub>4</sub>                               | 2,619.83      | 2,663.24       | 2,687.69       | 3,197.28       | 3,171.60       | 3,127.94       | 1,641.48       | 1,588.87       | 1,610.88       | 1,665.14       | 1,691.52       |
| N <sub>2</sub> O                              | 315.80        | 434.83         | 492.92         | 852.98         | 916.58         | 882.13         | 907.98         | 842.24         | 835.26         | 924.25         | 1,090.64       |
| <b>Total (Gg CO<sub>2</sub>e)</b>             | <b>81,610</b> | <b>100,561</b> | <b>141,077</b> | <b>218,635</b> | <b>225,345</b> | <b>228,476</b> | <b>235,540</b> | <b>225,493</b> | <b>218,015</b> | <b>234,702</b> | <b>253,661</b> |

## Sector Emissions per Category

Between 1990 and 2022, GHG emissions from the energy sector experienced significant growth across all categories as part of the country's development journey. However, such growth rate significantly decreased in the previous period due to the country's mitigation efforts as explained above. The **Energy Industries** category remained the largest

contributor, with emissions rising of 105,371Gg CO<sub>2</sub>e in 2022, making it a key driver of the overall trend. Similarly, the **Transport** category saw a substantial increase with emissions of 63,518 Gg CO<sub>2</sub>e in 2022. Other categories also exhibited notable trends:

- The **Manufacturing** category recorded 55,955 Gg CO<sub>2</sub>e in 2022.
- Fugitive emissions from the **Oil and Gas** category reached 9,562 Gg CO<sub>2</sub>e in 2022.
- The **Other Sectors** category (which includes commercial, residential and agriculture) recorded 19,256 Gg CO<sub>2</sub>e in 2022.



**Figure 23: GHG Emissions from Energy Sector by main category over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 21: GHG Emissions from Energy Sector by main category over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

| Energy Emissions by Category (GgCO <sub>2</sub> e) | 1990          | 2000           | 2005           | 2015           | 2016           | 2017           | 2018           | 2019           | 2020           | 2021           | 2022           |
|--|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Energy Industries                                  | 25,897        | 32,172         | 56,039         | 93,274         | 92,677         | 95,631         | 106,235        | 100,562        | 96,652         | 102,055        | 105,371        |
| Manufacturing Ind.                                 | 26,246        | 24,914         | 32,742         | 38,775         | 41,811         | 42,782         | 50,895         | 49,532         | 43,983         | 48,946         | 55,955         |
| Transport  | 15,399        | 27,536         | 29,035         | 49,394         | 53,017         | 51,527         | 51,764         | 48,007         | 50,106         | 55,185         | 63,518         |
| Other Sectors                                      | 9,703         | 11,222         | 17,572         | 31,156         | 32,113         | 32,353         | 17,667         | 17,977         | 18,323         | 18,797         | 19,256         |
| Oil and NG Fugitive Emissions                      | 4,364         | 4,718          | 5,688          | 6,037          | 5,727          | 6,184          | 8,980          | 9,414          | 8,952          | 9,719          | 9,562          |
| <b>Total (Gg CO<sub>2</sub>e)</b>                  | <b>81,610</b> | <b>100,561</b> | <b>141,077</b> | <b>218,635</b> | <b>225,345</b> | <b>228,476</b> | <b>235,540</b> | <b>225,493</b> | <b>218,015</b> | <b>234,702</b> | <b>253,661</b> |

The electricity sector is considered as the main contributor of GHG emissions from the Energy sector in Egypt, which accounted for 36% of the total emissions in 2022, followed by the Transport sector (25%), then Industry (22%), 5.5% for Petroleum Refining (including the energy own use of other oil companies), Residential & Commercial (7.18%), Agriculture (0.4%), and Oil and Natural Gas Venting and Flaring accounting the remainder 3.77%. The corresponding share in emissions for 2018 were as follows: 40% for electricity, 22% for

Transport, 21.6% for Industry, 5% for Petroleum Refining and 7.6% for the Residential & Commercial sector, 0.35% for Agriculture, and 3.8% for Oil and Natural Gas Venting and Flaring.

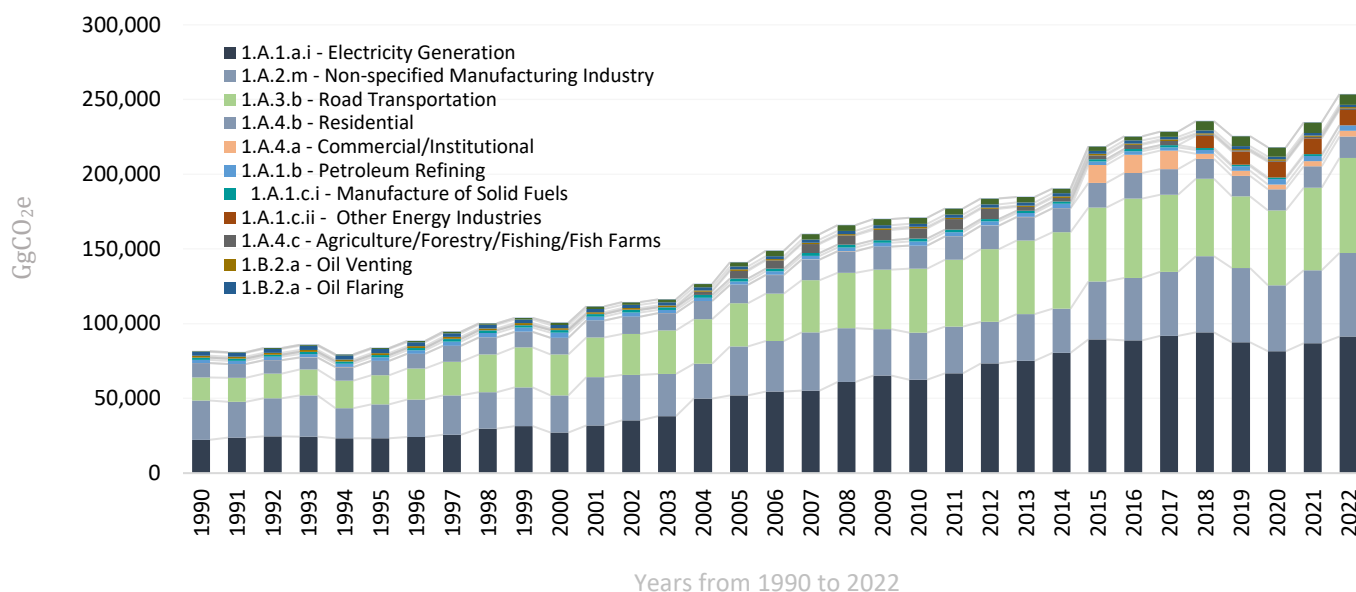


Figure 24: GHG Emissions from Energy Sector by source category over the period 1990 - 2022 (GgCO<sub>2</sub>e)

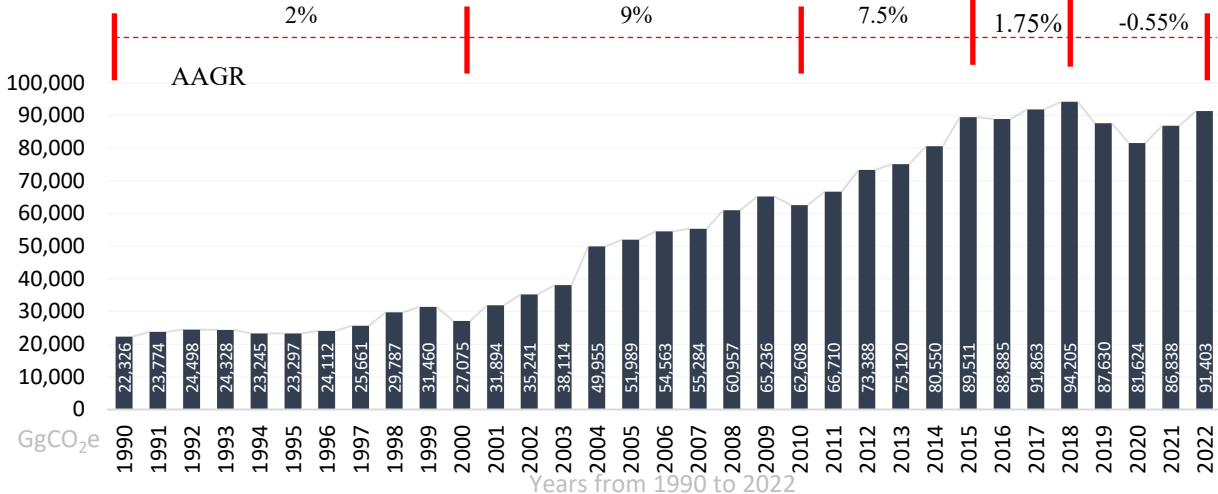
Table 22: GHG Emissions from Energy Sector by source category over the period 1990 - 2022 (GgCO<sub>2</sub>e)

| Energy Emissions by Category (GgCO <sub>2</sub> e) | 1990          | 2000           | 2005           | 2015           | 2016           | 2017           | 2018           | 2019           | 2020           | 2021           | 2022           |
|--|---------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|----------------|
| Electricity Generation                             | 22,326        | 27,075         | 51,989         | 89,511         | 88,885         | 91,863         | 94,205         | 87,630         | 81,624         | 86,838         | 91,403         |
| Manufacturing Ind.                                 | 26,246        | 24,914         | 32,742         | 38,775         | 41,811         | 42,782         | 50,895         | 49,532         | 43,983         | 48,946         | 55,955         |
| Transport  | 15,399        | 27,536         | 29,035         | 49,394         | 53,017         | 51,527         | 51,764         | 48,007         | 50,106         | 55,185         | 63,518         |
| Residential  | 9,685         | 10,941         | 12,215         | 16,465         | 17,059         | 17,233         | 13,280         | 13,717         | 14,199         | 14,269         | 14,382         |
| Commercial   | 18            | 59             | 63             | 12,019         | 12,315         | 12,386         | 3,552          | 3,381          | 3,283          | 3,566          | 3,845          |
| Petroleum Refining                                 | 2,174         | 3,392          | 2,277          | 2,293          | 2,297          | 2,268          | 2,627          | 3,111          | 3,589          | 3,458          | 3,644          |
| Manuf. of Solid Fuels                              | 1,397         | 1,705          | 1,773          | 1,470          | 1,495          | 1,500          | 1,105          | 1,108          | 1,111          | 1,111          | 0              |
| Other Energy Industries                            | 0             | 0              | 0              | 0              | 0              | 0              | 8,298          | 8,714          | 10,329         | 10,648         | 10,323         |
| Agriculture  | 0             | 222            | 5,294          | 2,672          | 2,739          | 2,735          | 835            | 879            | 841            | 962            | 1,029          |
| Oil venting  | 1,252         | 1,087          | 938            | 1,014          | 965            | 921            | 915            | 882            | 895            | 886            | 785            |
| Oil Flaring  | 2,578         | 2,238          | 1,931          | 2,087          | 1,987          | 1,897          | 1,871          | 1,803          | 1,829          | 1,812          | 1,606          |
| NG Venting   | 524           | 1,364          | 2,761          | 2,875          | 2,717          | 3,295          | 6,112          | 6,641          | 6,147          | 6,929          | 7,078          |
| NG Flaring   | 10            | 29             | 59             | 61             | 58             | 70             | 81             | 88             | 81             | 91             | 93             |
| <b>Total (Gg CO<sub>2</sub>e)</b>                  | <b>81,610</b> | <b>100,561</b> | <b>141,077</b> | <b>218,635</b> | <b>225,345</b> | <b>228,476</b> | <b>235,540</b> | <b>225,493</b> | <b>218,015</b> | <b>234,702</b> | <b>253,661</b> |

### 1.A.1. Energy Industries Trend (1990-2022)

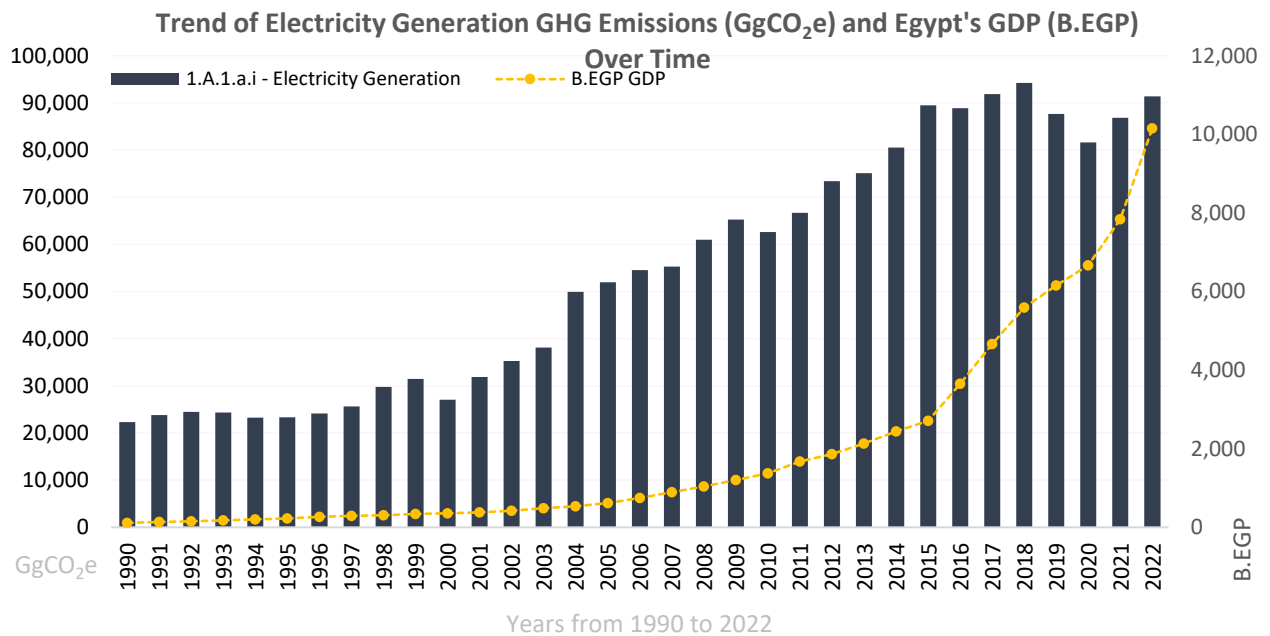
As shown in the figure below, the electricity generation’s emissions increased from 22,326 Gg CO<sub>2e</sub> (in 1990) to 91,403 Gg CO<sub>2e</sub> (in 2022). The AAGR has been 2% over the period between 1990 and 2000, increasing to 9% over the period from 2000 to 2010 (with a jump of 31% between 2003 and 2004). The rate of growth between 2010 and 2015 has slightly decreased to 7.5% most probably due to the disruption resulting from the Egyptian revolution in 2011. A significant drop in the annual growth rate is noticed between 2015 and 2018 in which it has been around 1.75% mostly associated with the initiation of the national GHG mitigation commitments, national energy policy reform and improved energy efficiency nationwide. The emissions reached a peak in 2018 (94,205 GgCO<sub>2e</sub>) before starting to decrease at a rate of 7% to 87,630 and 81,624 GgCO<sub>2e</sub> in 2019 and 2020. This could be a result of the energy policy reform coupled with the operation of three new mega combined cycle power plants which increased the thermal efficiency for the power generation. This is confirmed by the fact that between 2018 and 2022, electricity generation increased by 8.2%, while power stations' total fuel consumption decreased by 3.7%. This confirms the improvements in Specific Fuel Consumption (SFC) coupled with an increased share of renewable energy (wind and PV). This highlights the country’s commitments to GHG mitigation after Paris Agreement.

The spread of Corona disease during those years (2019 and 2020) could also have affected the rate of growth. In general, the 2022 emissions remain lower than 2018’s emissions by 3%.

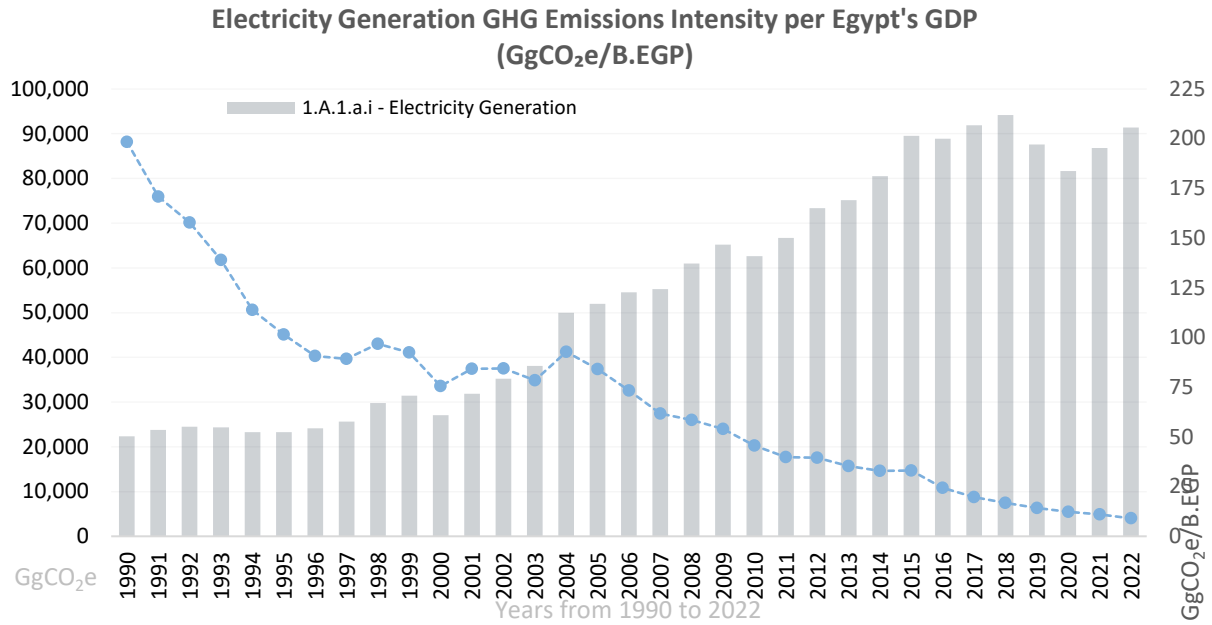


**Figure 25: GHG Emissions from Electricity Generation over the period 1990 - 2022 (GgCO<sub>2e</sub>)**

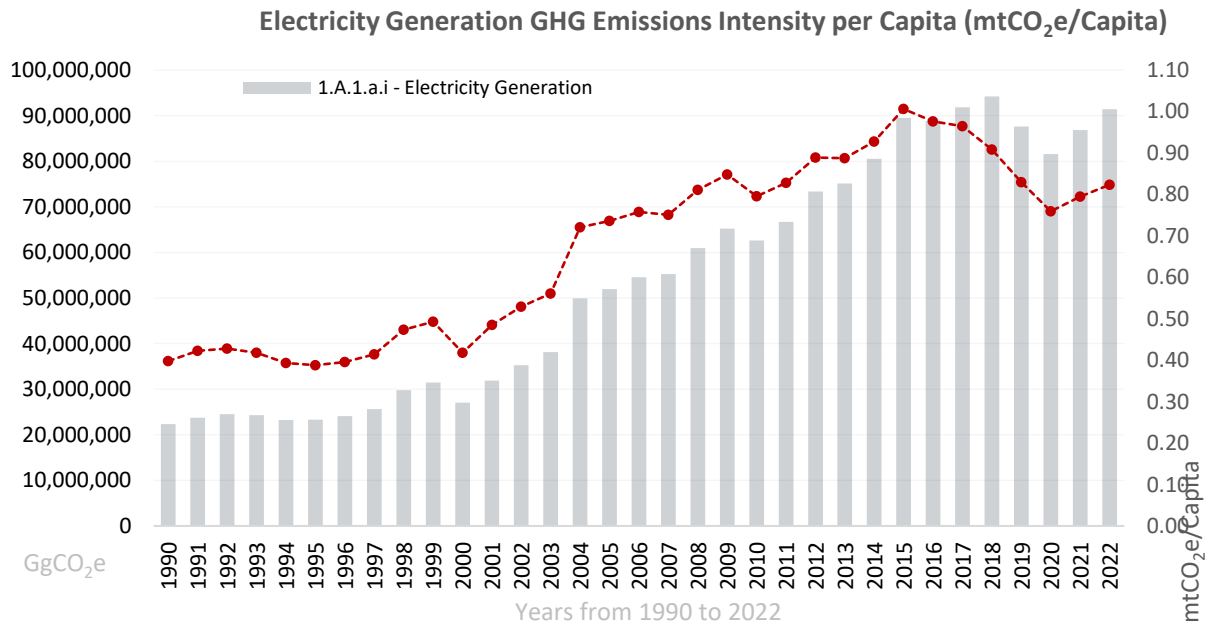
The rate of change in the electricity sector GHG emissions intensity per Egypt's GDP confirms that decoupling between economic development and electricity generation emissions has started around 2004/2005 where the intensity dropped from 92 GgCO<sub>2</sub>e/B.GDP down to 9 GgCO<sub>2</sub>e/B.GDP in 2022 representing a 90% total reduction and an average annual rate of decrease around 5%. The intensity per capita shows that decoupling between population growth and emissions started around 2015/2016 where the intensity (1mtCO<sub>2</sub>e/capita in 2015) dropped at a steady rate until 2020 reaching a minimum for that period of 0.76mtCO<sub>2</sub>e/capita before starting to increase reaching 0.82mtCO<sub>2</sub>e/capita in 2022. The average annual rate of growth for the intensity per capita between 2015 and 2022 remains however negative (- 2.7%) with the 2022 intensity lower than the 2015 intensity by 18%.



**Figure 26: GHG Emissions from Electricity Generation category over the period 1990 - 2022 (GDP B.EGP)**

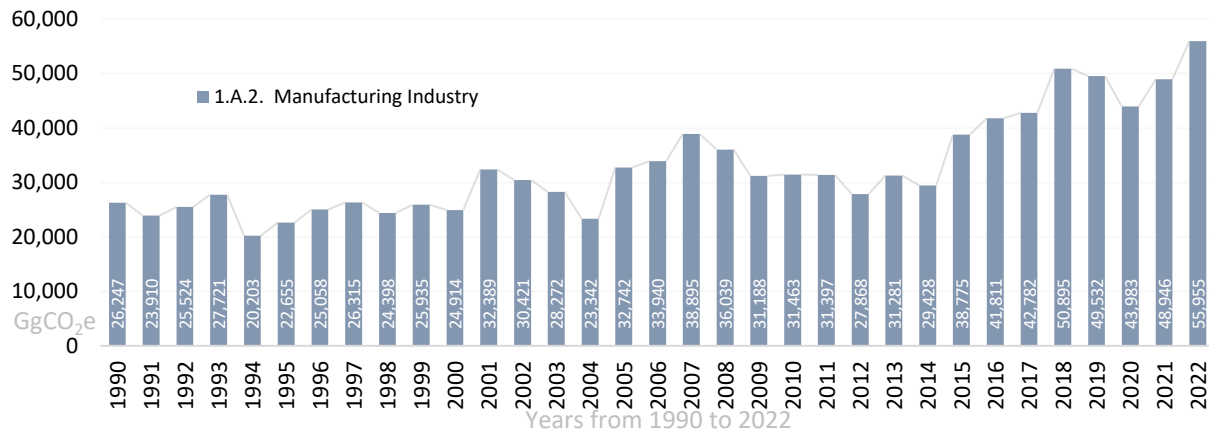


**Figure 27: GHG Emissions from Electricity Generation category over the period 1990 - 2022 (GgCO<sub>2</sub>e/GDP)**



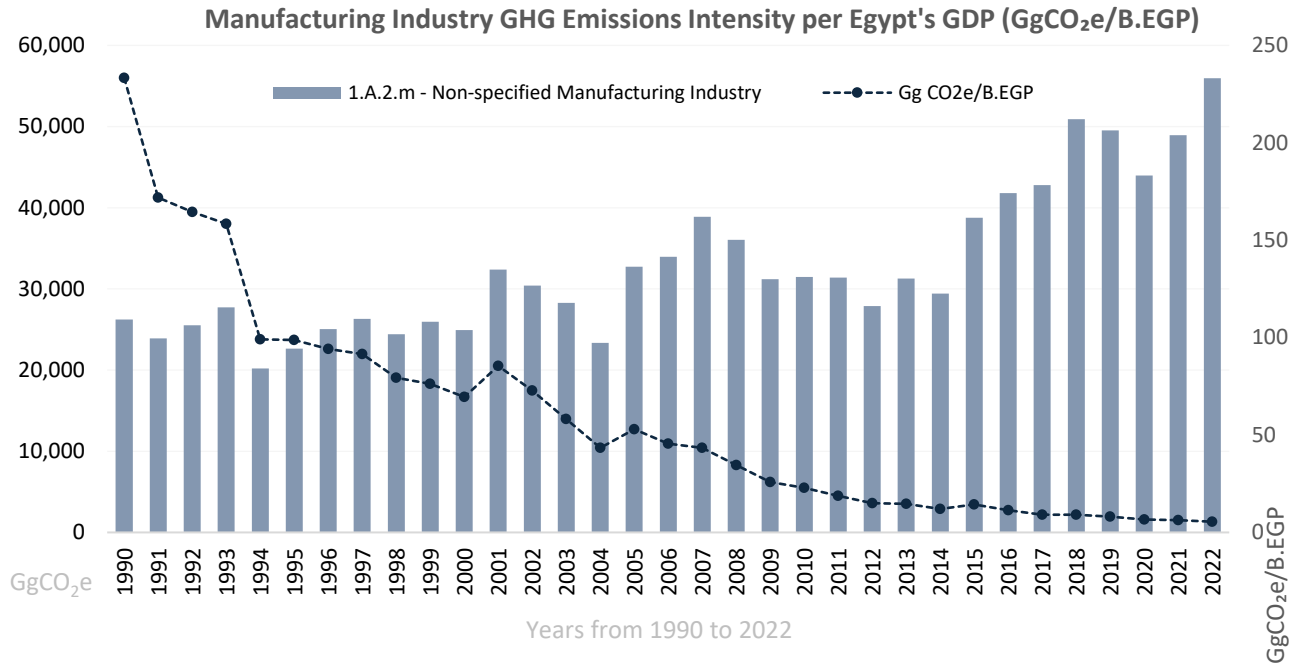
**Figure 28: GHG Emissions from Electricity Generation category over the period 1990 - 2022 (GgCO<sub>2</sub>e/capita)**

## 1.A.2. Manufacturing Industry Trend (1990-2022)



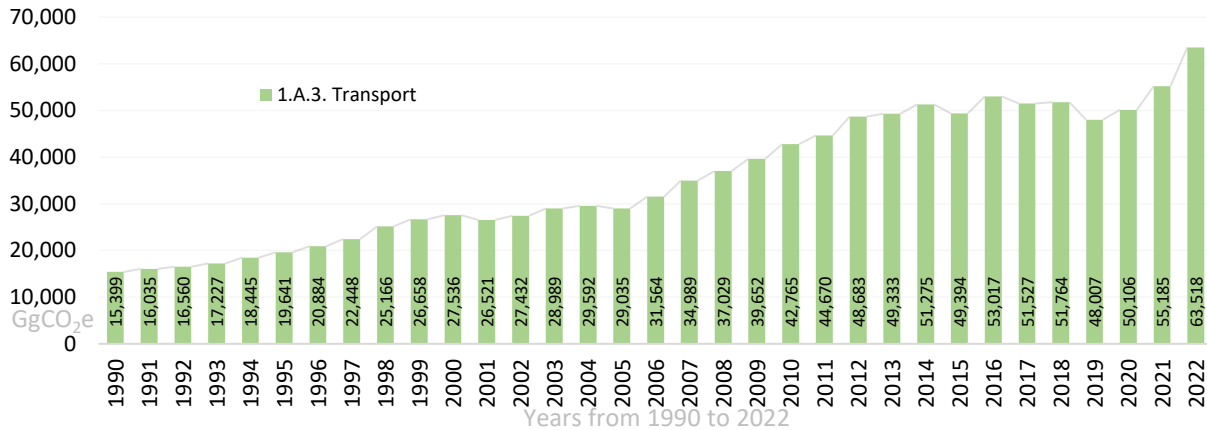
**Figure 29: GHG Emissions from Manufacturing Industry 1990 - 2022**

As shown in the figure above, the manufacturing industry's emissions increased from 26,247Gg CO<sub>2</sub>e (in 1990) to 55,955 Gg CO<sub>2</sub>e (in 2022). The emissions fluctuated but remained almost constant between 1990 and 2000. The AAGR between 2000 and 2010 has been around 3.8% and -1.3% between 2010 and 2014 resulting from the economic disruption caused by the 2011 revolution. Following a sharp increase of 32% between 2014 and 2015, the rate of growth in the emissions between 2015 and 2022 has been around 6% as a result of the industrial sector development in the Country. A growth rate of 9.7% can be seen between 2015 and 2018 before dropping in 2019 and 2020 mostly due to COVID-19 then increasing once again until reaching 55,955 Gg CO<sub>2</sub>e (in 2022). The industrial sector energy emissions intensity (per GDP) is shown below. The intensity per GDP has been decreasing at a rate of 15% between 2005 and 2010, and 11% from 2010 to 2022.



**Figure 30: GHG Emissions from Manufacturing Industry 1990 – 2022 per GDP (GgCO<sub>2</sub>e/B.EGP)**

### 1.A.3. –Transport Emissions Trend (1990-2022)

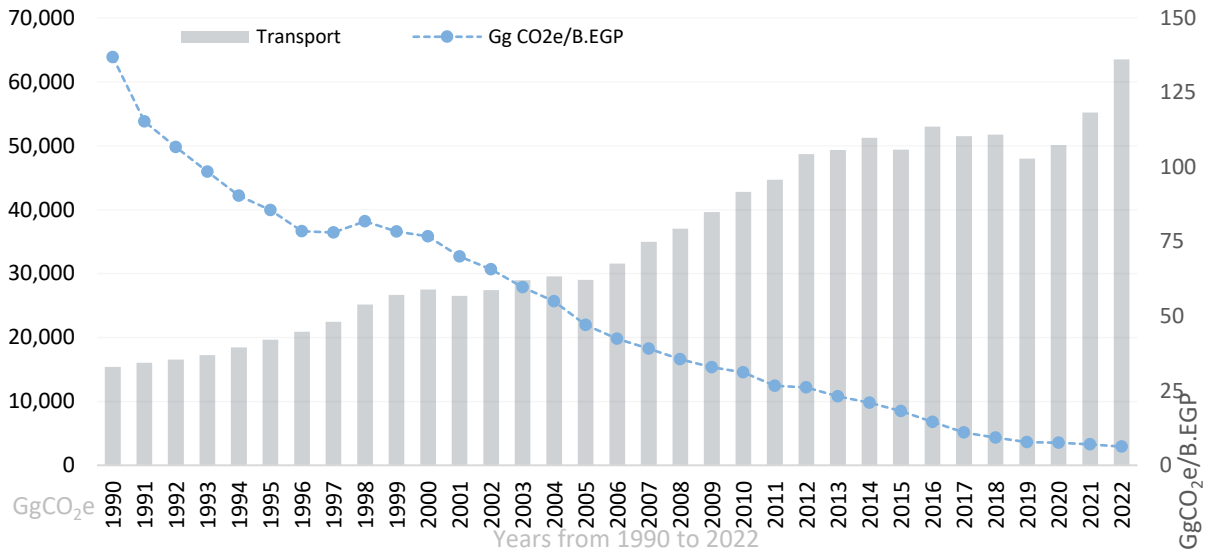


**Figure 31: GHG Emissions from Transport 1990 – 2022**

As shown in the figure above, the transport’s emissions increased from 15,399Gg CO<sub>2</sub>e (in 1990) to 63,518Gg CO<sub>2</sub>e (in 2022). The AAGR has been 6% over the period between 1990 and 2000, decreasing to 4.5% over the period from 2000 to 2010 and slightly decreased to 3% between 2010 and 2015 and 1.6% between 2015 and 2018 before increasing again to 5.6% between 2018 and 2022. A change in the emissions of -4% can be seen between 2014 and 2015 and -7% between 2018 and 2019. The latter decrease is most probably a result of the lockdown during the spread of Corona disease during 2020.

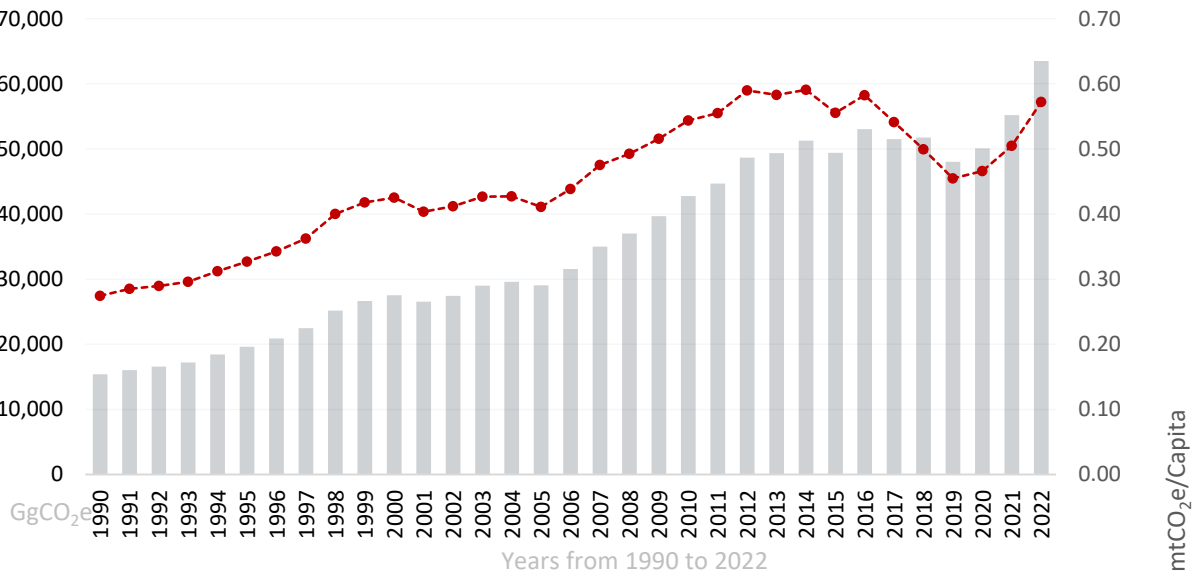
The transport sector’s emissions intensity per GDP has been decreasing since 2000 at a constant rate of around 10% per year. For the transport sector’s emissions intensity per capita, an annual drop of 7% between 2016 and 2019 can be seen before the intensity started to increase at a rate of 7.5% between 2019 and 2022.

**Transport sector GHG Emissions Intensity per Egypt's GDP (GgCO<sub>2</sub>e/B.EGP)**



**Figure 32: GHG Emissions from Transport 1990 – 2022 per GDP (GgCO<sub>2</sub>e/B.EGP)**

**Transport sector GHG Emissions Intensity per Capita (mtCO<sub>2</sub>e/Capita)**



**Figure 33: GHG Emissions from Transport 1990 – 2022 per Capita**

### **2.4.3 Methodology (Methods, Activity Data, Emission Factors)**

The IPCC 2006 Guidelines were adopted for estimating and reporting GHG emissions for the Energy sector. The Energy sector assessment applied Tier 1 methods from the IPCC 2006 Guidelines, while country-specific emission factors (Tier 2) were used for some categories as detailed below.

#### **Methods:**

- **Category Identification:** A review of the IPCC 2006 guidelines was conducted for all subcategories of the Energy sector and the GHG inventory of all previous years.
- The data needs were identified along with their sources for the estimation process.
- **Data Collection and Stakeholder Engagement:** Data collection questionnaires were prepared for all relevant sub-sectors and disseminated to all relevant stakeholders/entities. Activity data for the Energy sector was collected from national sources (mainly MoPMR and CAPMAS) and international sources, specifically IEA.
- **Calculation and Data Compilation.** Default IPCC emission factors and Good Practice Guidance were used in inventory estimations. Country-specific factors were used when available. The calculations were conducted on the latest version of the IPCC software (Version 2.93). CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O have been considered. Emissions resulting from the use of coal as a fuel in the cement industry since 2014 were included.

#### **Activity Data:**

- Domestic civil aviation and water-borne navigation were not considered in the GHG inventory emissions estimates due to data unavailability. On the other hand, emissions from both the international aviation and international water-borne navigation (international bunkers) were estimated and reported separately as a memo item.
- Aggregated fuel consumption data was mostly utilized for all sectors due to the unavailability of detailed or disaggregated data. Whenever available, disaggregated data were used (i.e. Industrial Sector in 2022).
- CO<sub>2</sub> Transport and Storage activities haven't been considered as they aren't applicable and didn't exist in Egypt during the reported period.

#### **Emission Factors:**

Egypt developed country-specific fuel emission factors and net heating values for some fuels. The table below shows both the default and country-specific emission factors and net heating values for the various fuels and their sources.

**Table 23: Default and Country-specific Emission Factors and Net Heating Values for Fuels and their Sources**

| Fuel Type                   | NHV (TJ/Gg)         | EF (tCO <sub>2</sub> /TJ) |
|-----------------------------|---------------------|---------------------------|
| Gas/Diesel Oil*             | 43.20               | 73.390                    |
| Residual Fuel Oil*          | 41.23               | 75.860                    |
| Special LFO**               | 315.03              | 434.83                    |
| Special LFO**               | 45.65               | IPCC Default Values       |
| Kerosene**                  | 46.27               | IPCC Default Values       |
| Jet Gasoline**              | 46.28               | IPCC Default Values       |
| Gasoline**                  | 46.99               | IPCC Default Values       |
| Liquefied Petroleum Gases** | 49.14               | IPCC Default Values       |
| Natural Gas*                | 48.9                | 55.697                    |
| Bituminous coal*            | 26.99               | 96.170                    |
| Petroleum coke*             | 34.11               | 94.270                    |
| Other Fuels                 | IPCC Default Values |                           |

\*Development of National Country Specific Emission Factors for Energy Sector, Egypt, Integral 2018

\*\* Ministry of Petroleum & Mineral Resources (MoPMR), Egypt

| Category  | Data sources           | Tier used | EF          |
|---|------------------------|-----------|-------------|
| <b>1.A - Fuel Combustion Activities</b>           |                        |           |             |
| 1.A.1 – Energy Industries                         | MOPMR & IEA            | T1,T2     | D/CS        |
| 1.A.2 – Manufacturing Industries and Construction | MOPMR & IEA            | T1,T2     | D/CS        |
| 1.A.3 - Transport                                 | MOPMR & IEA            | T1,T2     | D/CS        |
| 1.A.4 - Other Sectors                             | MOPMR & IEA            | T1,T2     | D/CS        |
| 1.A.5 – non-specified                             | MOPMR & IEA            | T1,T2     | D/CS        |
| <b>1.B – Fugitive Emissions from Fuels</b>        |                        |           |             |
| 1.B.1 – Solid Fuels                               | MOPMR, CAPMAS & IEA    | T1        | D/CS        |
| 1.B.2 – Oil and Natural Gas                       | MOPMR & IEA            | T1        | D/CS        |
| 1.B.3 – Other Emissions from energy production    | <b>MOPMR &amp; IEA</b> | <b>T1</b> | <b>D/CS</b> |

T1: IPCC Tier 1, T2: IPCC Tier 2.

#### **2.4.4 Recalculations**

The inventory for the years 1990 to 2015 have been already recalculated during the preparation of Egypt's NC4, which highly improved the accuracy compared to previous emissions inventories. The current inventory adopted the same methodology including the same EFs and Tiers previously used for the NC4. The only recalculation to be reported for the Energy sector inventory is the use of AR5 global warming potentials (GWP) replacing the previously used (BUR1 and NC4) AR2 GWPs.

## 2.5 Industrial Processes and Product Use (IPPU)

### 2.5.1 Overview of the Sector

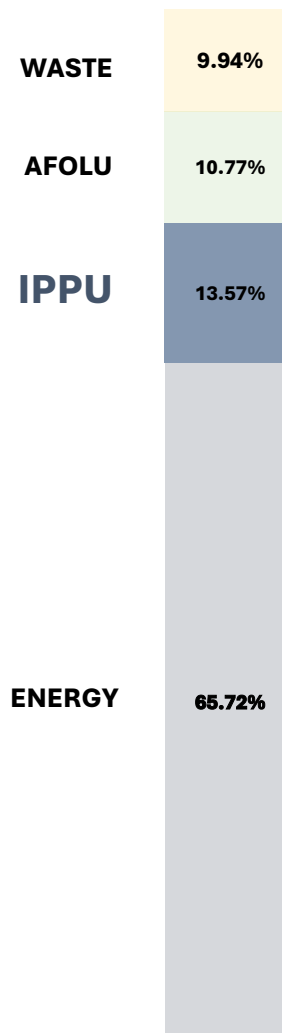
The main sources of GHG emissions in Egypt's Industrial Processes and Product Use (IPPU) sector include the mineral, chemical, and metal industries. The Mineral Industry, particularly the cement sector, contributes significantly to emissions through the calcination process, where limestone is heated to produce clinker, releasing carbon dioxide (CO<sub>2</sub>) as a byproduct. The Chemical Industry also plays a major role, with emissions primarily from the production of fertilizers and petrochemicals. These processes often involve the release of nitrous oxide (N<sub>2</sub>O) and other GHGs during chemical reactions and the use of raw materials.

Additionally, the Metal Industry, despite facing challenges, remains a notable source of emissions, especially from the iron, steel, and aluminum sectors. The production of these metals involves high-temperature processes that release CO<sub>2</sub>, and perfluorocarbons (PFCs) specifically for Aluminum. Emissions from Ozone Depleting Substances (ODS) Substitutes have also increased significantly due to the phasing out of ODS, leading to a rise in the use of hydrofluorocarbons (HFCs) as replacements. These sources collectively reflect the trends in Egypt's industrial sector and its impact on GHG emissions, highlighting the need for targeted mitigation strategies to address emissions from these key sectors.

The IPPU sector produced **52,376 GgCO<sub>2</sub>e** which accounts for 13.57% of the total national inventory in 2022. The main emissions contributors to the IPPU sector are the Mineral Industry at 50% followed by the Metal Industry at 18.9% and the Chemical Industry and Product Uses as Substitutes for Ozone Depleting Substances at 15.2% and 14.6%, respectively.

- **2.A Mineral Industry:**

The Mineral Industry encompasses activities such as cement production, lime production, glass manufacturing, and other uses of carbonates. Cement production is the primary source of emissions within this sector, as it involves the chemical transformation of limestone into clinker, which generates substantial CO<sub>2</sub> emissions. Lime production, though smaller in comparison, also contributes to emissions through a similar chemical process. Glass production emits CO<sub>2</sub> primarily due to calcination of raw



materials during their melting process. Other process uses of carbonates, such as in ceramics, generate additional emissions, though to a lesser extent.

- **2.B Chemical Industry:**

The Chemical Industry includes activities such as ammonia production, petrochemical manufacturing (e.g., methanol and ethylene), and other chemical processes. Ammonia production is the largest contributor to emissions in this sector, where CO<sub>2</sub> is released as a byproduct of chemical reaction. Petrochemical production, particularly for chemicals like methanol and ethylene, also generates significant emissions, as these processes require high temperatures and result in carbon releases. Smaller contributions come from nitric acid production and other chemical processes, although they represent a smaller share of the sector's emissions.

- **2.C Metal Industry:**

The Metal Industry includes the production of iron and steel, ferroalloys, lead, and zinc. Iron and steel production is the largest source of emissions within this sector. The production of these metals involves high-temperature processes that release CO<sub>2</sub> as part of the chemical reactions involved in metal extraction and refining. Ferroalloys, lead, and zinc production contribute to emissions as well, but to a smaller extent compared to iron and steel.

- **2.D Non-Energy Products from Fuels and Solvent Use:**

This sector includes emissions from the use of lubricants, paraffin wax, and other products derived from fuels and solvents. Lubricants are the largest source of emissions, as they break down during their use in vehicles and machinery, releasing CO<sub>2</sub>. Paraffin wax, which is used in products such as candles, cosmetics, and coatings, also generates emissions, though to a lesser extent.

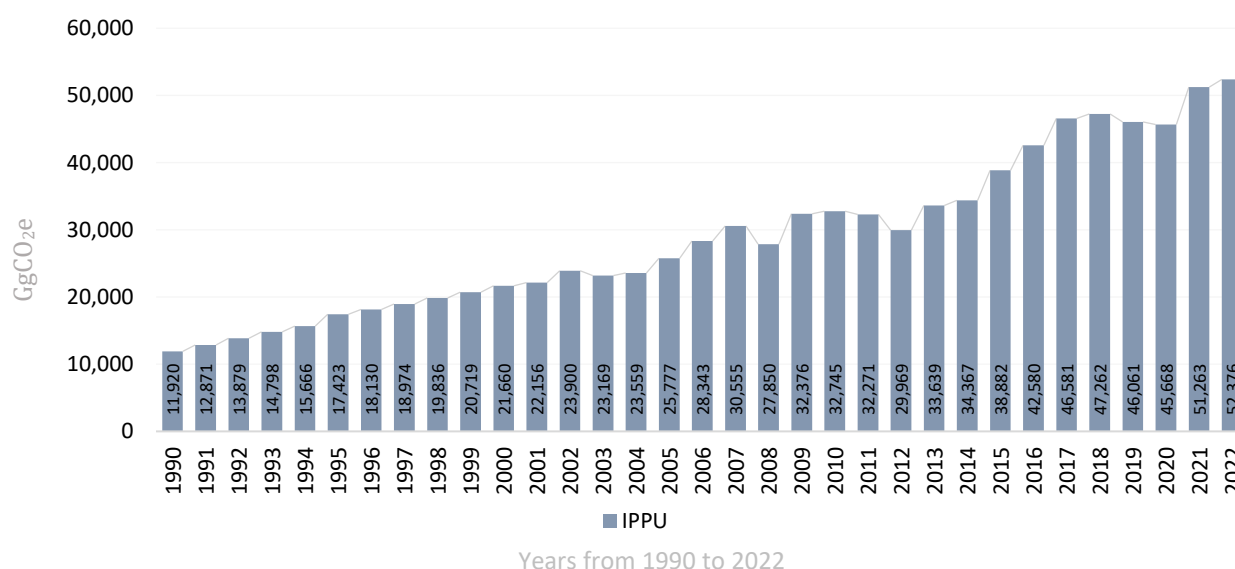
- **2.F Product Uses as Substitutes for Ozone-Depleting Substances:**

This sector involves emissions from the use of substitutes for ozone-depleting substances, such as refrigeration and air conditioning, foam-blowing agents, and fire protection. The largest source of emissions comes from refrigeration and air conditioning, where the use of hydrofluorocarbons (HFCs) as refrigerants results in the release of potent greenhouse gases. Foam-blowing agents and fire protection systems also use HFCs, contributing to smaller amounts of emissions.

## 2.5.2 IPPU Sector Emissions Trends

### Sector Overall Emissions

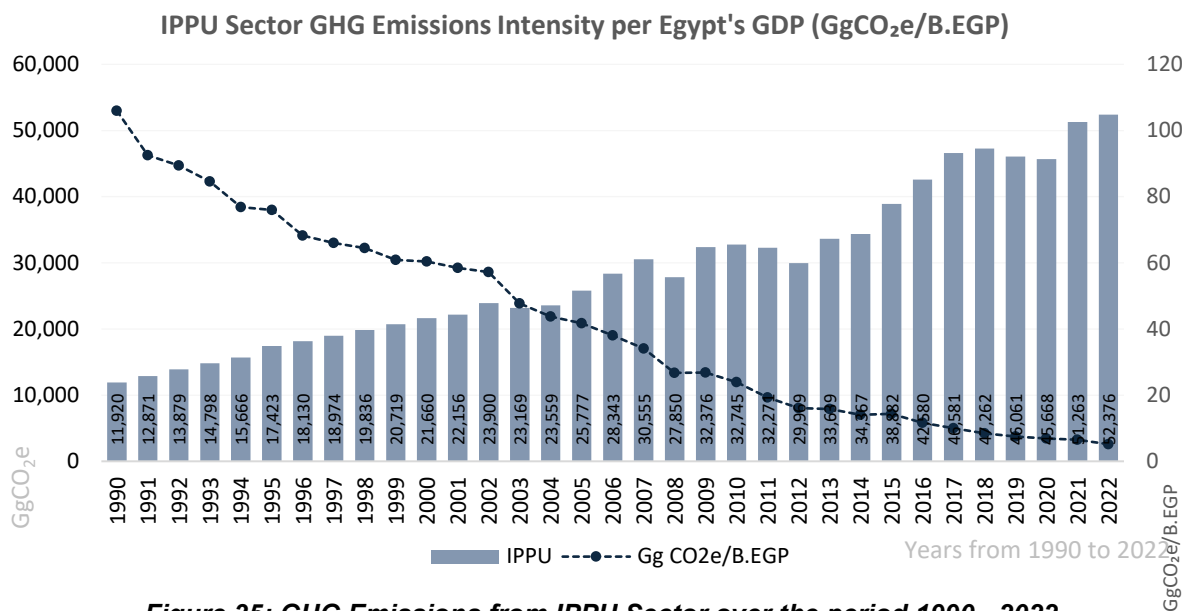
The data reveals a steady increase in emissions from the IPPU sector between 1990 and 2022. Starting at 11,920 Gg CO<sub>2</sub>e in 1990, emissions rose consistently through the 1990s and early 2000s, reaching a 52,376 GgCO<sub>2</sub>e in 2022; with an average annual growth rate of 4.9%. As shown in the figures below, the AAGR has been 6.1% between 1990 and 2000 and 4.5% between 2000 and 2010. The growth rate decreased to 1.45% between 2010 and 2014 resulting from the economic disruption caused by the 2011 revolution before the emissions increasing again at a rate of 10% between 2015 and 2018 and 4% as an average value between 2015 and 2022. The IPPU sector's emissions intensity (per GDP) is shown below. The intensity per GDP decreased by 95% from 1990 to 2022. The decrease rate has differed over the years depending on the economic conditions of the country with a maximum rate of decrease of 16% shown between the years 2015 and 2019.



**Figure 34: GHG Emissions from IPPU Sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 24: GHG Emissions from IPPU Sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

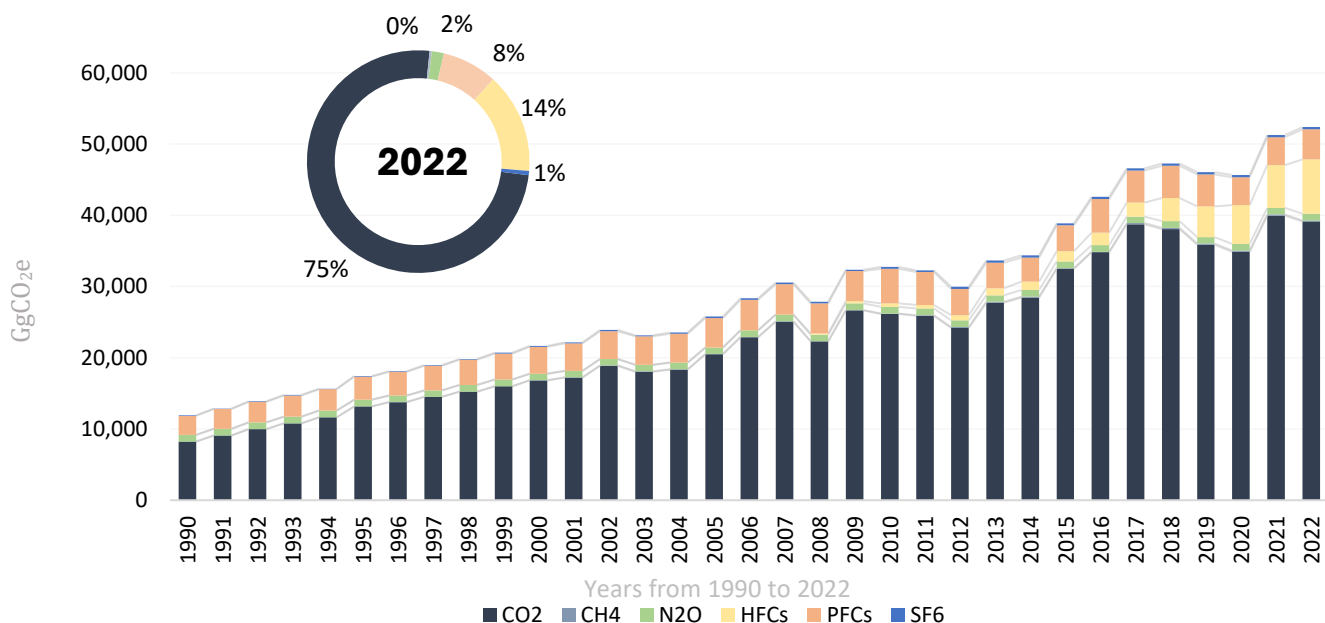
| Sector | 1990   | 2000   | 2005   | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   | 2022   |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| IPPU   | 11,920 | 21,660 | 25,777 | 38,882 | 42,580 | 46,581 | 47,262 | 46,061 | 45,668 | 51,263 | 52,376 |



**Figure 35: GHG Emissions from IPPU Sector over the period 1990 - 2022 (GgCO<sub>2</sub>e) per GDP (GgCO<sub>2</sub>e/B.EGP)**

### **Sector Emissions per Gas**

The trend of greenhouse gas emissions from 1990 to 2022 reveals an increase across all major gases, with CO<sub>2</sub> emissions remaining the dominant contributor to total emissions, rising from 8,241.6 Gg CO<sub>2</sub>e in 1990 to 39,120.9 Gg CO<sub>2</sub>e in 2022. This increase reflects the expansion of industrial activities, particularly in the mineral and chemical industries. The average annual growth rate between 1990 and 2022 was around 10.3%. HFCs showed exponential growth, emerging as a key contributor to the overall emissions profile. Starting from negligible levels in 1990, HFC emissions surged to 7,632.1 Gg CO<sub>2</sub>e by 2022, driven by their growing use as replacements for ozone-depleting substances. Other gases exhibited varying trends. Methane (CH<sub>4</sub>) and nitrous oxide (N<sub>2</sub>O) emissions remained relatively stable, reflecting minimal changes in processes that produce these gases. PFCs and SF<sub>6</sub>, primarily emitted in specific industrial applications, showed steady growth, with PFC emissions increasing from 2,674.03 Gg CO<sub>2</sub>e in 1990 to 4,213.44 Gg CO<sub>2</sub>e in 2022. These trends highlight the rising influence of synthetic gases, particularly HFCs, on the overall emissions profile and emphasize the need for targeted strategies to mitigate their growth.



**Figure 36: GHG Emissions from IPPU Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 25: GHG Emissions from IPPU Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

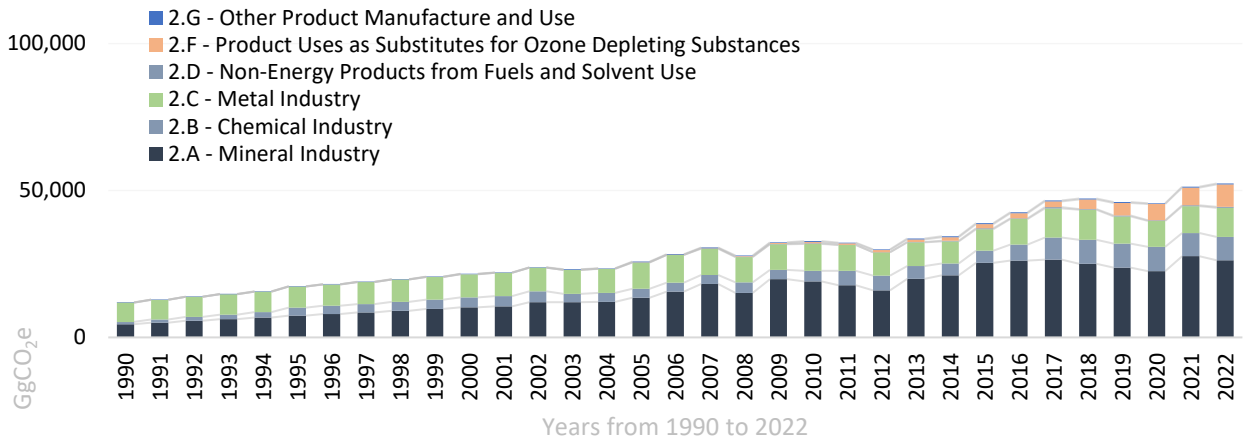
| Emissions by Gas (GgCO <sub>2</sub> e) | 1990          | 2000          | 2005          | 2015          | 2016          | 2017          | 2018          | 2019          | 2020          | 2021          | 2022          |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| CO <sub>2</sub>                        | 8,241.6       | 16,833.6      | 20,474.4      | 32,474.5      | 34,806.1      | 38,732.2      | 38,062.4      | 35,855.6      | 34,894.2      | 39,958.8      | 39,120.9      |
| CH <sub>4</sub>                        | 4.7           | 4.9           | 52.1          | 115.8         | 79.1          | 172.5         | 176.6         | 169.4         | 167.6         | 162.4         | 167.6         |
| N <sub>2</sub> O                       | 927.5         | 927.5         | 927.5         | 927.5         | 927.5         | 927.5         | 927.5         | 927.5         | 927.5         | 927.5         | 927.5         |
| HFCs                                   | 0.0           | 0.0           | 2.9           | 1,461.8       | 1,750.5       | 1,973.2       | 3,272.3       | 4,279.9       | 5,455.2       | 5,985.5       | 7,632.1       |
| PFCs                                   | 2,674.0       | 3,762.0       | 4,137.3       | 3,611.5       | 4,725.1       | 4,484.3       | 4,514.4       | 4,514.4       | 3,912.5       | 3,912.5       | 4,213.4       |
| SF <sub>6</sub>                        | 71.8          | 131.7         | 183.2         | 291.4         | 291.4         | 291.4         | 308.4         | 314.6         | 310.9         | 316.4         | 314.2         |
| <b>Total (Gg CO<sub>2</sub>e)</b>      | <b>11,920</b> | <b>21,660</b> | <b>25,777</b> | <b>38,882</b> | <b>42,580</b> | <b>46,581</b> | <b>47,262</b> | <b>46,061</b> | <b>45,668</b> | <b>51,263</b> | <b>52,376</b> |

### **Sector Emissions per Category**

Between 1990 and 2022, GHG emissions from the IPPU sector exhibited an increase across all categories. The **Mineral Industry (2.A)** remained the dominant contributor, where its emissions increased from 4,486 Gg CO<sub>2</sub>e in 1990 to 26,242 Gg CO<sub>2</sub>e in 2022, making it a key driver of the overall trend. Similarly, the **Chemical Industry (2.B)** demonstrated an increase in emissions, growing from 790 Gg CO<sub>2</sub>e in 1990 to 7,960 Gg CO<sub>2</sub>e in 2022. Other sectors also showed notable trends:

- Emissions from the **Metal Industry (2.C)** increased from 6,543 Gg CO<sub>2</sub>e in 1990 to 9,881 Gg CO<sub>2</sub>e in 2022.

- Emissions from **Non-Energy Products (2.D)** grew from 29 Gg CO<sub>2</sub>e in 1990 to 317 Gg CO<sub>2</sub>e in 2022.
- The **ODS Substitutes (2.F)** sector, which had no reported emissions in 1990, reached 7,632 Gg CO<sub>2</sub>e by 2022, reflecting an emerging contribution.
- The **Other Product Manufacture and Use (2.G)** increased from 72 Gg CO<sub>2</sub>e in 1990 to 314 Gg CO<sub>2</sub>e in 2022.



**Figure 37: GHG Emissions from IPPU Sector by category over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 26: GHG Emissions from IPPU Sector by category over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

| Emissions per Cat. (GgCO <sub>2</sub> e)  | 1990          | 2000          | 2005          | 2015          | 2022          |
|---|---------------|---------------|---------------|---------------|---------------|
| <b>2.A - Mineral Industry</b>   | 4,486         | 10,223        | 13,509        | 25,381        | 26,242        |
| <b>2.B - Chemical Industry</b>  | 790           | 3,385         | 2,994         | 4,112         | 7,990         |
| <b>2.C - Metal Industry</b>   | 6,543         | 7,844         | 8,995         | 7,367         | 9,881         |
| <b>2.D - Non-Energy Products from Fuels and Solvent Use</b>                         | 29            | 76            | 93            | 269           | 317           |
| <b>2.F - Product Uses as Substitutes for Ozone Depleting Substances<sup>5</sup></b> | -             | -             | 3             | 1,462         | 7,632         |
| <b>2.G - Other Product Manufacture and Use</b>                                      | 72            | 132           | 183           | 291           | 314           |
| <b>Total (GgCO<sub>2</sub>e)</b>  | <b>11,920</b> | <b>21,660</b> | <b>25,777</b> | <b>38,882</b> | <b>52,376</b> |

From 1990 to 2022, emissions from the **Mineral Industry (2.A)** significantly grew, with cement production continuing to be the dominant contributor. This increase reflects a rise in production volumes, as well as the difficulty in decarbonizing process-intensive activities like cement manufacturing. Lime and glass production emissions have increased more moderately, but cement remains the largest source, driven by the chemical processes involved, which remain challenging to reduce in terms of carbon emissions.

<sup>5</sup> Emissions from Refrigeration and AC are assumed to occur solely in the “Commercial Refrigeration” sub-category; all others are marked as “NO” based on data limitations. For Foam, emissions are assumed to arise only from “Closed Cell” types

Emissions from the **Chemical Industry (2.B)** significantly grew as well between 1990 and 2022. Ammonia production, which accounts for the bulk of emissions in the sector, saw significant growth in response to global fertilizer demand. Meanwhile, petrochemical production also grew, driven by increasing demand for plastics and chemicals. Despite improvements in process efficiency, the chemical industry's emissions remain high due to the intrinsic CO<sub>2</sub> release in ammonia synthesis.

Emissions from the **Metal Industry (2.C)** grew as well; albeit at lower rate, with iron and steel production remaining the largest emitting sector. This increase is mainly driven by the rising production levels within the sector. While ferroalloy, lead, and zinc emissions have grown more modestly, iron and steel production continue to be the dominant contributor. The emissions from this sector stem primarily from the chemical reactions involved in metal extraction, making it challenging to significantly reduce emissions without advancements in decarbonization technologies.

From 1990 to 2022, emissions from **Non-Energy Products from Fuels and Solvent Use (2.D)** had considerable growth. The increase was driven largely by the higher consumption of lubricants, which are essential in transportation and industrial machinery. The demand for paraffin wax also grew, as it is used in a variety of consumer products. While this sector's emissions make up a small portion of total industrial emissions, the growth indicates rising consumption of products that generate CO<sub>2</sub> emissions during use and degradation.

**Ozone Depleting Substances (2.F)** had no emissions in 1990 but saw exponential growth since its introduction in the early 2000s. The growth is primarily attributed to the increasing demand for refrigeration and air conditioning systems. Foam-blowing agents and fire protection applications also contributed to this rise, though to a lesser extent. This significant growth in emissions reflects both the global increase in refrigeration and air conditioning use and the continued reliance on HFCs, despite ongoing efforts to phase out high-GWP substances.

Overall, the data highlights that while the Mineral Industry continues to be the largest contributor, sectors such as Chemical Industry and ODS Substitutes have shown significant proportional growth. These trends emphasize the need for targeted mitigation efforts, particularly focusing on sectors with the most substantial and emerging contributions.

### **2.5.3 Methodology (Methods, Activity Data, and Emission Factors)**

The methodology adopted in compiling the national GHGI, is in accordance with the 2006 IPCC Guidelines. These guidelines, established by IPCC, provide a standardized approach for estimating and reporting GHGs. They focus on ensuring transparency, consistency, and comparability in national inventories of emissions and removals, particularly in sectors like the IPPU.

The IPPU sector assessment applied Tier 1 methods from the IPCC 2006 Guidelines, which are designed for countries with limited data availability. Tier 1 provides simplified, default methodologies based on global or regional averages, making it easier to estimate GHGs from industrial processes and product use. This approach utilizes default emission factors provided by the IPCC, ensuring a consistent and transparent framework for countries to report their emissions while adhering to international standards.

**Table 27: Methodology (Methods, Activity Data, and Emission Factors)**

| Category  | Data sources                 | Tier used | EF |
|---|------------------------------|-----------|----|
| <b>2.A - Mineral Industry</b>   |                              |           |    |
| 2.A.1 - Cement production   | US Geological Survey         | T1        | D  |
| 2.A.2 - Lime production   | Estimated<br>(extrapolation) | T1        | D  |
| 2.A.3 - Glass Production  | Estimated<br>(extrapolation) | T1        | D  |
| 2.A.4 - Other Process Uses of Carbonates                                |                              |           |    |
| 2.A.4.a – Ceramics  | Estimated<br>(extrapolation) | T1        | D  |
| <b>2.B - Chemical Industry</b>  |                              |           |    |
| 2.B.1 - Ammonia Production  | US Geological Survey         | T1        | D  |
| 2.B.2 - Nitric Acid Production  | Estimated<br>(extrapolation) | T1        | D  |
| 2.B.8 - Petrochemical and Carbon Black Production                       |                              |           |    |
| 2.B.8.a - Methanol  | MoPMR                        | T1        | D  |
| 2.B.8.b - Ethylene  | MoPMR                        | T1        | D  |
| 2.B.8.c - Ethylene Dichloride and Vinyl Chloride Monomer                | MoPMR                        | T1        | D  |
| 2.B.8.f - Carbon Black  | Estimated<br>(extrapolation) | T1        | D  |
| <b>2.C - Metal Industry</b>   |                              |           |    |
| 2.C.1 - Iron and Steel Production                                       | World Steel                  | T1        | D  |
| 2.C.2 - Ferroalloys Production  | US Geological Survey         | T1        | D  |
| 2.C.3 - Aluminum production   | US Geological Survey         | T1        | D  |
| 2.C.5 - Lead Production   | Estimated<br>(extrapolation) | T1        | D  |
| 2.C.6 - Zinc Production   | Estimated<br>(extrapolation) | T1        | D  |
| <b>2.D - Non-Energy Products from Fuels and Solvent Use</b>             |                              |           |    |
| 2.D.1 - Lubricant Use   | Estimated<br>(extrapolation) | T1        | D  |
| 2.D.2 - Paraffin Wax Use  | Estimated<br>(extrapolation) | T1        | D  |
| <b>2.F - Product Uses as Substitutes for Ozone Depleting Substances</b> |                              |           |    |
| 2.F.1 - Refrigeration and Air Conditioning                              | Ozone Unit - MoE             | T1        | D  |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning                 | Ozone Unit - MoE             | T1        | D  |
| 2.F.2 - Foam Blowing Agents   | Ozone Unit - MoE             | T1        | D  |
| 2.F.3 - Fire Protection   | Ozone Unit - MoE             | T1        | D  |
| 2.F.6 - Other Applications (please specify)                             | Ozone Unit - MoE             | T1        | D  |
| 2.F.1 - Refrigeration and Air Conditioning                              | Ozone Unit - MoE             | T1        | D  |
| <b>2.G - Other Product Manufacture and Use</b>                          |                              |           |    |
| 2.G.1 - Electrical Equipment  |                              |           |    |
| 2.G.1.b - Use of Electrical Equipment                                   | Estimated<br>(extrapolation) | T1        | D  |

The following steps were taken in preparing the IPPU inventory:

1. **Category identification.** A review of the IPCC 2006 guidelines was conducted for all subcategories of the IPPU sector and the GHG inventory of all previous years.
2. **The data needs were identified along with their sources for the estimation process.**
3. **Data collection and stakeholder engagement.** Data collection questionnaires were prepared for all relevant sub sectors and disseminated to all relevant stakeholders/entities. In cases where data was not available, extrapolation was conducted using previously available data.
4. **Calculation and data compilation.** Default IPCC emission factors and Good Practice Guidance were used in inventory estimations. Country or region-specific factors were used when available. The calculations were conducted on the latest version 2.93 of the IPCC Inventory Software.

The activity data requested varied depending on availability and equation parameters in the IPCC guidelines. The requested data included the following:

- The total annual production data.
- The total annual production capacity.
- The total annual consumption.
- The total annual Imports/Exports.
- The type of process, technology, and raw materials that are utilized in production or use.

Several entities were identified and contacted through the MOE:

1. Central Agency for Public Mobilization and Statistics (CAPMAS) – Collects data through questionnaires from industries.
2. Industrial Development Authority (IDA) – Provides information on production capacity and raw materials.
3. Federation of Egyptian Industries – Offers insights through its various industrial chambers.
4. National Ozone Unit (NOU) – Supplies data on ODS substitutes.
5. US Geological Survey (USGS) Mineral Yearbook – Provides comprehensive information on mineral production and trends.
6. Donor-funded projects (e.g., UNIDO, World Bank) – Collect data on specific industries.
7. Ministry of petroleum and mineral resources (MoPMR).
8. International publications – Such as the “Steel Statistical Yearbook” and reports from the Egyptian Petrochemical Company (ECHEM) were also used.

#### **2.5.4 Recalculations**

Recalculation has been performed for the IPPU sector inventory due to the use of AR5 GWP replacing the previously used (BUR1 and NC4) AR2 GWPs.

Recalculations were also performed for the ammonia production sub-sector for the years 2016 and 2017, as the previously reported activity data for these years were found to be inconsistent with the overall trend across the time series. A more reliable source of activity data was used to replace the earlier figures, ensuring alignment with actual production levels during those years. This recalculation improved the accuracy of the emissions estimates for ammonia production while maintaining consistency with the principles outlined in the IPCC 2006 Guidelines.

A recalculation was performed in the cement sector because the previous inventory (1990–2017) did not account for the CKD correction factor separately, leading to a rounded emission factor value. The updated calculation ensures greater accuracy.

**Table 28: Recalculations for the Ammonia Production Sub-sector (2016-2017)**

| GgCO <sub>2</sub>               | 2016         | Recalculated | %Change     | 2017       | Recalculated | %Change      |
|---------------------------------|--------------|--------------|-------------|------------|--------------|--------------|
| <b>2.B.1 Ammonia production</b> | <b>1,882</b> | <b>3,633</b> | <b>+93%</b> | <b>758</b> | <b>4,733</b> | <b>+524%</b> |

## 2.6 Agriculture, Forestry, and Other Land Use (AFOLU)

### 2.6.1 Overview of the Sector

The agricultural sector is a cornerstone of Egypt's economy, employing approximately 18.9% of the total labor force in 2022. During the 2021/2022 fiscal year, agriculture contributed 11.5% to the gross domestic product (GDP) with a growth rate of 4.0%.

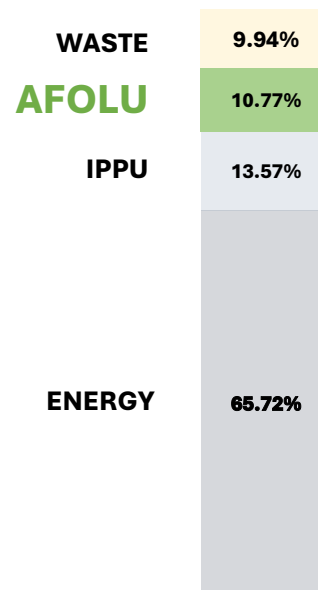
Egypt's arable land is predominantly concentrated in the Nile Valley and Delta, with additional reclaimed desert areas. The total cultivated land spans 9.6 million acres (1 acre = 0.42 hectares), which constitutes only 4% of the country's total land area. Annually, the cropped area is about 16.4 million acres, reflecting a cropping intensity of approximately 2:1. The country's arid climate results in sparse rainfall, ranging from 60–190 mm annually along the Mediterranean coast, 25–60 mm in the Nile Delta, and less than 25 mm in Upper Egypt.

Over 3.5 million acres of desert have been reclaimed for agriculture, distributed among various reclamation projects.

The Agriculture, Forestry, and Other Land Use (AFOLU) sector accounted for **41,561 Gg CO<sub>2</sub>e** of Egypt's national GHG emissions in 2022 with a share of 10.77% of the total inventory. Emissions primarily stemmed from enteric fermentation, manure management, field residue burning, agricultural soils, and rice cultivation. The largest contributors to the total GHG emissions are Aggregate Sources and Non-CO<sub>2</sub> Emissions Sources on Land (56%) followed by Livestock (44%).

The key greenhouse gases of concern are CO<sub>2</sub>, N<sub>2</sub>O, and CH<sub>4</sub>. CO<sub>2</sub> fluxes between the atmosphere and ecosystems are primarily controlled by uptake through plant photosynthesis and release via respiration, decomposition, and combustion of organic matter. N<sub>2</sub>O is primarily emitted from ecosystems as a by-product of nitrification and denitrification, while CH<sub>4</sub> is emitted through methanogenesis under anaerobic conditions in soils and manure storage, through enteric fermentation, and during incomplete combustion while burning organic matter. Other gases of interest (from combustion and soil) are NO<sub>x</sub>, NH<sub>3</sub>, NMVOC, and CO because they are precursors for the formation of greenhouse gases in the atmosphere. The formation of greenhouse gases from precursor gases is considered an indirect emission. Indirect emissions are also associated with leaching or runoff of nitrogen compounds, particularly NO<sub>3</sub> losses from soils, some of which can be subsequently converted to N<sub>2</sub>O through denitrification.

The direct emissions of N<sub>2</sub>O from agricultural soils include the total amount of nitrogen in soils through cropping practices. These practices include the application of synthetic



fertilizer, nitrogen from animal waste, production of nitrogen-fixing crops, nitrogen from crop residue mineralization, and soil nitrogen mineralization due to the cultivation of histosols. With the preparation of the First Biennial Update Report (BUR) and Fourth National Communication, Egypt adopted the *2006 IPCC Guidelines*, which refined the categorization of GHG emissions. The term "managed soils" is used in these guidelines to capture national anthropogenic emissions of **N<sub>2</sub>O** (both direct and indirect) from managed soils and **CO<sub>2</sub> emissions** from the use of urea-based fertilizers. Consequently, the term "agricultural soil" has been retained in trend analyses to align with prior reporting conventions.

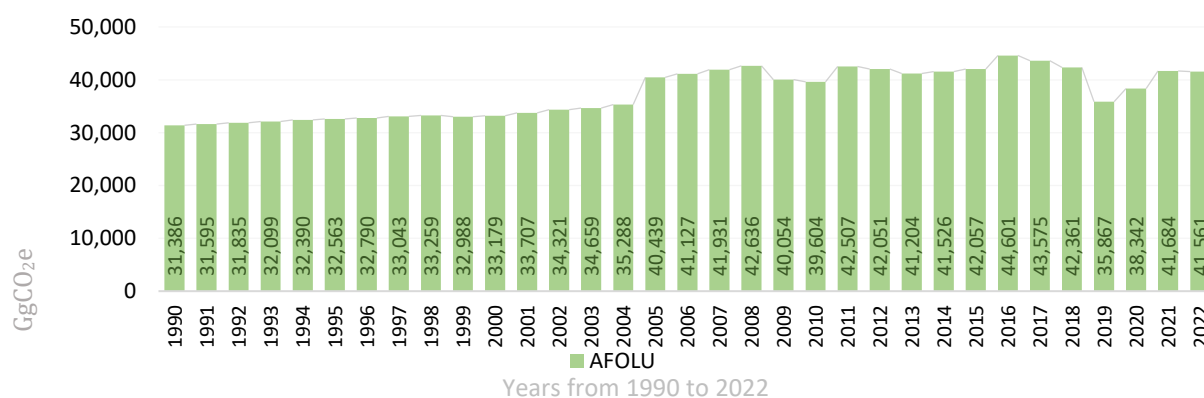
## 2.6.2 AFOLU Sector Emissions Trends

### Sector Overall Emissions

Total emissions from the AFOLU sector decreased over the period, from 42,361.2 Gg CO<sub>2</sub>e in 2018 to 41,561 Gg CO<sub>2</sub>e in 2022. A notable decrease occurred in 2019, with emissions falling to 35,867 Gg CO<sub>2</sub>e, primarily due to a reduction in the use of synthetic fertilizers and urea. The overall fluctuations in emissions reflect variations in the amounts of fertilizers used and changes in livestock numbers. Emissions from the AFOLU sector in 2022 were 2% lower than in 2018 for this reason. The graph below highlights the growth in GHG emissions from the AFOLU sector between 1990 and 2022. Key observations include:

- A **steady increase** in total emissions from the AFOLU sector, with variability due to agricultural inputs, particularly fertilizer prices and quantities.
- A **decline in emissions during 2019–2020**, attributable to reduced activity during the COVID-19 pandemic, followed by a rebound in 2021 and 2022.

This variability underscores the influence of economic and external factors (like the pandemic) on agricultural emissions, emphasizing the need for robust data monitoring and adaptive mitigation strategies in the sector.



**Figure 38: GHG Emissions from AFOLU Sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 29: GHG Emissions from AFOLU Sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

| Sector | 1990     | 2000     | 2005     | 2015     | 2016     | 2017     | 2018     | 2019     | 2020     | 2021     | 2022     |
|--------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| AFOLU  | 31,386.4 | 33,138.8 | 40,439.1 | 42,056.6 | 44,601.4 | 43,575.3 | 42,361.2 | 35,866.7 | 38,341.8 | 41,684.5 | 41,560.7 |



### Sector Emissions per Gas

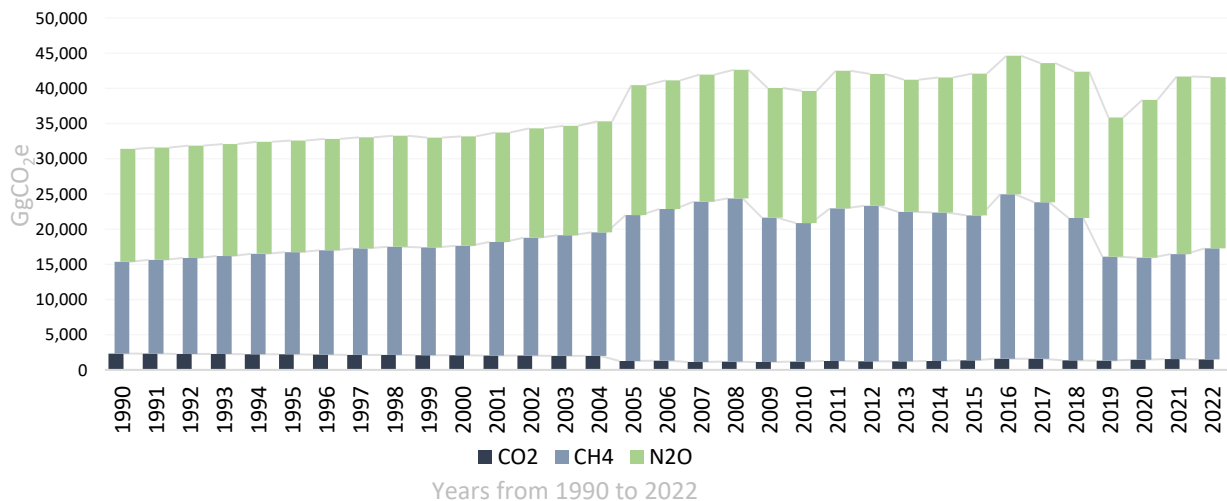
The trend of GHG emissions from 1990 to 2022 reveals increases across all major gases, with N<sub>2</sub>O emissions remaining the dominant contributor to total emissions. N<sub>2</sub>O emissions rose from 16,027.6 Gg CO<sub>2</sub>e in 1990 to 24,299.8 Gg CO<sub>2</sub>e in 2022.

Other gases exhibited varying trends. Methane emissions remained relatively stable throughout the years with an increase of 21% from 1990 to 2022, reflecting minimal changes in activities that produce these gases. While CO<sub>2</sub> emissions decreased by 31% for the same period.

In 2022, the AFOLU sector's GHG emissions were distributed across three primary gases:

- N<sub>2</sub>O: Representing the largest share at 58%, N<sub>2</sub>O emissions were primarily attributed to agricultural soils and manure management practices.
- CH<sub>4</sub>: Contributing 38%, CH<sub>4</sub> emissions originated mainly from enteric fermentation in livestock and rice cultivation.
- CO<sub>2</sub>: Accounting for the smallest share of 4%, CO<sub>2</sub> emissions were largely associated with biomass burning and liming activities.

This breakdown highlights the dominant role of nitrous oxide and methane in the AFOLU sector's emissions profile, underscoring the need for targeted mitigation strategies in soil and livestock management.



**Figure 39: GHG Emissions from AFOLU Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

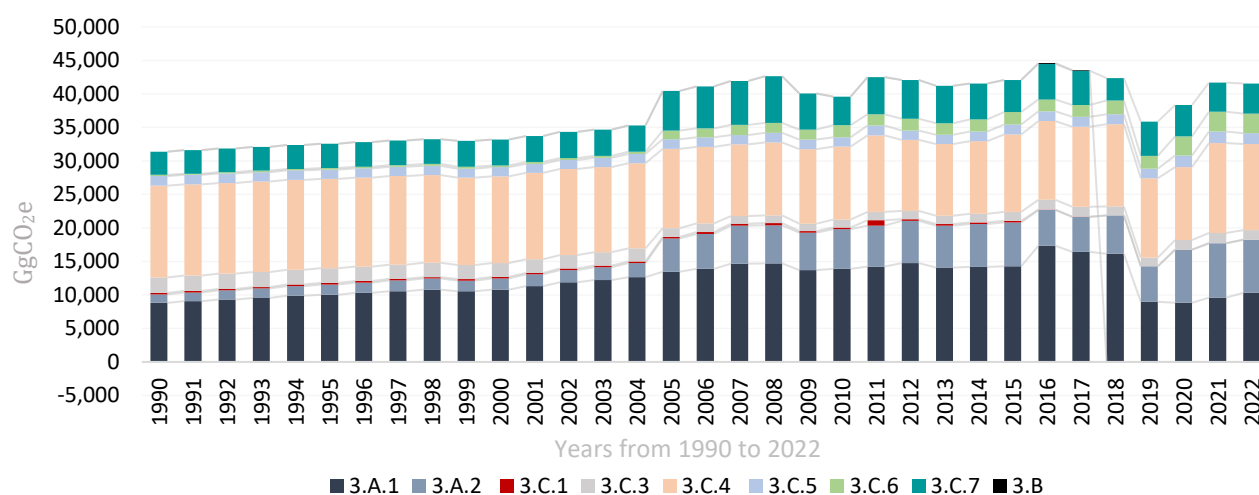
**Table 30: GHG Emissions from AFOLU Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

| Emissions by Gas (GgCO <sub>2</sub> e) | 1990            | 2000            | 2005            | 2015            | 2016            | 2017            | 2018            | 2019            | 2020            | 2021            | 2022            |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| CO <sub>2</sub>                        | 2,317.3         | 2,068.0         | 1,255.3         | 1,356.3         | 1,582.6         | 1,573.1         | 1,345.8         | 1,313.7         | 1,454.1         | 1,512.7         | 1,472.5         |
| CH <sub>4</sub>                        | 13,041.6        | 15,568.6        | 20,740.7        | 20,592.7        | 23,365.1        | 22,241.7        | 20,209.8        | 14,741.9        | 14,497.4        | 14,929.2        | 15,788.4        |
| N <sub>2</sub> O                       | 16,027.6        | 15,542.0        | 18,443.0        | 20,107.6        | 19,653.7        | 19,760.5        | 20,805.7        | 19,811.1        | 22,390.2        | 25,242.5        | 24,299.8        |
| <b>Total (Gg CO<sub>2</sub>e)</b>      | <b>31,386.4</b> | <b>33,178.6</b> | <b>40,439.1</b> | <b>42,056.6</b> | <b>44,601.4</b> | <b>43,575.3</b> | <b>42,361.2</b> | <b>35,866.7</b> | <b>38,341.8</b> | <b>41,684.5</b> | <b>41,560.7</b> |

### Sector Emissions per Category

Tracking GHG emissions across different categories within the AFOLU sector from 2018 to 2022 highlights significant shifts:

- **Enteric Fermentation:** The proportion of emissions attributed to enteric fermentation decreased markedly, from 38% in 2018 to 25% in 2022, reflecting a decline in livestock numbers. This reduction is primarily linked to higher feed prices, which led to a decrease in the total number of farm animals.
- **Manure Management:** Emissions from manure management increased from 13% in 2018 to 19% in 2022, driven primarily by a 51.13% rise in poultry numbers during this period, which significantly contributed to the increase in emissions from manure. Unlike cattle, poultry does not produce emissions from enteric fermentation; however, their growing numbers created an opposite trend in manure management emissions.
- **Rice Cultivation:** Emissions from rice cultivation grew from 8% in 2018 to 11% in 2022 reflecting changes in the scale of rice cultivation, including expansions in some years. However, the absolute GHG emissions from rice cultivation decreased compared to 2005 levels.
- **Agricultural Soils:** Emissions from agricultural soil rose slightly, accounting for 43% in 2018 and 45% in 2022, underscoring the dominant role of soil-related practices such as fertilizer application in the AFOLU sector’s emissions profile.



**Figure 40: GHG Emissions from AFOLU Sector by category over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 31: GHG Emissions from AFOLU Sector by category over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

| Emissions per Cat. (GgCO <sub>2</sub> e)                                | 1990            | 2000            | 2005            | 2015            | 2022            |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|
| <b>3.A.1 - Enteric Fermentation</b>                                     | 8,812.04        | 10,791.51       | 13,465.51       | 14,257.12       | 10,290.67       |
| <b>3.A.2 - Manure Management</b>  | 1,268.95        | 1,662.86        | 4,965.04        | 6,571.55        | 7,928.19        |
| <b>3.C.1 - Burning</b>  | 210.53          | 237.67          | 255.92          | 226.21          | 0.00            |
| <b>3.C.3 - Urea application</b>   | 2,317.34        | 2,068.01        | 1,255.34        | 1,356.27        | 1,475.18        |
| <b>3.C.4 - Direct N<sub>2</sub>O Emissions from managed soils</b>       | 13,700.60       | 12,935.00       | 11,845.77       | 11,536.27       | 12,819.17       |
| <b>3.C.5 - Indirect N<sub>2</sub>O Emissions from managed soils</b>     | 1,423.73        | 1,369.52        | 1,449.47        | 1,494.06        | 1,643.82        |
| <b>3.C.6 - Indirect N<sub>2</sub>O Emissions from manure management</b> | 183.97          | 236.67          | 1,301.58        | 1,846.34        | 2,899.73        |
| <b>3.C.7 - Rice cultivation</b>   | 3,469.28        | 3,877.31        | 5,900.44        | 4,768.82        | 4,506.56        |
| <b>3.B - Land</b>   | 0.00            | 0.00            | 0.00            | 0.00            | -2.65           |
| <b>Total (Gg CO<sub>2</sub>e)</b>                                       | <b>31,386.4</b> | <b>33,178.6</b> | <b>40,439.1</b> | <b>42,056.6</b> | <b>41,560.7</b> |

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### 3.A.1 - Enteric Fermentation

GHG emissions from enteric fermentation have shown a minor increase over the period from 1990 to 2022. The emissions grew by approximately 17%, rising from 8,812 Gg CO<sub>2</sub>e in 1990 to 10,291 Gg CO<sub>2</sub>e in 2022. This category is a significant source of CH<sub>4</sub> emissions within the AFOLU sector. Despite minor year-to-year fluctuations, the overall trend has remained relatively constant. Notably, emissions saw a slight decrease in 2019, 2020 and till 2022, corresponding to a temporary reduction in livestock activities likely due to economic and environmental factors. The long-term growth in emissions is directly linked to the expansion of Egypt's livestock population over this period.

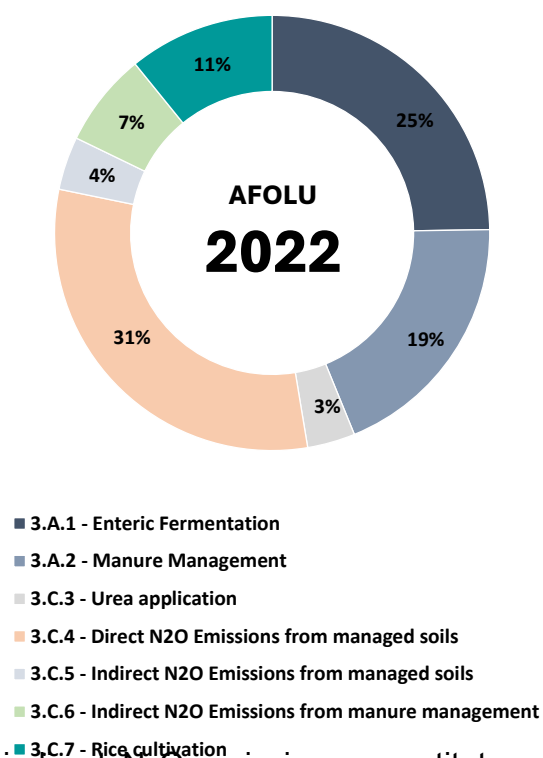
### 3.A.2 - Manure Management

Emissions from manure management, particularly indirect N<sub>2</sub>O emissions, constitute a relatively small fraction of Egypt's total GHG inventory. From 1990 to 2022, the emissions from manure management increased from 1,269 to 7,928 Gg CO<sub>2</sub>e, reflecting a consistent upward trend. The most significant surge occurred in 2021, followed by moderate growth in 2022. This steady increase aligns with the expansion of livestock operations and the greater volume of manure being managed overtime.

### 3.C.7 - Rice Cultivation

Rice cultivation remains to be one of the largest sources of CH<sub>4</sub> emissions within the AFOLU sector. Emissions increased by 30% from 3,469 Gg CO<sub>2</sub>e in 1990 to 4,507 Gg CO<sub>2</sub>e in 2022. A notable fluctuation occurred in 2018, when emissions decreased significantly due to a reduction in the area cultivated with rice, shrinking to 244 hectares compared to 543 hectares in 2019. In contrast, emissions peaked at 5,119 Gg CO<sub>2</sub>e in 2019. This variability highlights the sensitivity of emissions to changes in rice cultivation practices and the area under cultivation.

Emissions share per category for the AFOLU sector 2022



### **3.C - Aggregate Sources and Non-CO<sub>2</sub> Emission Sources on Land**

GHG emissions from aggregate sources and non-CO<sub>2</sub> emissions on land followed a steady upward trend from 1990 to 2003, with minor fluctuations thereafter. Emissions reached their peak in 2021, estimated at 23,951 Gg CO<sub>2</sub>e. While emissions have remained higher than pre-2000 levels, they began to exhibit a declining trend in 2022. This category represents a significant source of N<sub>2</sub>O emissions within the AFOLU sector.

#### **3.C.1 - Biomass Burning**

From 1990 to 2022, emissions from biomass burning showed significant variations due to data availability issues. For the period 2018–2022, emissions are considered negligible rather than strictly zero, based on expert judgment and the implementation of strict governmental measures to ban open-field burning of agricultural residues. Additionally, nationwide initiatives promoted alternative uses of agricultural waste, such as compost production and animal feed, to protect the environment. The sharp increase in fertilizer and feed prices in recent years has also encouraged farmers to fully utilize agricultural residues as valuable resources, further reducing the likelihood of open burning. As a result, biomass burning contributed minimal, if any, GHG emissions to the total AFOLU inventory during this period.

### **2.6.3 Methodology (Methods, Activity Data, and Emission Factors)**

In Egypt's prior submissions to the UNFCCC (the first, second, and third National Communications), GHG emissions from the AFOLU sector were calculated using the default methodology outlined in the *Revised 1996 IPCC Guidelines for National Greenhouse Gas Inventories* and the *Good Practice Guidance and Uncertainty Management in National Greenhouse Gas Inventories*. These guidelines recognize that various agricultural activities introduce nitrogen into soils, enhancing conditions for nitrification and denitrification, thereby increasing N<sub>2</sub>O emissions. The methodology categorizes N<sub>2</sub>O emissions into three sources:

1. **Direct N<sub>2</sub>O emissions from agricultural soils**, which include nitrogen inputs from fertilizers, animal waste, crop residues, and nitrogen-fixing crops.
2. **Direct soil emissions of N<sub>2</sub>O from livestock production.**
3. **Indirect N<sub>2</sub>O emissions** resulting from nitrogen leaching, runoff, and volatilization triggered by agricultural activities.

With the preparation of the First Biennial Update Report (BUR) and Fourth National Communication, Egypt adopted the *2006 IPCC Guidelines*, which refine the categorization of GHG emissions. The term "managed soils" is used in these guidelines to capture national anthropogenic emissions of **N<sub>2</sub>O** (both direct and indirect) from managed soils and **CO<sub>2</sub> emissions** from the use of urea-based fertilizers. Consequently, the term "agricultural soil" has been retained in trend analyses to align with prior reporting conventions.

Notably, emissions related to **land-use change were not estimated** in the trend analysis in earlier reports due to a lack of consistent calculations, except for the years 2016 - 2022, when such emissions were quantified. This highlights a gap in integrating land-use change emissions in Egypt's broader GHG inventory trend analysis.

The primary sources of activity data for the AFOLU sector include CAPMAS, the Economic Affairs Sector of the Ministry of Agriculture, the International Fertilizer Association (IFASTAT), and the Food and Agriculture Organization (FAO). Integration of recycling policies and the nationwide ban on agricultural waste burning have driven significant progress. Farmers now use most agricultural residues for composting, bioenergy production, and other sustainable purposes, which has significantly reduced open-field biomass burning on agricultural lands, making it negligible during the recent years. This outcome underscores the success of Egypt's environmental strategies, which align economic incentives with sustainability goals to reduce emissions and conserve resources.

Fertilizer usage trends were carefully analyzed due to data inconsistencies. Recalibration for the period 2005–2018, relying on IFASTAT data, addressed these irregularities, particularly for urea and nitrogen-based fertilizers. Similarly, for 2018–2022, emission calculations were based on IFASTAT data to maintain consistency. This recalibration provided a more accurate basis for analyzing emissions trends.

For emissions estimation, Tier 1 methods from the IPCC guidelines were primarily used. However, Tier 2 methodologies were introduced for livestock emissions, such as **enteric fermentation** and **manure management** for cattle and buffalo. The use of Tier 2 remains limited due to insufficient activity data but represents a step toward improved inventory quality. Future expansions of Tier 2 applications are anticipated as data availability improves.

Egypt lacks ecosystems classified as natural savannahs; therefore, emissions from this subcategory were not included in the inventory. For the Land Use, Land-Use Change, and Forestry (LULUCF) sector, MPG mandates separate reporting of emissions and removals. However, limited data availability restricted full separation. Data on land reclamation and croplands converted to settlements were used to estimate net changes in croplands, with flexibility provisions in the MPG allowing adjustments based on available data.

**Table 32: Methodology (Methods, Activity Data, and Emission Factors)**

| Category  | Data sources            | Tier used                    | EF       |
|---|-------------------------|------------------------------|----------|
| <b>3.A – Livestock</b>  |                         |                              |          |
| 3.A.1.a – Cattle  |                         |                              | D        |
| 3.A.1.a.i - Dairy Cows  | CAPMAS/EAS              | T2 (Simplified) <sup>6</sup> | D        |
| 3.A.1.a.ii - Other Cattle   | CAPMAS/EAS              | T2 (Simplified)              | D        |
| <b>3.A.1.b – Buffalo</b>  |                         |                              |          |
| 3.A.b.a.i - Dairy Buffalo   | CAPMAS/EAS              | T2 (Simplified)              | D        |
| 3.A.b.a.ii - Other Buffalo  | CAPMAS/EAS              | T2 (Simplified)              | D        |
| 3.A.1.c – Sheep   | CAPMAS                  | T1                           | D        |
| 3.A.1.d – Goats   | CAPMAS                  | T1                           | D        |
| 3.A.1.e – Camels  | FAOstat                 | T1                           | D        |
| 3.A.1.f – Horses  | FAOstat                 | T1                           | D        |
| 3.A.1.g - Mules and Asses   | CAPMAS                  | T1                           | D        |
| 3.A.1.h – Swine   | FAOstat Estimated value | T1                           | D        |
| 3.A.1.j Poultry   | CAPMAS                  | T1                           | D        |
| 3.A.1.j - Other (rabbits)   | CAPMAS                  | T1                           | D        |
| <b>3.B – Land</b>   |                         |                              |          |
| 3.B.1 - Forest land   | -                       | -                            | -        |
| 3.B.2 – Cropland  | CAPMAS/EAS              | T1 (Approach 1)              | D        |
| 3.B.3 – Grassland   | -                       | -                            | -        |
| 3.B.4 – Wetlands  | -                       | -                            | -        |
| 3.B.5 – Settlements   | CAPMAS/EAS              | T1 (Approach 1)              | D        |
| 3.B.6 - Other Land  | -                       | -                            | -        |
| <b>3.C - Aggregate sources and non-CO<sub>2</sub> emissions sources on land</b> |                         |                              |          |
|   |                         | <b>T1</b>                    | <b>D</b> |
| 3.C.1 - Emissions from biomass burning  | -                       | NA                           | NA       |
| 3.C.2 – Liming  | -                       | NA                           | NA       |
| 3.C.3 - Urea application  | IAFSTAT                 | T1                           | D        |
| 3.C.4 - Direct N <sub>2</sub> O Emissions from managed soils                    | IAFSTAT                 | T1                           | D        |
| 3.C.5 - Indirect N <sub>2</sub> O Emissions from managed soils                  | IAFSTAT                 | T1                           | D        |
| 3.C.6 - Indirect N <sub>2</sub> O Emissions from manure management              | CAPMAS/EAS              | T1                           | D        |
| 3.C.7 - Rice cultivation  | <b>CAPMAS/EAS</b>       | <b>T1</b>                    | <b>D</b> |

## 2.6.4 Recalculations

Recalculation has been performed for the AFOLU sector inventory due to the use of AR5 GWP replacing the previously used (BUR1 and NC4) AR2 GWPs.

To enhance the accuracy of the GHG inventory for the AFOLU sector, recalculations were also conducted to address potential underestimation or overestimation of emissions, particularly in key categories. These recalculations were based on newly acquired datasets that were deemed more reliable and accurate, the inclusion of newly added categories, and quality

<sup>6</sup> Simplified Tier 2 refers to the use of country-specific activity data in combination with IPCC default or regionally adjusted emission factors available in the IPCC Inventory Software. This approach improves accuracy over Tier 1 while not requiring fully country-specific emission factors.

assurance/quality control (QA/QC) measures such as cross-verifying activity data from multiple sources.

### **Updates to Urea Application and Nitrogen Fertilizers**

Recalculations for urea application and nitrogen fertilizers were applied for the entire period from 2005 to 2017. The data source for this period was revised to align with the International Fertilizer Association (IFA), the same source used for the years 2018–2022. This update ensured consistency and allowed for meaningful comparisons across the time series. The emission factors for nitrogen fertilizers, including urea, were also revised in accordance with the 2019 IPCC guidelines.

Previously, the 2006 IPCC guidelines provided an emission factor range for nitrogen fertilizers of 0.001 to 0.03 kg N<sub>2</sub>O–N (kg N)<sup>-1</sup>, with the upper limit reduced to 0.018 kg N<sub>2</sub>O–N (kg N)<sup>-1</sup> in the 2019 guidelines. The default value in the IPCC software for emission factors (EF) was set at 0.01, but recalculations were based on the updated upper limit of 0.018, ensuring compliance with the latest recommendations.

**Table 33: Updates to Urea Application and Nitrogen Fertilizers**

| Year | IAF STAT (New data reported) |                                       |   | Other sources (Old data reported) |                                       |   |
|------|------------------------------|---------------------------------------|---|-----------------------------------|---------------------------------------|---|
|      | Urea                         | Total N Synthetic Fertilizer for Rice | Total N without rice Synthetic Fertilizer | Urea                              | Total N Synthetic Fertilizer for Rice | Total N without rice Synthetic Fertilizer |
| 2005 | 1,711,828.0                  | 103,841.1                             | 1,205,158.9                               | 2,564,991                         | -                                     | 1,576,844.9                               |
| 2006 | 1,755,914.0                  | 109,948.5                             | 1,129,051.5                               | 2,606,539                         | -                                     | 1,564,149                                 |
| 2007 | 1,558,494.6                  | 115,463.4                             | 1,004,536.6                               | 2,548,543                         | -                                     | 1,557,534                                 |
| 2008 | 1,602,150.5                  | 122,163.8                             | 1,016,936.2                               | 2,467,518                         | -                                     | 1,534,904                                 |
| 2009 | 1,505,376.3                  | 94,515.2                              | 1,098,684.8                               | 2,467,920                         | -                                     | 1,534,954                                 |
| 2010 | 1,618,279.6                  | 75,468.0                              | 1,083,232.0                               | 2,416,873                         | -                                     | 1,531,867                                 |
| 2011 | 1,698,924.7                  | 97,270.7                              | 1,109,729.3                               | 2,230,065                         | -                                     | 1,464,361                                 |
| 2012 | 1,661,720.4                  | 101,618.2                             | 985,181.8                                 | 3,147,081                         | -                                     | 1,860,383                                 |
| 2013 | 1,673,118.3                  | 97,976.2                              | 1,006,123.8                               | 3,137,519                         | -                                     | 1,874,318                                 |
| 2014 | 1,720,430.1                  | 94,140.2                              | 1,030,459.8                               | 1,842,233                         | -                                     | 1,257,076                                 |
| 2015 | 1,849,462.4                  | 83,925.8                              | 1,136,674.2                               | 1,850,795                         | -                                     | 1,253,066                                 |
| 2016 | 1,991,397.8                  | 93,388.1                              | 1,188,412.0                               | 3,208,722.5                       | 93,389.9                              | 2,139,361                                 |
| 2017 | 1,978,494.6                  | 90,268.0                              | 1,225,332.0                               | 3,317,815.9                       | 90,269.8                              | 2,970,177                                 |

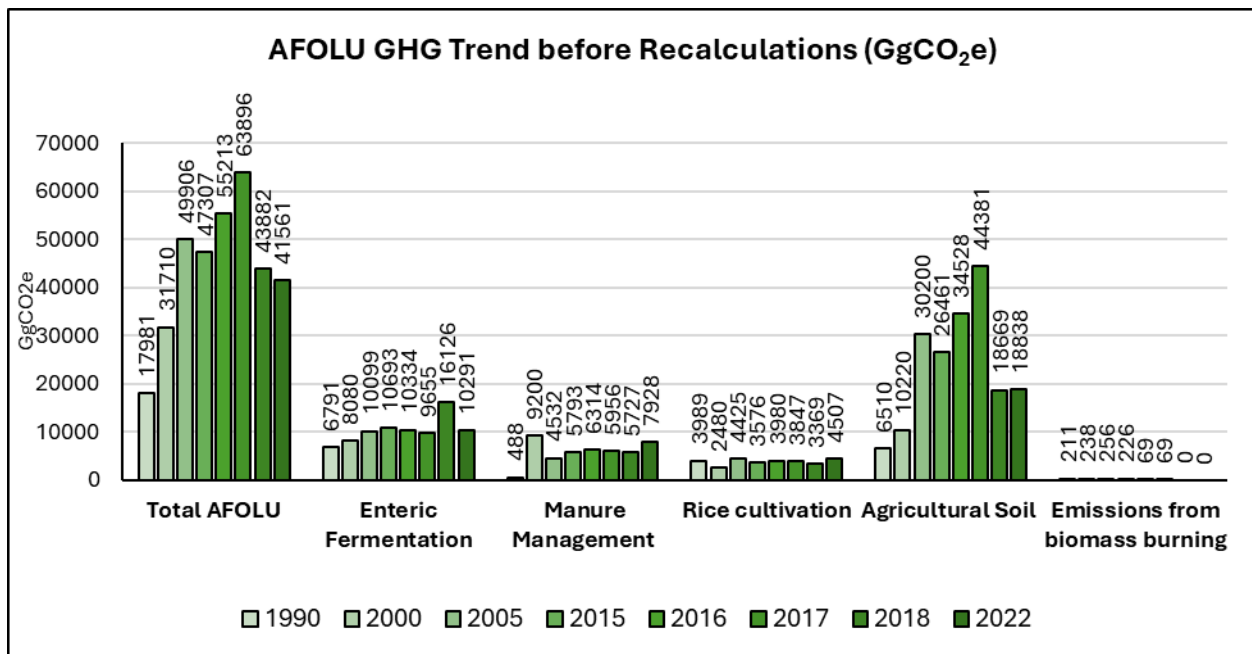
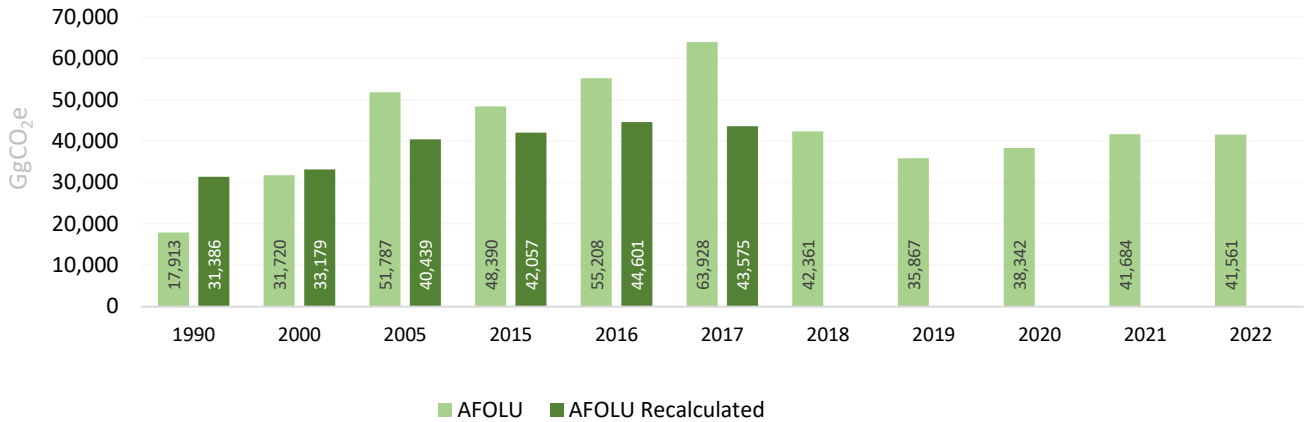
### **Recalculations for Livestock and Soil Emissions**

In addition to fertilizers, recalculations were made for emissions from livestock production, direct and indirect emissions from agricultural soils, and indirect emissions from fertilizer management. These adjustments, spanning the period from 2005 to 2022, reflect updates in the emission factors provided by the 2019 IPCC guidelines. By incorporating new data and methodological updates, the recalculations provide a more accurate representation of emissions and trends over time.

These comprehensive recalculations underline the commitment to improving the quality and accuracy of the GHG inventory, ensuring alignment with the most current IPCC guidelines and the evolving understanding of emissions dynamics in the AFOLU sector.

**Table 34: Recalculations for Livestock Emissions**

| Data source                      | EAS (New data reported) |           | CAPMAS (Old data reported) |           |
|----------------------------------|-------------------------|-----------|----------------------------|-----------|
|                                  | 2016                    | 2017      | 2016                       | 2017      |
| <b>3.A.1.a.i - Dairy Cows</b>    | 171,570                 | 188,900   | 5,012,217                  | 4,387,289 |
| <b>3.A.1.a.ii - Other Cattle</b> | 4,840,647               | 4,198,389 | -                          | -         |
| <b>Total Cattle</b>              | 5,012,217               | 4,387,289 | 5,012,217                  | 4,387,289 |



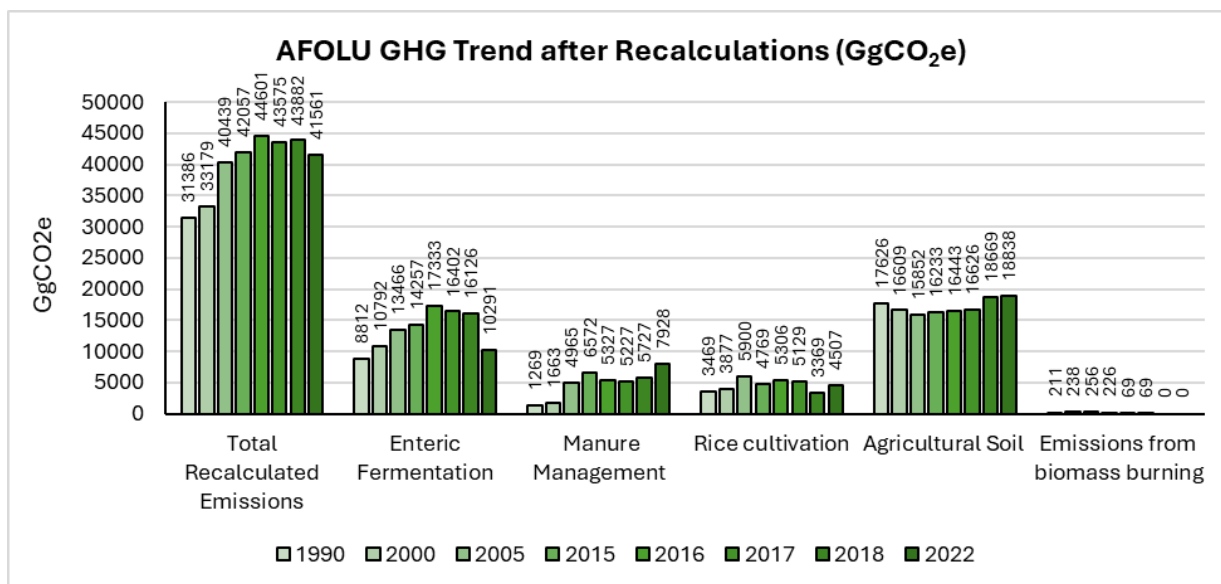


Figure 41: GHG Emissions from AFOLU sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)

Table 35: GHG Emissions from AFOLU sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)

| Sector/ Category                      | 1990      | 2000      | 2005          | 2015          | 2016      | 2017      | 2022       |
|---------------------------------------|-----------|-----------|---------------|---------------|-----------|-----------|------------|
| <b>Total AFOLU</b>                    | 17,981    | 31,710    | <b>49,906</b> | <b>47,307</b> | 55,213    | 63,896    |            |
| <b>Total Recalculated Emissions</b>   | 31,386.44 | 33,178.56 | 40,439.08     | 42,056.63     | 44,601.45 | 43,575.31 | 41,561     |
| <b>3.A.1 Enteric Fermentation</b>     | 6,791     | 8,080     | 10,099        | 10,693        | 10,334    | 9,655     |            |
| <b>Recalculated Emissions</b>         | 8,812     | 10,792    | 13,466        | 14,257        | 17,333    | 16,402    | 10,291     |
| <b>3.A.2 Manure Management</b>        | 488       | 9,200     | 4,532         | 5,793         | 6,314     | 5,956     |            |
| <b>Recalculated Emissions</b>         | 1,269     | 1,663     | 4,965         | 6,572         | 5,327     | 5,227     | 7,928      |
| <b>3.C.7 Rice cultivation</b>         | 3,989     | 2,480     | 4,425         | 3,576         | 3,980     | 3,847     |            |
| <b>Recalculated Emissions</b>         | 3,469     | 3,877     | 5,900         | 4,769         | 5,306     | 5,129     | 4,507      |
| <b>Agricultural Soil</b>              | 6,510     | 10,220    | 30,200        | 26,461        | 34,528    | 44,381    |            |
| <b>Recalculated Emissions</b>         | 17,626    | 16,609    | 15,852        | 16,233        | 16,443    | 16,626    | 18,838     |
| <b>Emissions from biomass burning</b> | 210.53    | 238       | 256           | 226           | 69        | 69        | No burning |

## 2.7 Waste

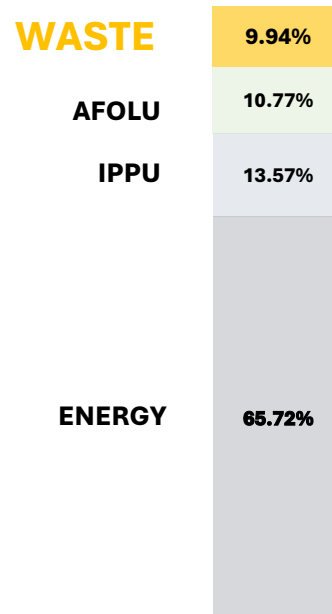
### 2.7.1 Overview of the Sector

This section overviews the main results of the GHGI of the Waste sector categories as defined by the IPCC 2006 guidelines (detailed below). Waste sector GHGI presented in this section estimates CO<sub>2</sub>, CH<sub>4</sub> and N<sub>2</sub>O emissions from the 4 waste and wastewater categories (4A, 4B, 4C, 4D) on the national level guided by categories structure and coding in the Waste Volume of the IPCC 2006 Guidelines.

#### **4A Solid waste disposal (SWD):**

For this GHGI, category 4A considers 3 main waste streams: municipal solid waste (MSW), non-hazardous industrial waste, and sewage sludge. Amounts of waste reported under category 4A are the balance of amounts remaining after mechanical/biological treatment (including composting), recover/recycling, and open burning. National expert consultation was held to identify key parameters and assumptions based on waste handling and disposal practices between 2018 and 2022. The consultation resulted in the following parameters and assumptions applied in the 4A solid waste disposal sub-category (time series from 2018 to 2022):

- Municipal solid waste (MSW) collection rates increased from 48% to 72% between 2018 and 2022.
- Uncollected MSW (which decreased from 52% in 2018 to 28% in 2022) is considered to end up in Uncategorized Waste Disposal Sites.
- Between 2018 and 2022, the processing capacity of mechanical-biological treatment (MBT) facilities increased from 15% to 36% of collected MSW.
- For MSW collected and processed in MBT facilities:
  - o 15% is recovered as recyclables
  - o 25% is composted (reported under 4B Biological Treatment of Waste)
  - o 20% is recovered as refuse-derived fuel (RDF)
  - o 40% is considered “reject” and ends up in disposal sites
- MSW collected but not processed in MBT facilities, in addition to the “reject” fraction from MBT facilities, ends up in disposal sites. These 2 waste streams are disposed as follows:
  - o 15% in Managed (anaerobic)
  - o 40% in Managed (semi-anaerobic)
  - o 45% in Unmanaged (deep)



The table below summarizes the distribution (in %) of the generated MSW by mass values for 2018 and 2022 were obtained from expert consultations and an assumed linear change was applied on from 2019 to 2021):

**Table 36: Distribution (in %) of the Generated MSW by Mass**

| Year | Collected (%) | Recycled (%) | RDF (%) | Composted (%) | Reject (%) | Uncollected (%) | % to SWDS |
|------|---------------|--------------|---------|---------------|------------|-----------------|-----------|
| 2018 | 48            | 7.2          | 9.6     | 12            | 19.2       | 52              | 71.2      |
| 2019 | 54            | 8.1          | 10.8    | 13.5          | 21.6       | 46              | 67.6      |
| 2020 | 60            | 9            | 12      | 15            | 24         | 40              | 64        |
| 2021 | 66            | 9.9          | 13.2    | 16.5          | 26.4       | 34              | 60.4      |
| 2022 | 72            | 10.8         | 14.4    | 18            | 28.8       | 28              | 56.8      |

Based on expert consultation, sludge resulting from domestic wastewater treatment and non-hazardous industrial waste between 2018 and 2022 were considered as follows:

- Sludge: 40% dried and mixed with fertilizer for land application. These amounts, to approximate the land application effect, were considered to be disposed in unmanaged shallow disposal sites.
- Sludge: 60% was composted. These amounts are considered under 4B Biological Treatment of Waste (in addition to MSW composted).
- Non-hazardous industrial waste: 100% was collected. Of the collected amounts, 80% was considered recovered as recyclables, reusables, and scrap. The unrecovered 20% of the generated non-hazardous industrial waste ends up in disposal sites.

#### **4B Biological Treatment of Waste:**

Methane and nitrous oxide emissions from biological treatment of solid waste are assumed to result from composting of organic fractions of municipal solid waste and sludge.

Expert consultations confirmed that the capacity of MBT facilities had increased from 15% to 36% (of the MSW collected) between 2018 and 2022. Sludge generated increased from 983,000 tonnes in 2016 to 2.27 million tonnes in 2022. The 2016 sludge generation amounts were obtained from a published study on facility level sludge generation rates carried out by a donor-funded project, while the 2022 amounts were obtained from expert consultation. Published data from ministries and the national statistics agency consistently indicate around 2 million tonnes per year. Arrangements for facility-level sludge data to improve accuracy of subcategory 4B for subsequent BTRs are being considered. Expert consultation also indicated that an estimated 40% of the sludge generated was composted. The 40% sludge composted was in addition to MSW composted in 4A. MSW composted is summarized in the table below:

**Table 37: The Municipal Solid Waste (MSW) Composted (2018-2022)**

| Year | MSW Collected (%) | MSW Composted (%) |
|------|-------------------|-------------------|
| 2018 | 48                | 12                |
| 2019 | 54                | 13.5              |
| 2020 | 60                | 15                |
| 2021 | 66                | 16.5              |
| 2022 | 72                | 18                |

**4C1 Waste incineration:** Waste incineration without energy recovery is considered to result predominantly from Ministry of Health incinerators dedicated to clinical and healthcare waste. This results in carbon dioxide and nitrous oxide as incineration takes place in controlled systems. As per stakeholder consultations undertaken for the first BUR and the Fourth National Communication, incineration of liquid fuels and organic chemicals predominantly takes place in cement kilns and, if data is available, it would be reported under the energy sector. However, initial findings of the national climate MRV component of an on-going donor-funded project indicate that amounts of waste mineral oils are treated thermally (without energy recovery) and that other amounts are landfilled in hazardous waste sites. However, the team was unable to verify the exact practices and amounts at the time of submission of this BTR. Egypt is currently improving the completeness of subcategory 4C1 for subsequent BTRs.

According to available data, an approximate 300 tonnes per day of hazardous clinical waste was generated. Of the amounts generated, only 93 tonnes per day were incinerated due to limitations on the capacity and condition of Ministry of Health incinerators. For the GHGI, the amount of 93 t/d was considered for 2018-2022 as no other data available

**4C2 Open Burning of Waste:** Open burning of small amounts of municipal solid waste takes place in rural areas and occasionally in urban disposal sites. In some cases, under hot weather conditions, spontaneous combustion may occur in deep accumulations which generate methane (usually inside disposal sites). Emissions include carbon dioxide, methane, and nitrous oxide from uncontrolled burning of fractions of municipal solid waste.

Based on expert consultations, a reduction in open-burning of municipal solid waste from 10% to 6% of total MSW generated was considered between 2018 and 2022. The amounts open-burned were considered in the mass balance when entering the amounts disposed in the 2006 IPCC software.

**4D1 Domestic Wastewater Treatment & Discharge:** For the purposes of estimating emissions from the municipal wastewater sector, population income groups are assumed to be 57% rural, 34% urban low-income and 9% urban high-income. The distribution between income groups was obtained from the IPCC defaults for Egypt.

In urban groups, 90% are assumed to be connected to a centralized aerobic treatment plant and 10% use septic systems. For rural groups, 24% are connected to centralized aerobic treatment plants, 46% use latrines, 29.5% use septic systems and the remaining 0.5% discharge water bodies. Data on wastewater collection, treatment, and discharge in urban and rural groups were obtained from the Holding Company for Water and Wastewater as well as the national statistics agency annual bulletin on drinking water and wastewater treatment.

Emissions include methane from conversion of biological oxygen demand (BOD) and nitrous oxide from nitrogen in domestic wastewater according to treatment method and final discharge.

**4D2 Industrial Wastewater Treatment & Discharge:** Wastewater quality discharged into public sewers from industrial facilities is regulated by law in Egypt. To comply with legal requirements, most industrial facilities include some level of wastewater treatment prior to discharge to the public sewer system. While Chemical Oxygen Demand (COD) is one of the wastewater quality parameters regulated by law, data on volumes of wastewater generated, type of treatment used, and level of COD in treated wastewater discharged to the sewer system was not available for preparing this GHGI.

IPCC default values for wastewater generation volumes and COD concentrations according to industry type are used to estimate methane emissions from industrial wastewater treatment and discharge. The activity data used for the estimation is annual production in the relevant industries. Annual production data is available from the national statistics agency (CAPMAS) for all industries. Paper and paperboard annual production values were obtained from the FAO Statistics yearbook on Forest Products. Over the 2018-2022 time series, the following 5 products constitute more than 98% of GHG emissions estimated from category 4D2:

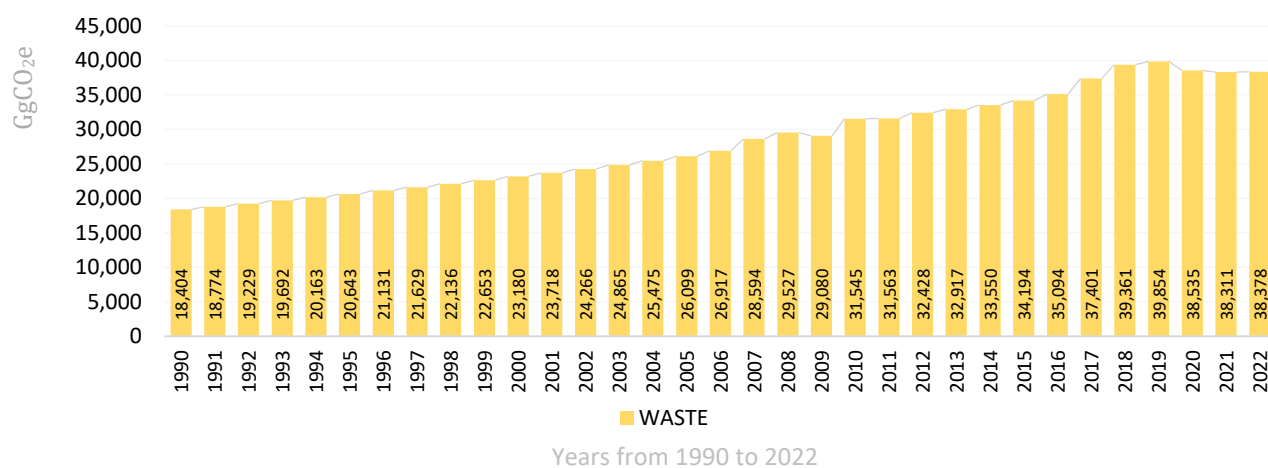
- Pulp and Paper (+72%)
- Organic Chemicals (+10%)
- Vegetables, fruits, juices (+3%)
- Sugar refining (+3%)
- Starch production (+2%)

The 5 products above contribute significantly to the waste sector GHGI as category 4D2 constitutes around 23% of the total waste sector GHGI (as detailed below). Collection of facility level data on COD levels and wastewater volumes for the largest impact industries could be an important area of improvement for future inventories as country/industry-specific wastewater generation and COD are likely to significantly impact the estimated emissions. Emissions include methane from conversion of chemical oxygen demand (COD) in industrial wastewater according to treatment method and final discharge.

## **2.7.2 Waste Sector Emissions Trends**

## Sector Overall Emissions

The trend below indicates a steady increase in waste sector GHGI between 1990 and 2019. Starting at 18,404 Gg CO<sub>2</sub>e in 1990, emissions rose consistently through the 1990s and 2000s, reaching 39,854 Gg CO<sub>2</sub>e in 2019. Between 2020 and 2022, emissions decreased by around 0.4%. The main contributors to the waste sector GHGI variations are waste disposal sites (4A) and industrial WWTD (4D2). Parameters and assumptions related to 4A were validated through expert consultation and likely reflect actual circumstances to a reasonable degree. While parameters and assumptions for 4D2 are based entirely on IPCC defaults and likely require country-specific enhancements.

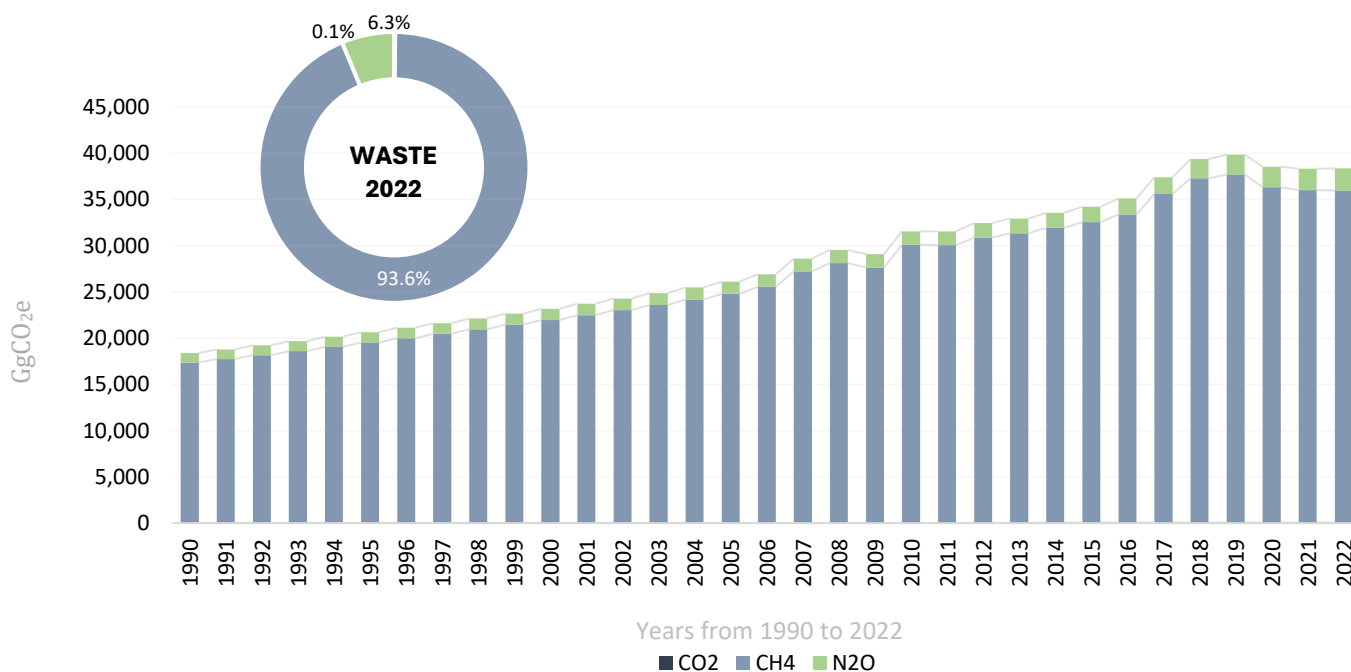


**Figure 42: GHG Emissions from Waste Sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 38: GHG Emissions from Waste Sector over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

| Sector | 1990   | 2000   | 2005   | 2015   | 2016   | 2017   | 2018   | 2019   | 2020   | 2021   | 2022   |
|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Waste  | 18,404 | 23,180 | 26,099 | 34,194 | 35,094 | 37,401 | 39,361 | 39,854 | 38,535 | 38,311 | 38,378 |

## Sector Emissions per Gas



**Figure 43: GHG Emissions from Waste Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

**Table 39: GHG Emissions from Waste Sector by gas over the period 1990 - 2022 (GgCO<sub>2</sub>e)**

| Emissions by Gas (GgCO <sub>2</sub> e) | 1990          | 2000          | 2005          | 2015          | 2016          | 2017          | 2018          | 2019          | 2020          | 2021          | 2022          |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| CO <sub>2</sub>                        | 24.9          | 28.9          | 31.6          | 49.8          | 52.3          | 54.1          | 68.0          | 64.1          | 60.5          | 57.3          | 54.4          |
| CH <sub>4</sub>                        | 17,344.2      | 21,949.0      | 24,751.5      | 32,484.2      | 33,339.6      | 35,548.7      | 37,211.7      | 37,638.1      | 36,247.8      | 35,950.1      | 35,920.8      |
| N <sub>2</sub> O                       | 1,035.1       | 1,202.3       | 1,315.4       | 1,660.0       | 1,702.0       | 1,797.9       | 2,081.0       | 2,151.8       | 2,226.4       | 2,303.2       | 2,402.5       |
| <b>Total (Gg CO<sub>2</sub>e)</b>      | <b>18,404</b> | <b>23,180</b> | <b>26,099</b> | <b>34,194</b> | <b>35,094</b> | <b>37,401</b> | <b>39,361</b> | <b>39,854</b> | <b>38,535</b> | <b>38,311</b> | <b>38,378</b> |

The ratio of the three primary greenhouse gases—CO<sub>2</sub>, CH<sub>4</sub>, and N<sub>2</sub>O—remained relatively consistent over the years. Methane (CH<sub>4</sub>) continued to dominate, representing **94%** of total waste sector emissions, with a contribution of **35,920 Gg CO<sub>2</sub>e** in 2022. This was followed by nitrous oxide (N<sub>2</sub>O) at **6.3%** (2,402 Gg CO<sub>2</sub>e), while carbon dioxide (CO<sub>2</sub>) made up only **0.14%** of the sector's emissions in the same year. These proportions highlight the significant role of methane in the waste sector emissions profile.

## Sector Emissions per Category

In the most recent published GHG inventory prepared for the Waste sector in Egypt (Egypt's first BUR: inventory years 2006-2015), solid waste disposal (4A) and wastewater treatment & discharge (4D) accounted for 97% of waste sector emissions in CO<sub>2</sub>eq. Solid waste disposal was the highest contributor, typically exceeding 55% of waste sector emissions. Domestic wastewater treatment & discharge (4D1) contributed around 17% while industrial

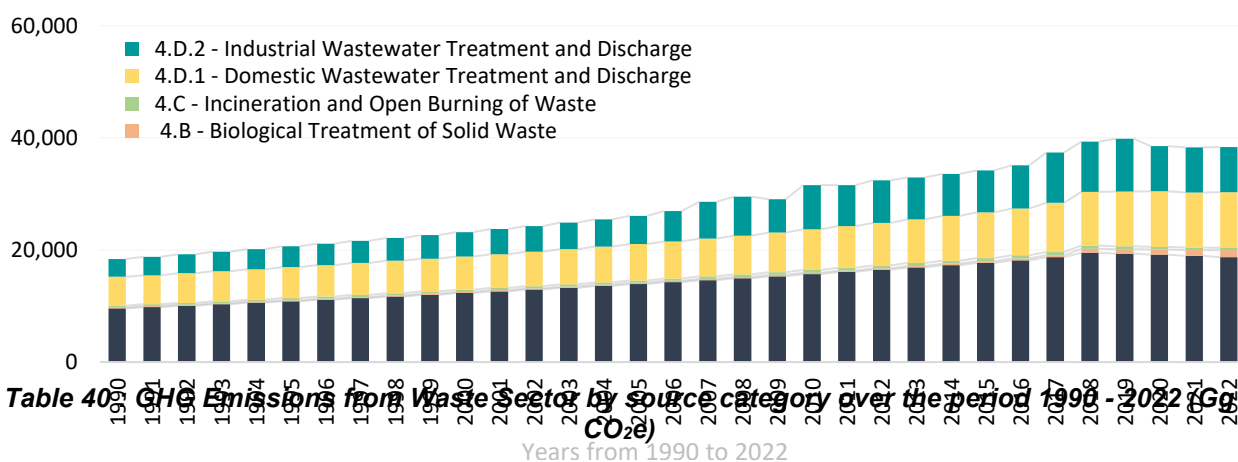
wastewater treatment and discharge (4D2) contributed around 23% for a combined share of over 40% of waste sector GHG emissions. Biological treatment of waste (4B)-composting- emits around 1% while incineration of healthcare/clinical waste in addition to open burning of (municipal) waste (4C) contributes with 2% of emissions in the sector.

In this GHGI for the BTR1, between 2018 and 2022, the relative contributions of sub-categories to the overall waste sector GHGI were relatively constant. Taking 2018 as an example, sub-categorical contributions (in % of total waste sector GHGI, based on CO<sub>2</sub>eq) could be summarized as:

- 4A Waste Disposal Sites (WDS): 49.6%
- 4B Biological Treatment of Waste: 1.77%
- 4C Incineration and open-burning of waste: 1.5%
- 4D Wastewater Treatment and Discharge (WWTD): 47.2%
  - o 4D1 Domestic WWTD: 24.3%
  - o 4D2 Industrial WWTD: 22.9 %

Over the time series 2018-2022, the overall waste sector GHGI (on CO<sub>2</sub>eq basis) decreased by 2.5%. The main contributors to the decrease in waste sector GHGI over the time series were a 4% decrease from 4A (WDS) and a 2.9% decrease from 4D (WWTD). Within 4D (WWTD), 4D1 (Domestic WWTD) increased by 4.2% between 2018 and 2022, while 4D2 (Industrial WWTD) decreased by 10.5%.

The 4% decrease from 4A (WDS) is the result of the increase in domestic waste collection rates and in MBT processing capacity. Combined, these led to a reduction in final amounts disposed in waste disposal sites and an increase in amounts composted (4B). The 10.5% decrease in 4D2 (Industrial WWTD) reflects available data on annual industrial production.



**Figure 44: GHG Emissions from Waste Sector by source category over the period 1990 - 2022 (Gg CO<sub>2</sub>e)**

|   |          |           |           |           |           |           |
|---|----------|-----------|-----------|-----------|-----------|-----------|
| 4.A – Solid waste disposal                | 9,556.50 | 12,308.28 | 13,908.92 | 17,709.95 | 19,509.88 | 18,730.22 |
| 4.B - Biological Treatment of Solid Waste | 148.15   | 190.83    | 216.59    | 281.51    | 696.30    | 1,224.76  |

| Emissions per Cat. (GgCO <sub>2</sub> e)              | 1990             | 2000             | 2005             | 2015             | 2018             | 2022             |
|---|------------------|------------------|------------------|------------------|------------------|------------------|
| 4.C - Incineration and Open Burning of Waste          | 341.89           | 394.55           | 430.63           | 552.43           | 589.17           | 396.56           |
| 4.D.1 - Domestic Wastewater Treatment and Discharge   | 5,169.19         | 5,962.76         | 6,506.66         | 8,192.43         | 9,550.07         | 9,953.73         |
| 4.D.2 - Industrial Wastewater Treatment and Discharge | 3,188.42         | 4,323.73         | 5,035.72         | 7,457.74         | 9,015.29         | 8,072.39         |
| <b>Total (GgCO<sub>2</sub>e)</b>                      | <b>18,404.16</b> | <b>23,180.15</b> | <b>26,098.51</b> | <b>34,194.05</b> | <b>39,360.71</b> | <b>38,377.67</b> |

### 2.7.3 Methodology (Methods, Activity Data, and Emission Factors)

With the exception of the waste disposal sites category, tier 1 methodologies were used for calculation of GHG emissions from waste sector categories due to lack of resources and country-specific data. Tier 2 was used for waste disposal sites as good quality country-specific activity data on current and historical waste disposal was available. The table below presents the details of the methodologies used for each source category.

**Table 41: Methodological tiers for waste sector categories**

| Category                                      | Tier Method Description   | Tier used   |
|---|---|---|
| <b>Solid Waste Disposal Sites</b>             | <b>Tier 1:</b> The estimations of the Tier 1 methods are based on the IPCC FOD method using mainly default activity data and default parameters.  | Tier 2  |
|   | <b>Tier 2:</b> Tier 2 methods use the IPCC FOD method and some default parameters but require good quality country-specific activity data on current and historical waste disposal at SWDS.   | Reasonably good country-specific current and historical data is available               |
| <b>Biological Treatment of Solid Waste</b>    | <b>Tier 1:</b> Tier 1 uses the IPCC default emission factors.   | Tier 1  |
|   | <b>Tier 2:</b> Country-specific emission factors based on representative measurements are used for Tier 2.<br><b>Tier 3:</b> Tier 3 methods would be based on facility or site-specific measurements (on-line or periodic).   | Sufficiently reliable and available country-specific emission factors are not available |
| <b>Incineration and Open Burning of Waste</b> | The <b>Tier 1</b> method is a simple method used when CO <sub>2</sub> emissions from incineration/open burning are not a key category. Data on the amount of waste incinerated/open-burned are necessary.   | Tier 1  |
|   | The <b>Tier 2</b> method is based on country-specific data regarding waste generation, composition and management practices.  | National data on waste generated and waste fractions are available.                     |
| <b>Wastewater Treatment and Discharge</b>     | The <b>Tier 1</b> method applies default values for the emission factor and activity parameters. This method is considered good practice for countries with limited data.   | Tier 1  |
|   | The <b>Tier 2</b> method follows the same method as Tier 1 but allows for incorporation of a country specific emission factor and country specific activity data.<br><br>For a country with good data and advanced methodologies, a country specific method could be applied as a <b>Tier 3</b> method. | Country specific emission factors are not available.                                    |

Entities engaged using tailored questionnaires for data collection and parameter/assumption consultation included:

- Central Agency for Public Mobilization and Statistics (National Statistics Agency)
- Egyptian Environmental Affairs Agency
- Waste Management Regulatory Authority

### **Activity Data**

Sources of activity data used for the preparation of the GHGI inventory sector include:

- CAPMAS (National Statistics Agency)
- Egyptian Environmental Affairs Agency
- Waste management regulatory Authority

### **Emission Factors**

Applicable default emission factors were used in all waste sector categories as defined by the 2006 IPCC GHGI guidelines and built into the 2006 IPCC software.

#### **2.7.4 Recalculations**

The only recalculation to be reported for the Waste sector inventory is the use of AR5 global warming potentials (GWP) replacing the previously used (BUR1 and NC4) AR2 GWPs. As methane (GWP 21 in AR2 compared to GWP 28 in AR5) constitutes more than 90% of waste sector emissions, the recalculation using AR5 GWPs leads to a significant increase in estimated waste sector emissions throughout the time series.

## Chapter 3: Information Necessary to Track Progress Made in the Implementation and Fulfillment of Nationally Determined Contributions under Article 4 of the Paris Agreement

### 3.1 National Circumstances and Institutional Arrangements

As outlined by the MPGs paragraphs 59-62, each Party shall describe its national circumstances relevant to progress made in implementing and achieving its NDC under Article 4 of the Paris Agreement, including: government structure, population profile, geographical profile, economic profile, climate profile, sector-specific details, the impact of national circumstances on GHG emissions over time, and institutional arrangements for monitoring progress in implementing and achieving the NDC under Article 4.

These requirements are comprehensively addressed in Chapter 1 of this report under the following subsections: *1.1 Geophysical Characteristics, 1.2 Climate Profile, 1.3 Socioeconomic Profile, 1.4 Key Mitigation Sectors, 1.5 Effect of National Circumstances on GHG Emissions, and 1.8 Institutional Arrangements.*

### 3.2 Description of a Party's Nationally Determined Contribution under Article 4 of the Paris Agreement (including updates)

Egypt's GHG emission reduction target is a reduction of 37% in the Electricity Sector, 65% in the associated petroleum gases sub-sector within the Oil & Gas Sector, and 7 % in the Transport Sector relative to the BAU emission projections by 2030. The starting year of the NDC is 2015 (reference year) till the end of the year 2030. These targets were submitted to the UNFCCC on 24<sup>th</sup> June 2023 as the second update of Egypt's Nationally Determined Contribution (NDC).

Information on the description of Egypt's NDC is shown in the table below, which constitutes the **CTF Appendix Description of a Party's nationally determined contribution under Article 4 of the Paris Agreement, including updates**, in accordance with Decision 5/CMA.3.

**Table 42: Description of Egypt's NDCs (CTF Appendix)**

| Reporting requirement  | Description   |        |   |  |                     |   |             |        |     |                 |       |     |           |       |    |
|--|---|--------|---|--|---------------------|---|-------------|--------|-----|-----------------|-------|-----|-----------|-------|----|
| Target(s) and description, including target type(s), as applicable                                   | <p>Egypt's NDC has mitigation emission reduction target for the below three sectors relative to the deviation from BAU emission projections by 2030. The sectoral emission reduction targets as a result of implementing mitigation measures are as follows:</p> <table border="1"> <thead> <tr> <th rowspan="2">Sector</th> <th colspan="2">Mitigation emission reductions in 2030 compared to BAU Scenario</th> </tr> <tr> <th>GgCO<sub>2</sub>e</th> <th>%</th> </tr> </thead> <tbody> <tr> <td>Electricity</td> <td>80,520</td> <td>37%</td> </tr> <tr> <td>Oil &amp; Gas (APG)</td> <td>1,682</td> <td>65%</td> </tr> <tr> <td>Transport</td> <td>8,960</td> <td>7%</td> </tr> </tbody> </table> | Sector | Mitigation emission reductions in 2030 compared to BAU Scenario |  | GgCO <sub>2</sub> e | % | Electricity | 80,520 | 37% | Oil & Gas (APG) | 1,682 | 65% | Transport | 8,960 | 7% |
| Sector   | Mitigation emission reductions in 2030 compared to BAU Scenario   |        |   |  |                     |   |             |        |     |                 |       |     |           |       |    |
|  | GgCO <sub>2</sub> e   | %      |   |  |                     |   |             |        |     |                 |       |     |           |       |    |
| Electricity  | 80,520  | 37%    |   |  |                     |   |             |        |     |                 |       |     |           |       |    |
| Oil & Gas (APG)  | 1,682   | 65%    |   |  |                     |   |             |        |     |                 |       |     |           |       |    |
| Transport  | 8,960   | 7%     |   |  |                     |   |             |        |     |                 |       |     |           |       |    |
| Target year(s) or period(s), and whether they are single-year or multi-year target(s), as applicable | Egypt's NDC is a single-year target, with target year of 2030.  |        |   |  |                     |   |             |        |     |                 |       |     |           |       |    |

|  |   |
|--|---|
| Reference point(s), level(s), baseline(s), base year(s) or starting point(s), and their respective value(s), as applicable                               | The reference year for Egypt's GHG emissions is 2015, which is the starting point of the projections. The reference baseline is the BAU between 2015 and 2030. The Business-as-Usual (BAU) projection end year is 2030.   |
| Time frame(s) and/or periods for implementation, as applicable   | The time frame for implementation is between 2020 and 2030. It starts on 16 <sup>th</sup> November 2015 and ends on 31 <sup>st</sup> December 2030.   |
| Scope and coverage, including, as relevant, sectors, categories, activities, sources and sinks, pools and gases, as applicable                           | Egypt's NDC is a sectoral emission reduction target compared to the BAU projection of each of the three sectors by 2030. Key sectors covered under the quantitative targets are (1) Electricity (Power Generation, Transmission, and Distribution), (2) Oil & Gas, and (3) Transport. Policies and measures are reported for the following sectors: Industry, Buildings and Urban Cities, Tourism, and Waste. The Agriculture and Land Use sectors have not been included under the mitigation actions. The greenhouse gases covered are CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O emissions converted to CO <sub>2</sub> equivalents multiplied by their respective global warming potential (GWP). |
| Intention to use cooperative approaches that involve the use of ITMOs under Article 6 towards NDCs under Article 4 of the Paris Agreement, as applicable | Egypt expresses interest for voluntary cooperation in emerging international carbon markets governed by Article 6 of the Paris Agreement.   |
| Any updates or clarifications of previously reported information, as applicable  | Not applicable.   |

### 3.3 Information Necessary to Track Progress Made in Implementing and Achieving Nationally Determined Contributions Under Article 4 of the Paris Agreement

Egypt has made notable advancements towards its Nationally Determined Contributions (NDC) across multiple sectors. In the **electricity sector**, renewable energy integration and rolling out of energy efficiency across the value chain are progressing. The **oil and gas sector** has implemented projects to recover flared associated petroleum gas, contributing to emissions reductions and energy efficiency improvements. Similarly, the **transport sector** is expanding sustainable public transport systems, including electric railways and bus systems using lower-carbon fuels.

#### 3.3.1 Selected Indicators

Table below presents the selected indicators for the Electricity, Oil and Gas (Associated Gases subsector), and Transport sectors with quantitative targets in Egypt's NDC.

*Table 43: Selected Indicators*

| NDC Commitment  | Indicators  |
|---|---|
| Achieve a 37% reduction in GHG emissions from the electricity sector (generation, transmission, and distribution) by 2030.  | Indicator 1: GHG Emission Levels for Electricity Generation, Transmission, and Distribution |
| Recover and utilize associated gases from crude oil fields through 17 implemented projects and 36 additional planned projects by 2030, with a 65% reduction of GHG emissions by 2030 in the associated petroleum gas subsector. | Indicator 2: GHG Emission Levels for Oil and Gas (Associated Gases Subsector)               |
| Achieve 7% reduction in GHG emissions from the transport sector by 2030.  | Indicator 3: GHG Emission Levels for Transport Sector                                       |

#### 3.3.2 Description of Progress by Sector

##### 3.3.2.1 Electricity Sector

According to Egypt's Second Updated NDC, the GHG reduction in the Electricity Sector is as shown in the Table below.

**Table 44: GHG Emission Reductions in the Electricity Sector**

|   |                                  |
|---|----------------------------------|
| Baseline GHG Emissions in 2015 =          | <b>87,694 GgCO<sub>2e</sub></b>  |
| BAU GHG Emissions by 2030 =               | <b>214,740 GgCO<sub>2e</sub></b> |
| Mitigation Target by 2030 =               | <b>80,520 GgCO<sub>2e</sub></b>  |
| GHG reduction % compared to BAU in 2030 = | <b>37%</b>                       |

**NDC Commitment:** Achieve 37% GHG emissions reduction compared to the BAU from the electricity sector (generation, transmission, and distribution) by 2030.

- **Description:** This quantitative target in the NDC aims to lower significantly the overall GHG emissions generated from the electricity sector. This includes emissions across the electricity value chain, starting from electricity generation, which currently relies largely on fossil fuels, then the transmission network that transfers the high-voltage electricity over long distances, and finally, the distribution of electricity through local networks and its consumption by end users.

**Indicator 1: GHG Emission Levels for Electricity Sector.** The GHG Emissions decrease as a result of implementing mitigation measures in the Electricity Generation, Transmission, and Distribution sector reflected under the Mitigation GHG Emissions levels in the reporting period between 2015 till the end of 2022. It is compared to the BAU emission levels of the Electricity Generation, Transmission, and Distribution sectors.

- **Type of Indicator:** quantitative including GHG calculations.

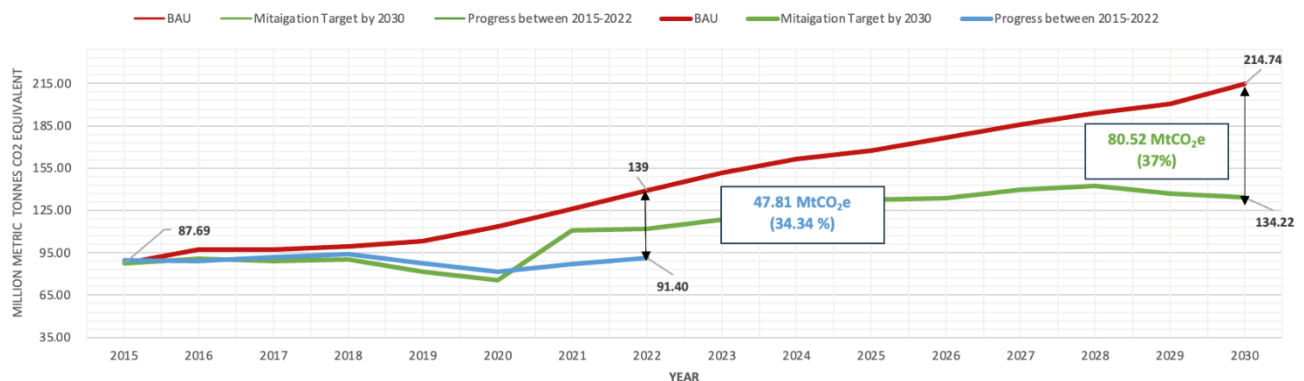
▪ **Progress Summary (2015 - 2022):**

Egypt has achieved remarkable success in transitioning to low carbon pathway in the electricity sector (generation, transmission, and distribution) with a substantial GHG emission reduction of **47,810 GgCO<sub>2</sub>e in 2022**, with a **decrease of 34.34%** in compared to BAU levels for that same year. Egypt's electricity sector is advancing steadily towards the **2030 target of 37%** overall GHG emission reduction.

**Table 45: GHG Emissions Reduction Compared to BAU in Electricity Sector (CTF Table 4)**

| Year  | 2015   | 2016      | 2017      | 2018      | 2019       | 2020       | 2021       | 2022       | Target by 2030 |
|---|--------|-----------|-----------|-----------|------------|------------|------------|------------|----------------|
| BAU GHG Emissions Levels for Electricity Sector (GgCO <sub>2</sub> e)                             | 87,694 | 97,291.62 | 97,317.41 | 99,342.26 | 103,479.11 | 113,414.67 | 125,853.49 | 139,213.87 | <b>214,740</b> |
| <b>Indicator 1:</b> GHG Emission Levels for Electricity Sector (GgCO <sub>2</sub> e) <sup>7</sup> | 87,694 | 88,885.34 | 91,863.12 | 94,204.76 | 87,629.62  | 81,623.72  | 86,837.94  | 91,403.40  | <b>134,220</b> |
| GHG Emission Reduction % Compared to BAU for Electricity Sector                                   | 0%     | 8.64%     | 5.60%     | 5.17%     | 15.32%     | 28.03%     | 31.0%      | 34.34%     | <b>37%</b>     |

**Progress towards the NDC Commitment of the GHG Emissions Reduction in the Electricity (Generation, Transmission, and Distribution) Sector**



**Figure 20: Progress towards the NDC Commitment of GHG Emissions Reduction in the Electricity Sector (including Generation, Transmission, and Distribution)**

This outstanding achievement is primarily due to the adoption of energy-efficient technologies on both supply and demand sides, extensive fossil fuel subsidy removal program, expansion in natural gas as a fuel for power generation (i.e. decreasing share of LFO and HFO), conversion of simple cycle gas turbines to combined cycle power plants, scale-up of energy efficient lighting, abandoning plans to include coal in power generation mix, and increase of renewable energy generation within its power generation mix. It comes as a result of several comprehensive reforms in the energy sector aimed at promoting sustainability and enhancing efficiency. This has been supported by adopting legislations and strategies, such as Electricity Law 87/2015 and the launch of national strategies, primarily Egypt's Integrated Sustainable Energy Strategy (ISES)

<sup>7</sup> Indicator is based on Egypt's national inventory for electricity generation subcategory for reported years 2015 – 2022, including any recalculations.

2035 and Second National Energy Efficiency Action Plan (NEEAP II, 2018/2019 – 2021/2022).

As a result, these measures have significantly reduced fuel consumption for electricity generation and overall electricity consumption. This progress has been achieved despite a growing population and the expansion of development projects, underscoring Egypt's dedication to advancing a more sustainable energy future.

### 3.3.2.2 Oil and Gas Sector

According to Egypt's Second Updated NDC, the GHG reduction in the Oil and Gas (Associated Gases Subsector) is as shown in Table below.

**Table 46: GHG Emission Reductions in Oil and Gas (Associated Gases Subsector)**

|   |                                 |
|---|---------------------------------|
| Baseline GHG Emissions in 2015 =          | <b>2,137 Gg CO<sub>2</sub>e</b> |
| BAU GHG Emissions by 2030 =               | <b>2,575 Gg CO<sub>2</sub>e</b> |
| Mitigation Target by 2030 =               | <b>1,682 Gg CO<sub>2</sub>e</b> |
| GHG reduction % compared to BAU in 2030 = | <b>65%</b>                      |

**NDC Commitment:** Recovery and utilization of associated gases generated from the crude oil fields with 65 % GHG emission reduction by 2030.

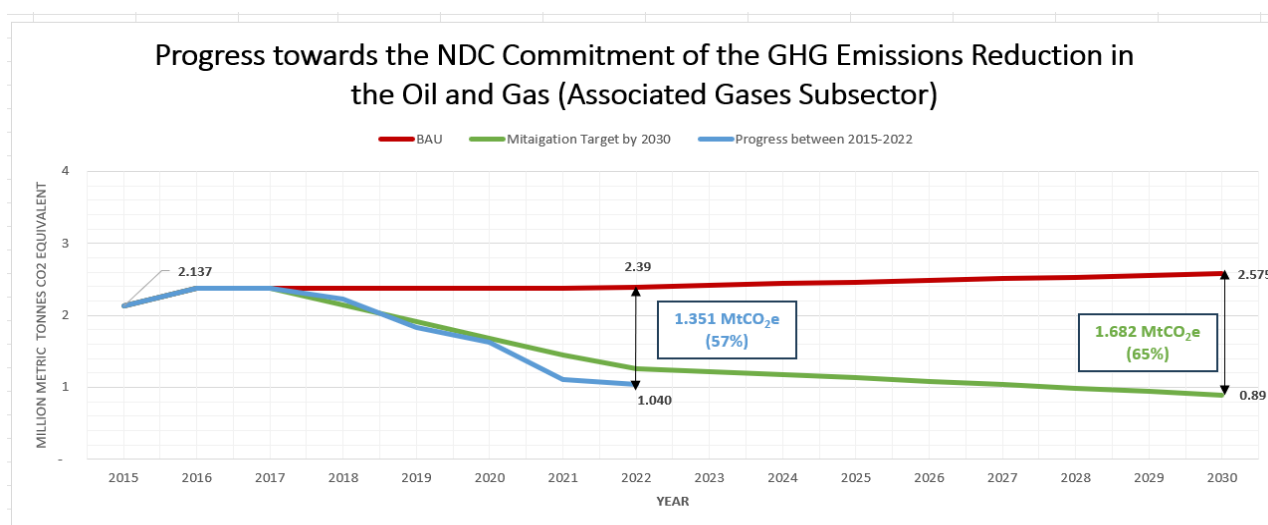
- **Description:** This quantitative target in the NDC focuses on the recovery and utilization of associated gases produced from crude oil fields. The program is part of an ongoing initiative that has already implemented 17 projects, with an additional 36 projects planned for 2030. The goal is to redirect associated gases which would typically be flared and wasted, to inject into natural gas pipeline; on-site electricity generation; or alternatively to gas processing facilities for the production of LPG (liquefied petroleum gas), natural gas, and condensates. This approach aims to significantly reduce GHG emissions from the associated gases subsector.
- **Indicator 2: GHG Emission Levels for Oil & Gas Sector (Associated Gases subsector).** The GHG Emissions decrease are as a result from the recovery of flared associated petroleum gas within the associated gases subsector reflected under the Mitigation GHG Emissions levels in the reporting period between 2015 till end of 2022. It is compared to the BAU emission levels of the associated gases subsector.
- **Type of Indicator:** quantitative including GHG calculations.
- **Progress Summary (2015 - 2022):**

Egypt has made significant progress in the recovery and utilization of flared associated gases produced from crude oil fields. Efforts in the oil and gas sector have resulted in a

cumulative GHG emission reduction of **1,351 Gg CO<sub>2</sub>e in 2022**, with a **decrease of 57% in emissions** compared to BAU levels for that same year. The associated gases subsector of Egypt's Oil & Gas industry is on track to achieve the **2030 target of a 65% overall GHG emission reduction**, with significant progress already made.

**Table 47: GHG Emissions Reduction Compared to BAU in Oil & Gas Sector (CTF Table 4)**

| Year  | 2015  | 2016  | 2017  | 2018  | 2019  | 2020  | 2021  | 2022  | Target by 2030 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|----------------|
| BAU GHG Emissions Levels for Oil & Gas Sector (GgCO <sub>2</sub> e)                                 | 2,137 | 2,371 | 2,371 | 2,371 | 2,370 | 2,370 | 2,370 | 2,391 | <b>2,575</b>   |
| Indicator 2: Mitigation GHG Emission Levels for Oil & Gas Sector (GgCO <sub>2</sub> e) <sup>8</sup> | 2,137 | 2,371 | 2,371 | 2,220 | 1,827 | 1,630 | 1,103 | 1,040 | <b>890</b>     |
| GHG Emission Reduction % compared to BAU for Oil & Gas Sector                                       | 0%    | 0%    | 0%    | 6%    | 23%   | 31%   | 53%   | 57%   | <b>65%</b>     |



**Figure 21: Progress towards the NDC Commitment of GHG Emissions Reduction in the Oil & Gas Sector (Associated Gases Subsector)**

### 3.3.2.3 Transport Sector

According to the Egypt's Second Updated NDC, the GHG reduction in the transport sector is as shown in table below.

<sup>8</sup> This indicator has been calculated in accordance with UNFCCC CDM methodology [AM0009: Recovery and utilization of gas from oil fields that would otherwise be flared or vented --- Version 7.0](#). The emissions from consumption of fossil fuels/electricity for the recovery, pre-treatment, transportation were not calculated. Furthermore, in order to adopt a conservative approach, the emissions reductions resulting from fuel savings to displace diesel by associated gases for on-site electricity generation were also excluded from the calculations.

**Table 48: GHG Emission Reductions in the Transport Sector**

|   |                                   |
|---|-----------------------------------|
| Baseline GHG Emissions in 2015 =          | <b>48,235 Gg CO<sub>2</sub>e</b>  |
| BAU GHG Emissions by 2030 =               | <b>124,360 Gg CO<sub>2</sub>e</b> |
| Mitigation Target by 2030 =               | <b>8,960 Gg CO<sub>2</sub>e</b>   |
| GHG reduction % compared to BAU in 2030 = | <b>7%</b>                         |

**NDC Commitment:** Achieving 7% reduction in GHG emissions from the transport sector by 2030.

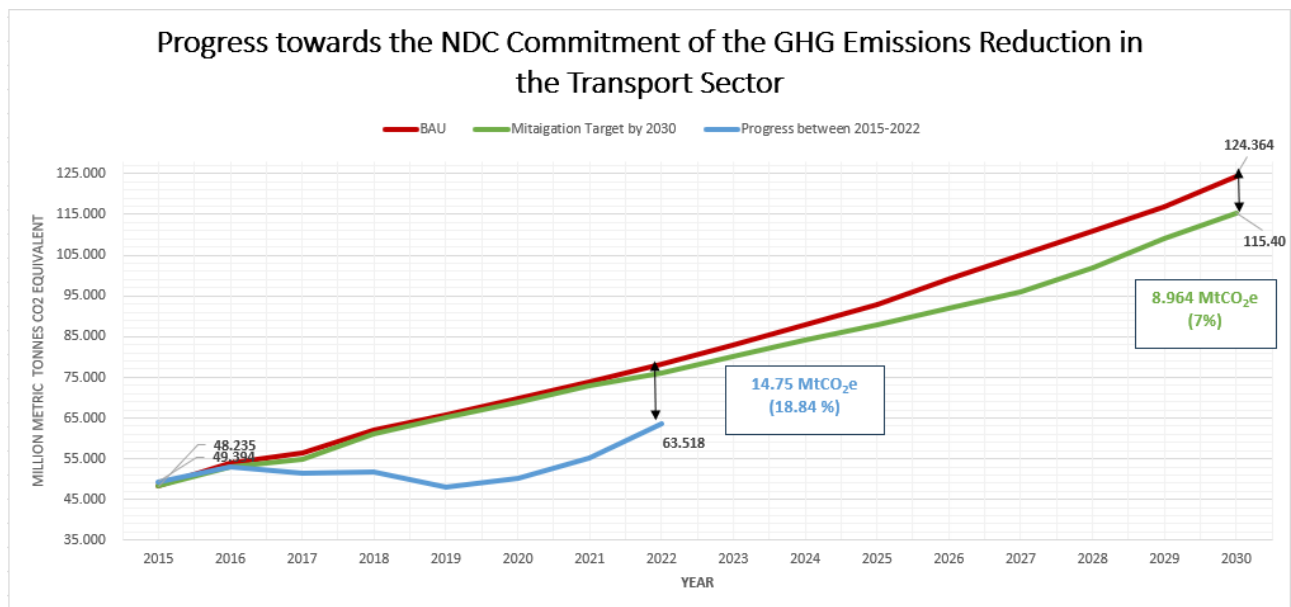
- **Description:** This quantitative target in the NDC aims to lower the overall GHG emissions generated by the transport sector. Since road transport is by far the largest GHGs contributor in the transport sector in Egypt, it is planned to drive low carbon modal shift from private passenger and freight vehicles into mass transit mainly through the execution of metro lines, monorail lines, light rail transit (LRT), upgrading existing tramlines, Bus Rapid Transit (BRT) lines as well as the expansion and upgrading Egypt’s road and using low carbon fuel in domestic aviation. Fossil fuel subsidy removal plays a significant role in reducing consumption and, in turn, emissions from the sector.
- **Indicator 3: Mitigation of GHG Emission Levels for Transport Sector.** The GHG Emission Reductions are a result of implementing mitigation measures in the Transport sector reflected under the Mitigation GHG Emissions levels in the reporting period between 2015 till the end of 2022. It is compared to the BAU emission levels of the Transport sector.
- **Type of Indicator:** quantitative including GHG calculations.

▪ **Progress Summary (2015 -2022):**

Egypt has achieved outstanding success to adopt more sustainable low carbon modes of transport with a substantial **13,200 GgCO<sub>2</sub>e in 2022** with a **decrease of 16.86% of emissions** compared to BAU levels for that same year. This has surpassed the **2030 target of 7%** overall GHG emission reduction. This positive trend was since 2015 and continued till 2022 due to multiple policy interventions, such as energy subsidy reform program, and other influencing factors that led to behavioral changes in road transport.

**Table 49: GHG Emissions Reduction Compared to BAU in Transport Sector (CTF Table 4)**

| Year  | 2015      | 2016      | 2017      | 2018      | 2019      | 2020      | 2021      | 2022      | Target by 2030 |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|----------------|
| BAU GHG Emissions Levels for Transport Sector (GgCO <sub>2</sub> e)                                 | 48,235.00 | 54,000.33 | 56,338.77 | 62,091.10 | 65,790.97 | 69,709.51 | 73,862.69 | 78,264.22 | <b>124,360</b> |
| Indicator 3: Mitigation GHG Emission Levels for Transport Sector (GgCO <sub>2</sub> e) <sup>9</sup> | 49,393.50 | 53,016.87 | 51,527.00 | 51,764.00 | 48,007.00 | 50,106.00 | 55,185.00 | 63,518.00 | <b>115,400</b> |
| GHG Emission Reduction % compared to BAU for Transport Sector                                       | -2.40%    | 1.82%     | 8.542%    | 16.63%    | 27.03%    | 28.127%   | 25.29%    | 18.84%    | <b>7%</b>      |



**Figure 22: Progress towards the NDC Commitment of GHG Emissions Reduction in the Transport Sector**

Since 2016, the government has implemented fuel price increases by phasing out energy subsidies. Additionally, regulations have been introduced to phase out older vehicles by imposing age restrictions on transport and passenger cars. A major step in improving public

<sup>9</sup> Indicator is based on Egypt's national inventory for road transport subcategory for reported years 2015 – 2022, including any recalculations.

transit in Cairo was the opening of the third metro line. According to a 2019 World Bank study, long-term fluctuations in real GDP have influenced traffic patterns through reduced fuel consumption, new car purchases, maintenance intensity, and the retirement of older, fuel-inefficient vehicles. The new metro line led to a reduction of 40 cars per tile, while fuel subsidy cuts removed 44 cars per tile. These policy measures have effectively offset the traffic congestion and air pollution by removing 3 cars for every 2 cars added due to a growing economy.

Since there are no quantitative targets for the remaining mitigation sectors, the relevant policies and measures implemented are reported under section 3.5 and CTF Table 5.

### **3.4 Methodologies and accounting approaches for tracking progress toward implementing and achieving the NDC**

Egypt's NDC has been accounted for based on net GHG emissions and removals in 2030 and the accounting approaches are aligned to the GHG National Inventory. Egypt's national greenhouse gas (GHG) inventory follows the methodologies set out in the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, incorporating updates from the 2019 Refinement to enhance precision and reliability. These guidelines use a tiered approach to estimate emissions and removals, with each tier reflecting a different level of complexity and data specificity. While Tier 1 is the foundation of Egypt's inventory, the country is beginning to adopt Tier 2 approaches where feasible, aiming for greater accuracy and alignment with international standards under the Paris Agreement. Egypt's national GHG inventory uses the GWP values from the IPCC Fifth Assessment Report (AR5), which ensures consistency with international reporting standards.

Furthermore, Egypt has not participated yet in cooperative approaches that involve the use of ITMOs. Egypt plans to report in the future accounting methodologies accordingly when this occurs in the future. As such, Egypt's NDC accounting is consistent with Article 4, paragraphs 13 and 14. Egypt also takes into account, where appropriate, existing methods and guidance under the Convention. Details of the methodologies and accounting approaches to be used to track progress in implementing and achieving the NDC are provided in the table below.

**Table 50: Methodology and Accounting Approaches in NDC Progress Tracking (CTF Table 3)**

| Reporting requirement  | Description or reference to the relevant section of the BTR  |
|--|--|
| <b>For the first NDC under Article 4:<sup>a</sup></b>  |  |
| Accounting approach, including how it is consistent with Article 4, paragraphs 13–14, of the Paris Agreement (para. 71 of the MPGs)  | For its first NDC, Egypt accounted for its anthropogenic GHG emissions and removals using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, incorporating updates from the 2019 Refinement to enhance precision and reliability. While Tier 1 is the foundation of Egypt's inventory, the country is beginning to adopt Tier 2 approaches where feasible, aiming for greater accuracy and alignment with international standards under the Paris Agreement. Egypt's national GHG inventory uses the GWP values from the IPCC Fifth Assessment Report (AR5), which ensures consistency with international reporting standards. Egypt's NDC accounting is consistent with Article 4, paragraphs 13 and 14. Egypt also takes into account, where appropriate, existing methods and guidance under the Convention. |
| <b>For the second and subsequent NDC under Article 4, and optionally for the first NDC under Article 4:<sup>b</sup></b>  |  |
| Information on how the accounting approach used is consistent with paragraphs 13–17 and annex II of decision 4/CMA.1 (para. 72 of the MPGs)  | To be reported for second and subsequent NDC under Article 4.  |
| Explain how the accounting for anthropogenic emissions and removals is in accordance with methodologies and common metrics assessed by the IPCC and in accordance with decision 18/CMA.1 (para. 1(a) of annex II to decision 4/CMA.1)  | To be reported for second and subsequent NDC under Article 4.  |
| Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/CMA.1)  | To be reported for second and subsequent NDC under Article 4.  |
| Explain how overestimation or underestimation has been avoided for any projected emissions and removals used for accounting (para. 2(c) of annex II to decision 4/CMA.1)   | To be reported for second and subsequent NDC under Article 4.  |
| <b>For each NDC under Article 4:<sup>b</sup></b>   |  |
| <b>Accounting for anthropogenic emissions and removals in accordance with methodologies and common metrics assessed by the IPCC and adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement:</b>   |  |
| Each methodology and/or accounting approach used to assess the implementation and achievement of the target(s), as applicable (para. 74(a) of the MPGs)  | Egypt assessed the implementation and achievement of its NDC targets by accounting for its anthropogenic GHG emissions and removals using the 2006 IPCC Guidelines. For the Oil & Gas (associated gases subsector) the mitigation emission reduction was calculated in accordance to UNFCCC CDM methodology AM0009.  |
| Each methodology and/or accounting approach used for the construction of any baseline, to the extent possible (para. 74(b) of the MPGs)  | Data used in quantifying the baseline GHG emissions of the reference year 2015 is based on Egypt's GHG Inventory submitted to the UNFCCC in 2019 under the First BUR. The modelling of the 2030 projections (BAU and target reductions) was based on analysis for Egypt's Low Emission Development Strategy (LEDS) utilizing the LEAP software. For the electricity sector, "Scenario 1B" in the Integrated Sustainable Energy Strategy 2035 was selected as the BAU. For the oil & gas sector, it was assumed that all the generated associated gases from oil wells will continue to be flared in the BAU. For the transport sector, the BAU was based on an average annual growth rate of 6% calculated for the sector's energy consumption during the period between 2006-2015.  |
| If the methodology or accounting approach used for the indicator(s) in Table 1 differs from those used to assess the implementation and achievement of the target, describe each methodology or accounting approach used to generate the information generated for each indicator in Table 4 (para. 74(c) of the MPGs) | Not applicable. The accounting approach for the indicator does not differ from the accounting approach used to assess the implementation and achievement of Egypt's NDC target.  |
| Any conditions and assumptions relevant to the achievement of the NDC under Article 4, as applicable and available (para. 75(i) of the MPGs)   | The achievement of Egypt's NDC is conditional on the provision of adequate, appropriate international finance through highly concessional finance and grants as appropriate. The Egyptian national efforts alone will not be sufficient to fulfill the country's aspirations described in this updated NDC to contribute to the international climate change GHGs reduction targets. Therefore, Article 9 of the Paris Agreement, which states that  |

| Reporting requirement   | Description or reference to the relevant section of the BTR  |
|---|--|
|   | developed parties shall provide support to developing countries, should be enacted.  |
| Key parameters, assumptions, definitions, data sources and models used, as applicable and available (para. 75(a) of the MPGs)   | As Egypt's NDC is based on net GHG emissions and removals in 2030, the accounting approach is aligned with the methodologies in Egypt's GHG National Inventory. Any key parameters, assumptions, definitions, data sources and models used within our GHG National Inventory would also be used to account for Egypt's NDC targets.  |
| IPCC Guidelines used, as applicable and available (para. 75(b) of the MPGs)   | Egypt accounted for its anthropogenic GHG emissions and removals using the 2006 IPCC Guidelines for National Greenhouse Gas Inventories, incorporating updates from the 2019 Refinement.   |
| Report the metrics used, as applicable and available (para. 75(c) of the MPGs)  | Egypt's emissions for CO <sub>2</sub> , CH <sub>4</sub> , and N <sub>2</sub> O emissions will be derived using the 2006 IPCC Guidelines, via the Sectoral approach, and reported as well as CO <sub>2</sub> equivalents multiplied by their respective global warming potential (GWP). The Tier 1 methodology will be used for most emissions estimates. Tier 2 methodology will be used where relevant and depending on the availability of data. The aggregation of GHG emissions and removals will be reported using the 100-year time- horizon GWP values from the IPCC Fifth Assessment Report. |
| For Parties whose NDC cannot be accounted for using methodologies covered by IPCC guidelines, provide information on their own methodology used, including for NDCs, pursuant to Article 4, paragraph 6, of the Paris Agreement, if applicable (para. 1(b) of annex II to decision 4/CMA.1)   | Not applicable. Egypt's NDC will be accounted for using IPCC guidelines.   |
| Provide information on methodologies used to track progress arising from the implementation of policies and measures, as appropriate (para. 1(d) of annex II to decision 4/CMA.1)   | Not applicable. Egypt did not select to use accounting approaches in annex II to decision 4/CMA.1.   |
| <b>Where applicable to its NDC, any sector-, category or activity-specific assumptions, methodologies and approaches consistent with IPCC guidance, taking into account any relevant decision under the Convention, as applicable (para. 75(d) of the MPGs):</b>  |  |
| For Parties that address emissions and subsequent removals from natural disturbances on managed lands, provide detailed information on the approach used and how it is consistent with relevant IPCC guidance, as appropriate, or indicate the relevant section of the national GHG inventory report containing that information (para. 1(e) of annex II to decision 4/CMA.1, para. 75(d)(i) of the MPGs) | Not applicable. Egypt's NDC did not include GHG emissions and removals from natural disturbances.  |
| For Parties that account for emissions and removals from harvested wood products, provide detailed information on which IPCC approach has been used to estimate emissions and removals (para. 1(f) of annex II to decision 4/CMA.1, para. 75(d)(ii) of the MPGs)  | Not applicable. Egypt, at present, has no GHG emissions and removals from harvested wood products.   |
| For Parties that address the effects of age-class structure in forests, provide detailed information on the approach used and how this is consistent with relevant IPCC guidance, as appropriate (para. 1(g) of annex II to decision 4/CMA.1, para. 75(d)(iii) of the MPGs)   | Not applicable.  |
| How the Party has drawn on existing methods and guidance established under the Convention and its related legal instruments, as appropriate, if applicable (para. 1(c) of annex II to decision 4/CMA.1)   | Not applicable.  |
| Any methodologies used to account for mitigation benefits of adaptation actions and/or economic diversification plans (para. 75(e) of the MPGs)   | Not applicable. Egypt's NDC did not account for the mitigation benefits of adaptation actions and/or economic diversification plans.   |
| Describe how double counting of net GHG emission reductions has been avoided, including in accordance with guidance developed related to Article 6 if relevant (para. 76(d) of the MPGs)  | Egypt has not yet in cooperative approaches that involve the use of internationally transferred mitigation outcomes (ITMOs) under Article 6. When this occurs, it will be reported accordingly.  |
| Any other methodologies related to the NDC under Article 4 (para. 75(h) of the MPGs)  | Not applicable.  |

| Reporting requirement  | Description or reference to the relevant section of the BTR   |
|--|---|
| <b>Ensuring methodological consistency, including on:</b>  |   |
| Explain how consistency has been maintained in scope and coverage, definitions, data sources, metrics, assumptions, and methodological approaches, including on baselines, between the communication and implementation of NDCs (para. 2(a) of annex II to decision 4/CMA.1)   | Not applicable. Egypt did not select to use accounting approaches in annex II to decision 4/CMA.1.  |
| Explain how consistency has been maintained between any GHG data and estimation methodologies used for accounting and the Party's GHG inventory, pursuant to Article 13, paragraph 7(a), of the Paris Agreement, if applicable (para. 2(b) of annex II to decision 4/CMA.1) and explain methodological inconsistencies with the Party's most recent national inventory report, if applicable (para. 76(c) of the MPGs) | As Egypt's NDC is based on net GHG emissions and removals in 2030, the methodologies used for accounting will be equivalent to, and therefore consistent with, the methodologies in Egypt's GHG National Inventory. |
| <b>For Parties that apply technical changes to update reference points, reference levels or projections, the changes should reflect either of the following (para. 2(d) of annex II to decision 4/CMA.1):</b>  |   |
| Explain how any methodological changes and technical updates made during the implementation of their NDC were transparently reported (para. 2(e) of annex II to decision 4/CMA.1)  | Not applicable. Egypt did not select to use accounting approaches in annex II to decision 4/CMA.1.  |
| <b>Striving to include all categories of anthropogenic emissions or removals in the NDC and, once a source, sink or activity is included, continuing to include it (para. 12 (c) of decision 4/CMA.1 and para. 3 of annex II to decision 4/CMA.1):</b>   |   |
| Explain how all categories of anthropogenic emissions and removals corresponding to their NDC were accounted for (para. 3(a) of annex II to decision 4/CMA.1)  | Not applicable. Egypt did not select to use accounting approaches in annex II to decision 4/CMA.1.  |
| Explain how the Party is striving to include all categories of anthropogenic emissions and removals in its NDC, and, once a source, sink or activity is included, continue to include it (para. 3(b) of annex II to decision 4/CMA.1)  |   |
| Explain why any categories of anthropogenic emissions or removals are excluded (para. 12 (c) of decision 4/CMA.1 and para. 4 of annex II to decision 4/CMA.1)  |   |
| <b>Each Party that participates in cooperative approaches that involve the use of ITMOs towards an NDC under Article 4, or authorizes the use of mitigation outcomes for international mitigation purposes other than achievement of its NDC</b>   |   |
| Provide information on any methodologies associated with any cooperative approaches that involve the use of ITMOs towards an NDC under Article 4 (para. 75(f) of the MPGs)   | Egypt has not participated yet in cooperative approaches that involve the use of internationally transferred mitigation outcomes (ITMOs) under Article 6. When this occurs, it will be reported accordingly.        |

### 3.5 Mitigation Policies, and Measures, Actions, and Plans, with Co-benefits resulting from Adaptation Actions and Economic Diversification Plans

Egypt's NDC is aligned with Egypt's developmental and climate change policies, including Sustainable Development Strategy: Egypt's Vision 2030, the emerging Long Term Low Emission Development Strategy 2050 (LT-LEDS), the National Climate Change Strategy 2050 (NCCS), National Strategy for Disaster Risk Reduction 2030 and the National Strategy for Adaptation to Climate Change. In addition to sectoral strategies, such as: Integrated Sustainable Energy Strategy 2035, National Energy Efficiency Action Plan II (2018 – 2022), National Water Resources Plan (2017- 2037), Integrated Solid Waste Management Strategy, and Sustainable Agricultural Development Strategy towards 2030 (SADS 2030), and the Egyptian Petroleum Sector Energy Efficiency Strategy 2022-2035.

The mitigation policies and measures encompass activities within the following key sectors: electricity, oil & gas, transport, industry, buildings and urban cities, tourism, and waste. The following section provides a summary of the mitigation policies and measures that have been implemented, adopted, or planned for implementation including with co-benefits (including any relevant adaptation actions) and economic diversification plans.

The progress in several of these policies and measures indicated in the NDC will be elaborated on in the subsequent sections and CTF Table 5 in the Annex.

#### 3.5.1 Electricity Sector

This section describes the policies and measures in the electricity sector indicated in the NDC with the progress made from 2015 till 2022.

**Table 51: Mitigation Policies and Measures in Electricity Sector**

| Policies and Measures   | Status  |
|---|---------|
| <b>A] Electricity Sector</b>  |         |
| <b>PAM A.1:</b> Gradual removal of electricity subsidies under national economic reform program   | Adopted |
| <b>PAM A.2:</b> Installing additional renewable energy (RE) capacities to increase electricity generation contribution to be 42% of generation mix by 2030  | Adopted |
| <b>PAM A.3:</b> Improve energy efficiency in electricity generation by maintaining, upgrading, and replacing obsolete power plants.   | Adopted |
| <b>PAM A.4:</b> Activation of the role of electricity distribution companies in achieving energy efficiency improvements and promotion of large-scale and small-scale decentralized renewable energy systems for subscribers by implementing Egypt's Sustainable Energy Action Plans required by the Electricity Law 87/2015. | Adopted |
| <b>PAM A.5:</b> Improve and upgrade the transmission and distribution networks including extra high voltage substations, control centers, and smart grids.  | Adopted |

**PAM A.1:** Gradual removal of electricity subsidies under national economic reform program

- **Description:** The Government of Egypt launched a comprehensive energy policy reform programme that included energy subsidy phase-out and comprehensive reforms for electricity and oil & gas sectors. Prior to this programme, energy subsidies constituted 22% of total government expenditure and 6% of the country's GDP in 2012/13.<sup>10</sup> Between 2014 and FY2017/18, energy subsidies dropped by nearly half to 3.4 percent of Egypt's total GDP and comprised of only 0.3 percent of total GDP in FY2019/2020.<sup>11</sup>
- **Progress Summary (2015 – 2022):** This policy and measure (PAM) was initially a five-year plan to phase out internal subsidies in the electricity sector that was officially endorsed as per the Prime Minister's Decree No. 1257. The aim was to reflect actual production costs in electricity tariffs while safeguarding vulnerable segments of the population through targeted support. Steps were taken to implement a comprehensive five-year subsidy reform initiative, which includes annual tariff increases for most user segments on 1 July each year, that was extended due to multiple economic crises to be completed by FY2024/2025.

By 2021/2022, significant strides had been made in reducing subsidies, with most consumer categories approaching cost-reflective electricity pricing. The government maintained its focus on improving energy efficiency and diversifying the energy mix, including solar and wind projects.

**PAM A.2:** Installing additional renewable energy (RE) capacities to increase electricity generation contribution to be 42% of generation mix by 2030.

- **Description:** This PAM aims to increase the share of renewable energy sources in the generation mix to 42% by 2030. Achieving this involves accelerating the expansion of on-grid renewable energy to reduce electricity generation from fossil fuel power plants, including replacing inefficient thermal power plants with renewable energy capacities. This PAM is aligned with the renewable energy sources identified in Egypt's Integrated Sustainable Energy Strategy (ISES 2035), which includes wind, solar, hydropower, and biomass. Nevertheless, Egypt is exploring additional clean energy options beyond these sources as part of its commitment to diversifying its energy portfolio and to ensure the achievement of its emission reduction target in the electricity sector.

<sup>10</sup> Financial Statements of the State's General Budget for FY 2017/18, Ministry of Finance, Egypt and Breisinger et al. (2019). Energy subsidy reform for growth and equity in Egypt: The approach matters. Energy Policy 129, pp 661-671.

<sup>11</sup> Developing Human Capital in Egypt through Energy Subsidy Reforms: A Case Study. World Bank and Baseera, April 2021.

- **Progress Summary (2015 – 2022):** Investments in renewable energy in Egypt have been encouraged by the government through multiple policy measures regulated under Renewable Energy Law and other supporting legislations. As a result, according to the annual report of Egyptian Electricity Holding Company for FY 2022/2023, the total installed capacity of wind and solar power plants reached 3,308 MW in FY 2022/2023, marking a remarkable 273% increase from FY 2015/2016, when it was just 887 MW. The total renewable energy capacity, including hydropower, reached 6,140 MW in the same period. Key renewable energy accomplishments include the launch of the Benban Solar Park (totaling 1,465 MW), Assiut Hydropower Plant (32 MW), Kom Ombo Solar PV Plant (26 MW), and Gabal El-Zeit Wind Power Plant (580 MW).

Moreover, Egypt's Energy Strategy is currently being updated until 2040 to align with global advancements in renewable energy technologies, energy storage developments, and the emerging shift towards hydrogen. As part of this transition, coal will be removed from the energy mix and replaced with renewable energy under the BOO scheme. In this context, one of the most significant coal power plant projects that was canceled is the 6,000 MW Hamrawein coal-fired power plant, which was planned for construction along the Red Sea coast.

**Table 52: Renewable Energy Share in Electricity Generation (Source: EEHC Annual Reports FY 2015/2016 – 2022/2023)<sup>12</sup>**

| Calendar Year                                 | 2015         | 2016         | 2017         | 2018         | 2019          | 2020          | 2021          | 2022          |
|---|--------------|--------------|--------------|--------------|---------------|---------------|---------------|---------------|
| Fiscal Year                                   | 2015/2016    | 2016/2017    | 2017/2018    | 2018/2019    | 2019/2020     | 2020/2021     | 2021/2022     | 2022/2023     |
| Installed hydropower capacities (MW)          | 2,800        | 2,800        | 2,832        | 2,832        | 2,832         | 2,832         | 2,832         | 2,832         |
| Installed wind and solar capacities (MW)      | 887          | 887          | 1,157        | 2,247        | 3,016         | 3,016         | 3,264         | 3,308         |
| <b>Total</b>                                  | <b>3,687</b> | <b>3,687</b> | <b>3,989</b> | <b>5,079</b> | <b>5,848</b>  | <b>5,848</b>  | <b>6,096</b>  | <b>6,140</b>  |
| Electricity Generated from RE Installed (GWh) | 15,597       | 15,630       | 15,770.35    | 17,664       | 23,701        | 24,971        | 25,183        | 26,100        |
| Total Electricity Generation (GWh)            | 186,320      | 189,550      | 196,760      | 199,843      | 197,357       | 204,794       | 214,220       | 216,252       |
| <b>RE Share in Electricity Generation (%)</b> | <b>8.37%</b> | <b>8.23%</b> | <b>8.02%</b> | <b>8.84%</b> | <b>12.01%</b> | <b>12.19%</b> | <b>11.76%</b> | <b>12.07%</b> |

Renewable energy accounted for 12.07% of Egypt's electricity generation in 2022, indicating slow progress toward the target of 42% by 2030. While this represents a notable increase

<sup>12</sup> The original data from EEHC has been reported as fiscal years. It has been assumed that calendar years are equivalent to fiscal years (such as: calendar year 2015 is sourced from FY 2015/2016). Source: [http://www.moe.gov.eg/english\\_new/report.aspx](http://www.moe.gov.eg/english_new/report.aspx)

in RE capacity and demonstrates Egypt's commitment to strengthening its renewable energy sector and meeting its NDC targets, the path forward is not without challenges. Key obstacles include financial and technological barriers, particularly the devaluation of the Egyptian Pound and availability of foreign currency, which directly impacts the initial capital costs of imported renewable energy equipment. Moreover, integrating renewable energy sources like solar and wind into the existing grid infrastructure presents challenges. Ensuring grid stability and reliability while accommodating the variability of renewable energy generation is technically demanding. Additionally, developing the required infrastructure, such as transmission lines and storage facilities, is crucial to support renewable energy generation. However, the unavailability of sufficient finance to expand the grid to be able to accommodate the required renewable energy capacity is hindering the progress of implementation.

**PAM A.3:** Improve energy efficiency in electricity generation by maintaining, upgrading, and replacing obsolete power plants. This includes conversion of simple cycle gas turbines to combined cycle power plants, installation of supercritical steam units, and other measures.

- **Description:** This PAM focuses on enhancing the efficiency of electricity generation processes through regular maintenance and upgrade of current power generation facilities. Additionally, it emphasizes the need to phase out outdated and inefficient facilities to transition toward more efficient generation technologies. Such replacement with newer and cleaner technologies leads to higher energy production with reduced environmental impact and lower GHG emissions and other pollutants, ensuring that electricity is generated with minimal waste and maximum efficiency, contributing to a more sustainable energy future.

**Progress Summary (2015 – 2022):** In recent years, Egypt has made a notable progress in enhancing energy efficiency within the electricity sector, a critical step towards sustainable development. The Specific Fuel Consumption Rate (SFC) refers to the amount of fossil fuel consumed by on-grid power plants for each unit of electricity generated, expressed in grams per kilowatt-hour (gm/kWh). A lower SFC Rate signifies more efficient use of fossil fuels, leading to lower greenhouse gas emissions, which is essential for mitigating climate change.

Data from 2015 to 2022 illustrates a consistent decrease in fossil fuel consumption at power generation, highlighting the country's commitment to optimizing energy use and reducing environmental impact. In 2015/2016, energy consumption was recorded at 212.4 gm/kWh, indicating that there is room for improvement. This figure decreased to 210 gm/kWh in 2016/2017, signaling the start of a positive trend that continued and ultimately reached an impressive 176.3 gm/kWh in 2022/2023. This reduction represents about 17% decrease compared to the 2015/2016 levels.

From 2014 to 2020, 28,229 MW of new power generation capacities were added, among which 51 % (14,400 MW) came from three Mega power projects where highly efficient combined cycle power plants were introduced. In addition, simple cycle

power plants were converted into combined power plants which have a capacity of 1,850 MW (Ministry of Electricity and Renewable Energy (MoERE), 2022).

This data highlights Egypt's strong dedication to optimizing energy usage, resulting in a more sustainable and efficient electricity sector that not only meets growing demand but also contributes meaningfully to broader environmental goals.

**Table 53: Specific Fuel Consumption Rate of Electricity Power Plants (gm/kWh)**

| Calendar Year   | 2015      | 2016      | 2017      | 2018      | 2019      | 2020      | 2021      | 2022      |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Fiscal Year   | 2015/2016 | 2016/2017 | 2017/2018 | 2018/2019 | 2019/2020 | 2020/2021 | 2021/2022 | 2022/2023 |
| Specific Fuel Consumption Rate of Electricity Power Plants (gm/kWh) <sup>13</sup> | 212.4     | 210       | 206.3     | 191.1     | 185.2     | 180.4     | 180.8     | 176.3     |

**PAM A.4:** Activation of the role of electricity distribution companies in achieving energy efficiency improvements and promotion of large-scale and small-scale decentralized renewable energy systems for subscribers by implementing Egypt's Sustainable Energy Action Plans required by the Electricity Law 87/2015.

- **Description:** Electricity distribution companies play a crucial role in enhancing energy efficiency and promoting both large and small-scale decentralized renewable energy systems for their subscribers. This involvement is facilitated through the implementation of Sustainable Energy Action Plans mandated by Electricity Law 87/2015. These plans are designed to guide distribution companies in identifying and implementing strategies that include awareness raising, energy efficiency improvements, and promotion of renewable energy with end-users.

<sup>13</sup> Source: EEHC Annual Reports, [http://www.moee.gov.eg/english\\_new/report.aspx](http://www.moee.gov.eg/english_new/report.aspx) and input from MoERE.

- **Progress Summary (2015 – 2022):** National statistics indicate a significant rise in the number of clean energy generation licenses issued (i.e. renewable electricity generation and cogeneration/tri-generation), with 2018 marking a notable peak of 37 licenses granted, contributing to a total of 64 licenses overall. This trend reflects the growing adoption of clean energy initiatives and strong regulatory support for licensing in the sector over the past eight years. The overall increase signifies a substantial transformation in the licensing landscape, highlighting increased activity and investment in the clean energy market.

**Table 54: Number of generation licenses issued from EgyptERA for clean electricity (Source: MoERE, 2024)<sup>14</sup>**

| Year   | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|--|------|------|------|------|------|------|------|------|
| Number of generation licenses issued from EgyptERA for clean electricity | 3    | 1    | 0    | 37   | 4    | 3    | 4    | 12   |

For electricity savings, Egypt has launched a variety of energy efficiency initiatives mentioned in Egypt’s National Energy Efficiency Action Plan (NEEAP II) that spanned the period from 2018/2019 to 2021/2022. As highlighted in Egypt’s First Energy Efficiency Report published in 2022, an assessment of the measures implemented during the NEEAP II period revealed significant progress in reducing GHG emissions, which demonstrated both short-term economic feasibility and long-term sustainability. The evaluation quantified electricity saving and GHG emission reduction as listed in the Table below. Collectively, these measures achieved an impressive total of 63,162,380 MWh electricity savings and 29,688,959 tCO<sub>2</sub> emission reduction during the period between 2018/2019 – 2021/2022.

<sup>14</sup> Data provided by Ministry of Electricity and Renewable Energy (MoERE) in November 2024.

**Table 55: Electricity savings achieved by sectors on the demand side (Source: Egypt's First Energy Efficiency Report, 2022)**

| # | Measure   | Description  | Indicators                          | 2018       | 2019       | 2020       | 2021       | Total<br>(4 years) |
|---|---|--|-------------------------------------|------------|------------|------------|------------|--------------------|
|   |   |  |                                     | 2018/2019  | 2019/2020  | 2020/2021  | 2021/2022  |                    |
| 1 | Activation of the role of Electricity Distribution Companies (EDCs) | <ul style="list-style-type: none"> <li>3 EDCs installed Off-grid PVs (replacing diesel generators), isolated PY plants (replacing grid power), and PYs on EDCs' buildings.</li> <li>EDCs installed 156,350 sets of low loss transformers.</li> </ul> | Electricity savings (MWh/year)      | 789,899    | 789,899    | 789,899    | 789,899    | <b>3,159,596</b>   |
|   |   |  | GHG emission reductions (tCO2/year) | 410,811    | 410,811    | 410,811    | 410,811    | <b>1,643,245</b>   |
| 2 | Introduction of LEDs in residential and building sectors            | <ul style="list-style-type: none"> <li>EDCs distributed 156 million LED lamps<sup>15</sup> in residential and other buildings.</li> </ul>  | Electricity savings (MWh/year)      | 13,831,550 | 13,831,550 | 13,831,550 | 13,831,550 | <b>55,326,201</b>  |
|   |   |  | GHG emission reductions (tCO2/year) | 6,340,599  | 6,340,599  | 6,340,599  | 6,340,599  | <b>25,362,397</b>  |
| 3 | Improving energy efficiency of public street lighting               | <ul style="list-style-type: none"> <li>EEHC, together with municipalities, replaced over 4 million street luminaires with efficient ones.</li> <li>NUCA introduced a street lighting PV system.</li> </ul>   | Electricity savings (MWh/year)      | 234        | 573        | 1,841,582  | 2,608,339  | <b>4,450,728</b>   |
|   |   |  | GHG emission reductions (tCO2/year) | 134        | 329        | 1,056,658  | 1,496,606  | <b>2,553,727</b>   |
| 4 | PV Installation under FIT and net metering systems                  | <ul style="list-style-type: none"> <li>26,240 MWh/year PV system was introduced under the FIT scheme.</li> <li>30,224 MWh/year PV system was introduced under the net metering system.</li> </ul>  | Electricity savings (MWh/year)      | 56,464     | 56,464     | 56,464     | 56,464     | <b>225,855</b>     |
|   |   |  | GHG emission reductions (tCO2/year) | 32,398     | 32,398     | 32,398     | 32,398     | <b>129,590</b>     |

<sup>15</sup> Source: JCEE Project "Development of Four (4) Energy Efficiency Action Plans & Quantification of GHG Mitigation Potential of Nine (9) EE Measures Under the NEEAP II", February 2023. Re-calculation for LED lamps electricity savings estimates in Egypt's 1<sup>st</sup> Energy Efficiency Report.

**PAM A.5:** Improve and upgrade the transmission and distribution networks including extra high voltage substations, control centers, and smart grids.

- **Description:** This PAM aims to enhance the infrastructure and technology necessary for efficiently delivering electricity from generation sources to end users by updating both transmission and distribution (T&D) systems and improve their reliability, efficiency, and capacity to accommodate growing demand. Upgrading transmission networks also involves enhancing extra high-voltage substations, which are critical for managing large volumes of electricity over long distances while minimizing losses. Additionally, the policy highlights the importance of modern control centers, which serve as the central hub for electricity management. It also incorporates smart grid technologies, which would enhance the grid's ability to operate more adaptively and efficiently, improve demand response capabilities, and facilitates the integration of renewable energy sources, such as solar and wind energy. This modernized framework not only increases operational efficiency but also improves overall stability and resilience of the national electricity grid allowing for better integration of renewable energy sources.
- **Progress Summary (2015 – 2022):** Egypt's national electricity grid has experienced substantial improvements, particularly characterized by a notable reduction in transmission and distribution (T&D) losses<sup>16</sup>. In 2016, T&D losses were recorded at 17.6%, highlighting some initial operational challenges and signaling some underlying inefficiencies. This trend continued, peaking at 22.6% in 2020, reflecting serious obstacles in the grid's transmission and distribution processes. However, a positive shift occurred in the following years. In 2021, T&D losses fell to 21.2%, and improvement continued in 2022, with losses recorded at 19.4%. This significant reduction demonstrates Egypt's effective measures to enhance grid efficiency and the country's commitment to sustainable energy practices.

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<sup>16</sup> This relates to the losses that occur in transmission of electricity between the sources of supply and points of distribution, including non-technical losses such as theft or metering inaccuracies. Implementing electricity savings on the transmission and distribution networks reduces these T&D losses and GHG emissions.

**Table 56: Percentage of Transmission & Distribution Losses**

| Year                         | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|------------------------------|------|------|------|------|------|------|------|------|
| Percentage of T&D Losses (%) | -    | 17.6 | 17.7 | 21.7 | 22.5 | 22.6 | 21.2 | 19.4 |

The co-benefits and economic diversification from the mitigation policies and measures in the Electricity Sector are summarized in Table below.

**Table 57: Co-benefits and Economic Diversification in the Electricity Sector**

| A] Electricity Sector   |
|---|
| <p><b><u>Economic Diversification:</u></b> Egypt is a major gas producer in the MENA region and is reliant on hydrocarbon electricity generation. In Egypt’s Integrated Energy Strategy (ISES) 2035, it is planned to diversify energy sources through the expansion in renewable energy, energy efficiency, and other clean sources. This would optimize electricity, reduce electricity production costs and boost the national economy.</p>                  |
| <p><b><u>Co-Benefits:</u></b></p> <ul style="list-style-type: none"> <li>• Reduced local air pollution from fossil fuel combustion.</li> <li>• Conservation of natural resources.</li> <li>• Lower carbon emissions from cleaner energy sources help mitigate the effects of climate change on ecosystems and biodiversity.</li> <li>• Local job creation.</li> <li>• Lower burden on national economy and foreign currency reserves to import fuel.</li> </ul> |

### 3.5.2 Oil and Gas Sector

This section describes the policies and measures in the oil and gas sector indicated in the NDC with the progress made from 2015 till 2022.

**Table 58: Mitigation Policies and Measures in Oil and Gas Sector**

| Policies and Measures  | Status  |
|--|---------|
| <b>B] Oil and Gas Sector</b>   |         |
| <b>PAM B.1:</b> Gradual removal of petroleum products subsidies under national economic reform program.  | Adopted |
| <b>PAM B.2:</b> Recover and utilize associated gases from crude oil fields through 17 implemented projects and 36 additional planned projects by 2030.   | Adopted |
| <b>PAM B.3:</b> Expand natural gas pipelines to serve 180 additional villages, reaching 476,000 residents by 2030.   | Adopted |
| <b>PAM B.4:</b> Implement energy efficiency measures to reduce 5% of the energy consumption sector, with audits in two refineries, one petrochemical plant, and two upstream oil and gas facilities. | Adopted |
| <b>PAM B.5:</b> Produce 205,000 cubic meters of medium-density wood panels (MDF) annually from 250,000 tons of rice straw in Idku city.  | Adopted |

**PAM B.1:** Gradual removal of petroleum products subsidies under national economic reform program.

- **Description:** The subsidies of petroleum products constitute an essential part of total subsidies in Egypt's state budget. Petroleum products are primarily gasoline, diesel, and LPG, which have traditionally been the most heavily subsidized fuels in Egypt. The Government of Egypt implemented a phased program to remove subsidies on petroleum products as part of broader economic reform agenda, which included measures to reduce the fiscal deficit, improve resource allocation, and enhance the efficiency of energy consumption.
- **Progress Summary (2015 – 2022):** The share of total subsidies of petroleum products has been declining with reference to 80% in 2014. The government began reducing subsidies on petroleum products, resulting in periodic increases in fuel prices. The Egyptian pound was floated in November 2016, leading to a sharp depreciation of the currency and increased costs of energy imports which accelerated the need to reduce subsidies. Fuel prices were adjusted multiple times, aligning more closely with international market rates. The government introduced social protection measures, such as cash transfer programs, to mitigate the impact of higher fuel costs on low-income households. By 2019, subsidies for several petroleum products were significantly reduced, with some items sold at or near cost-recovery prices.

The fuel pricing indexation mechanism was first implemented in June 2018 within the framework of the \$12 billion IMF loan agreement. This quarterly automatic fuel pricing mechanism was introduced to link domestic fuel prices to global oil prices, exchange rates, and other cost factors. This mechanism ensured transparency and avoided abrupt price shocks, as adjustments were capped at 10% per quarter.

Subsidies for petroleum products decreased by 46.8% in FY 2020/21 and by 34.7% in FY 2021/22 (MoP, 2023). This decline was partly attributed to the stability of exchange rates, which averaged EGP 15.78 and EGP 16.51 per US dollar during FYs 2020/21 and 2021/22, respectively. The COVID-19 pandemic briefly delayed some reforms as global oil prices dropped and economic recovery became a priority. Moreover, in FY 2022/23, subsidies for petroleum products increased significantly due to a sharp rise in global petroleum prices and currency fluctuations, highlighting the challenges of external market dependencies.

**PAM B.2** Recovery and utilization of associated gases generated from the crude oil fields with 65 % GHG emission reduction by 2030.

- **Description:** This measure in the NDC focuses on the recovery and utilization of associated gases produced from crude oil fields. The program is part of an ongoing

initiative that has already implemented 17 projects, with an additional 36 projects planned through 2030. The goal is to redirect associated gases which would typically be flared and wasted, to inject into natural gas pipeline; on-site electricity generation; or alternatively to gas processing facilities for the production of LPG (liquefied petroleum gas), natural gas, and condensates. This approach aims to significantly reduce GHG emissions from the associated gases subsector.

- **Progress Summary (2015 – 2022):** Between 2018 and 2022, Egypt made significant progress in implementing gas recovery and utilization projects. Over this period, a total of 23 projects were completed, showcasing a steady and consistent effort to utilize associated petroleum gases (APG) for sustainable energy. From 2018 to 2020, four projects were completed each year, adding up to 12 projects by the end of 2020. This momentum continued with the completion of eight additional projects in 2021 and three more in 2022. These efforts underscore Egypt’s commitment to reducing greenhouse gas emissions and enhancing energy sustainability.

**Table 59: Number of gas recovery and utilization projects completed (Source: MoPMR, 2024<sup>17</sup>)**

| Year   | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 |
|--|------|------|------|------|------|------|------|------|
| <b>Number of gas recovery and utilization projects</b> | 0    | 0    | 0    | 4    | 4    | 4    | 8    | 3    |

By the end of 2022, Egypt had successfully implemented 23 projects aimed at recovering and utilizing 56.35 million standard cubic feet per day (MMSCFD) of associated petroleum gases (APG) that were previously flared at production sites. Over the five-year period from 2018 to 2022, a cumulative total of 20,569 million standard cubic feet (SCF) of associated gases were recovered in 2022. These recovered gases were repurposed for various applications, including sale as fuel, on-site electricity generation, and as a substitute for diesel in operational processes.

<sup>17</sup> Data provided by Ministry of Petroleum and Mineral Resources (MoPMR) in November 2024.

**Table 60: Annual Volume of Associated Gases Recovered (Source: MoPMR, 2024)**

| Year   | 2015 | 2016 | 2017 | 2018  | 2019  | 2020   | 2021   | 2022   |
|--|------|------|------|-------|-------|--------|--------|--------|
| Annual volume of associated gases recovered (million SCF/year)     | 0    | 0    | 0    | 2,409 | 6,023 | 3,030  | 7,902  | 1,205  |
| Cumulative volume of associated gases recovered (million SCF/year) | 0    | 0    | 0    | 2,409 | 8,432 | 11,462 | 19,364 | 20,569 |
| Average Net Heating Value (BTU/SCF)                                | -    | -    | -    | 1,085 | 1,125 | 1,121  | 1,154  | 1,200  |

The key challenge is provision of funding for advanced measurement equipment, particularly for monitoring of flared gas, methane fugitives, fuel consumption and associated emissions. Access to advanced monitoring and verification technologies, such as real-time emissions monitoring tools, to improve data accuracy and coverage. Furthermore, there is lack of expertise in advanced measurement and monitoring techniques.

**PAM B.3:** Expand natural gas pipelines to serve 180 additional villages, reaching 476,000 residents by 2030.

- **Description:** This PAM considers *The Decent Life Initiative (Hayah Karima)*, launched in January 2021, that aims to enhance living standards in Egypt by expanding access to clean fuel for households, particularly in rural areas. As part of this initiative, natural gas pipelines have already been connected to 86 villages, improving the quality of life and energy access for many residents. The plan includes extending this network to an additional 180 villages, which will benefit approximately 476,000 residential units. These villages and residential units traditionally rely on less sustainable fuel sources, such as kerosene, LPG cylinders or biomass, for cooking, heating, and other energy needs.

- **Progress Summary (2015 – 2022):**

Under the *Hayah Karima programme*, during the years 2021 and 2022, 248 villages were successfully connected to the natural gas pipeline network. This progress demonstrates accelerated efforts compared to the planned extension of 180 additional villages by 2030.

Under the *Hayah Karima initiative*, 104,000 residential units have gained access to natural gas, significantly improving living standards, reducing dependence on traditional fuels, and promoting energy sustainability in rural areas.

**PAM B.4:** Implement energy efficiency measures to reduce 5% of the sector's energy consumption, with audits in two refineries, one petrochemical plant, and two upstream oil and gas facilities.

**Description:** This PAM aims to enhance energy efficiency within Egypt's petroleum sector through cost-effective, low-investment measures, targeting a 5% reduction in the sector's overall energy consumption. The initiative includes conducting energy efficiency audits to identify energy savings opportunities at key facilities, specifically two refineries, one petrochemical plant, and two upstream oil and gas facilities. Additionally, a Voluntary Annual Target has been set for all petroleum operations to conserve energy, encouraging ongoing, sector-wide commitment to energy efficiency. By focusing on achievable, low-cost improvements, this target supports the sector in reducing operational costs and greenhouse gas emissions, aligning with Egypt's broader climate goals and commitments under its NDCs.

▪ **Progress Summary (2015 – 2022):**

The implementation of 266 no and low-cost energy efficiency measures marks a significant milestone in advancing energy efficiency within the sector. These initiatives achieved a 5.64% reduction in energy consumption, exceeding the NDC target of a 5% reduction through low-investment energy-saving measures in petroleum companies.

Significant progress has been achieved in conducting energy efficiency audits within the oil and gas sector to identify opportunities for reducing energy consumption and emissions. By the end of 2022, six energy efficiency audits were completed, including one audit in 2021 and five in 2022. These audits serve as a foundational step toward improving energy performance, optimizing resource utilization, and supporting Egypt's sustainability and emissions reduction goals.

The key challenges encountered are absence of automated QA/QC processes in data systems, which increases the risk of transcription errors and unit inconsistencies, impacting data integrity; difficulty in integrating data across various platforms and departments; and gaps in training on energy savings verification and emissions reduction calculations. Financial support is required to establish an electronic energy management system for energy-intensive consumption companies; support operation of the Practical Training Facility of Center of Excellence for Energy Transition to promote best practices for emissions reduction technologies and energy efficiency measures; and economic incentives or funding mechanisms to support the implementation of energy efficiency projects identified through technical energy audits.

**PAM B.5:** Produce 205,000 cubic meters of medium-density wood panels (MDF) annually from 250,000 tons of rice straw in Idku city.

- **Description:** This PAM in the NDC aims to harness natural resources more efficiently by repurposing agricultural waste, specifically rice straw, into sustainable building materials. The plan proposes the production of Medium-Density Fiberboard (MDF) in Idku City, with an annual capacity of 205,000 cubic meters from approximately 250,000 tons of rice straw.
- **Progress Summary (2015 – 2022):** The Wood Tech Company, affiliated with the Ministry of Petroleum and Mineral Resources, has achieved a major milestone by successfully advancing its innovative project to the trial production phase. This development highlights significant progress toward achieving full operational capacity and marks a key step in the project's implementation journey. Commercial operations are scheduled to begin in December 2024, signaling the transition from trial production to full-scale industrial activity. The project aims to support sustainable resource utilization and foster industrial growth, aligning with Egypt's national economic and environmental objectives.

**Other PAMS:**

- Manufacture 75,000 tons of biodegradable plastic bags annually.
- Convert plastic waste into oil to produce 30,000 tons of polyethylene.
- Extract 350,000 tons of algae oil annually for biofuels and produce 100,000 tons of bioethanol annually.

These prior policies were deemed unfeasible due to technical challenges and require support to overcome these obstacles

The co-benefits and economic diversification from the mitigation policies and measures in the Oil & Gas Sector are summarized in Table below.

**Table 61: Co-benefits and Economic Diversification in Oil & Gas Sector**

| B] Oil and Gas Sector   |
|---|
| <p><b><u>Economic Diversification:</u></b> the oil and gas sector has been a significant contributor to Egypt's economy, accounting for around 10% of the country's Gross Domestic Product (GDP) and 40% of its exports. The sector has been a major source of government revenue, with oil and gas exports generating significant foreign exchange earnings. However, the government recognizes that the country's dependence on the oil and gas sector poses significant risks to its economic stability and sustainability. With the ongoing natural gas shortages, it is useful to explore alternative energy sources.</p>  |
| <p><b><u>Co-benefits:</u></b></p> <ul style="list-style-type: none"> <li>• Recovery of associated gas recovery generates a new energy source alternative to natural gas.</li> <li>• Improve local air quality.</li> <li>• Lower burden on national economy and foreign currency reserves to import fuel.</li> <li>• Enhancing quality of life and supporting community development by expanding natural gas pipelines improves energy access in rural villages.</li> <li>• Diverting energy saved to other purposes useful to the economy.</li> <li>• Reduce local air pollution from fossil fuel combustion.</li> <li>• Enhanced energy efficiency lowers operational costs in the oil and gas sector.</li> <li>• Utilization of agricultural waste (rice straw) that are currently open burned and cause local air pollution.</li> <li>• Local job creation.</li> </ul> |

### 3.5.3 Transport Sector

This section describes the policies and measures in the transport sector indicated in the NDC with the progress made from 2015 till 2022.

**Table 62: Mitigation Policies and Measures in Transport Sector**

| Policies and Measures  | Status  |
|--|---------|
| <b>C] Transport</b>  |         |
| <b>PAM C.1:</b> The expansion in Cairo metro network.  | Adopted |
| <b>PAM C.2:</b> The development of Alexandria Metro (Abu Qir – Alexandria railway line) and rehabilitation of the Raml tram line.  | Adopted |
| <b>PAM C.3:</b> The operation of New Capital monorail at the length of 56.5 km (22 stations) and 6th October monorail at the length of 42 km (12 stations).  | Adopted |
| <b>PAM C.4:</b> The operation of the Light Rail Transit (LRT) electric train and the operation of the rapid electric train.  | Adopted |
| <b>PAM C.5:</b> The transformation of public buses to operate on lower carbon intensive fuels, efficient routes through the adoption of Bus Rapid Transit (BRT) systems. Moreover, the encouragement of use of bicycles and construction of designated lanes and other infrastructure. | Adopted |
| <b>PAM C.6:</b> Implement the National Road Project that aims to develop new roads and improve interconnections between cities and decrease commuting time and fuel consumption for road vehicles.   | Adopted |
| <b>PAM C.7:</b> Greening of the civil aviation sector.   | Adopted |

### **PAM C.1:** The expansion in Cairo metro network.

- **Description:** The National Authority for Tunnels (NAT) are committed to executing the expansion of Cairo metro network through the construction and operation of stage 3 of Line 3 (17.7 km); Line 4 (42 km) that extends from 6<sup>th</sup> October City, Giza, Abbassia, Nasr City, and El Rehab city; and Line 6 (35 km) that connects Maadi, Old City Centre, Shubra El Kheima. The GHG emission reductions from Cairo metro network includes the rehabilitation of existing lines 1 and 2.
- **Progress Summary (2015 – 2022):**  
Cairo Metro opened in 1987 as Line 1 from Helwan to Ramses Square with a length of 29 km. As of 2013, the metro carried nearly 4 million passengers per day and as of May 2024, the Cairo Metro has 84 stations of which 5 are transfer stations, with a total length of 106.8 km. The system currently consists of three operational lines, numbered 1 to 3.

Cairo Metro Line 3 is the newest, opening the first section in 2012. It presently operates from Rod El-Farag Corridor and Cairo University to Adly Mansour, where it connects to the Cairo Light Rail Transit. Eventually, it will be extended to Cairo International Airport. The total length of the line will be approximately 50 km, most of which is in the bored tunnel, and is implemented in four phases as shown in the table below.

The expansion in Cairo metro network through the construction and operation of Stage 3 of Line 3 which extends over a length of 17.7 km is estimated to contribute to reduce traffic-related GHG emissions by almost 120,000 tCO<sub>2e</sub> annually due to mainly the expected shift to public transport (mainly the new metro) from private cars, and to the reduction of conventional bus line services, and diesel buses.<sup>18</sup>

Cairo Metro Line 4 (42 km) extends from Nasr City, Abbassia, and Giza. The first phase, which covers a length of 19 km and 17 stations and extends from Hadaek El Ashgar to El Fustat is under construction. It is estimated that the operation of the first phase of Line 4 in 2028 will reduce GHG emissions by approximately 75,886 tCO<sub>2e</sub> annually by 2030.<sup>19</sup>

<sup>18</sup> Source: <https://inclusiveinfra.gihub.org/case-studies/cairo-metro-egypt/>

<sup>19</sup> Source: [https://www2.jica.go.jp/en/evaluation/pdf/2022\\_EG-P43\\_1\\_s.pdf](https://www2.jica.go.jp/en/evaluation/pdf/2022_EG-P43_1_s.pdf)

**Table 63: The Phases of Cairo Metro Line**

| Metro Line 3 Phases  | Start of Operation | Length in km | Expected number of passengers served passenger/day |
|--|--------------------|--------------|--|
| Phase 1 from Attaba station to Abbassia                        | February 2012      | 4.4km        | 55,000   |
| Phase 2 to Attaba -Al Ahram Station                            | May 2014           | 7.7 km       | 75,000   |
| Phase 4A from Haroun to El Shams Club                          | June 2019          | 3.7 km       | 125,000  |
| Phase 4B from El Shams Club to Adly Mansour                    | August 2020        | 7.8 km       | 200,000  |
| Phase 3A from Attaba station to Kit Kat station                | October 2022       | 4.0 km       | 255,000  |
| Phase 3B from Kit Kat station to Rod El-Farag Corridor station | January 2024       | 6.6 km       | 350,000  |
| Phase 3C from Kit Kat to Cairo University                      | May 2024           | 7.1 km       | 350,000  |

- **Description:** In the city of Alexandria, it is planned to develop the Alexandria Metro

**PAM C.2:** The development of Alexandria Metro (Abu Qir – Alexandria railway line) and rehabilitation of the Raml tram line.”

(Abu Qir – Alexandria railway line) and rehabilitation of the existing Raml tram line.

- **Progress Summary (2015 – 2022):** The Raml Tram is being rehabilitated over its length of 13.2 km and 24 stations from Victoria to Raml station. As for the Abu Qir metro, it extends to 21.7 km, 20 stations from Abu Qir to Misr Railway station. The Raml Tram is to be contracted in 2025, and the Abu Qir metro rehabilitation started in early 2024. The two projects would transport 61,000 passengers/hour/direction and 13,800 passengers/hour/direction, respectively.

**PAM C.3:** The operation of New Capital monorail at the length of 56.5 km (22 stations) and 6th October monorail at the length of 42 km (12 stations).

- **Description:** The Cairo Monorail is a two-line monorail rapid transit system currently under construction in the Cairo region and is projected to become the longest driverless monorail system in the world when completed. The two lines will create the first public transport from the New Administrative Capital and 6th of October City to the Cairo metropolitan area.
- **Progress Summary (2015 – 2022):** The New Capital monorail at the length of 56.5 km (22 stations) and the 6th of October monorail at the length of 42 km (12 stations) are currently under construction. The New Capital Monorail should start operation on April 2025, and the 6th of October monorail by January 2026. The expected number of passengers to be served by the New Capital Monorail is 500,000 passengers per day, and the 6th of October monorail will also serve about 500,000 passengers per day.

**PAM C.4:** The operation of the Light Rail Transit (LRT) electric train and the operation of the rapid electric train.

- **Description:** The operation of the Light Rail Transit (LRT) electric train (Al Salam – 10th of Ramadan – New Capital) at the length of 103 km (19 stations). In addition, operation of the high-speed electric train GreenLine (Ain Sokhna – New Capital – Borg El Arab – Alamein – Matrouh) at the length of 660 km (22 stations). Others include the high speed electric train blue line (6<sup>th</sup> October – Luxor – Aswan) at the length of 1060 km (28 stations), the high speed electric train red line (Luxor – Qena – Safaga – Hurghada), 264 km and the LRT electric train (West Port Said - Abu Qir).

- **Progress Summary (2015 – 2022):**

The LRT system links Cairo with 10th of Ramadan City and the New Administrative Capital. The main branch of the system serves the city of Cairo in Adly Mansour station, providing an interchange with Line 3 of the Cairo Metro. The line extends east, serving the New Urban Communities of El Obour, Future City, El Shorouk, New Heliopolis, and Badr City. At Badr Station, the tracks separate, with one branch turning north towards the 10th of Ramadan City and another turning south towards the New Administrative Capital. The northern branch currently terminates in the Knowledge City Station, in the outskirts of 10th of Ramadan. Twelve stations of the LRT with a length of 70 km are already constructed and operating. The line will reach the center of the city via an extension of 16.5 km with three more stations.

The New Administrative Capital branch turns south, serving the Capital International Airport before terminating at Arts and Culture City. This station will provide an interchange with the Cairo-New Administrative Capital Monorail line in the future. The branch will serve the Nativity Cathedral and the Octagon military complex with an extension of over 20.4 km and four stations overall before terminating at the future New Administrative Capital high-speed rail station. There is another extension of 5.5 km (3.4 mi) and one station to the industrial zone under study.

As for the High-Speed Rail Network, it comprised of 3 lines for passengers and freight with a total of about 2000 kms. Line 1 (Green Line) extends from Sokhna (Red Sea) via the New Capital, 6th October, reaching Alexandria and AlAlamein (Mediterranean Sea) over a total length of 660 km and 22 stations. Line 2 (Blue Line) extends from 6th October City all the way south to reach Aswan and Abu Simbel, extending over a length of 1060 km and 28 stations. Line 3 (Red Line) plans to link Qena to Safaga and Hurghada (Red Sea) with a length of 264 km and 3 stations. This plan is to serve 2.5 million passengers per day and 20,000 tons of freight per day.

**PAM C.5:** The transformation of public buses to operate on lower carbon intensive fuels (i.e. natural gas), efficient routes through the adoption of Bus Rapid Transit (BRT) systems. Moreover, the encouragement of use of bicycles and construction of designated lanes and other infrastructure.

- **Description:** The transformation of public buses to operate on lower carbon intensive fuels), efficient routes through the adoption of Bus Rapid Transit (BRT) systems. Moreover, the encouragement of the use of bicycles and construction of designated lanes and other infrastructure.
- **Progress Summary (2015 – 2022):**  
The Bus Rapid Transit (BRT) project is being implemented by the Ministry of Transport<sup>20</sup>, as an alternative to the fifth metro line that operates on the ring road. The BRT will also be an alternative to the microbus. A service road will be constructed to connect the microbus stops and the new bus stations. The project is being implemented in two phases, with 49 stations on the ring road. The project aims to operate 100 electric buses along the road, and they will be connected to other means of transportation, including service stop points under the ring road, in addition to other means of transportation such as the metro, trains, and SuperJet.

The project consists of 49 stations on the ring road, including 36 stations as a first phase. The first phase included expanding the distance from the Mariouteya/Munib axis to the Alexandria Agricultural Road and the distance from the Mansourieh/Fayoum Road/Al Wahat Road intersection, with a total of 76 km. The construction of stations, infrastructure, and systems is underway for the BRT project.

Moreover, the Land Transport Regulatory Authority has increased the number of licenses of the mass transport companies, whether intracity and intercity. Also the Ministry of Transport is encouraging the “park and ride” policy by establishment of car parks at the stations of the electric trains.

**PAM C.6:** Implement the National Road Project that aims to develop new roads and improve interconnections between cities and decrease commuting time and fuel consumption for road vehicles.

- **Description:** This PAM is related to the implementation of the National Road Project that aims to develop new roads of 7,000 km length to sum up the total road network to 30,000 km and upgrade 10,000 km of the current road infrastructure. Moreover, establish 34 new road axes on the Nile, construct 1,000 bridges and tunnels, construct paved roads within the governorates, and utilize modern asphalt recycling technologies to reduce environmental impacts. This would improve

<sup>20</sup> [https://www.sis.gov.eg/Story/191144/Bus-Rapid-Transit-\(BRT\)?lang=en-us#:~:text=The%20Bus%20Rapid%20Transit%20\(BRT, and%20the%20new%20bus%20stations](https://www.sis.gov.eg/Story/191144/Bus-Rapid-Transit-(BRT)?lang=en-us#:~:text=The%20Bus%20Rapid%20Transit%20(BRT, and%20the%20new%20bus%20stations)

interconnections between cities and decrease commuting time and fuel consumption for road vehicles.

- **Progress Summary (2015 – 2022):** In August 2014, the "National Road Project" was launched with an aim to develop new roads of 7,000 km length to sum up the total road network to 30,000 km and upgrade 10,000 km of the current road infrastructure. Moreover, establish 34 new road axes on the Nile, construct 1,000 bridges and tunnels, construct paved roads within the governorates, and utilize modern asphalt recycling technologies to reduce environmental impacts. This would improve interconnections between cities and decrease commuting time and fuel consumption for road vehicles. By 2022, the Ministry of Transportation had constructed 5500 km of new roads, 900 bridges and tunnels, rehabilitated 7500 km of roadway, besides execution of the national project for local road pavement enhancement within the Governorates (around 202 projects) as well as establishment of 13 Nile crossings.

**PAM C.7:** Greening of the civil aviation sector.

- **Description:** This PAM is related to greening the civil aviation sector by introducing 2% biofuels to airplanes, converting passenger buses and other vehicles to operate on cleaner fuels, installing PV in airports and improving the energy efficiency of its facilities, and other resource efficiency measures.
- **Progress Summary (2015 – 2022):** The Ministry of Civil Aviation, The Governorate of South Sinai, Japan, and UNDP inaugurated a solar panel station at the Sharm El Sheikh International Airport in mid-2023 (UNDP, 2023). Moreover, the Egyptian Ministries of Environment, Civil Aviation, Trade, and Industry signed a cooperation protocol to implement a solar power plant connected to the grid and chargers equipped with solar-powered display screens at the Cairo International Airport. The project was implemented in tandem with UNDP and the Global Environment Facility (GEF).

The co-benefits and economic diversification from the mitigation policies and measures in the Transport Sector are summarized in Table below.

**Table 64: Co-benefits and Economic Diversification in Transport Sector**

| C] Transport Sector  |
|--|
| <p><b><u>Economic Diversification:</u></b> Egypt's transport sector is undergoing significant transformation as part of the country's broader economic diversification strategy. An important component is the 'electrification' of the sector with the ambition that the share of renewable energy in the nation electricity grid would increase. In parallel, promote modal shift from passenger cars and micro and minibuses to electric monorails, trains, and buses.</p>  |
| <p><b><u>Co-benefits:</u></b></p> <ul style="list-style-type: none"> <li>• Higher local air quality, improved public health, and lower healthcare costs by reducing respiratory and cardiovascular diseases associated with pollution.</li> <li>• Enhanced quality of life from less commuting time.</li> <li>• Reduce costs associated with traffic congestion and fuel consumption.</li> <li>• Investments in green infrastructure create new industries and generate employment opportunities.</li> <li>• Lower burden on national economy and foreign currency reserves to import fuel.</li> </ul> |

### 3.5.4 Industry Sector

This section describes the policies and measures in the industry sector indicated in the NDC with the progress made from 2015 till 2022. Egypt is decarbonizing the industrial sector by reducing the energy intensity, use of renewable and alternative fuels, and low carbon process improvements, through a number of policies and measures

**Table 65: Mitigation Policies and Measures in Industry Sector**

| Policies and Measures   | Status  |
|---|---------|
| <b>D] Industry</b>  |         |
| <b>PAM D.1:</b> Alternative fuels partial substitution, lowering the clinker content in cement up to 80% conditional on meeting relevant national standards, and energy efficiency improvements.  | Adopted |
| <b>PAM D.2:</b> Energy savings in audited industries due to the application of solar water heating in industry or solar energy for power.   | Adopted |
| <b>PAM D.3:</b> Energy savings in industry due to replacement of old inefficient motors with IE3 or higher motors.  | Adopted |
| <b>PAM D.4:</b> The transition towards low carbon nitrogen fertilizer production, replace feedstock with green hydrogen to produce green ammonia.   | Adopted |
| <b>PAM D.5:</b> Promote eco-industrial parks concept to scale up resource efficiency through intra- firm exchanges, improvement of economic, environmental, and social performances of businesses, and creation of green industries (such as recycling and renewable energy) towards an inclusive and sustainable industrial development. | Adopted |

#### **PAM D.1: Low Carbon Roadmap for the Egyptian Cement Industry.**

- **Description:** Implement measures in the low carbon roadmap for the Egyptian cement industry including alternative fuels partial substitution, lowering the clinker content in cement up to 80% conditional on meeting relevant national standards, and energy efficiency improvements.
- **Progress Summary (2015 – 2022):** In March 2021, EEAA issued Ministerial Decree 49/2021 to require cement companies to replace a minimum of 10% of fossil fuels with Refuse Derived Fuel (RDF) and pay a carbon tax equivalent to 1% of the coal/pet-coke price (0.1% of this amount is directed to support RDF manufacturers). The cement sector has already started using alternative fuel at a share of 6.4% in 2015 to replace a percentage of the coal used as the main fuel for thermal energy. Furthermore, it is planned to decrease the average specific energy consumption from 3,710 to 3,540 MJ/ton cement.

#### **PAM D.2: Enhance electrical and thermal energy efficiency in other resource-intensive sectors and with SMEs.**

- **Description:** The energy-intensive industries represent 68.47% of the total energy consumption of the industrial sector, while SMEs account for 11% of the country's total electricity consumption. There was a decrease in the average specific thermal energy consumption by 10% for three energy-intensive industries (iron and steel, fertilizers, and ceramic tiles industries). Furthermore,

increase the share of solar heating in the industrial processes of relevant sectors and promote roof-top PV systems. The industrial process heat represents 23% of the energy consumption in the textile industry, 33% of that in the food industry, and 7% in the chemical sector in Egypt.

- **Progress Summary (2015 – 2022):** According to the UNIDO “Utilizing Solar Energy for Industrial Process Heat” (SHIP) project, the identified potential “thermal” energy savings of 22.65 GWh annually. Moreover, roadmaps for implementation of solar thermal energy in 3 industrial sectors were developed, as well as two standards for solar energy systems and a framework for the certification of personnel working in the installation and maintenance of the solar energy systems. The project has also developed an extra roadmap covering the tools for strengthening the local manufacturing of solar water heaters (SWHs) and solar thermal technologies in the Egyptian market. The project has developed an extra roadmap covering the tools for strengthening the local manufacturing of SWHs and solar thermal technologies in the Egyptian market.

**PAM D.3: A motor system optimization programme to replace inefficient motors.**

- **Description:** A stand-alone motor system optimization programme has been initiated to replace old inefficient motors with IE3 or higher motors in industrial plants to achieve savings in electrical energy consumption.
- **Progress Summary (2015 – 2022):** A stand-alone motor system optimization programme has been initiated to replace old inefficient motors with IE3 or higher motors in industrial plants to achieve savings in electrical energy consumption. This had been reinforced with the issuance of Ministerial Decree #463/2020 in October 2020 by Ministry of Trade and Industry to mandate producers and importers of electric motors to comply with the Egyptian specification for minimum energy performance standard (MEPS). According to the UNIDO Industrial Motors Energy Efficiency Programme, the identified potential energy savings of 89.33 GWh annually. Guidelines on best practices developed in motors rewinding, highlighting drawbacks of bad rewinding practices, focusing on most commonly used 3-phase induction motors in industrial sector was developed.

**PAM D.4: Application of sector-specific process improvements.**

- **Description:** This NDC policy is related to the application of sector-specific process improvements, such as the transformation of the charcoal sector from traditional open pits into mechanized kilns and the replacement of feedstock with green hydrogen to produce green ammonia and transition towards low carbon nitrogen fertilizer production.
- **Progress Summary (2015 – 2022):** The transition toward low-carbon nitrogen fertilizer production and the replacement of the feedstock with green hydrogen to produce green ammonia was initiated when Misr Fertilizers Production Company

"Mopco" signed an agreement in 2023 for a green ammonia production project in Damietta. The initial investment cost is approximately 890 million dollars, aiming to produce 150,000 tons of green ammonia annually. The operation is expected to begin in 2027. Also, the Sovereign Fund of Egypt (TSFE) and Suez Canal Economic Zone (SCZone) signed on Sunday 30 June 2024, four agreements worth \$33 billion in the field of green ammonia with European developers which are as follows<sup>21</sup>:

- German company DAI Infrastruktur GmbH (DAI) signed the first agreement worth \$11 billion to develop a green ammonia project in East Port Said. The project aims to export roughly two million tons of green ammonia annually.
- The second agreement, worth \$4.25 billion, was signed with India's OCIOR Energy. The deal involves building a green ammonia project at Sokhna Port, targeting the European market.
- The third agreement worth \$3.46 billion was signed with TAQA Arabia and French company Voltalia. This alliance will develop a green ammonia project at Sokhna Port.
- As for the fourth agreement, it is worth \$14 billion. Signed with BP, MASDAR, Hassan Allam Utilities, and Infinity Power Holding, the agreement aims to construct a green ammonia project at Sokhna Port.

#### **PAM D.5: Promote eco-industrial parks concept.**

- **Description:** Promote the eco-industrial parks concept to scale up resource efficiency through intra-firm exchanges, improvement of economic, environmental, and social performances of businesses, and creation of green industries (such as recycling and renewable energy) towards an inclusive and sustainable industrial development.
- **Progress Summary (2015 – 2022):** The UNIDO Global Eco-Industrial Parks Programme is implemented in Egypt from 2022 for three years until 2024. Three industrial parks in Egypt were targeted for demonstration activities: Robbiki Leather Cluster, Orascom Industrial Parks – Sokhna Complex (formerly named Suez Industrial Development Company (SIDC), and Polaris Parks. The objective is to demonstrate the viability and benefits of EIP approaches in scaling up resource productivity and improving the economic, environmental, and social performances of businesses and thereby contribute to inclusive and sustainable industrial development in Egypt. The specific expected outcome of the country-level intervention in Egypt is the improved environmental, economic and social performance of industries in Egypt through the implementation of EIP approaches in selected pilot industrial parks and an increased role of EIPs in environmental, industrial, and other relevant policies at the national level.

The co-benefits and economic diversification from the mitigation policies and measures in the Industry Sector are summarized in the Table below.

<sup>21</sup> <https://sis.gov.eg/Story/193422/PM-witnesses-the-signing-of-4-green-ammonia-deals-worth-%2433b?lang=en-us>

**Table 66: Co-benefits and Economic Diversification in the Industry Sector**

| D] Industry Sector   |
|--|
| <p><b><u>Economic Diversification:</u></b> Egypt is actively diversifying its industrial sector to reduce reliance on traditional industries and foster sustainable economic growth. High-value sectors such as petrochemicals, automotive manufacturing, electronics, pharmaceuticals, and green &amp; low carbon technologies. Egypt implemented policies and initiatives to promote industrial development, including the establishment of industrial parks and zones, SMEs development, and promotion of innovation and entrepreneurship.</p>  |
| <p><b><u>Co-benefits:</u></b></p> <ul style="list-style-type: none"> <li>• Reducing local air pollution, conserving biodiversity, and improving environmental quality.</li> <li>• Improved public health and enhanced quality of life.</li> <li>• Investments in green technologies generate employment opportunities.</li> <li>• Creating high-value export green products.</li> <li>• Reduce operational costs and increase productivity.</li> <li>• Reduce energy demand through water conservation, recycling, and rainwater harvesting.</li> <li>• Increasing the sustainability of natural resources.</li> <li>• Lower burden on national economy and foreign currency reserves to import fuel.</li> </ul> |

### 3.5.5 Buildings and Urban Cities Sector

This section describes the policies and measures in the buildings and urban cities sector indicated in the NDC with the progress made from 2015 to 2022. Egypt has promoted sustainability in existing and new buildings and urban developments to adopt low carbon standards and programmes.

**Table 67: Mitigation Policies and Measures in Buildings and Urban Cities Sector**

| Policies and Measures   | Status  |
|---|---------|
| <b>E] Buildings and Urban Cities</b>  |         |
| <b>PAM E.1:</b> Promoting the use of renewable energy and energy efficiency in existing and new establishments and rank sustainability interventions in accordance with national priorities. This includes the installation of rooftop PV panels for electricity generation, 5,300 solar water heaters, and expanding the use of LED lighting in the residential sector by 2030.  | Adopted |
| <b>PAM E.2:</b> Expanding energy efficiency labels and specifications for appliances programme, elimination of non-energy efficient equipment, and raising awareness among consumers on purchasing alternative energy efficient home appliances.  | Adopted |
| <b>PAM E.3:</b> Promote green buildings by activating the energy efficiency codes for new buildings, adopting procedures for the renovation of existing buildings to meet energy performance standards, adopting voluntary green buildings guidelines, and rolling out incentives to encourage the use of the best available technologies for sustainable buildings. Energy Efficiency Building Codes for new residential buildings and commercial and government buildings were first developed by the Housing and Building Research Center (HBRC) and then enacted by ministerial decrees issued in 2005, 2009 and 2010. It is planned to develop 16,960 residential units according to green building standards by 2030 and increase awareness and community participation on sustainable buildings. | Adopted |
| <b>PAM E.4:</b> Increase green spaces and sustainable parks in new cities that are irrigated with treated wastewater to act as carbon sinks to improve the quality of life for citizens and reduce negative health impacts. Furthermore, increase the per capita share of public green areas in existing cities, such as Ahl Masr Walkway and Ain Hayah project.  | Adopted |
| <b>PAM E.5:</b> Adopt the National Active Mobility Strategy to encourage citizens to use bicycles and walking in designated paths and shift gradually to electric vehicles using clean energy sources and the establishment of the necessary infrastructure inside cities.  | Adopted |
| <b>PAM E.6:</b> Installing energy efficient and/or solar-operated street lighting and advertisements in internal roads and in highways between cities.  | Adopted |

**PAM E.1:** Promoting the use of renewable energy and energy efficiency in existing and new establishments and rank sustainability interventions in accordance with national priorities. This includes installation of rooftop PV panels for electricity generation, 5,300 solar water heaters, and expanding the use of LED lighting in residential sector by 2030.

- **Description:** This PAM aims to promote the adoption of renewable energy and energy-efficient solutions in both existing and new establishments, aligning with national priorities. Key initiatives include the installation of rooftop photovoltaic (PV) panels to generate electricity, the deployment of 5,300 solar water heaters, and the expansion of LED lighting usage in the residential sector.
- **Progress Summary (2015 – 2022):**

The expansion of LED lighting in the residential sector has been partially reported under A.7 “Electricity savings achieved by sectors on the demand side”. The Electricity Distribution Companies (EDCs) distributed 156 million LED lamps in residential and other buildings. This has achieved a total of 55,326,201 MWh electricity savings and 25,362,397 tCO<sub>2</sub> emission reduction during the period between 2018/2019 – 2021/2022.

For the renewable energy installed, this has been partially reported under **PAM A.7** “Electricity savings achieved by sectors on the demand side” under “PV Installation under FIT and net metering systems”. This PAM focuses on expanding the use of renewable energy in existing and new buildings, with significant legislative and project-driven progress. Decree No. 2532 of 2016 initially set a Feed-in Tariff (FiT) for renewable energy projects, allocating 300 MW for capacities under 500 kW and 2,000 MW for larger capacities. However, this decree expired on 28/10/2017, prompting an amendment to Circular No. 1 of 2017. This amendment introduced a net metering system to encourage electricity production using photovoltaic (PV) power plants for capacities up to 20 MW.

Rooftop solar PV installations showed limited progress, with three installations each in 2015 and 2016, decreasing to two in 2017, four in 2018, and one in 2019 and 2021, with no data for 2020 and no installations in 2022–2023. Annual installed capacities peaked at 105.35 kW in 2015 but remained below 1 kW annually in subsequent years. Electricity generation from renewables grew from 395 MWh in 2015 to a peak of 2,596.63 MWh in 2021 before declining to 1,300.53 MWh in 2022 and 1290.33 MWh in 2023. In terms of implementation, one of the major initiatives is the Rooftop Photovoltaic Installation Project in Egypt's New Administrative Capital (NAC). This project aims to integrate renewable energy into the city's urban infrastructure, with 18 MWp of rooftop solar panels being installed across 64 government buildings. Furthermore, the promotion of renewable energy extends to educational institutions, with 7,272 secondary schools set to adopt PV panels as part of the broader Energy Efficiency Improvement Project (EEIP).

In 2016, 48 solar water heater installations were completed, with an annual installed capacity of 1.5 million liters per year. By 2017, this increased significantly to 200 installations, achieving an annual installed capacity of 6 million liters per year.

**PAM E.2:** Expanding energy efficiency labels and specifications for appliances programme, elimination of non-energy efficient equipment, and raising awareness among consumers on purchasing alternative energy efficient home appliances.

- **Description:** This PAM aims to enhance the adoption of energy-efficient appliances by expanding energy efficiency labels and specifications across various appliances. Additionally, this initiative seeks to raise awareness among consumers about the importance of energy efficiency in their purchasing decisions.
- **Progress Summary (2015 – 2022):**

Key efforts include organizing 14 training courses focused on energy-efficient street lighting, attended by 327 engineers from government entities and electricity distribution companies. Additionally, capacity-building initiatives have trained engineers at energy efficiency testing laboratories on the proper methods for conducting tests for household appliances, involving key stakeholders like the Ministry of Electricity and Renewable Energy, the New and Renewable Energy Authority, and the Egyptian Organization for Standardization and Quality. Furthermore, a comprehensive seven-month training programme was successfully delivered to 1,166 shop managers, sales staff, and customer service representatives across various appliance stores.

Between 2015 and 2023, eliminating non-energy-efficient equipment steadily increased energy savings. Removals grew from 3,360 units (0.4 MWh/year saved) in 2015 to 10,342 units (4,934.95 MWh/year saved) in 2023, with notable peaks in 2018 (6,668 units) and 2022 (8,095 units). Energy savings rose consistently, reaching 4,934.95 MWh/year saved by 2023.

**PAM E.3:** Promote green buildings by activating the energy efficiency codes for new buildings, adopting procedures for the renovation of existing buildings to meet energy performance standards, adopting voluntary green buildings guidelines, and rollout incentives to encourage the use of best available technologies for sustainable buildings.

- **Description:** This PAM aims to promote green buildings by activating energy efficiency codes for new constructions, implementing renovation procedures for existing buildings to meet energy performance standards, and adopting voluntary green building guidelines. This initiative also includes rolling out incentives to encourage the use of the best available technologies for sustainable buildings. By 2030, the goal is to develop 16,960 residential units in line with green building

standards while enhancing awareness and community engagement in sustainable building practices.

- **Progress Summary (2015 – 2022):**

Energy Efficiency Building Codes for new residential buildings and for commercial and government buildings were first developed by the Housing and Building Research Center (HBRC) and then enacted by ministerial decrees issued in 2005, 2009, and 2010. It is planned to develop 16,960 residential units according to green building standards by 2030 and increase awareness and community participation on sustainable buildings.

From 2015 to 2023, building renovations to meet energy standards progressed steadily, starting with one renovation in 2015 and peaking at two in 2016. Annual energy savings rose from 150 MWh in 2015 to 827 MWh in 2020, stabilizing around 822–826 MWh annually from 2021 to 2023. Renovations primarily involved installing solar power stations.

One notable initiative under this PAM is "Housing for All," Egypt's first national programme dedicated to providing affordable housing for 1 million low-income households while integrating green building principles. This initiative is also the first of its kind in the region to focus on green social housing. By utilizing the Green Pyramid Rating System (GPRS), the programme aims to minimize the environmental footprint of construction and promote sustainability. As part of its pilot phase, 7,000 GPRS-certified units have already been constructed, and plans are underway to deliver an additional 25,000 units over the next three years.

The development of residential units according to green building standards has shown notable advancement, with 16,710 units completed in 2022 and 7,896 units in 2023. These units are being developed to meet green building criteria. In addition, efforts to increase awareness about green building practices among stakeholders have primarily focused on workshops as a key measure. These workshops were held from 2015 to 2019 and 2022, with a total of one awareness movement conducted each year.

The adoption of voluntary green building guidelines began with the introduction of green building guidelines in 2022, with 16,710 projects following these voluntary guidelines that year, and 7,896 projects in 2023.

**PAM E.4:** Increase green spaces and sustainable parks in new cities that are irrigated with wastewater treated to act as carbon sinks to improve quality of life for citizens and reduce negative health impacts. Furthermore, increase the per capita share of public green areas in existing cities, such as Ahl Masr Walkway and Ain Hayah project.

- **Description:** This PAM aims to expand green spaces and develop sustainable parks in newly established cities, utilizing treated wastewater for irrigation. This

initiative focuses on creating carbon sinks, which play a crucial role in reducing greenhouse gas emissions and enhancing the overall quality of life for citizens by mitigating negative health impacts. Additionally, the target seeks to increase the per capita share of public green areas in existing urban areas, with notable projects such as the Ahl Masr Walkway and the Ain Hayah project serving as prime examples of this vision. These efforts aim to foster a healthier, more sustainable urban environment while promoting public well-being.

- **Progress Summary (2015 – 2022):**

New green spaces, including parks and islands in the new cities, are being established and irrigated using treated wastewater, reaching 11,500 faddens of green spaces irrigated with treated wastewater. Additionally, for all housing projects in new cities, 60% of the total project area is dedicated to green spaces.

Mamsha Ahl Masr (The Walkway of Egypt’s People) is a project aimed at creating accessible, two-level promenades along the Nile Corniche in Cairo and Giza. This project aims to promote active mobility through walking. Stretching 54 km, the walkways will offer recreational spaces and better public access to the Nile waterfront, helping to reduce exposure to air pollution. The first phase, from Imbaba Bridge to 15 May Bridge, is completed, featuring walkways, a floating restaurant, and other facilities. The second phase adds a 4.7 km walkway, and the third phase extends to two other sectors, which are under progress.

**PAM E.5:** “Adopt the National Active Mobility Strategy to encourage citizens to use bicycles and walking in designated paths and shift gradually to electric vehicles using clean energy sources and the establishment of the necessary infrastructure inside cities.”

- **Description:** Adopt and implement the National Active Mobility Strategy to promote sustainable urban transportation. The strategy aims to encourage citizens to prioritize walking and cycling by developing designated, safe, and accessible pathways. It also facilitates a gradual transition to electric vehicles powered by clean energy sources, reducing dependency on conventional fuels.
- **Progress Summary (2015 – 2022):** For active mobility, bicycle paths have been constructed over the years, with the following progress: 1.5 km in 2017, 2 km in 2018, 3 km in 2019, 1 km in 2020, 1.5 km in 2021, and 0.8 km in 2022. In addition, the first phase of Cairo Bike introduced 250 bicycles across 26 stations, with plans to expand to 500 bicycles and 45 stations in the second phase. Spanning over six square kilometers in downtown Cairo, El-Sayeda Zainab, Garden City, and Al Attaba, all stations are solar-powered and equipped with surveillance cameras. Bicycles can be rented via a mobile app or prepaid card.

For electric vehicles and charging stations, regulatory measures have been implemented to encourage the adoption and local production of electric vehicles (EVs). Ministerial Resolution 255/2018 exempted EVs from customs duties and allowed the import of used EVs up to three years old, marking an exception to the ban on importing used cars. Additionally, Presidential Decree 549/2020 expanded incentives by allowing companies involved in EV manufacturing and assembly to import vehicles, fostering the local assembly of EVs and enhancing opportunities for the industry's growth.

The Prime Minister directed coordination between ministries and authorities to establish a legal framework and plan for a company dedicated to creating, operating, and managing electric vehicle (EV) charging stations. The initiative focuses on Cairo, Giza, Alexandria, and Sharm El-Sheikh as part of the state's strategy to localize and expand the use of EVs. Measures include determining charging service prices in collaboration with the Ministry of Electricity and identifying suitable sites for the stations. Additionally, efforts were reviewed to restructure the Nasr Export and Import Company into the "Gosoor" project, aimed at supporting Egyptian manufacturers with promotion, mediation, and logistics services, and designing an electronic catalog for better marketing and market expansion.

**PAM E.6:** Installing energy efficient and/or solar-operated street lighting and advertisements on internal roads and in highways between cities.

- **Description:** The policy involves the installation of energy-efficient and/or solar-powered street lighting and advertisements along internal roads and highways between cities. This initiative aims to reduce energy consumption and reliance on traditional power sources by incorporating renewable energy solutions, such as solar panels, to power streetlights and advertising displays.

For energy efficiency and solar operated street lightening and advertisements on roads, this has been partially reported under **PAM A.4** "Electricity savings achieved by sectors on the demand side" under "improving energy efficiency of public street lighting". EEHC, together with municipalities, replaced over 4 million street luminaires with efficient ones.

From 2015 to 2023, installations of energy-efficient and solar-operated advertisements along roads and highways steadily increased, from 3500 installations (0.756 MW) in 2015 to 25,000 installations (5.4 MW) in 2023. Significant growth occurred in 2021 with 11,000 installations (2.376 MW) and 2022 with 15,000 installations (3.24 MW), reflecting a consistent rise in capacity.

Between 2015 and 2023, energy-efficient and solar-operated lighting installations grew significantly, boosting energy savings from 0.2% (2,250 installations, 0.22 MW capacity) in 2015 to 10.50% (81,891 installations, 14,367.18 MW capacity) in

2023. Electricity generation also rose sharply, from 989 MWh in 2017 to 21,845.79 MWh in 2023, reflecting consistent progress in sustainable lighting initiatives.

The co-benefits and economic diversification from the mitigation policies and measures in the Buildings and Urban Cities Sector are summarized in the Table below.

**Table 68: Co-benefits and Economic Diversification in Buildings and Urban Cities Sector**

| E] Building and Urban Cities Sector   |
|---|
| <p><b>Economic Diversification:</b> The Government has implemented policies and initiatives to promote sustainable urban development, including the Urban Development Strategy, Investment Law No. 72 of 2017, and the development of a new administrative capital, as well as initiatives to promote smart cities and green building practices.</p>  |
| <p><b>Co-benefits:</b></p> <ul style="list-style-type: none"> <li>• Reducing local air pollution and improving environmental quality, water, and resources conservation.</li> <li>• Higher local air quality, improved public health, and lower healthcare costs by reducing respiratory and cardiovascular diseases associated with pollution.</li> <li>• The use of solar energy and energy efficiency reduces dependence on imported fossil fuels.</li> <li>• Better quality of life, reduced exposure to extreme temperatures, and other climate change-related weather events.</li> <li>• Increasing green areas lowers temperatures for residents.</li> <li>• Lower electricity and water bills.</li> <li>• Investments in green infrastructure create new industries and generate employment opportunities.</li> <li>• Lower burden on national economy and foreign currency reserves to import fuel.</li> </ul> |

### 3.5.6 Tourism Sector

This section describes the policies and measures in the tourism sector indicated in the NDC with the progress made from 2015 to 2022. Egypt strives towards low carbon touristic developments and the greening of hotels and resorts.

**Table 69: Mitigation Policies and Measures in the Tourism Sector**

| Policies and Measures   | Status  |
|---|---------|
| <b>F] Tourism</b>   |         |
| <p><b>PAM F.1:</b> Promoting the use of renewable energy, such as solar PV power plants, solar water heating for domestic uses and for swimming pools in touristic hotels and resorts, and solar water desalination.</p>  | Adopted |
| <p><b>PAM F.2:</b> Implementing energy efficiency improvements through LED lighting replacements, improved building envelope, employing efficient heating, ventilation, and air conditioning (HVAC) systems, efficient water pumping, and influencing the behavior of the hotel guests towards energy efficiency.</p> | Adopted |

**PAM F.1:** “Promoting the use of renewable energy, such as solar PV power plants, solar water heating for domestic uses and for swimming pools in touristic hotels and resorts, and solar water desalination.”

- **Description:** This policy aims to boost the adoption of renewable energy within the tourism sector by promoting various solar-based technologies. This includes the deployment of solar PV power plants, solar water heating systems for both domestic use and swimming pools in hotels and resorts, as well as solar-powered water desalination systems. These initiatives are designed to support the shift toward sustainable energy sources, reduce reliance on conventional energy, and contribute to the overall reduction of greenhouse gas emissions.
- **Progress Summary (2015 – 2022):** This has been partially reported under **PAM A.4** “Electricity savings achieved by sectors on the demand side” under “PV Installation under FIT and net metering systems”. Egypt’s tourism sector has made significant progress in adopting renewable energy technologies to reduce reliance on fossil fuels. Through the UNDP Egypt PV Project (2018-2019), 768 kW of solar photovoltaic (PV) systems were installed at five locations, including three hotels in Cairo, one hotel in the Red Sea region, and a cultural site in Old Cairo. These installations generate 1,353 MWh annually, reducing emissions by an estimate of 0.832 ktCO<sub>2e</sub> per year.

As part of the preparations for COP27, the Egypt PV Project also installed seven solar PV systems at hotels and resorts in Sharm El Sheikh, providing a total capacity of 1,864 kW. Additionally, by collecting electricity consumption data from a sample of Green Star hotels, solar water heaters were introduced in 10 hotels, replacing electric and diesel-fired heating systems. In total, 750 units (250 liters each) were installed, saving approximately 4.5 million kWh annually. These initiatives, led by the Ministry of Tourism and Antiquities, underscore the sector’s commitment to sustainable energy practices, reducing GHG emissions, and advancing sustainable development goals.

**PAM F.2:** Implementing energy efficiency improvements through LED lighting replacements, improved building envelope, employing efficient heating, ventilation, and air conditioning (HVAC) systems, efficient water pumping, and influencing the behavior of the hotel guests towards energy efficiency.

- **Description:** This policy focuses on enhancing energy efficiency within the tourism sector by implementing a range of improvements. Key measures include replacing traditional lighting with LED alternatives, upgrading building envelopes to enhance insulation, and using efficient HVAC systems. It also involves optimizing water pumping systems and encouraging hotel guests to adopt energy-saving practices. These actions aim to reduce overall energy consumption, lower greenhouse gas emissions, and promote sustainable practices in the hospitality industry.
- **Progress Summary (2015 – 2022):**

This has been partially reported under **PAM A.4** “Electricity savings achieved by sectors on the demand side” under “introduction of LEDs in residential and building sectors”.

Egypt's tourism sector has undertaken significant energy efficiency improvements to reduce fuel and electricity consumption and lower GHG emissions. LED lighting upgrades were implemented in 13 Green Star Hotels, with the installation of 38,450 LED lamps ranging from 3 to 48 watts. This measure resulted in annual energy savings of approximately 200,000 kWh. Additionally, AC shading improvements were applied in 17 Green Star Hotels, targeting 2,742 air conditioning units—representing 60% of the total AC systems—achieving energy savings of 150,000 kWh annually.

The sector also advanced energy efficiency through the Green Star Hotel (GSH) certification programme, where, as of March 2024, 182 hotels (out of 1,247) obtained certification. Notably, 40% of the GSH requirements relate to energy and water efficiency, significantly contributing to GHG emissions reductions. Moreover, the UNDP Green Sharm Project addressed multiple sustainability aspects, including energy efficiency, waste management, renewable energy, sustainable transportation, and biodiversity, demonstrating a holistic approach to environmental sustainability in the tourism industry. These initiatives, adopted by the Ministry of Tourism and Antiquities, highlight Egypt's commitment to sustainable tourism development.

The co-benefits and economic diversification from the mitigation policies and measures in the Tourism Sector are summarized in the Table below.

**Table 70: Co-benefits and Economic Diversification in the Tourism Sector**

|  |
|--|
| <b>F] Tourism Sector</b>   |
| <b>Economic Diversification:</b> Egypt's tourism sector is highly volatile to external shocks. It is critical to identify cost savings opportunities and also attract eco-conscious tourists. Sustainable and resilient tourism practices, including energy efficiency, waste reduction, and water conservation in tourism facilities.   |
| <b>Co-benefits:</b> <ul style="list-style-type: none"> <li>• Sustainable tourism attracts eco-conscious tourists, creating new job opportunities and supporting local businesses.</li> <li>• Use of renewable energy to develop unconventional water sources (i.e. solar desalination).</li> <li>• Reducing local air pollution and improving environmental quality, water and resources conservation.</li> <li>• Reduce operational costs.</li> <li>• Investments in green technologies and generate employment opportunities.</li> </ul> |

### 3.5.7 Waste Sector

This section describes the policies and measures in the waste sector indicated in the NDC with the progress made from 2015 to 2022. Egypt has been decarbonizing the waste sector through a number of policies and actions.

**Table 71: Mitigation Policies and Measures in Waste Sector**

| Policies and Measures   | Status  |
|---|---------|
| <b>G] Waste Management</b>  |         |
| <b>PAM G.1:</b> Enhancing the waste management infrastructure, improving collection efficiency and increasing recycling and energy recovery rates | Adopted |

| Policies and Measures  | Status  |
|--|---------|
| <b>PAM G.2:</b> Increase green spaces and sustainable parks in new cities that are irrigated with treated wastewater   | Adopted |
| <b>PAM G.3:</b> Expand the coverage of municipal and industrial wastewater tertiary treatment infrastructure and rehabilitate existing facilities, utilize treated wastewater and grey water, and recover sewage sludge for recycling and energy use; and "increase green spaces and sustainable parks in new cities that are irrigated with treated wastewater. | Adopted |

**PAM G.1:** Enhancing the waste management infrastructure, improving collection efficiency and increasing recycling and energy recovery rates.

- **Description:** Attracting investments in upgrading the solid waste management infrastructure in all governorates to improve collection efficiency from 55% to 95% by the year 2025 and increase recycling and energy recovery rates. This entails the establishment of fixed and mobile transfer stations, rehabilitation and new construction of mechanical and biological treatment (MBT) plants to utilize at least 60% of the collected waste, and closure of uncontrolled dumpsites to be replaced with sanitary landfills but not to exceed 20% of the collected waste by 2025.
- **Progress Summary (2015 – 2022):**

Solid Waste Management Policy reforms took place with the issuance of Waste Management Regulation Law 202/2020 and its Executive Regulations, Prime Minister Decree 41/2019 on waste-to-energy feed in tariff (October 2019), and Ministerial Decree 49/2021 for mandatory partial replacement of alternative fuels in cement sector (March 2021).

According to the Waste Management Regulatory Authority (WMRA), about six uncontrolled dumpsites have been closed and replaced with sanitary landfills. About 6 uncontrolled waste dumpsites will have been closed by 2023, and 21 sanitary landfills will be constructed and operating by 2023.

Collection of municipal solid waste is the responsibility of the local governmental authorities in each governorate. WMRA has reported that the collection efficiency increased from 40% in 2022 to 60% in 2023, and the Ministry of Local Development reported an increase in the waste collection coverage to 24 million tonnes of municipal solid waste annually out of the generated 26 million tonnes, representing 90% collection efficiency.

The Ministry of Local Development reported that around 8.5 million tonnes per year of the generated waste are being directed to the mechanical and biological treatment (MDT) plants to be treated. Approximately 4.3 million tonnes per year are turned into compost and 1.7 million tonnes are transformed to refuse-derived fuel (RDF) to be used as alternative fuel in cement factories. Therefore, around 35% of the collected waste is being treated in the MBT plants. According to the

Waste Management Regulatory Agency, 48 waste treatment mechanical and biological treatment (MBT) lines will be operational by 2023.

In addition, a number of internationally funded projects are working in the waste sector, including:

- The National Solid Waste Management Programme was initially launched in 2012 under the Ministry of Environment of the Government of Egypt (GoE) and is currently in its third phase, which extends from 2022 to 2026. The project supports the Waste Management Regulatory Authority (WMRA) and has been establishing a sustainable and integrated solid waste management system and infrastructure in four governorates in Egypt (Kafr El Sheikh- Gharbeya- Assiut- Quena).
- In Greater Cairo, the Air Pollution Management and Climate Change Project, operating since 2020 and expected to end in 2026, focuses on reducing vehicle emissions, improving the management of solid waste, and strengthening the air and climate decision-making system. The component of solid waste management includes the establishment of an integrated waste management facility in 10<sup>th</sup> Ramadan City and the closure and rehabilitation of the Abu Zaabal dumpsite. The 10<sup>th</sup> Ramadan Complex will mitigate impacts resulting from waste disposal in both Cairo and Qalyoubia Governorates as the complex will include<sup>22</sup>:
  - Sanitary landfill in Qalyoubia Governorate for rejects of treated municipal solid waste (227.5 acres)
  - Construction and demolition waste treatment facility (23 acres).
  - Sanitary landfill in Cairo Governorate for rejects of treated municipal solid waste (447 acres).
  - Medical waste treatment and disposal plant in Cairo and Qalyoubia governorates (16.51 acres).
  - Urban Communities Authority landfill for rejects of treated municipal solid waste and construction and demolition waste (100 acres).
  - Municipal solid waste treatment plant for Cairo Governorate (Organic fertilizer production and recycling plant) (212 acres).
  - Municipal solid waste treatment plant in Qalyoubia Governorate (organic fertilizer production and recycling plant) (106 acres).

**PAM G.2:** Increase waste-to-energy contribution in solid waste management up to 20% of collected waste by 2026.

- **Description:** Increase waste-to-energy contribution in solid waste management up to 20% of collected waste by 2026 through utilization of waste as alternative fuel in cement sector, waste to biofuels, and installation of 300 MW to generate electric power through incineration, pyrolysis, and other modern technologies.

<sup>22</sup> The World Bank (2020), Greater Cairo Air Pollution Management and Climate Change Project, <https://www.eeaa.gov.eg/Uploads/Project/Files/2022110812125143.pdf>

- **Progress Summary (2015 – 2022):** Egypt has signed for the establishment of a Waste to Energy plant in 2023 of USD 120 million in investments to be built in the Abu Rawash industrial zone in Giza Governorate west of Greater Cairo. It will have the capacity to process 1,200 tonnes of municipal solid waste daily to produce 30 MW of power. The Ministry of Local Development reported that 1.7 million tonnes per year are transformed to refuse-derived fuel (RDF) to be used as alternative fuel in cement factories.

**PAM G.3:** Expand the coverage of municipal and industrial wastewater tertiary treatment infrastructure and rehabilitate existing facilities, utilize treated wastewater and grey water, and recover sewage sludge for recycling and energy use.

**and** increase green spaces and sustainable parks in new cities that are irrigated with treated wastewater.

- **Description:** Increase green spaces and sustainable parks in new cities that are irrigated with treated wastewater to act as carbon sinks to improve quality of life for citizens and reduce negative health impacts. The treated wastewater used in irrigating non-edible plants would conserve fresh water that would have been used for same purpose.
- **Progress Summary (2015 – 2022):** Egypt is expanding the coverage of municipal and industrial wastewater tertiary treatment infrastructure and rehabilitating existing facilities, utilizing treated wastewater, and grey water, and recovering sewage sludge for recycling and energy use. Recently Bahr Al-Baqar, one of the largest agricultural drainage and wastewater treatment plant of its kind worldwide, was inaugurated in Port Said with production capacity of 5.6 million cubic meters per day to recycle and reuse the drainage water that flows along the Bahr Al-Baqar drain to be used in reducing the gap for agricultural irrigation (September 2021).

Wastewater Treatment Plant in Beni Suef New City, with a total capacity of 52,000 m<sup>3</sup>/day, is designed to serve the city's growing population. It produces around 12,000 cubic meters of tertiary treated water daily, which is used for irrigating green spaces, benefiting 160,000 residents and 30,000 visitors from the local university and industrial workforce. Moreover, the Sewage Treatment Plant in New Minya City has inaugurated its first phase in 2023, operating with a daily capacity of 20,000 m<sup>3</sup>/day, out of a planned total capacity of 140,000 m<sup>3</sup>/day. The treated water is repurposed for irrigating green spaces across the city, contributing to sustainable water reuse and urban greening efforts.

The co-benefits and economic diversification from the mitigation policies and measures in the Waste Sector are summarized in Table below.

**Table 72: Co-benefits and Economic Diversification in Waste Sector**

| <b>GJ Waste Sector</b>  |
|---|
| <p><b><u>Economic Diversification:</u></b> The Government is focusing on promoting recycling, waste-to-energy projects, and the development of a circular economy. With rapid urbanization and increased industrial activity, waste generation has risen significantly, prompting the need for innovative solutions that not only address environmental concerns but also create new economic opportunities.</p>  |
| <p><b><u>Co-benefits:</u></b></p> <ul style="list-style-type: none"><li>• Reduce landfill/dumpsites and minimize environmental pollution.</li><li>• Improved public health from adequate solid waste management and sanitation.</li><li>• Using treated wastewater for irrigation conserves potable water, making urban water use more sustainable.</li><li>• Create green jobs in waste management, recycling, and energy recovery sectors.</li><li>• Increase green products of high-added value to generate new revenue streams.</li></ul> |

## Chapter 4: Information Related to Climate Change Impacts and Adaptation under Article 7 of the Paris Agreement

### 4.1 National Circumstances, Institutional Arrangements and Legal Framework

As outlined by the MPGs paragraph 106, each Party should provide information on national circumstances relevant to adaptation actions of Parties, including biogeophysical characteristics, demographics, economy, infrastructure and information on adaptive capacity; Institutional arrangements and governance; and legal and policy frameworks and regulations.

These requirements are comprehensively addressed in Chapter 1 of this report, under subsections: *1.1 Biogeophysical Characteristics, 1.2 Climate Profile, 1.3 Socioeconomic Profile, 1.6 Key Adaptation Sectors, 1.7 Climate Change Vulnerabilities and Adaptive Capacity, and 1.8 Institutional Arrangements including the Legal Framework*. While the remaining information is covered under this Chapter.

As mentioned, Egypt is a developing country characterized by its arid and semi-arid climate, experiences hot, dry summers and mild winters. Most rainfall is concentrated along the Mediterranean coast, leaving other regions with little precipitation. Over the past 25 years, Egypt has witnessed rising temperatures and frequent extreme weather events, causing economic losses. In 2022, the highest temperature recorded was 42 .6°C in Aswan.

Egypt depends on the Nile River, which provides 55.5 billion cubic meters (BCM) of water annually, based on international treaties. However, Egypt's water needs exceed 114 BCM. The water deficit is managed through various methods: agricultural reuse, treated wastewater, desalination, and the extraction of non-renewable groundwater. The Nile Delta is particularly vulnerable to climate change; rising sea levels and salinization pose serious threats to agriculture and water security.

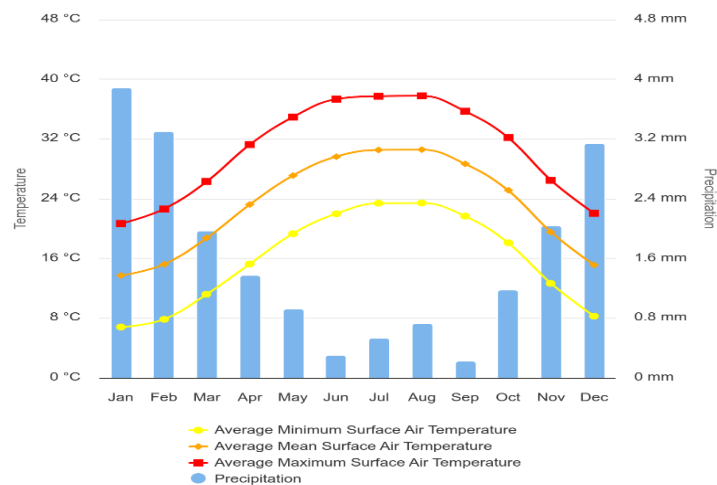
By 2024, Egypt's population reached over 105 million, with 95% concentrated in the Nile Valley and Delta. Rapid population growth and urbanization strain natural resources and infrastructure, exacerbating climate challenges. Cairo alone houses over 10 million people, putting additional pressures on housing, employment, and public services.

Climate change poses significant risks to Egypt's infrastructure, particularly in the Nile Delta, where sea-level rise and salinity intrusion threaten coastal areas. Extreme weather events like heatwaves and droughts also strains inland regions. Despite investments in renewable energy and transportation, ongoing efforts are needed to ensure Egypt's infrastructure is resilient to future climate impacts, as outlined in Egypt Vision 2030 and the National Climate Change Strategy 2050.

## 4.2 Impacts, Risk and Vulnerabilities of Climate Change

### 4.2.1 Historical Climate Data (1901–2022)

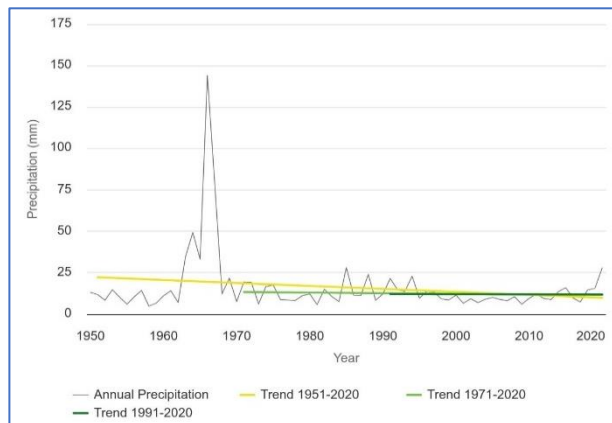
According to data from the World Bank’s Climate Change Knowledge Portal (CCKP), Egypt’s average annual temperature is 22.5°C, with monthly averages ranging between 13°C in January and 30°C in July. Annual precipitation is remarkably low totaling only 33.3 mm, with most rainfall occurring between December and February. Over the past thirty years, Egypt has experienced a significant warming trend, with average annual temperatures rising by 0.53°C per decade, particularly during the summer months, accompanied by a notable increase in daily minimum temperatures. This has resulted in fewer cold nights and more warm nights (World Bank, 2023).



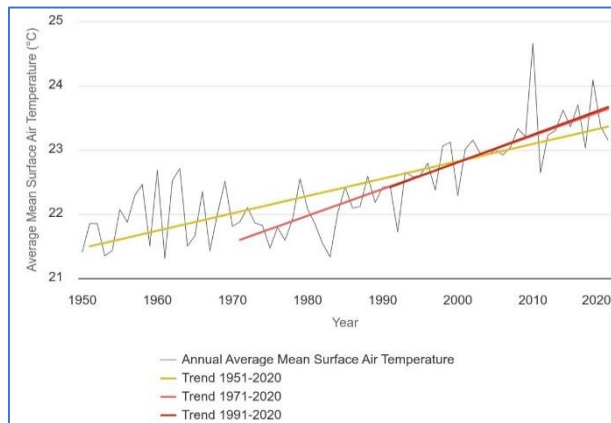
**Figure 23: Monthly Climatology of Average Minimum Surface Air Temperature, Average Mean Surface Air Temperature, Average Maximum Surface Air Temperature & Precipitation in Egypt, 1991-2022 (Source: <https://climateknowledgeportal.worldbank.org/country/egypt> )**

Historical data also show a consistent reduction in annual precipitation, with a 22% decline over the past three decades. This has exacerbated water scarcity, contributing to extended droughts and reduced water availability in many areas. Additionally, the frequency and severity of flash floods have increased, particularly in winter and early spring months.

**Figure 24: Precipitation Annual Trends with Significance of Trend per Decade 1951 – 2020 (World Bank, 2023)**



**Figure 25: Average Mean Surface Air Temperature Annual Trends with Significance of Trend per Decade 1951 – 2020 (World Bank, 2023)**



#### **4.2.2 Projected Future Climate Trends**

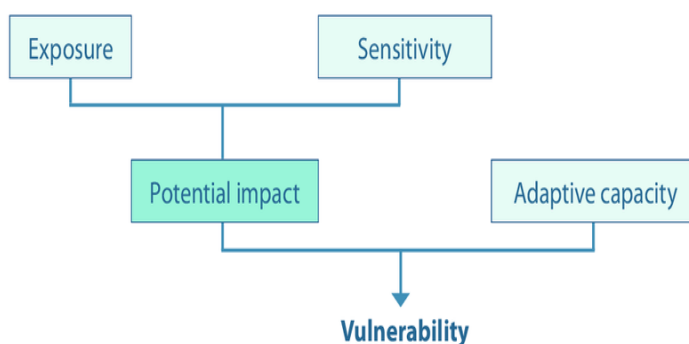
Climate projections based on the Coupled Model Intercomparison Project (CMIP) indicate that Egypt will experience substantial warming by the end of the century, depending on the emissions scenarios. Under a high-emission scenario (RCP8.5), temperatures are projected to rise by 2.1°C to 5.7°C by the 2080s, with the interior regions and summer months experiencing the most rapid increases. Heatwaves are expected to become more frequent, intense, and prolonged, while cold spells will diminish.

In terms of precipitation, Egypt is expected to see a continuation of reduced rainfall, with longer dry spells and an increase in the intensity of heavy rainfall events, though overall annual precipitation will remain low. The combination of rising temperatures and decreasing precipitation will intensify evaporation rates, worsen water scarcity and increase the likelihood of droughts.

The projected climate changes pose significant challenges for Egypt, particularly in the areas of water resource management, agriculture, and public health. Rising temperatures and reduced precipitation will heighten water scarcity, affecting both agricultural productivity and the availability of water for a growing population. Longer periods of extreme heat will also have adverse effects on human health, ecosystems, and livestock. To mitigate these impacts, robust adaptation and resource management strategies will be essential in safeguarding Egypt’s future against climate vulnerabilities.

### 4.2.3 Egypt's Vulnerability to Climate Change

The Intergovernmental Panel on Climate Change (IPCC) defined vulnerability in its fourth assessment report released in 2007 as ‘the degree, to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate change and variation to which a system is exposed, its sensitivity, and its adaptive capacity’ (IPCC, 2007).



**Figure 26: Vulnerability and its Components**

Egypt is highly susceptible to the impacts of climate change. According to Intergovernmental Panel on Climate Change (IPCC), the Nile Delta has been identified as one of the world’s three “extreme” vulnerability hotspots, where future climate projections indicate severe impacts, including sea level rise, water scarcity and deficit, and more frequent and intense extreme weather events such as heat waves, flash floods, heavy rains, sand and dust storms. Egypt's vulnerability is driven by its dependence on the Nile River, which support key sectors such as, agriculture, industry, fisheries, and energy. This dependence heightens the risk, especially as rising temperatures, reduced rainfall, and increasing water deficits threaten water availability for various uses. The ND-GAIN Index ranked Egypt 107 out of 181 countries in 2019, indicating a high level of vulnerability to climate change due to political, geographic, and social factors. The index measures both vulnerability to climate change and the country’s readiness to improve resilience (World Bank, 2021).

#### 4.2.3.1 Sectoral Vulnerabilities

The impacts of climate change are already evident in sectors such as water resources, agriculture, health, coastal zones, and infrastructure.

##### 1. **Water Resources**

Climate change significantly impacts Egypt's water resources, exacerbating existing vulnerabilities in this critical sector. Fluctuations in the flow of the Nile, combined with reduced rainfall in the Upper Nile Basin and the Mediterranean coastal zone, pose severe challenges to potable water availability, agricultural irrigation, and industrial

processes. The economic implications are profound, as these challenges disrupt agricultural productivity and industrial operations. Additionally, prolonged and intensified droughts further exacerbate water scarcity, while extreme weather events such as flooding and storm surges increase water turbidity, reducing potable water supplies and heightening the risk of waterborne diseases, particularly among vulnerable populations.

## **2. Agriculture and Food Security**

Rising temperatures and declining precipitation adversely affect crop yields, threatening food security and agricultural livelihoods. The resulting economic instability is particularly severe for rural communities, where agriculture accounts for a significant share of employment and income. Climate-related crop losses and reduced agricultural productivity increase food prices, disproportionately affecting low-income households.

## **3. Public Health**

Climate change poses growing risks to public health, particularly through intensified heat waves, which exacerbate existing health conditions and disproportionately affect vulnerable populations, including the elderly, children, and outdoor workers. The economic burden of climate-related health issues includes increased healthcare costs and productivity losses due to heat-related illnesses. Extreme weather events also compromise public health infrastructure. Flooding damages water treatment facilities, reducing potable water supplies, especially in regions reliant on these sources for drinking water.

## **4. Coastal Zones**

Egypt's Mediterranean coast is highly vulnerable to rising sea levels. Land subsidence along the northern coastline, including in the Nile Delta, is already underway, contributing to the increased risk of coastal inundation. Subsidence rates in the Delta vary from 1–8.4 millimeters per year, affecting major cities like Alexandria and Port Said. Between 1993 and 2010, sea levels in the Mediterranean rose by 2.6 cm per decade. By the end of the century, they may rise by 22 cm.

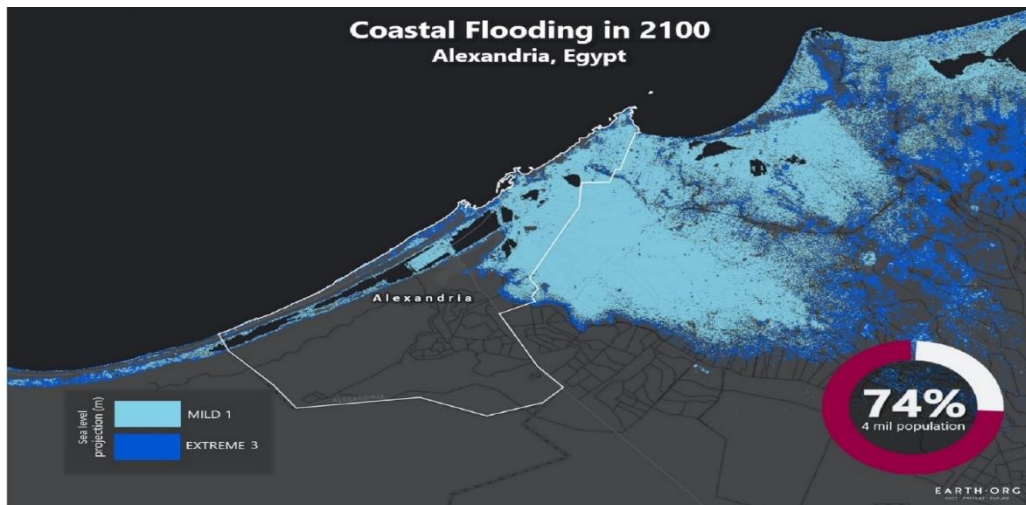
Projections indicate that by 2100, sea levels could rise by one to three meters, with significant displacement of populations, as shown in **Figure 27**. These changes have severe economic implications, including damage to coastal infrastructure, ports, and tourism facilities. Socially, sea level rise threatens to displace millions of people. By 2030, around 45 million Egyptians will be seriously threatened by sea level rise, and by 2060, the population living in Low Elevation Coastal Zones (LECZ) is expected to grow to 63.5 million, representing a 249% increase over 60 years (IPCC, 2022).

Recent storm surges and flooding events illustrate these risks:

- December 2010, January 2011, and October 2015: Storm surges reached 1.2 meters above sea level, causing coastal flooding in the Nile Delta and damage to coastal structures.
- Alexandria (2015): Heavy rainfall led to urban flooding, affecting water treatment facilities and reducing potable water supplies. Saltwater intrusion into coastal aquifers further compounded the water crisis.

The economic costs of repairing and rebuilding damaged infrastructure strain public finances. Socially, the displacement caused by flooding events and the disruption of basic services disproportionately affect low-income people.

Egypt's socio-economic vulnerability is heightened by the prevalence of informal settlements, which are more exposed to environmental hazards due to inadequate infrastructure and limited preparedness among residents. The most affected social groups include the elderly, children, women, and the poor, who often have limited adaptive capacity.

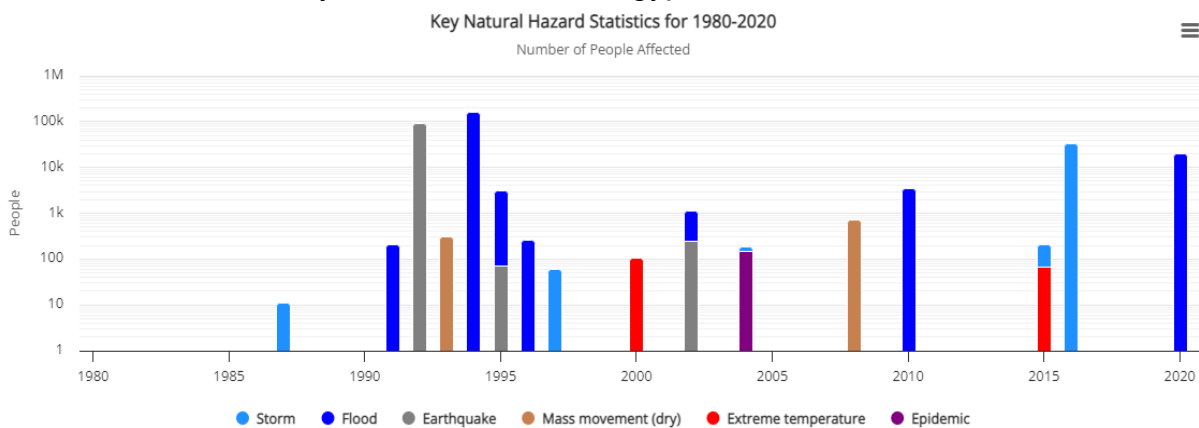


**Figure 27: Sea-level Rise Projections by 2100 for Two Scenarios with the Amount of Rise in Meters (mild = 1m, extreme = 3m) (percentage and total population displacement indicated at the bottom right of the image). (Source: <https://earth.org/data-visualization/sea-level-rise-by-the-end-of-the-century-alexandria/>)**

#### 4.2.4 Exposure to Climate Hazards

Egypt's Nile Delta and Mediterranean coastline are highly vulnerable to natural hazards exacerbated by climate change, including shoreline erosion, sea-level rise, subsidence, and storm surges. The combination of these hazards, along with heavy rainfall, flash floods, and dust storms, poses significant risks to both humans' lives and property. The following chart provides an overview of the most frequent natural disasters in Egypt and illustrates the impacts of those disasters on human populations. The chart shows that, out of climate related hazards, floods have the highest risk and has affected the highest number of people between 1980 and 2020, followed by storms. Moreover,

**Table 73** summarizes key climate hazards in Egypt, their associated risks, and vulnerable



areas to each.

**Table 73: Summary of Key Climate Hazards in Egypt, Associated Risks, and Vulnerable Areas to each (World Bank, 2022)**

| Climate Hazard | Key Risks  | Vulnerable Areas   | Maps |
|----------------|--|--|------|
| Sea-Level Rise | <ul style="list-style-type: none"> <li>-Coastal Erosion</li> <li>-Inundation</li> <li>-Salinization of ground water</li> <li>-Damage to Infrastructure</li> <li>-Impacts on Tourism</li> </ul> | <ul style="list-style-type: none"> <li>-Alexandria</li> <li>-Delta Region</li> <li>-Coastal Resorts</li> </ul> |      |

**Figure 28: Key Natural Hazards Statistics from 1980 – 2020 (Source: <https://climateknowledgeportal.worldbank.org/country/egypt/vulnerability/?text=Historical%20hazards,in%20flash%20floods%20in%20Egypt>)**

| Climate Hazard                              | Key Risks   | Vulnerable Areas  | Maps  |
|---|---|---|---|
| <b>Increase in Average Temperatures</b>     | <ul style="list-style-type: none"> <li>-Sea Level Rise</li> <li>-Extreme Weather Events</li> <li>-Water Scarcity</li> <li>-Agricultural Productivity</li> <li>-Ecosystem Degradation</li> </ul> | <ul style="list-style-type: none"> <li>-Coastal Regions</li> <li>-Nile Delta</li> <li>-Oases</li> <li>-Urban Areas</li> </ul>   | <p>Hot Day Heat Risk<br/>RISK FACTOR CATEGORIZATION</p>   |
| <b>Extreme Heat Waves</b>                   | <ul style="list-style-type: none"> <li>-Public Health Risks</li> <li>-Loss Agricultural Productivity</li> <li>-Structural Damage</li> <li>-Energy Requirements</li> </ul>                       | <ul style="list-style-type: none"> <li>-Heat wave hazard levels in Egypt, ranging from high in the western and southern regions to medium and low in the eastern and northern areas.</li> </ul> | <p>High Medium Low Very Low</p>   |
| <b>Flash Floods and Heavy Precipitation</b> | <ul style="list-style-type: none"> <li>-Flash Floods</li> <li>-Urban Flooding</li> <li>-Soil Erosion</li> <li>-Agricultural Damage</li> </ul>   | <ul style="list-style-type: none"> <li>-Red Sea Coast</li> <li>-Western Desert</li> <li>-Sinai Peninsula</li> <li>-Urban Areas</li> <li>-Agricultural Regions</li> </ul>                        | <p>PRECIPITATION (MM)</p> <p>0 608 1216 1824 2432 3040 3648 4256 4864 5472 6080</p> <p>Coastal Flood risk<br/>Very High High Medium Low</p> |

**4.2.5 Sensitivity of Assets, Infrastructure, and the Wider Society**

Egypt's assets, infrastructure, and society are highly vulnerable to climate change, with risks varying across regions and population groups. Climate hazards, including sea-level rise, extreme weather events, and heatwaves, significantly impact critical infrastructure systems. Heatwaves reduce energy generation efficiency, while flooding damages highways, power lines, and inadequate drainage systems, leading to operational disruptions, higher maintenance costs, and power outages.

Key sectors, including agriculture, fisheries, tourism, and health, face significant impacts. Rising temperatures and changes in rainfall patterns are putting agriculture at risk while fisheries are affected by changes in water conditions. Water scarcity endangers both

consumption and industrial uses that are highly affected by fluctuation of the Nile River. Heat stress and waterborne diseases threaten public health; coastal tourism suffers from coastal erosion and degradation of coral reefs. Alongside the thread from heavy rains and rising seas to Egypt's cultural heritage sites lead to damages and that increase preservation costs.

Socially, low-income communities, women, children, and the elderly are more exposed due to limited adaptive capacity and poor infrastructure. Poor urban planning and inadequate infrastructure in cities like Cairo and Alexandria increase sensitivity to heatwaves and flooding. Low-income communities lack the resources to recover from climate-related losses, while women in rural areas are more affected by water scarcity and food shortages due to their caregiving roles. The elderly, with limited mobility, face heightened risks during extreme weather events such as heatwaves.

### 4.3 Summary of Observed and Potential Impacts of Climate Change across Sectors

| Key Sectors                          | Climate Stressors                       | Potential Impacts                    | Existing/Planned Adaptation Actions             | Effectiveness of Adaptation                      | Risk Level | Institutional and Policy Context                     | Resilience Capacity | Data Sources  |
|--------------------------------------|---|--------------------------------------|---|--|------------|--|---------------------|---|
| Agriculture                          | Temperature increase                    | Reduced crop yield                   | Drought-resistant crops                         | Moderate effectiveness in certain regions        | Extreme    | National Agricultural Strategy, NDCs                 | Medium              | Ministry of Agriculture, Desert Research Center   |
|                                      | Drought                                 | Increased irrigation needs           | Improved irrigation systems                     | High in areas with new irrigation systems        | High       | Policies on water use efficiency                     | Medium              | Scientific Studies, National Plans  |
| Water                                | Reduced Nile flow                       | Water scarcity                       | Water conservation programs                     | Effective at community level                     | High       | National Water Resources Plan                        | Medium              | Ministry of Water Resources, Coastal Reports  |
|                                      | Higher evaporation rates                | Increased water demand               | Groundwater extraction                          | Moderate effectiveness due to depletion          | High       | UNFCCC NDC Reports                                   | Low                 | Research Institutes and Water Management Policies   |
| Sea and River Defense Infrastructure | Sea-level rise                          | Coastal erosion                      | Sea walls, levees                               | Effective for critical infrastructure protection | High       | Coastal protection policy framework                  | High                | Environmental Impact Assessments  |
|                                      | River flooding                          | Damage to riverbanks                 | Flood management plans                          | High effectiveness in urban zones                | High       | Integrated Flood Risk Management Plans               | Medium              | National Flood Management Programs  |
| Ecosystems and Biodiversity          | Habitat loss, temperature changes       | Species decline                      | Protected areas, reforestation                  | Moderate, requires expansion                     | Extreme    | National Biodiversity Strategy                       | Medium              | - Ministry of Environment, global studies<br>- Egyptian Biodiversity Strategy and Action Plan 2015-2030 |
| Fisheries                            | Ocean warming, acidification            | Fish stock decline                   | Sustainable fisheries programs, aquaculture     | Moderate, needs scaling up                       | High       | Fisheries management policies                        | Medium              | National Institute of Oceanography and Fisheries  |
| Health                               | Heat waves, vector-borne disease spread | Heat stress, increased disease rates | Public health campaigns, health system upgrades | Effective in urban zones                         | Extreme    | Public Health Policies (Heat and Disease Management) | Low-Medium          | - Ministry of Health, WHO guidelines.<br>-UNICEF (2022). Children's Climate Risk Index: Egypt Report    |

| Key Sectors                        | Climate Stressors                         | Potential Impacts   | Existing/Planned Adaptation Actions   | Effectiveness of Adaptation                       | Risk Level | Institutional and Policy Context    | Resilience Capacity | Data Sources  |
|------------------------------------|---|---|---|---|------------|-------------------------------------|---------------------|---|
| Tourism                            | Extreme weather, sea-level rise           | Tourism loss, infrastructure damage   | Climate-resilient infrastructure, diversification   | Moderate effectiveness                            | Low-Medium | Tourism sector policies             | low                 | Ministry of Tourism and Antiquities reports, local tourism data |
| Transport                          | Flooding, heat waves                      | Road damage, disrupted transport systems  | Flood-resistant infrastructure, heat-resistant materials  | Effective where infrastructure has been upgraded  | Low        | National Transport Policy           | Medium              | Ministry of Transport, Infrastructure Reports                   |
| Housing                            | Heat waves, flooding                      | Increased cooling demands, housing damage   | Energy-efficient designs, improved drainage systems   | Moderate, needs expansion to informal housing     | Low-Medium | Housing and Urban Planning Policies | Low                 | - Local Housing Authorities, National Housing Strategy          |
| Community and Regional Development | Drought, extreme weather                  | Economic decline, displacement risks  | Drought mitigation programs, resilient planning   | Effective in regions with active local governance | High       | National Urban Development Strategy | Medium              | Regional government reports, NGOs                               |
| Oil and Gas Sector                 | Rising temperatures                       | -Reduced efficiency in refineries and processing plants due to overheating<br>- Increased energy demand for cooling operations.<br>- Health and safety risks for field operators. | -Installing advanced cooling systems and heat-resistant materials in facilities.<br>- Enhancing personal protective equipment (PPE) |   | High       |                                     |                     |   |
|                                    | Increased frequency & intensity of storms | - damage to offshore and coastal infrastructure (e.g., platforms, pipelines, refineries).<br>-Disruptions in oil and gas production and supply chains.                            | -Improving early warning and emergency response systems.<br>-Strengthening design standards for offshore structures.                |   | Low-Medium |                                     |                     |   |
|                                    | Sea level rise                            | -Corrosion and damage to infrastructure.  | Enhancing drainage systems and flood barriers.  |   | high       |                                     |                     |   |

### 4.3.1 Qualitative Methodology for Climate Change Impact Assessment

This climate change impact assessment employs a comprehensive, multi-step approach to evaluate the vulnerabilities and risks of climate stressors across key sectors. The methodology is designed to ensure a thorough analysis, drawing on both quantitative and qualitative data sources.

#### **4.3.1.1 Identification of Climate Stressors and Sectorial Vulnerabilities**

Key climate stressors (i.e. temperature increases, drought, sea-level rise, flooding) are systematically identified for each sector. The associated vulnerabilities, such as reduced agricultural yields, increased irrigation demands, or coastal erosion, are mapped using climate vulnerability indicators. This process incorporates data from local agencies, scientific studies, and sector-specific assessments.

#### **4.3.1.2 Impact Analysis and Evaluation**

Impacts are assessed through a structured analysis of severity, geographic extent, and duration. This includes both immediate and long-term consequences of climate stressors. High-risk regions (i.e. Upper Egypt and Nile Delta) were given a special attention, with particular focus on the magnitude of effects such as water scarcity, ecosystem degradation, or infrastructure damage. The significance of these impacts is evaluated based on the sensitivity and adaptive capacity of affected sectors. This includes assessing how well each sector can withstand or recover from climate-induced disruptions.

#### **4.3.1.3 Assessment of Adaptation Measures**

Existing and planned adaptation strategies (i.e. drought-resistant crops, improved irrigation systems, coastal defenses) were reviewed to determine their effectiveness. The assessment considers factors such as regional applicability, scalability, and long-term viability. Effectiveness is rated based on successful implementation in areas with high exposure to climate risks. The assessment also identifies gaps where adaptation measures need further enhancement or expansion, particularly in vulnerable regions or sectors lacking resilience.

#### **4.3.1.4 Climate Vulnerability Mapping and Risk Assessment**

Vulnerability mapping is conducted to visualize high-risk areas and sectors. Risk levels are assigned based on an integration of climate indicators, sectorial stressors, and institutional capacity. This allows for a clear understanding of where the greatest risks lie and where adaptation efforts should be prioritized. Resilience capacity is evaluated based on institutional frameworks, policy support, and community-level adaptation actions. This includes an analysis of how national strategies (i.e. National Water Resources Plan and National Biodiversity Strategy) contribute to enhancing sectorial resilience.

#### **4.3.1.5 Synthesis of Data and Policy Context**

The assessment draws on diverse data sources, including government reports, scientific studies, and community feedback, to provide a robust foundation for evaluating climate impacts. Additionally, the institutional and policy context is analyzed to ensure alignment with national climate goals and international commitments (i.e. NDCs and UNFCCC

reports). This methodology provides a structured, data-driven approach to identifying climate vulnerabilities and evaluating the effectiveness of adaptation measures, ensuring that the assessment is both actionable and aligned with broader climate resilience objectives.

#### **4.4 Adaptation Strategies, Policies, Plans, Goals and Actions to Integrate Adaptation into National Policies and Strategies**

Egypt has implemented numerous sector-specific projects over the past decade to alleviate the impacts of climate change, including:

- **Sustainable Agriculture Investments and Livelihoods Project (SAIL) (2014–2023):** This project, supported by GEF, IFAD, and the Ministry of Agriculture, focused on enhancing agricultural resilience in vulnerable rural communities.
- **Urban Adaptation Initiatives:** These include the **Participatory Development Programme in Urban Areas (PDP) (2010–2018)**, implemented by GIZ in collaboration with the Ministry of Housing and Environment, which worked on improving urban resilience and infrastructure.
- **Coastal Protection Efforts:** Initiatives like **Adaptation to Climate Change in the Nile Delta through Integrated Coastal Zone Management (2009–2017)** and **Enhancing Climate Change Adaptation in the North Coast and Nile Delta Regions (2018–2024)**, both funded by the Green Climate Fund, aim to address the risks posed by sea-level rise and coastal erosion (UNDP, 2018).

In alignment with Egypt's ongoing commitment to addressing climate change, the country has developed and implemented several strategic frameworks, policies, and plans aimed at enhancing adaptation efforts and integrating climate considerations into national development agendas. Central to these efforts is the **National Climate Change Strategy 2050 (NCCS)**, which aims to consolidate all aspects of climate change into a comprehensive framework that serves as a fundamental reference for integrating climate considerations into the country's overall planning across various sectors.

The NCCS encompasses five key goals:

1. **Achieving Sustainable Economic Growth:** Promoting low-emission development across sectors.
2. **Enhancing Adaptive Capacity:** Building resilience to climate change and mitigating associated negative impacts.
3. **Strengthening Governance:** Improving the governance of climate change actions.
4. **Enhancing Climate Financing:** Developing the infrastructure needed for climate finance.

5. **Promoting Research and Awareness:** Encouraging scientific research, technology transfer, and public awareness to combat climate change.

The NCCS aligns with Objective 3.1 of the updated Egypt Vision 2030, supporting the country's economic and development goals while following a low-emission approach. Moreover, the NCCS emphasizes improving the quality of life for Egyptian citizens, preserving natural resources, and reinforcing Egypt's leadership in international climate change efforts. The NCCS 2050 is under active implementation with priority given to enhancing infrastructure resilience and scaling up renewable energy projects, while promoting gender-responsive measures for vulnerable communities.

### **National Adaptation Plan (NAP)**

As part of Egypt's broader climate adaptation efforts, the National Adaptation Plan (NAP) focuses on addressing climate vulnerabilities across critical sectors such as agriculture, water resources, coastal zones, health, and urban infrastructure. Launched in March 2017 with a stocktaking workshop and the subsequent establishment of an Adaptation Task Force under the National Council for Climate Change in November 2017, the NAP integrates climate adaptation into Egypt's sustainable development framework.

Key stakeholders in these efforts include the Ministry of Environment, Ministry of Water Resources and Irrigation, Ministry of Agriculture, along with international partners such as UNDP, Green Climate Fund (GCF), the World Bank, and GIZ. These organizations collaborate to enhance Egypt's institutional capacity for climate adaptation and reduce vulnerabilities across sectors.

The objectives of the NAP are to ensure that climate adaptation becomes a central component of national development planning, aligning with Egypt's Vision 2030 and integrating adaptation strategies into various sectoral policies.

#### **4.4.1 Key Sector Strategies, Plans and Policies**

This section draws on the detailed overview of key sector strategies, plans, and policies provided in **Chapter 1, subsection 1.8.5**. These strategies reflect Egypt's commitment to sustainable development, resilience building, and low-emission growth, aligning with Vision 2030, NCCS 2050 and international frameworks like the Paris Agreement. The table summarizing these strategies and plans by sector is also presented in **Chapter 1**.

Recognizing water scarcity as a significant challenge, Egypt prioritizes the sustainable management of water resources through the **Climate Change Adaptation Strategy for the Ministry of Water Resources & Irrigation (2013)** and the **Strategy for Development and Management of Water Resources 2050**, which includes initiatives for improved irrigation techniques and water conservation. The Water Resources Strategy 2050 represents a shift towards adapting to water scarcity, rationalizing its consumption, and linking water resources management to energy and food.

The **National Water Resources Plan (NWRP-2017-2037)** further supports these efforts by addressing water management challenges. Complementing these efforts is the 2030 Strategic Vision for Treated Wastewater Reuse in Egypt, which emphasizes the importance of recycling water to meet growing demands.

In the energy sector, Egypt's Integrated and Sustainable Energy Strategy (ISES) 2035 and the National Energy Efficiency Action Plan (NEEAP) reflect the country's commitment to transitioning towards low-emission development and renewable energy sources. The adoption of the National Renewable Energy Strategy in 2008 marked a significant milestone in this regard, setting ambitious targets for generating 20% of electricity from renewable resources by 2022. These strategies are aligned with the broader goals of Egypt's Vision 2030, which envisions a sustainable and resilient energy sector that supports economic growth and reduces greenhouse gas emissions.

The **Sustainable Agricultural Development Strategy towards 2030 (SADS 2030)** focuses on enhancing food security and supporting farmers in adapting to climate variability through the promotion of climate-smart agricultural practices. The strategy builds on previous agricultural policies, such as the 1980s and 1990s Agricultural Development Strategies, which emphasized sector liberalization and economic reforms. The Agricultural Development Strategy towards 2017 aimed for self-sufficiency and increased agricultural production. Additionally, Egypt has developed the **National Action Plan (NAP) to Combat Desertification (2024–2030)** to enhance resilience through sustainable land management aligning with national adaptation strategies. The NAP focuses on land rehabilitation, water-efficient irrigation, afforestation, and soil conservation, while strengthening institutional coordination and community participation. It also includes monitoring mechanisms to support data-driven decisions reinforcing Egypt's commitments under the **United Nations Convention to Combat Desertification (UNCCD)**. By integrating sustainable land management approaches, the NAP complements Egypt's broader adaptation and environmental sustainability objectives, particularly in agriculture, water resources, and ecosystem protection.

Coastal management is also a key area of focus, particularly in response to the risks posed by sea-level rise and coastal erosion. The **National Strategy for Integrated Coastal Zone Management (ICZM) aims** to address vulnerabilities in coastal areas by mitigating the impacts of sea-level rise and preserving marine biodiversity. This strategy is part of a broader **ICZM Plan** for the North Coast of Egypt aimed at linking land use development with effective coastal protection. Given that climate adaptation in coastal zones often involves both water and energy-intensive infrastructure, such as flood barriers, desalination plants, and wastewater treatment facilities, improving energy efficiency is crucial to maintaining long-term sustainability.

In addition to sector-specific strategies, Egypt has also integrated climate adaptation into broader social and economic policies. The National Strategy for Gender Mainstreaming in Climate Change ensures that gender perspectives are incorporated into adaptation planning recognizing the critical role of women in climate resilience. Similarly, national social support programs such as Takaful, Karama, and Hayat Karima contribute to

mitigating the socio-economic impacts of climate change, particularly for vulnerable populations. Other strategies include the National Strategy for the Empowerment of Egyptian Women 2030, Egypt's National Population and Development Strategy 2023-2030, Egypt country strategic plan (2023–2028), and The National Human Rights Strategy 2021-2026.

Moreover, Egypt's commitment to advancing environmental sustainability is reflected in its adoption of the National Green Hydrogen Strategy (2023) and the Low-Carbon Hydrogen Strategy (2024). These strategies aim to position the country as a global leader, targeting significant CO<sub>2</sub> reduction, job creation, and a renewable energy mix exceeding 42% by 2030, while boosting Egypt's competitiveness in the global hydrogen market. These strategies underscore Egypt's dedication to fostering innovation and sustainable development in the face of climate change.

Through these comprehensive strategies and plans, Egypt continues to make significant progress in its adaptation efforts, addressing both immediate and long-term challenges posed by climate change. The integration of these initiatives into national policies and development plans ensures that Egypt remains on a path toward sustainable and resilient growth.

#### **4.4.2 How best available science, gender perspectives and indigenous, traditional and local knowledge are integrated into adaptation**

Egypt's adaptation strategies are informed by a holistic approach that integrates best available science, gender perspectives, and indigenous, traditional, and local knowledge. These elements ensure that adaptation efforts are effective, inclusive, and culturally sensitive.

Adaptation policies in Egypt rely heavily on scientific research, climate models, and environmental monitoring. The country integrates these tools into decision-making, particularly in key areas such as agriculture, water management, and biodiversity. For instance, the National Strategy for Climate Change 2050 promotes the integration of scientific methods alongside traditional knowledge for sustainable resource management. Another example is the case of the Bedouin communities in Wadi Allaqi, who use rotational grazing and water management practices, which showcases the importance of local knowledge in addressing climate risks, as recognized by the designation of Wadi Allaqi as a UNESCO biosphere reserve.

Additionally, initiatives like the NWFE (National Platform for Green Projects) promote sustainable energy, water, and food security projects by linking scientific advancements with traditional and local knowledge. This platform focuses on both mitigation and adaptation, particularly addressing water and food shortages through science-backed, community-driven projects.

Egypt promotes women's participation in decision-making and empowers them as agents of change with strategies such as the National Strategy for Mainstreaming Gender in Climate Change (NSGMCC) and the National Strategy for the Empowerment of Egyptian Women 2030. These strategies focus on sectors like agriculture, water, and health, aiming to mitigate gender-based inequalities and enhance women's access to resources, reproductive health services, and decision-making roles.

In line with Egypt's commitment to gender-sensitive adaptation, the African Women's Climate Change Adaptation Initiative (AWCAP) serves as a regional effort to integrate gender-responsive approaches into climate governance. The initiative promotes gender-sensitive perspectives in adaptation and mitigation, strengthens women's participation in environmental governance, and enhances their access to financial and productive resources. AWCAP aligns with Egypt's Global Perspective on Women, Environment, and Climate Change emphasizing the need for capacity building, policy integration, and just transition opportunities for women in key areas such as agriculture, water, energy, and health. By leveraging knowledge generation, data analysis, and training opportunities, AWCAP supports women's role as equal players in climate action and ensures their meaningful inclusion in adaptation strategies.

Additionally, Egypt's National Climate Change Strategy (NCCS) 2050 integrates gender considerations, particularly in objective 2.G, which focuses on empowering women to adapt to climate change "Strengthening women's response considerations to help them adapt to climate change."

On the ground, initiatives include the involvement of mobile health teams, community-based organizations, and local entities in addressing women's health and climate impacts at the community level. The Environmental and Climate Investment Electronic Platform further supports gender-responsive adaptation efforts by providing access to green finance and enabling community-led projects that account for gender differences.

Women's critical roles in agriculture, food security, and natural resource management are emphasized, but their underrepresentation in decision-making remains a challenge. Despite facing compounded vulnerabilities, women are key agents of change in building climate resilience. Egypt's participation in COP27 reflects its global commitment to embedding gender-sensitive perspectives into climate policies, promoting women's leadership, and ensuring their voices are included in environmental governance. Egypt's approach prioritizes the empowerment of vulnerable groups and aims for a more inclusive and equitable environmental transition.

Egypt values indigenous and local knowledge systems in its adaptation strategies, particularly in agriculture and water management. Bedouin practices in desert regions,

such as Wadi Allaqi, emphasize sustainable grazing and water conservation, demonstrating how traditional knowledge enhances climate resilience. By integrating this knowledge into national policies and conservation efforts, such as the Wadi Allaqi Biosphere Reserve, Egypt preserves valuable cultural heritage, while improving adaptation outcomes.

However, challenges remain, including the documentation and transmission of traditional knowledge and addressing gender gaps in decision-making. To strengthen the inclusion of indigenous knowledge and gender-sensitive approaches, legal frameworks must protect community rights and ensure the equitable participation of all stakeholders in adaptation strategies.

#### **4.4.3 Stakeholder Involvement, including Subnational, Community-level, and Private Sector Plans, Priorities, Actions, and Programs**

Climate change adaptation in Egypt involves diverse stakeholders, including government bodies, subnational authorities, private sector actors, international organizations, non-governmental organizations (NGOs), and community-level organizations. The National Council for Climate Change (NCCC), established by Prime Minister Decree No. 1912/2015 (amended by Decree No. 1129/2019), leads climate governance, coordinating cross-sectoral efforts under the National Climate Change Strategy 2050. Key roles of the NCCC include policy coordination, multi-stakeholder collaboration, capacity building, monitoring and reporting mechanism, and implementation of NAP. Involvement spans national ministries, such as the Ministry of Water Resources, Agriculture, and Renewable Energy, and international organizations like UNDP. The National Climate Change Strategy 2050 also stated the importance of defining stakeholder's roles and responsibilities as outlined in the third goal of NCCS; *"Goal 3: Enhancing Climate Change Action Governance, Objective, (3.a): Defining the roles and responsibilities of the different stakeholders in order to achieve the strategic goals."* The table below outlines key stakeholders, their roles, interests, policies, and programs in the adaptation process.

**Table 74: Summary of Key Stakeholders, Roles and Responsibilities, Actions in the Adaptation Process**

| Stakeholder  | Roles & Interests   | Key Policies & Strategies   | Programs & Actions  |
|--|---|---|---|
| <b>Ministry of Environment (MoE)</b>                                     | <p><u>Role:</u> Develops national policies, strategies, and coordinates adaptation efforts.</p> <p><u>Interest:</u> Economic resilience, biodiversity conservation.</p>   | <p>Environmental Protection Law, National Climate Change Strategy (NCCS) 2050, Egypt's Vision 2030.</p>   | <p>Climate risk management program, coastal protection program, climate-smart agriculture, raising awareness.</p>         |
| <b>Egyptian Environmental Affairs Agency (EEAA)</b>                      | <p><u>Role:</u> Implements NAP, coordinates adaptation activities, focuses on loss and damage.</p> <p><u>Interest:</u> National adaptation capacity.</p>  | <p>NCCS 2050, National Action Plan (NAP), Third National Communication (TNC), Forth National Communication (FNC).</p>   | <p>The Integrated Coastal Zone Management (ICZM), capacity building, public awareness.</p>                                |
| <b>National Council for Climate Change (NCCC)</b>                        | <p><u>Role:</u> Supervises climate activities, integrates climate in national development planning.</p> <p><u>Interest:</u> Cross-ministerial collaboration.</p>  | <p>NCCS 2050, Egypt's Nationally Determined Contributions (NDCs), Egypt's Vision 2030.</p>  | <p>MRV system, stakeholder engagement.</p>  |
| <b>National Ministries (Water, Agriculture, Energy, Petroleum)</b>       | <p><u>Role:</u> Manages water resources, food security, fisheries management, transitions to renewable energy, and the regulation of petroleum activities, including exploration, production, refining, and emissions management.</p> <p><u>Interest:</u> Climate-resilient agriculture, energy transition.</p> | <p>Egypt's National Water Resources Plan (NWRP) 2037, The Sustainable Agriculture Development Strategy (SADS) 2030, Egypt's Integrated Sustainable Energy Strategy (ISES) 2035, The National Energy Efficiency Action Plan (NEEAP), Fisheries Development Plan, and the Egyptian Petroleum Sector Energy Efficiency Strategy 2022-2035.</p> | <p>Modern irrigation, water reuse, drought-resistant crops, renewable energy integration.</p>                             |
| <b>Local Level (Subnational Governments)</b>                             | <p><u>Role:</u> Implements national policies, disaster risk reduction (DRR), community engagement.</p> <p><u>Interest:</u> Reducing local vulnerability.</p>  | <p>Local Climate Adaptation Plans, Egypt's National Strategy for Disaster Risk Reduction (DRR), water management policies.</p>  | <p>Alexandria Coastal Zone Management (ICZM), Beheira water conservation efforts, climate-resilient housing in Cairo.</p> |
| <b>International Organizations (UNDP, UNFCCC, IFAD, World Bank, GIZ)</b> | <p><u>Role:</u> Provides funding, technical expertise, and capacity building for climate resilience.</p> <p><u>Interest:</u> Climate resilience, low-carbon transition.</p>   | <p>The Paris Agreement, NDCs, Climate Change Action Plan (2021-2025).</p>   | <p>NAP process, climate finance, climate-smart agriculture, water efficiency and irrigation programs.</p>                 |

| Stakeholder   | Roles & Interests   | Key Policies & Strategies   | Programs & Actions  |
|---|---|---|---|
| <p align="center"><b>Businesses and Private Sector</b></p>                          | <p><u>Role:</u> Innovates technology, invests in green projects, and manages climate risks.</p> <p><u>Interest:</u> Sustainability, market opportunities.</p>                     | <p>NCCS 2050, ISO environmental standards.</p>                        | <p>Renewable energy projects (Benban Solar Park- Wind Farms in Zafarana), energy efficiency, sustainable agriculture.</p> |
| <p align="center"><b>Research Institutions (Universities, Research Centers)</b></p> | <p><u>Role:</u> Conducts climate research, supports policy, and develops adaptation technologies.</p> <p><u>Interest:</u> Scientific advancement, national development goals.</p> | <p>NAP, NDCs, Science, Technology &amp; Innovation Strategy 2030.</p> | <p>Climate-smart agriculture, renewable energy research, water management projects, education and training Programs.</p>  |
| <p align="center"><b>NGOs (Youth Loves Egypt, Nature Conservation Egypt)</b></p>    | <p><u>Role:</u> Advocates for climate awareness, community engagement, and education.</p> <p><u>Interest:</u> Environmental conservation, capacity building.</p>                  | <p>NCCS 2050. Sustainable Development Goals (SDGs)</p>                | <p>Environmental campaigns, biodiversity protection, Climate Change and Health Initiatives.</p>                           |

## **4.5 Progress on Implementation of Adaptation**

Egypt has made significant progress in implementing its adaptation strategies across key sectors aligning with the adaptation component of its Nationally Determined Contribution (NDC). The country has undertaken various initiatives to enhance climate resilience, including improvements in water resource management, agricultural adaptation, policy development, and multi-stakeholder coordination.

### **4.5.1 Implementation of the Actions Identified in Adaptation Strategies**

Egypt has actively pursued the adaptation measures outlined in its national policies and sectoral plans. These include large-scale infrastructure projects, climate-smart agriculture practices, and initiatives to protect vulnerable communities from climate risks. Through national programs, Egypt has integrated resilience-building efforts across different sectors, ensuring sustainable development pathways.

### **4.5.2 Institutional and Policy Reforms for Adaptation Implementation**

The government has strengthened institutional frameworks to enhance climate adaptation governance. This includes revising policies to mainstream climate resilience into national planning, enhancing coordination between ministries, and improving financial mechanisms to support adaptation investments. The establishment of specialized climate adaptation units within relevant ministries has further improved policy integration and implementation efficiency.

### **4.5.3 Implementation of Adaptation Actions Identified in the Adaptation Component of NDCs**

Egypt's NDC adaptation targets for agriculture and water resources are being actively implemented through a combination of policy reforms, infrastructure development, and capacity-building programs:

#### **4.5.3.1 Agriculture Adaptation**

Egypt's adaptation strategy for agriculture focuses on increasing crop resilience, improving irrigation efficiency, and supporting farmers in adapting to climate change. The country is implementing modern surface irrigation techniques across 4 million feddans to increase water use efficiency by 20%. Additionally, climate-resilient crop varieties that can withstand drought, salinity, and high temperatures are being introduced, aiming to boost crop yields by 10-15%. These measures are expected to benefit 10 million people and ensure food security in vulnerable farming regions.

Other key adaptation measures include:

- Developing stress-resistant crop species through breeding programs.
- Expanding biodiversity for strategic crops.
- Implementing livestock immunization and disease prevention programs.

- Closing the feed gap by introducing high-nutritional value, non-traditional animal fodder.
- Revising policies to adapt agricultural lands to rising sea levels in the northern Delta.
- Mitigating land degradation risks through sustainable land-use practices.
- Strengthening early warning systems and crisis management frameworks.
- Providing capacity-building programs for farmers to promote efficient land and water management.

These comprehensive strategies aim to build a more resilient agricultural sector, safeguard rural livelihoods, and contribute to national and regional food security.

#### **4.5.3.2 Water Resources & Irrigation Adaptation\***

Egypt is implementing an ambitious water security and climate resilience program, focusing on modernizing irrigation infrastructure, expanding desalination, and promoting sustainable water management. The country is rehabilitating 20,000 km of irrigation canals to reduce water losses and benefit 60 million people. Additionally, water conservation measures across the agricultural, industrial, and municipal sectors are improving water efficiency and quality.

Other key adaptation measures include:

- Developing large-scale renewable energy-powered desalination projects with a total capacity of 4 million m<sup>3</sup>/day, benefiting 33 million people.
- Expanding rainwater harvesting and aquifer recharge projects, particularly in Sinai, the Red Sea, and Upper and Middle Egypt.
- Increasing the use of treated wastewater and agricultural drainage for irrigation, with mega treatment plants such as Bahr el Baqar, Mahsama, and Hammam increasing reused water to 14 million m<sup>3</sup>/day.
- Strengthening regional cooperation with Nile Basin countries to enhance transboundary water management, improve water-sharing agreements, and support joint sustainable water projects.

These strategies aim to reduce water stress, secure agricultural and drinking water supplies, and enhance climate resilience in Egypt's water sector.

#### **4.5.4 Coordination Activities and Changes in Regulations, Policies, and Planning**

Egypt has undertaken several initiatives to improve coordination and planning for adaptation efforts, including:

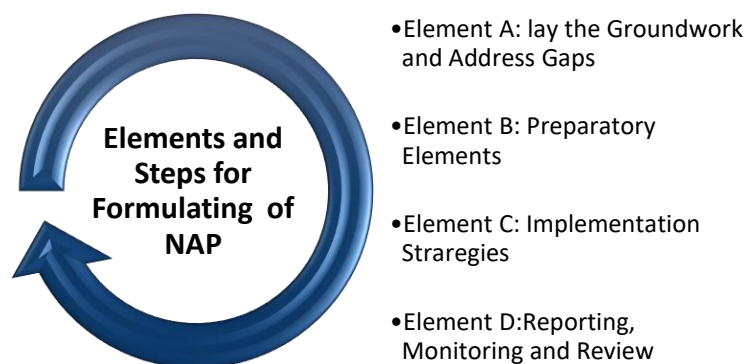
- Establishing national adaptation coordination committees to enhance inter-ministerial collaboration.
- Strengthening partnerships with international organizations, research institutions, and private sector stakeholders.
- Revising land-use policies to integrate climate risks, particularly for coastal areas and agricultural lands.

- Enhancing local and community-based adaptation planning to ensure the participation of vulnerable groups in decision-making processes.

Through these efforts, Egypt continues to make significant strides in advancing its adaptation agenda, ensuring long-term climate resilience across key sectors.

#### **4.6 Monitoring and Evaluation of Adaptation Actions and Processes:**

The operational framework of climate change adaptation involves a set of actions and activities that are consistent with the main objectives of any strategy and execution phases. It is expected that the implementing agencies would separately identify and describe their roles and responsibilities in full. They would also prepare an action plan, in order to achieve strategic objectives within the limits of their competence. It is important that this is followed through monitoring and evaluation so as to improve the procedures of implementation, planning and resource allocation. Monitoring and Evaluation (M&E) is a crucial stage of the policy cycle regarding adaptation: it appears in the National Adaptation Policies (NAP) Guidelines associated with reviewing progress and effectiveness. As shown in Figure 29, the formulation of a NAP includes a structured framework of elements and steps, highlighting M&E as an integral component of the process. For the National MRV system Structure, it shows on Chp.1 Institutional Arrangements subsection



**Figure 29: Element and Steps for Formulating NAP.** (Source: UNFCCC Technical Guidelines for the National Adaptation Plan Process. (Source: <https://unfccc.int/topics/adaptation-and-resilience/resources/publications/technical-guidelines-for-the-national-adaptation-plan-process>).

#### **4.7 Information Related to Averting, Minimizing, and Addressing Loss & Damage Associated with Climate Change Impacts**

Egypt's efforts to avert, minimize, and address loss and damage associated with climate change are grounded in the need to respond to projected climate-related risks, vulnerabilities, and adaptive capacities across various sectors. Observed and potential impacts, including extreme weather events such as floods and heatwaves, along with slow onset events like desertification and sea-level rise, pose severe threats to critical

areas, especially the Nile Delta. These challenges threaten key sectors like agriculture and water resources, which are vital to Egypt’s economy and food security.

Over the last 20 years, natural hazards have killed nearly 1,500 people, causing \$346.7 million in economic damages. Notable events include a deadly 2009 rockslide in Cairo and severe flooding in 2010 that displaced thousands of people and damaged over 4,000 houses. Climate change is expected to increase the potential impact of hazards. (GFDRR, 2019).

Data from the Emergency Event Database: EM-Dat database, presented in Table 75, indicates Egypt has experienced various natural disasters, including floods, landslides, epidemics, and storms from 1900 to 2020 (GFDRR, 2019).

**Table 75: Natural Disasters in Egypt, 1900 – 2020. (Source: <https://thinkhazard.org>)**

| Natural Hazard             | Subtype           | Events Count | Total Deaths | Total Affected | Total Damage ('000 USD) |
|----------------------------|-------------------|--------------|--------------|----------------|-------------------------|
| <b>Earthquake</b>          | Ground Movement   | 5            | 594          | 92,996         | 1,200,000               |
| <b>Epidemic</b>            | Bacterial Disease | 1            | 10,276       | 0              | 0                       |
|                            | Viral Disease     | 2            | 15           | 143            | 0                       |
| <b>Extreme Temperature</b> | Cold Wave         | 1            | 3            | 105            | 0                       |
|                            | Heat Wave         | 3            | 164          | 66             | 0                       |
| <b>Flood</b>               | Flash Flood       | 2            | 13           | 468            | 0                       |
|                            | Riverine Flood    | 6            | 638          | 167,960        | 140,000                 |
| <b>Storm</b>               | Convective Storm  | 6            | 109          | 47,807         | 126,000                 |
| <b>Mass Movement (dry)</b> | Rockfall          | 1            | 98           | 697            | 0                       |
|                            | Subsidence        | 1            | 34           | 300            | 0                       |

Scientific assessments reveal the vulnerabilities of Egypt’s coastal regions, where rising sea levels and salinization directly threaten agricultural productivity. Between 1993 and 2010, the Mediterranean Sea rose by 2.6 centimeters per decade, a significant trend expected to worsen, with sea levels projected to increase by 22 centimeters by the end of the century. This escalation has left Egypt’s coastline, particularly in areas like Rosetta, highly vulnerable to erosion, saltwater intrusion, and increased soil salinity. The salinity of Rosetta’s coast rose sharply from 27 percent in 1964 to over 29 percent by 2015, contributing to the deterioration of cultivated land and the degradation of freshwater resources (Al-Mailam et al., 2023).

These coastal issues increase water scarcity and pose a direct threat to agricultural productivity in the Nile Delta, one of Egypt’s most crucial agricultural regions. Increased soil salinity and declining freshwater availability have led to significant crop damage and reduced yields, affecting national food security.

In response to these impacts, Egypt has embarked on several adaptation initiatives. Agricultural production in vulnerable regions, such as the Nile Delta, is being enhanced through targeted interventions, with projected investments of \$4 billion. Similarly, \$2 billion has been allocated for the rehabilitation of agricultural areas in the Northern Delta affected by sea-level rise. Egypt is also focused on increasing resilience in climatically

vulnerable areas by combating desertification and rehabilitating degraded pastures, with a budget of \$3.5 billion dedicated to these activities. Improving water management is another priority, with projects such as the development of on-farm irrigation in the Nile Valley and Delta estimated at \$4 billion. Additionally, supporting early warning systems, agricultural weather forecasting, and establishing agricultural insurance are expected to cost \$1.5 billion.

Water resource management is also a significant area of focus, with cross-cutting projects such as water desalination using solar energy allocated \$625 million. Natural protection efforts along the Rosetta shoreline using innovative techniques like the sand motor will cost \$120 million, while the rehabilitation of irrigation canals to enhance agricultural resilience will require \$4.5 billion. Coastal protection and development efforts in three Mediterranean cities, integrating climate adaptation into urban planning, are set to receive \$2 billion, while scaling up solar-powered irrigation projects is expected to cost \$50 million. Furthermore, infrastructure projects such as building a breakwater at the Port of Alexandria to mitigate the impacts of rising sea levels will receive \$108 million in funding. The total cost of implementing these adaptation measures is estimated at \$50 billion, forming part of Egypt's broader climate strategy. However, the country's ability to implement these measures is conditional on receiving adequate international financial support. As outlined in Egypt's second updated NDC, \$50 billion is required for adaptation.

Egypt has also taken significant steps to mitigate the adverse effects of climate change through various initiatives. The Integrated Coastal Zone Management (ICZM) Plan aims to develop climate-resilient strategies that link land use planning with coastal protection measures over the next 10-15 years. The government has also integrated Disaster Risk Reduction (DRR) strategies into national planning, focusing on developing hazard maps and early warning systems to reduce the vulnerability of communities and critical infrastructure, particularly against extreme weather events like floods.

Despite significant efforts by the Egyptian government to mobilize resources through domestic public and private channels, meeting these targets will not be possible without substantial international support. Egypt emphasizes the need for developed countries to fulfill their commitments under Article 9 of the Paris Agreement, which mandates financial support to developing countries. This support should be delivered through international and regional development partners, funds, and private investors using a variety of financial modalities, including blended finance, green bonds, and grants (EEAA, 2023).

Institutional arrangements within Egypt, such as the National Council for Climate Change, alongside key ministries, continue to drive national climate efforts. These institutions collaborate with international partners to ensure that Egypt's adaptation and mitigation plans are effectively implemented. Egypt remains committed to its sustainable development goals as part of its Vision 2030, which integrates climate action into the country's broader developmental objectives, ensuring that loss and damage from climate impacts are adequately addressed.

#### **4.8 Cooperation, Good Practice, Experience, and Lessons Learned**

Egypt has been actively engaged in a range of national, regional, and international initiatives that aimed at sharing information, promoting good practices, and exchanging experiences related to climate adaptation. These cooperative efforts have been central to strengthening Egypt's adaptive capacity and have enabled the integration of climate adaptation actions into national strategies and planning frameworks.

Through collaborations with international organizations like the United Nations Environment Programme (UNEP) and the Global Environment Facility (GEF), Egypt has shared and adopted policy innovations that have informed its national adaptation strategies. Notable examples include the National Adaptation Plan (NAP) and pilot projects focused on sustainable agricultural practices and water resource management, particularly in vulnerable regions such as the Nile Delta. These initiatives have provided valuable insights into embedding climate science into planning frameworks, thereby enhancing the resilience of local communities.

Egypt's efforts in ICZM and disaster risk reduction have further highlighted the importance of incorporating adaptation actions at different governance levels. ICZM, in particular, has facilitated the exchange of knowledge on coastal protection, providing strategies that have been applied both locally and regionally to mitigate the effects of sea-level rise and coastal erosion.

Egypt's cooperation extends across local, national, regional, and international levels, involving diverse actors such as local governments, farmers' cooperatives, international donors, and regional organizations. These efforts focus on water conservation, renewable energy projects, and transboundary water management. International cooperation with institutions like the UNFCCC, Green Climate Fund (GCF), and European Bank for Reconstruction and Development (EBRD) has mobilized funding and technical support for large-scale climate projects, advancing Egypt's climate resilience.

In terms of strengthening scientific research and institutional capacities, Egypt has made significant progress by improving its early warning systems, enhancing its capacity to conduct vulnerability assessments, and developing robust monitoring and evaluation frameworks. These advancements have been crucial for evidence-based decision-making and have helped ensure that adaptation measures are more effective and responsive to climate risks. The enhanced national early warning systems have significantly improved Egypt's preparedness for extreme weather events, which has, in turn, increased the resilience of vulnerable areas.

Egypt has also played a leading role in sharing lessons learned with other developing nations, particularly within regional forums. Through its experiences in addressing challenges such as water scarcity, desertification, and agricultural resilience, Egypt has contributed to shaping regionally adapted solutions and identifying common priorities for climate adaptation.

Ultimately, Egypt's cooperative efforts underscore the vital role of partnerships in fostering innovation and building adaptive capacity. By leveraging regional and international cooperation, Egypt has not only strengthened its own resilience but has also contributed to the global exchange of good practices, science, and policy advancements in climate adaptation. These efforts demonstrate that effective cooperation is key to addressing the multifaceted challenges posed by climate change.

In addition, Egypt has significantly invested in strengthening its climate research and monitoring systems. Systematic observation of key climate variables, such as temperature, precipitation, and sea-level rise, has provided vital data for informing adaptation actions. The development of robust monitoring and evaluation frameworks has enabled Egypt to track its adaptation progress, optimize resource allocation, and incorporate lessons learned into future planning, ensuring that adaptation actions remain effective and durable.

## **Chapter 5: Financial, Technology Development and Transfer, and Capacity Building Needed and Received under Articles 9-11, and Article 13 of the Paris Agreement**

### **5.1 National Circumstances**

As outlined by the MPGs paragraphs 130, each Party should provide information on national circumstances and institutional arrangements and country-driven strategies relevant to reporting on the support needed and received, including:

- (a) A description of the systems and processes used to identify, track and report support needed and received, including a description of the challenges and limitations;
- (b) Information on country priorities and strategies and on any aspects of the Party's NDC under Article 4 of the Paris Agreement that need support.

These requirements are comprehensively addressed in Chapter 1 of this report, under subsection *1.8 Institutional Arrangements*. The remaining information is covered under this Chapter.

### **5.2 Country Priorities, Strategies, and Regulations**

Egypt has played a pivotal role in global climate negotiations under the UNFCCC, consistently advocating for Africa's climate justice, finance, and adaptation needs. As a leader in the African Group of Negotiators, Egypt has influenced major climate agreements, including securing climate finance commitments at COP21 (Paris, 2015) and pushing for operationalizing the Paris Rulebook at COP24 (Katowice, 2018). At COP26 (Glasgow, 2021), Egypt emphasized the need for loss and damage finance, greater accessibility to the Green Climate Fund (GCF), and a just energy transition for developing nations.

The pinnacle of Egypt's commitment to climate action has been highlighted through its role in hosting the Conference of the Parties (COP27) in Sharm El-Sheikh in 2022. This event served as a significant milestone for the country, allowing it to showcase its commitment to sustainable development and climate resilience while advancing climate diplomacy on a global scale. At COP27, known as Africa's COP, Egypt led negotiations to establish the historic Loss and Damage Fund and launched key African-led climate initiatives, such as the Sharm El-Sheikh Adaptation Agenda and the Africa Carbon Markets Initiative.

In conjunction with COP27, Egypt launched its National Climate Change Strategy (NCCS) 2050, outlining a long-term vision for climate resilience and low-emission development. COP27 marked important advancements in global climate action, particularly through the establishment of the "Loss and Damage fund", which aims to provide essential financial

aid to countries adversely affected by climate change, emphasizing the moral responsibility of the global community to compensate these nations.

In line with this commitment, COP27 focused on adaptation financing, with countries agreeing to double adaptation finance by 2025 to enhance the resilience of vulnerable nations. For the first time, food security was integrated into the conference agenda, emphasizing the significance of sustainable agriculture and climate resilience through initiatives like the Food and Agriculture for Sustainable Transformation (FAST)" programme. Additionally, new Just Energy Transition Partnerships (JETP) for Indonesia and Vietnam demonstrated a commitment to supporting renewable energy transitions while ensuring fairness for affected workers and communities. Despite the ongoing challenge of meeting the \$100 billion annual climate finance target, COP27 improved transparency and accountability in tracking financial contributions, reinforcing the necessity to increase both mitigation and adaptation financing. The conference also introduced the Global Shield initiative, spearheaded by the G7 and V20 countries, aimed at providing financial protection against climate-induced losses through insurance and disaster relief. It also highlighted the urgent need for greater financial support and climate justice for African countries and the Global South, addressing the disproportionate impacts of climate change on these regions and stressing the importance of collective action in the global response to climate change.

Reinforced by COP27 achievements, Egypt's climate action priorities are primarily outlined in two key strategic policy documents: the National Climate Change Strategy 2050 and the second updated NDC. These documents reflect Egypt's comprehensive approach to tackling climate change while balancing economic growth and environmental sustainability.

### **5.2.1 Egypt's NCCS 2050 and Financial Support Required**

Egypt's National Climate Change Strategy 2050 (NCCS) serves as a comprehensive roadmap to guide the country toward sustainable economic development while addressing the challenges posed by climate change. This strategy is designed to meet Egypt's commitments under the Paris Agreement and aligns with the Sustainable Development Strategy (SDS), also known as Egypt's Vision 2030. Below is a summary of the main components of NCCS and the financial needs for its implementation:

**Table 76: Main Components of Egypt's National Climate Change Strategy (NCCS) 2050**

| Goal  | Objectives   |
|---|--|
| <b>Goal 1: Achieving Sustainable Economic Growth and Low-Emission Development</b> | <ul style="list-style-type: none"> <li>- Transition to renewable and alternative energy sources (e.g., wind, solar, bioenergy)</li> <li>- Reducing greenhouse gas emissions from key sectors like energy and transportation</li> <li>- Enhancing energy efficiency across industries, buildings, and infrastructure</li> <li>- Promoting sustainable consumption and production, reducing waste and pollution in agriculture and waste management</li> </ul> |
| <b>Goal 2: Enhancing Adaptive Capacity and Resilience to Climate Change</b>       | <ul style="list-style-type: none"> <li>- Protect citizens, especially vulnerable groups (women, children, elderly) from health risks due to climate change</li> <li>- Minimize damage to national assets, ecosystems, infrastructure, and heritage from climate impacts</li> </ul>   |

|   |  |
|---|--|
|   | <ul style="list-style-type: none"> <li>- Develop resilient infrastructure to handle extreme weather events like floods, heat waves, and sea level rise</li> <li>- Implement disaster risk reduction strategies, early warning systems, and community engagement</li> </ul>   |
| <b>Goal 3: Enhancing Climate Change Governance</b>  | <ul style="list-style-type: none"> <li>- Clearly define roles and responsibilities for different stakeholders, including government, private sector, and civil society</li> <li>- Improve Egypt's international ranking in climate action and attract investments and climate finance opportunities</li> <li>- Reform sectoral policies to align with climate mitigation and adaptation needs</li> <li>- Strengthen institutional, procedural, and legal arrangements such as Monitoring, Reporting, and Verification (MRV) systems</li> </ul>                               |
| <b>Goal 4: Enhancing Climate Financing Infrastructure</b>                                   | <ul style="list-style-type: none"> <li>- Promote local green banking and develop green credit lines to support environmentally sustainable projects</li> <li>- Expand innovative financing mechanisms such as green bonds and results-based financing, with a focus on adaptation projects</li> <li>- Engage the private sector in climate finance and promote green job creation</li> <li>- Align with Multilateral Development Banks (MDB) guidelines to access more climate finance, building on successes from current programmes like the Benban Solar Plant</li> </ul> |
| <b>Goal 5: Enhancing Scientific Research, Technology Transfer, and Knowledge Management</b> | <ul style="list-style-type: none"> <li>- Strengthen scientific research and technological innovation for climate change mitigation and adaptation</li> <li>- Foster cooperation between universities, research centers, and government for technology transfer and disaster preparedness</li> <li>- Raise public awareness on climate change issues across all stakeholder groups, including decision-makers, citizens, and students</li> <li>- Develop educational materials and national campaigns on climate change to foster behavioral change and engagement</li> </ul> |

The overall estimated financing needed for implementing Egypt's climate change mitigation and adaptation programs within the strategy is **USD 324 billion**:

- **Mitigation Programmes:** The total cost is projected at **USD 211 billion**, with **USD 57.6 billion** in secured funding. This leaves a **funding gap of USD 153.6 billion** that needs to be filled to fully support mitigation efforts.
- **Adaptation Programmes:** The total cost is estimated at **USD 113 billion**, with **USD 18.3 billion** already being secured. This results in a **funding gap of USD 94.7 billion** to ensure the successful implementation of adaptation initiatives.

**5.2.2 Egypt's Second Updated NDC and Financial Support Required**

Egypt's Second Updated NDC highlights several key aspects, including the focus sectors and targets, and the estimated financial requirements for climate change mitigation and adaptation commitments. The table below provides a summary by sector.

**Table 77: Financial Requirements for Climate Change Mitigation and Adaptation**

| Sector                               | Target   |
|--------------------------------------|--|
| <b>Mitigation: USD 196 billion</b>   |  |
| <b>Electricity</b>                   | Egypt committed to reduce emissions by 37% (80 Mt CO <sub>2</sub> e) by 2030 compared to BAU, conditional on external support. Plans to install additional renewable energy capacities generating 42% of electricity by 2035.  |
| <b>Oil and Gas</b>                   | Plans to reduce GHG emissions in the associated petroleum gases sub-sector within the Oil & Gas Sector by 65% (1.682 Mt CO <sub>2</sub> e) by 2030 through the recovery and utilization of associated petroleum gases, along with measures to improve energy efficiency, producing biofuels. |
| <b>Transport</b>                     | Aims for a 7% reduction (9 Mt CO <sub>2</sub> e) in emissions by 2030 through expanding metro networks, high-speed rail, electric vehicles, and promoting the use of lower-carbon fuels like natural gas for buses.  |
| <b>Industry</b>                      | Focusing on energy efficiency and low-carbon technologies, particularly in cement and petrochemical sectors, and encouraging the use of alternative fuels.   |
| <b>Buildings</b>                     | Promoting energy-efficient appliances, solar panels, and green buildings.  |
| <b>Adaptation: USD 50 billion</b>    |  |
| <b>Water Resources</b>               | Projects include desalination using solar energy, rehabilitation of irrigation canals, and expanding wastewater reuse, improving agricultural resilience.  |
| <b>Agriculture</b>                   | Introducing climate-resilient crops and irrigation practices, enhancing biodiversity, and improving livestock and fisheries management.  |
| <b>Coastal Zones</b>                 | Coastal protection measures aim to address sea-level rise in the Nile Delta, including breakwaters, sand nourishment, and dune stabilization.  |
| <b>Tourism and Urban Development</b> | Promoting renewable energy in hotels, greening urban spaces, and protecting vulnerable sites from climate impacts.   |

The successful implementation of Egypt’s updated NDC through 2030 is contingent upon receiving substantial international financial support. The total estimated financial need for this period amounts to USD 246 billion, distributed as follows:

- **Mitigation:** USD 196 billion is required to fund mitigation measures aimed at reducing greenhouse gas emissions across key sectors such as electricity, oil and gas, transport, industry, and buildings.
- **Adaptation:** USD 50 billion is needed to enhance Egypt’s resilience to climate change, focusing on projects related to water resources, agriculture, coastal zones, and urban development.

Under Section 5.4, examples of required projects and activities will be provided in more detail. Achieving the targets set out in Egypt’s NDC is contingent on securing international support through concessional financing, grants, and innovative financial mechanisms such as green bonds. Without this external financial support, Egypt’s ability to meet its climate goals will be significantly limited. Egypt’s achievement of its climate targets and goals also hinges on accelerating climate finance through international support and greater private sector engagement.

### **5.2.3 Sustainable Finance Policies and Initiatives**

#### **Green Public Finance**

Egypt has issued several international sovereign green bonds as part of its broader strategy to finance environmentally sustainable projects. In September 2020, the country issued its first sovereign green bond of \$750 million, marking a landmark achievement as Egypt became the first country in the Middle East and North Africa (MENA) region to achieve this milestone. The proceeds from this bond are allocated to financing clean transportation, renewable energy, water desalination, wastewater treatment, and other environmentally friendly infrastructure projects, garnering significant interest from global investors focused on green finance. Building on the success of this initial issuance, Egypt has since accessed other global green bond markets, including the issuance of Panda

bonds (denominated in Chinese yuan) and Samurai bonds (denominated in Japanese yen), both aimed at funding eco-friendly initiatives. These efforts are part of Egypt's strategic push to attract foreign direct investment for its green economy.

The Egyptian government has further implemented various green incentives to promote sustainable development, with a particular focus on green hydrogen projects and renewable energy initiatives. The newly introduced Green Hydrogen Incentives Law (2024) offers significant benefits to projects related to green hydrogen production, including tax credits ranging from 33% to 55% on revenues, exemptions from value-added tax (VAT) on production equipment, and a waiver of registration fees for companies and land associated with green hydrogen initiatives. Additionally, projects that qualify can benefit from Egypt's Golden License, which streamlines administrative approvals into a single step. Complementing this, the Tax Incentives for Green Economy Programme (2023) provides tax advantages for businesses engaged in green hydrogen, renewable energy, and sustainability projects, including VAT exemptions on equipment and raw materials used in such initiatives. Additionally, Egypt is advocating for 50% of government investments to be directed toward environmentally sustainable projects, thereby reinforcing its commitment to a greener economy.

#### *Encourage Private sector financing*

In addition to the above mentioned public sector financing needs, the Egyptian Financial Regulatory Authority (FRA) has been proactively developing a legislative framework to support private sector green and climate financing. Key initiatives in this framework include the introduction of a Green Bond framework in 2020, which established regulations for issuing green bonds that enable companies to fund environmentally beneficial projects such as renewable energy and sustainable infrastructure.

Moreover, in 2021, the FRA mandated that all companies listed on the Egyptian Stock Exchange and select non-bank financial institutions report on Environmental, Social, and Governance (ESG) standards and climate-related risks. Also in 2021, the Regional Center for Sustainable Finance (RCSF) was established to act as a hub for green finance in the Middle East and Africa, promoting sustainable investment and building capacity within non-banking financial institutions. To further bolster ESG initiatives, the FRA amended regulations in 2023 to allow more entities, including financing and consumer finance companies, to establish and manage ESG-focused investment funds and expanded the definition of bonds to include green and sustainable bonds, thereby encouraging their issuance for environmentally friendly projects.

The Central Bank of Egypt has also launched several important initiatives that aimed at promoting sustainable finance and integrating environmental, social, and governance (ESG) principles within the Egyptian banking sector. Among these measures are the "Guiding Principles for Sustainable Finance" established in 2021, which provide a framework for banks to incorporate ESG elements into their financial decisions, particularly in lending and investment. These principles also establish methods for identifying and managing climate-related risks, focusing on financing projects that are climate-friendly, thereby aligning with Egypt's Vision 2030 and enhancing the integration

of environmental and social factors in banking practices. Following this, the "Binding Sustainable Finance Regulations" implemented in 2022 require banks to establish sustainability units by April 2023, hire certified environmental consultants to assess climate and environmental risks starting in July 2023, and submit quarterly and annual sustainability reports, all aimed at ensuring a thorough commitment to sustainable financial practices.

### 5.3 Underlying Assumptions, Definitions, and Methodologies

In accordance with the Modalities, Procedures, and Guidelines (MPG) assigned for the development of transparency for this specific chapter within the report under the Paris Agreement, the following underlying assumptions, definitions, and methodologies have been used to provide information on the support needed and received:

**Table 78: Underlying assumptions used for information on needed and received support**

| Item                                     | Description  | Methodology/Assumptions   |
|--|--|---|
| <b>Conversion of Domestic Currency</b>   | Converting domestic currency into USD  | Egypt uses the <b>average exchange rate</b> for the reporting year, based on the Central Bank of Egypt's official rates. <b>Assumption:</b> The exchange rate applied remains constant for the duration of the reporting period unless significant currency fluctuations warrant adjustments. The exchange rate used is the buy rate from the Central Bank of Egypt on the 11/12/2024 of 50.409 EGP for each dollar and for 53.06 for each Euro.  |
| <b>Estimation of Support Needed</b>      | Estimating financial, technical, and capacity-building support required for implementing Egypt's NDCs and climate strategies | Needs assessments are conducted using Egypt's Second <b>Updated Nationally Determined Contribution (NDC) and the National Climate Change Strategy 2050</b> , supported by sectoral studies to estimate mitigation and adaptation costs. The financial estimates are derived from the required upfront capital expenditures to implement mitigation and adaptation programmes, capacity building and technology transfer, and the human resources needed to implement the actions.   |
| <b>Determination of Reporting Year</b>   | Time frame for reporting financial support   | The time frame from <b>January 1, 2022, to June 6<sup>th</sup> of 2024</b> is adopted for this report. Only project that have been approved and started in 2024 has been reported on .  |
| <b>Identification of Support Sources</b> | Categorizing sources of support as bilateral, multilateral, or regional  | Bilateral support is provided through structured agreements between two parties, typically involving a donor country and the recipient nation. This type of support is characterized by direct financial transfers or assistance aimed at specific projects or initiatives. In contrast, multilateral support is coordinated and managed by international organizations or financial institutions that gather contributions from multiple countries. These institutions then allocate resources to fund large-scale projects. |
| <b>Determination of Support Status</b>   | Categorizing support as committed, received, or needed   | Support is categorized as:<br><ul style="list-style-type: none"> <li>- <b>Committed:</b> Formally pledged but not yet disbursed.</li> <li>- <b>Received:</b> Funds disbursed to Egypt.</li> <li>- <b>Needed:</b> Future financial requirements identified for planned or ongoing programs.</li> </ul>   |
| <b>Status of Supported Activities</b>    | Reporting the status of supported activities (planned, ongoing, completed)   | Activities are classified based on their implementation status:<br><ul style="list-style-type: none"> <li>- <b>Planned:</b> In planning phase.</li> <li>- <b>Ongoing:</b> Implementation started.</li> <li>- <b>Completed:</b> Project objectives met. Monitoring and evaluation (M&amp;E) reports are used for status tracking.</li> </ul>   |
| <b>Identification of Channels</b>        | Identifying channels of support (bilateral, regional, multilateral)  | Financial support is categorized based on the type of funding mechanism through which it is provided. Bilateral channels involve direct agreements between two parties, usually between a donor country and the recipient nation, while multilateral channels involve funding from international organizations or multilateral banks, financial institutions that pool resources from multiple countries or facilities to support large-scale projects.   |
| <b>Type of Support</b>                   | Identifying the type of support (mitigation, adaptation, cross-cutting)  | Projects are categorized as:<br><ul style="list-style-type: none"> <li>- <b>Mitigation:</b> Focus on reducing GHG emissions.</li> <li>- <b>Adaptation:</b> Resilience-building projects.</li> <li>- <b>Cross-cutting:</b> Addressing both adaptation and mitigation.</li> </ul>   |

|   |   |  |
|---|---|--|
| <b>Identification of Financial Instruments</b>          | Identifying the financial instruments used (grant, concessional loan, non-concessional loan, equity, guarantee) | Financial support is categorized by the type of instrument:<br>- <b>Grants</b><br>- <b>Concessional loans</b><br>- <b>non-concessional loans</b><br>- <b>Equity</b><br>- <b>Guarantees</b> . Terms are specified in project agreements.  |
| <b>Sectors and Subsectors</b>                           | Identifying sectors and subsectors receiving support  | Support is reported for all relevant sectors and subsectors identified in this chapter, including but not limited to Energy, Water Resources, Agriculture, Waste Management, and other areas as detailed in the tables and narrative. For the purpose of this report, subsectors refer to specific categories within a broader sector, such as renewable energy within Energy, or crop production within Agriculture, to accurately reflect the full range of areas receiving support. |
| <b>Use, Impact, and Results</b>                         | Reporting on the use, impact, and estimated results of support  | Performance indicators, such as GHG reductions, resilience improvements, and job creation, are used to measure the impact of support. Data is sourced from national M&E systems.   |
| <b>Contribution to Technology and Capacity-building</b> | Report on contributions to technology transfer and capacity-building  | Contributions to <b>technology development</b> and <b>capacity-building</b> are collected through relevant stakeholders and reported KPI such as technologies deployed, and number of personnel trained when available.  |
| <b>Avoidance of Double Counting</b>                     | Avoiding double counting when reporting financial support   | To prevent double counting, financial flows are tracked separately for transparency-related capacity-building and other forms of climate support. The institutional framework collecting this data clearly distinguishes between funding allocated for transparency efforts and broader climate initiatives. Consequently, certain projects may appear multiple times, each time specifying the relevant activity and its associated financial amount.                                 |

## 5.4 Information on Financial Support Needed by Egypt under Article 9 of the Paris Agreement

### 5.4.1 Priority Sectors for Securing International Finance

Egypt seeks international financial support across multiple sectors to implement its climate mitigation and adaptation strategies in line with its second updated NDCs and national climate change strategy by 2050. Key sectors targeted for this support include the energy sector, with a goal of expanding renewables installed capacities so that the electricity produced from renewables reaches up to 40% of total electricity generated by 2040.

In the oil and gas sector, the focus is on reducing GHG emissions on the associated petroleum gas subsector via recovery of associated petroleum gases that were flared at oil production sites, energy efficiency improvements, and biofuel production. The transport sector aims to enhance public transport systems, such as Cairo Metro and high-speed rail. In industry, efforts concentrate on increasing energy efficiency and adopting low-carbon technologies, particularly within the cement and petrochemical sectors. Water resource projects involve solar-powered desalination, rehabilitation of irrigation canals, and wastewater reuse. In agriculture, initiatives include introducing climate-resilient crops, enhancing irrigation practices, and preserving biodiversity. Additionally, protective measures in coastal zones address sea-level rise through the construction of breakwaters and dune stabilization. Finally, in tourism and urban development, priorities include greening urban areas, promoting renewable energy usage in hotels, and safeguarding cultural sites from climate impacts.

### 5.4.2 Barriers and Gaps to Attracting International Finance

While Egypt is committed to achieving its National Climate Change Strategy 2050 and updated NDC commitments, several barriers such as currency instability, shortage in foreign currency, high lending rates and inflation limit the country's and private sector ability to secure international finance across key sectors. Below is a further breakdown of existing gaps:

**Table 79: Barriers and Gaps Attracting International Finance**

| Barrier   | Description   |
|---|---|
| <b>High Initial Capital Costs</b>                   | Large-scale projects, particularly in <b>renewable energy</b> and <b>transport infrastructure</b> , require significant upfront investments, deterring investors who seek shorter payback periods.                              |
| <b>Technological and Capacity Constraints</b>       | Key sectors like <b>industry</b> , <b>agriculture</b> , and <b>water resources</b> require costly, advanced technologies. Difficulty accessing these technologies deters financiers who prefer proven, scalable solutions.      |
| <b>Limited Private Sector Engagement</b>            | The private sector's participation in <b>climate finance</b> is limited due to insufficient financial incentives and perceived risks, particularly in sectors like <b>renewable energy</b> and <b>green urban development</b> . |
| <b>Low Returns in Agriculture and Water Sectors</b> | Projects in <b>agriculture</b> and <b>water resources</b> offer long-term environmental benefits but relatively low financial returns, discouraging investment without concessional finance or grants.                          |
| <b>Inadequate Risk Mitigation Mechanisms</b>        | A lack of insurance mechanisms, especially in vulnerable sectors like <b>coastal zones</b> and <b>agriculture</b> , deters investment due to the high risk of climate-related impacts.  |

### 5.4.3 Contribution of Financial Support to Egypt's NDC and Long-Term Goals of the Paris Agreement

The financial support will help Egypt contribute to the achievement of its NDC as previously mentioned, and it will also contribute to the long-term goals of the Paris Agreement, specifically by:

- **Transitioning to a Low-Carbon Economy:** Investments in renewable energy, energy efficiency, and sustainable industries will drive Egypt's transition to a low-emission economy, contributing to global efforts to limit temperature rise to well below 2°C.
- **Building Climate Resilience:** Funding for adaptation projects in critical sectors like water and agriculture will enhance Egypt's resilience to climate change, particularly in regions like the Nile Delta, which are vulnerable to sea-level rise and desertification.
- **Leveraging International Cooperation:** By aligning its projects with international financial mechanisms (e.g., Green Climate Fund, Multilateral Development Banks), Egypt can secure more resources for scaling up its climate actions, thus contributing to the collective global effort under the Paris Agreement.

## 5.5 Breakdown of Financial Support Needed

**Table 80: Breakdown of Required Climate Financial Support by Mitigation Sector**

| Information Category  | Details   |  |
|---|---|--|
| <b>Title of Activity/Programme/Project</b>  | <b>Electricity Programme</b>  | <b>Oil and Gas Programme</b>   |
| <b>Programme/Project Description</b>  | Renewable energy projects aimed at increasing energy generation from wind and solar resources, replacing inefficient thermal power plants, and integrating smart meters for energy management. Projects include: Wind power plants, Solar PV power plants, Solar CSP power plants, Replacement of inefficient thermal power plants with renewable energy, and smart meters. | Projects aimed at reducing emissions from -associated petroleum gas flaring, enhancing energy efficiency, developing biodegradable plastics, producing bioethanol and biofuels, utilizing carbon capture and utilization (CCU) in melamine production, and manufacturing wooden plates from rice straw. Projects include: associated Petroleum gases recovery, energy efficiency improvement Biodegradable plastic production, Bioethanol production, Melamine project in Damietta Port (CCU), Extracting algae oil for biofuels, Fuel oil from waste plastic, and wooden plates production (MDF) from rice straw. |
| <b>Estimated Amount (Domestic Currency)</b>   | EGP 4,722,617,574,000   | EGP 165,845,610,000  |
| <b>Estimated Amount (USD)</b>   | \$40,526 million (Wind power plants), \$23,754 million (Solar PV power plants), \$18,109 million (Solar CSP power plants), \$10,000 million (Thermal power replacement), \$1,297 million (Smart meters) Total: \$93,686 million USD   | \$150 million (Gas flaring reduction), \$600 million (Biodegradable plastic production), \$130 million (Bioethanol), \$260 million (Melamine project), \$600 million (Algae biofuels), \$50 million (Fuel oil from plastic), \$1,500 million (Wooden plates) Total: \$3,290 million  |
| <b>Expected Timeframe</b>   | UA  | UA   |
| <b>Expected Financial Instrument</b>  | UA  | UA   |
| <b>Type of Support</b>  | Mitigation  | Mitigation   |
| <b>Sector</b>   | Energy  | Energy, Industry   |
| <b>Subsector</b>  | Electricity Generation<br>Renewable energy deployment, energy efficiency improvement, grid modernization, and emission reductions from power generation   | Oil and Gas, Emission reduction, renewable fuel production, waste-to-energy conversion, carbon capture and utilization, sustainable industrial practices   |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | UA  | UA   |
| <b>Anchored in National Strategy and NDC</b>  | Aligned with the national energy and climate change strategies and contributions included in Nationally Determined Contributions (NDC) for increasing renewable energy and reducing carbon emissions in the power sector  | Aligned with the national strategy for industrial sustainability and emissions reduction and Contributions included in Nationally Determined Contributions (NDC) for reducing industrial emissions and transitioning to renewable fuel production.   |
| <b>Expected Use</b>   | Generating renewable electricity, reducing GHG emissions, and improving energy efficiency of national electricity grid.   | Reducing emissions from the oil and gas sector, producing biofuels, and utilizing waste materials for energy and production.   |
| <b>Expected Impact</b>  | Significant reduction in GHG emissions, increased share of renewable energy in the energy mix, and improved energy management.  | Significant reduction in CO <sub>2</sub> and other greenhouse gas emissions, transition to biodegradable and renewable products, and reduced reliance on fossil fuels.   |
| <b>Estimated Results</b>  | Large-scale deployment of wind and solar energy, replacement of inefficient power plants, and integration of smart grid technologies.   | Implementation of emission-reducing technologies, large-scale production of biofuels and biodegradable plastics, and development of sustainable industrial processes.  |

Information Category

Details

| Title of Activity/Programme/Project   | Transport Programme   | Industry Programme   |
|---|---|--|
| <b>Programme/Project Description</b>  | Large-scale transport infrastructure projects aimed at upgrading metro systems, developing electric high-speed rails and electric light rail networks, implementing a bus rapid transit system, and rehabilitating the Alexandria tram to reduce emissions and improve urban mobility.<br>Projects include Upgrading the Cairo metro network, Electric High-Speed Rails (HSR), Bus Rapid Transit (BRT) system - Ring Road, Electric light rail network, and Alexandria Raml tram rehabilitation project | Aims at improving energy efficiency and promoting sustainable industrial practices, focusing on reducing emissions and introducing green technologies. Projects include Transform traditional charcoal open pits to mechanized kilns, green hydrogen for green ammonia, and Regulatory Efficient Motors. |
| <b>Estimated Amount (Domestic Currency)</b>   | EGP 276,527,139,030   | EGP 600,875,280,000  |
| <b>Estimated Amount (USD)</b>   | \$2,160 million (Cairo metro Line 6), \$3,000 million (Electric light rail Port Said - AbuQir), \$83.67 million (BRT system), \$242.0 million (Alexandria tram rehabilitation) <b>Total: \$5,485.67 million</b>   | \$ 138 million (Charcoal kilns), \$140 million (Green hydrogen for ammonia), \$11,642 million (Efficient Motors) <b>Total: \$11,920 million</b>  |
| <b>Expected Timeframe</b>   | UA  | UA   |
| <b>Expected Financial Instrument</b>  | UA  | UA   |
| <b>Type of Support</b>  | Mitigation  | Mitigation   |
| <b>Sector</b>   | Transport   | Industry   |
| <b>Subsector</b>  | Public transport modernization, electric transport systems, urban mobility improvement, and emission reduction from transport   | Energy efficiency, Green Hydrogen, Industrial emissions reduction  |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | UA  | UA   |
| <b>Anchored in National Strategy and NDC</b>  | Aligned with the national strategy for sustainable urban transport and emission reductions and contributions included in Nationally Determined Contributions (NDC) for reducing transport-related emissions and improving sustainable urban transport systems.  | Aligned with the national climate strategy and industrial sustainability roadmap contributions included in Nationally Determined Contributions for emission reductions and industrial sustainability.  |
| <b>Expected Use</b>   | Modernizing public transport infrastructure, reducing emissions, and promoting sustainable urban mobility.  | Efficient industrial operations, emission reductions, and sustainable energy transitions.  |
| <b>Expected Impact</b>  | Significant reduction in CO <sub>2</sub> emissions, improved urban mobility, and transition to electric and sustainable transport systems.  | Improved energy efficiency of industrial activities, deployment of low carbon technologies (green H <sub>2</sub> )   |
| <b>Estimated Results</b>  | Large-scale deployment of electric transport systems, reduction of urban transport emissions, and improved connectivity in cities.  | Estimated reduction in GHG emissions, increase in energy efficiency, promotion of sustainable industrial technologies.   |

| Title of Activity/Programme/Project   | Unified Smart Card Project for Transport  |
|---|---|
| <b>Programme/Project Description</b>  | <p>The project will target all public transportation sectors in Egypt to streamline fare collection and improve travel experiences through a unified smart card system. By connecting multiple transit modes and integrating real-time journey planning and operational management tools, the project seeks to address the challenges of fragmented transport systems and improve overall service delivery.</p> <p>The objective of this action is to develop and implement a Unified Smart Card System that integrates with MaaS and Trip Planner applications. This initiative aims to enhance fare collection, streamline journey planning, and provide real-time updates, creating a seamless travel experience across different transportation modes. The system will also link key points of interest and tourist destinations to improve passenger convenience and operational efficiency.</p> |
| <b>Estimated Amount (Domestic Currency)</b>   | EGP 419,000,000   |
| <b>Estimated Amount (USD)</b>   | \$8,380,000   |
| <b>Expected Timeframe</b>   | UA  |
| <b>Expected Financial Instrument</b>  | UA  |
| <b>Type of Support</b>  | Mitigation  |
| <b>Sector</b>   | Transport   |
| <b>Subsector</b>  | Public transport modernization, electric transport systems, urban mobility improvement, and emission reduction from transport   |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | UA  |
| <b>Anchored in National Strategy and NDC</b>  | Aligned with the national strategy for sustainable urban transport and emission reductions and contributions included in Nationally Determined Contributions (NDC) for reducing transport-related emissions and improving sustainable urban transport systems   |
| <b>Expected Use</b>   | Modernizing public transport infrastructure, reducing emissions, and promoting sustainable urban mobility.  |
| <b>Expected Impact</b>  | The impact of the project is to transform the public transportation experience in Egypt by creating a unified, efficient, and user-friendly fare collection and journey planning system. This will lead to better service delivery, increased ridership, and improved operational performance. The project will also support the broader goals of smart energy solutions and sustainable transportation.  |
| <b>Estimated Results</b>  | <p>Fully functional MaaS and Trip Planner applications integrated with the Unified Smart Card System.</p> <ul style="list-style-type: none"> <li>•A centralized backend system supporting fare collection and real-time journey planning.</li> <li>•Established hosting infrastructure and operational management for the system.</li> <li>•Comprehensive documentation, including technical specifications and user guides.</li> <li>•Training materials and sessions for stakeholders on the new system.</li> </ul> <p>Improved passenger experience with seamless travel and payment processes across multiple transit modes.</p> <ul style="list-style-type: none"> <li>•Enhanced operational efficiency and revenue management for public transport operators.</li> <li>•Increased convenience for users through real-time information and integration with key points of interest.</li> </ul>   |

| Information Category | Details |
|----------------------|---------|
|----------------------|---------|

|   |   |
|---|---|
| <b>Title of Activity/Programme/Project</b>  | <b>Construction works of the charging station in Sharm El Sheikh</b>  |
| <b>Programme/Project Description</b>  | <p>The construction of the charging station in Sharm El-Sheikh aims to achieve several key objectives, aligning with Egypt's sustainability and green mobility initiatives:</p> <ol style="list-style-type: none"> <li><b>Promote Sustainable Transportation:</b> Support the transition to electric vehicles (EVs) and electric buses, reducing reliance on fossil fuels. Facilitate the widespread adoption of EVs by providing essential charging infrastructure.</li> <li><b>Reduce Carbon Emissions &amp; Environmental Impact:</b> Lower greenhouse gas emissions by enabling clean energy-powered transportation. Contribute to Sharm El-Sheikh's transformation into a green city, in line with Egypt's climate action goals.</li> <li><b>Support COP27 &amp; Global Climate Commitments:</b> Enhance the city's infrastructure to host eco-friendly transportation for international conferences and tourism. Showcase Egypt's commitment to sustainable development and climate change mitigation.</li> <li><b>Improve Infrastructure &amp; Smart Mobility:</b> Develop a modern charging network that supports EV users, including tourists and residents. Integrate advanced charging technologies to ensure efficiency and ease of use.</li> <li><b>Boost Economic Growth &amp; Tourism:</b> Attract investment in clean energy and transportation sectors. Enhance the city's appeal as an eco-friendly tourist destination, supporting green tourism initiatives.</li> <li><b>Enhance Public Transport Efficiency:</b> Enable the operation of electric public buses, reducing urban congestion and pollution.</li> </ol>                      |
| <b>Estimated Amount (Domestic Currency)</b>   | EGP 108,000,000   |
| <b>Estimated Amount (USD)</b>   | \$2,160,000   |
| <b>Expected Timeframe</b>   | UA  |
| <b>Expected Financial Instrument</b>  | UA  |
| <b>Type of Support</b>  | Mitigation  |
| <b>Sector</b>   | Transport   |
| <b>Subsector</b>  | Public transport modernization, electric transport systems, urban mobility improvement, and emission reduction from transport   |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | Aligned with the national strategy for sustainable urban transport and emission reductions and contributions included in Nationally Determined Contributions (NDC) for reducing transport-related emissions and improving sustainable urban transport systems.  |
| <b>Anchored in National Strategy and NDC</b>  | Aligned with the national strategy for sustainable urban transport and emission reductions and contributions included in Nationally Determined Contributions (NDC) for reducing transport-related emissions and improving sustainable urban transport systems   |
| <b>Expected Use</b>   | <p>The expected use of the charging station construction in Sharm El-Sheikh includes several key applications that contribute to sustainable transportation and environmental goals:</p> <ol style="list-style-type: none"> <li><b>Charging Electric Buses:</b> Powering a fleet of electric buses used for public transportation and tourism. Supporting eco-friendly transport for residents and visitors, especially during major events like COP27.Reducing dependency on diesel and gasoline-powered buses.</li> <li><b>Supporting Private Electric Vehicles (EVs):</b> Providing charging points for private EV owners, including locals and tourists. Encouraging the adoption of electric cars by ensuring reliable charging infrastructure.</li> <li><b>Green Tourism &amp; Sustainable Mobility:</b> Facilitating zero-emission transportation for tourists in a globally recognized resort city. Enhancing Egypt's image as an eco-friendly travel destination.</li> <li><b>Integration with Renewable Energy Sources:</b> Utilizing solar-powered charging stations to reduce reliance on non-renewable energy. Lowering the carbon footprint of transportation within the city.</li> <li><b>Enhancing Smart City Infrastructure:</b> Supporting Egypt's vision for smart and sustainable cities by introducing modern EV charging networks. Implementing real-time monitoring and management systems for efficient energy use.</li> <li><b>Economic &amp; Environmental Benefits:</b> Reducing fuel consumption and air pollution in Sharm El-Sheikh. Creating new business opportunities in EV-related services and green technology</li> </ol> |
| <b>Expected Impact</b>  | Significant reduction in CO <sub>2</sub> emissions, improved urban mobility, and transition to electric and sustainable transport systems.  |
| <b>Estimated Results</b>  | Improved urban mobility, and transition to electric and sustainable transport systems.  |

| Title of Activity/Programme/Project   | Solar power plants   | OPS (onshore power supply)  | Installations of three power plants in qustal, Arquen, Kafra land ports  |
|---|--|---|--|
| <b>Programme/Project Description</b>  | Establishment of Solar power plants of building in ports (Safaga- Hurgada- Sharm Elsheikh- Nuweibaa- Portawfik) which are used to reduces greenhouse gas emissions, contributing to cleaner air.   | Establishment of onshore power supply in all terminals of ports (Safaga- Hurgada- Sharm Elsheikh- Nuweibaa- Portawfik) which are used to reduce emissions from ships, noise and improves the working environment onboard. | Installations of three power plants in qustal, Arquen, Kafra land ports.   |
| <b>Estimated Amount (Domestic Currency)</b>   | EGP 335,000,000  | EGP 150 million   | EGP 150 million  |
| <b>Estimated Amount (USD)</b>   | 6,621,888.21 USD   | \$2,959,500 USD   | \$3 million USD  |
| <b>Expected Timeframe</b>   | UA   | UA  | One year   |
| <b>Expected Financial Instrument</b>  | UA   | UA  | UA   |
| <b>Type of Support</b>  | mitigation   | mitigation  | Mitigation   |
| <b>Sector</b>   | Energy   | Energy  | Energy   |
| <b>Subsector</b>  | Renewable energy deployment, energy efficiency improvement, grid modernization, and emission reductions from power generation  | Renewable energy deployment, energy efficiency improvement, grid modernization, and emission reductions from power generation   | Renewable deployment, energy efficiency improvement, grid modernization end emission reduction from power generation |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | UA   | UA  | UA   |
| <b>Anchored in National Strategy and NDC</b>  | Aligned with the national energy and climate change strategies and contributions included in Nationally Determined Contributions (NDC) for increasing renewable energy and reducing carbon emissions in the power sector.  | Aligned with the national energy and climate change strategies and contributions included in Nationally Determined Contributions (NDC) for increasing renewable energy and reducing carbon emissions in the power sector. | UA   |
| <b>Expected Use</b>   | Generating renewable electricity, reducing GHG emissions, and improving energy efficiency of national electricity grid.  | Generating renewable electricity, reducing GHG emissions, and improving energy efficiency of national electricity grid.   | UA   |
| <b>Expected Impact</b>  | Significant reduction in GHG emissions, increased share of renewable energy in the energy mix, and improved energy management. This helps to align with global sustainability goals and enhances the port's environmental reputation. Ports that invest in renewable energy can improve their image among stakeholders, customers, and the public. It demonstrates a commitment to sustainability and eco-friendly practices, which is increasingly important to consumers and business partners | Significant reduction in GHG emissions, increased share of renewable energy in the energy mix, and improved energy management.  | UA   |
| <b>Estimated Results</b>  | Large-scale deployment of solar energy, replacement of inefficient power plants, and integration of smart grid technologies.   | Large-scale deployment of wind and solar energy, replacement of inefficient power plants, and integration of smart grid technologies.   | UA   |

| Information Category                | Details                    |                   |              |
|-------------------------------------|----------------------------|-------------------|--------------|
| Title of Activity/Programme/Project | Buildings and Urban Cities | Tourism Programme | Waste Sector |

|  |   |  |   |
|--|---|--|---|
| <b>Programme/Project Description</b>   | Projects aimed at improving energy efficiency in urban buildings by integrating energy-efficient cooling technologies to reduce energy consumption and emissions in the urban environment. Project includes energy efficient cooling in buildings | Projects aimed at improving energy efficiency and integrating renewable energy systems in the tourism sector, particularly in hotels and resorts, to reduce energy consumption and carbon emissions. Project includes energy efficiency and renewable energy in hotels and resorts | Projects aimed at upgrading municipal solid waste (MSW) management infrastructure, including mechanical biological treatment (MBT) plants and waste-to-energy facilities, to reduce landfill waste, generate alternative energy, and reduce greenhouse gas emissions. These include new investments and upgrading of MSW management infrastructure (i.e., MBT plants, waste-to-energy plants) and operation and maintenance |
| <b>Estimated Amount (Domestic Currency)</b>  | EGP 12,602,250,000  | EGP 17,391,105,000   | EGP 282,340,809,000   |
| <b>Estimated Amount (USD)</b>  | \$250 million   | \$345 million  | \$5,601 million   |
| <b>Expected Timeframe</b>  | UA  | UA   | UA  |
| <b>Expected Financial Instrument</b>   | UA  | UA   | UA  |
| <b>Type of Support</b>   | Mitigation  | Mitigation   | Mitigation  |
| <b>Sector</b>  | Energy  | Energy   | Waste   |
| <b>Subsector</b>   | Buildings and Urban Cities Energy efficiency in buildings, urban cooling systems, and sustainable building technologies   | Buildings (Tourism)  | Solid waste management  |
| <b>Contribution to technology development and transfer and /or to capacity-building building</b> | UA  | UA   | UA  |
| <b>Anchored in National Strategy and NDC</b>   | Aligned with national urban sustainability and energy efficiency strategies and contributions included in Nationally Determined Contributions (NDC) for energy efficiency and reducing emissions from urban buildings.                            | Aligned with national strategies for sustainable tourism and energy efficiency and contributions included in Nationally Determined Contributions (NDC) for reducing carbon emissions in the tourism sector and promoting energy efficiency.  | Aligned with the national waste management strategy and renewable energy goals and contributions included in Nationally Determined Contributions (NDC) for waste management and emission reductions through waste-to-energy technologies.   |
| <b>Expected Use</b>  | Reducing energy consumption in buildings and improving urban cooling efficiency.  | Reducing energy consumption and emissions in hotels and resorts by implementing renewable energy and energy-efficient systems.   | Managing municipal solid waste more efficiently, reducing landfill waste, and generating renewable energy from waste materials.   |
| <b>Expected Impact</b>   | Significant reduction in energy consumption and CO <sub>2</sub> emissions from the building sector, improved urban climate resilience.  | Significant reduction in energy consumption and carbon emissions in the tourism sector, enhanced sustainability in hotel and resort operations.  | Significant reduction in landfill waste and greenhouse gas emissions, increased renewable energy generation, and improved waste management systems.   |
| <b>Estimated Results</b>   | Large-scale implementation of energy-efficient cooling systems in urban buildings, reduction of emissions from cooling.   | Widespread adoption of renewable energy and energy-efficient practices in the tourism industry, contributing to emission reductions and sustainable tourism growth.  | Large-scale implementation of waste-to-energy facilities, improved waste management infrastructure, and reduction of emissions from waste disposal.   |

**Table 81: Breakdown of Climate Financial Support Needed by Adaptation Sector**

| Information Category  | Details  |  |
|---|--|--|
| Title of Activity/Programme/Project   | Agriculture Programme  | Water Programme  |
| <b>Programme/Project Description</b>  | Adaptation projects in systems and agriculture sector aimed at enhancing agricultural production, rehabilitating areas affected by sea-level rise, increasing resilience in vulnerable areas, developing irrigation systems, and establishing early warning and agricultural insurance systems. Projects include: <ul style="list-style-type: none"> <li>▪ Enhancing agricultural production for adaptation to climate change in the Valley and Nile Delta regions</li> <li>▪ Rehabilitation of Agricultural Areas in Northern Delta Affected by the Repercussions of Sea-Level Rise</li> <li>▪ Increasing the resilience of climatically vulnerable areas through degraded pastures in marginal areas</li> <li>▪ Development of on-farm Irrigation in the old Valley and the Delta</li> <li>▪ Supporting the establishment of early warning systems, improving agricultural weather forecasting services, modern agricultural extension, and establishing an agricultural insurance system against climate risks</li> </ul> | Adaptation projects focused on water resources including solar-powered desalination, shore protection, rehabilitation of irrigation canals, coastal protection, scaling up solar pumping, and modernizing on-farm practices to enhance agricultural climate resilience. Projects include Water desalination, Natural shore protection, Rehabilitation of irrigation canals, Coastal protection, Solar pumping, Agricultural climate resilience. Projects include: <ul style="list-style-type: none"> <li>▪ Water desalination using solar energy</li> <li>▪ Natural protection of Rosetta shoreline using the sand motor</li> <li>▪ Rehabilitation of irrigation canals to enhance agricultural climate resilience</li> <li>▪ Integration of coastal protection and development in 3 Egyptian cities in the Mediterranean</li> <li>▪ Scaling up solar pumping for irrigation</li> </ul> Improve agricultural climate resilience by modernizing on-farm practices |
| <b>Estimated Amount (EGP)</b>   | EGP 756,135,000,000  | EGP 569,369,655,000  |
| <b>Estimated Amount (USD)</b>   | Enhancing agricultural production: \$4,000 million, Rehabilitation of agricultural areas: \$2,000 million, Increasing resilience: \$3,500 million, On-farm irrigation: \$4,000 million, Early warning systems: \$1,500 million Total: \$15,000 million   | Water desalination: \$625 million, Natural shore protection: \$120 million, Rehabilitation of irrigation canals: \$4,500 million, Coastal protection: \$2,000 million, Solar pumping: \$50 million, Modernizing on-farm practices: \$4,000 million Total: \$11,295 million   |
| <b>Expected Time Frame</b>  | UA   | UA   |
| <b>Expected Financial Instrument</b>  | UA   | UA   |
| <b>Type of Support</b>  | Adaptation   | Adaptation   |
| <b>Sector</b>   | Agriculture  | Water Resources  |
| <b>Subsector</b>  | Agricultural resilience, irrigation systems, climate adaptation in farming, early warning systems, insurance for climate risks   | Water desalination, irrigation canal rehabilitation, coastal protection, solar-powered irrigation, climate-resilient farming practices   |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | UA   | UA   |
| <b>Anchored in National Strategy and NDC</b>  | Aligned with the national strategy for agriculture adaptation to climate change and contributions included in Nationally Determined Contributions (NDC) for agricultural resilience and climate adaptation.  | Aligned with the national water resource management and climate change strategies and Contributions included in Nationally Determined Contributions (NDC) for climate-resilient water management.  |
| <b>Expected Use</b>   | Improving agricultural resilience, irrigation systems, and early warning mechanisms to adapt to climate change.  | Improving water resource management, protecting shorelines, rehabilitating irrigation systems, and enhancing agricultural resilience through water-saving technologies.  |
| <b>Expected Impact</b>  | Deployment of climate-smart technologies (irrigation systems) and early warning system, rehabilitation of agricultural areas   | Reduced water scarcity, improved irrigation efficiency, and increased resilience to climate change impacts on water resources.   |
| <b>Estimated Results</b>  | Enhanced resilience and adaptive capacity, and reduced vulnerability to climate change impacts   | Enhanced water management, increased use of renewable energy for irrigation, and improved coastal protection.  |

## 5.6 Information on Financial Support Received by Egypt under Article 9 of the Paris Agreement

Article 9 of the Paris Agreement commits developed countries to provide financial resources to assist developing countries in their efforts to mitigate and adapt to climate change. Egypt, as a developing country party to the agreement, has received financial support to bolster its transition towards a low-carbon, climate-resilient economy. This support has been channeled through various multilateral and bilateral financial mechanisms, including concessional loans, grants, and technical assistance.

**Table 82: Breakdown of Received Financial Support**

| Information Category  | Details   |   |
|---|---|---|
|   | Green Economy Financing Facility Egypt II (GEFF Egypt II)   | Egypt - Electricity and Green Growth Support Programme II (EGGSP II)  |
| <b>Title of Activity/Programme/Project</b>  |   |   |
| <b>Programme/Project Description</b>  | GEFF Egypt II is designed to help Egypt's transition to a green economy by providing a combination of concessional loans and grants to private sector MSMEs. The programme supports investments in energy efficiency, renewable energy, water efficiency, and resource-efficient technologies. GEFF II also provides grant incentives of up to 10-15% on successful project completion, as well as free technical assistance for project development. Its scope includes key sectors such as agriculture, construction, and manufacturing, and contributes to cross-cutting goals including climate change mitigation and sustainability. | The EGGSP II aims to promote a sustainable, competitive, and diversified electricity sector in Egypt to ensure security of supply and support climate change mitigation and green growth. The expected outcomes of the programme include: i) rationalization of electricity tariffs, ii) enhanced financial sustainability of the electricity sector, iii) improved corporate governance and competitiveness of key electricity institutions, iv) enhanced security of energy supply through renewable energy and energy efficiency, and v) stronger private sector engagement for better service delivery. The programme also supports low-carbon economic growth. |
| <b>Channel</b>  | Multilateral (via EBRD, supported by EU, AFD, and GCF)  | Bilateral (via AfDB)  |
| <b>Recipient Entity</b>   | Private sector MSMEs in Egypt across various sectors, including agriculture, construction, and manufacturing.   | Government of Egypt (Ministry of Electricity and Renewable Energy)  |
| <b>Implementing Entity</b>  | European Bank for Reconstruction and Development (EBRD)   | African Development Bank (AfDB) and Ministry of Electricity and Renewable Energy  |
| <b>Amount Received (Domestic Currency)</b>  | EGP 8,821,575,000   | EGP 4,536,810,000   |
| <b>Amount Received (USD)</b>  | \$175 million (GEFF II total funding)   | USD 90 million  |
| <b>Time Frame</b>   | Start: 2022   | Signature Date: 20 April 2022   |
| <b>Financial Instrument</b>   | Grant and Loan  | Loan  |
| <b>Status</b>   | Received  | Received  |
| <b>Sector</b>   | Energy efficiency, renewable energy, resource and water efficiency, circular economy  | Energy, specifically electricity and green energy growth  |
| <b>Subsector</b>  | Agriculture, construction, manufacturing, MSMEs   | Electricity sector reforms, renewable energy, energy efficiency   |
| <b>Type of Support</b>  | Mitigation  | Mitigation  |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | UA  | UA  |
| <b>Status of Activity</b>   | Ongoing   | Ongoing   |
| <b>Use of Support</b>   | Financing green technologies and sustainable solutions for MSMEs to promote energy efficiency, renewable energy, and climate resilience across various sectors.   | The financial support is used to improve the efficiency of Egypt's electricity infrastructure, facilitate reforms in the energy sector, and support green energy growth and climate adaptation initiatives.   |
| <b>Impact</b>   | GEFF II aims to significantly reduce Egypt's carbon footprint by enabling MSMEs to adopt sustainable technologies. It supports the country's green transition through investments in energy-efficient technologies, water-saving initiatives, and renewable energy. It also aims to foster inclusivity by supporting equal access to green finance for men and women.   | The programme is expected to enhance the reliability of Egypt's electricity supply, promote the adoption of renewable energy, and support low-carbon economic growth.   |
| <b>Estimated Results</b>  | More than €150 million in green investments; Significant reductions in energy consumption and greenhouse gas emissions across sectors; Creation of job opportunities and enhanced competitiveness of MSMEs. GEFF II builds on the success of GEFF I, which funded over 100 projects and enabled energy-efficient upgrades for private sector firms.   | Increased share of renewable energy in Egypt's energy mix, reduced greenhouse gas emissions, and improved energy security. The programme supports Egypt's transition to a sustainable, low-carbon economy, in line with the country's climate commitments under the Paris Agreement.  |

| Information Category  |  | Details   |   |
|---|--|---|---|
| Title of Activity/Programme/Project   | Helwan Wastewater Treatment Project (WWTP)   | Sustainable Transformation for Agricultural Resilience in Upper Egypt (STAR)  | Transport Program   |
| <b>Programme/Project Description</b>  | The project focuses on expanding and upgrading the Helwan Wastewater Treatment Plant (WWTP) in Cairo, improving water quality, sanitation, and pollution reduction. It will serve 2.2 million inhabitants, provide treated wastewater for irrigation, and generate biogas, contributing to climate change mitigation and adaptation. The operation will contribute to: (i) environmental protection, depollution, and climate action; (ii) increasing access to sanitation and water services; (iii) improving public health; and (iv) promoting sustainable economic development. | The STAR project aims to improve the living standards of smallholder farmers, poor households, and vulnerable women and youth in Upper Egypt. It focuses on increasing income and resilience through better market linkages, climate-adapted agricultural practices, and the development of small rural businesses. The project also includes water infrastructure rehabilitation and strengthening rural institutions. | Cairo Monorail, which consists of two lines: the Administrative Capital Line and the 6th of October Line                            |
| <b>Channel</b>  | Multilateral (via EIB, EU-Neighborhood Investment Platform, Agence Française de Développement (AFD))   | Bilateral (via IFAD)  | Green Bond  |
| <b>Recipient Entity</b>   | Construction Authority for Potable Water and Wastewater  | Government of Egypt   | Government of Egypt (ministry of transport through National Authority for Tunnels)  |
| <b>Implementing Entity</b>  | European Investment Bank (EIB) and partner organizations   | International Fund for Agricultural Development (IFAD)  | National Authority for Tunnels  |
| <b>Amount Received (Domestic Currency)</b>  | EGP 8,975,213,000  | EGP 3,253,396,860   | EGP 17,492,061,800  |
| <b>Amount Received (USD)</b>  | EUR 88 million loan from the EIB<br>USD 57 million from AFD<br>EUR 27 million grant from the EU Total USD: <b>\$178,044,297</b>  | IFAD Financing: USD 64.54 million   | USD 347 million   |
| <b>Time Frame</b>   | Signature Date: 30 November 2022   | Start Date: 2022  | Signature Date: September 2020  |
| <b>Financial Instrument</b>   | Loan and Grant (mobilized through EU-NIP, EUR 27 million)  | Grant and Loan  | Green bond  |
| <b>Status</b>   | Received   | Received  | Received  |
| <b>Sector</b>   | Water, waste   | Agriculture, Water  | Transport   |
| <b>Subsector</b>  | Water treatment, waste management, sanitation  | Agricultural resilience, rural business development, irrigation infrastructure  | electric transport systems, urban mobility improvement, and emission reduction from transport                                       |
| <b>Type of Support</b>  | Crosscutting   | Crosscutting  | Mitigation  |
| <b>Contribution to technology development and transfer and /or to capacity-building</b> | UA   | UA.   | Development and transfer of electric rail technologies through monorail. Boosting Egypt's Capabilities with New Monorail Technology |
| <b>Status of Activity</b>   | Ongoing  | Ongoing   | Ongoing   |
| <b>Use of Support</b>   | The project contributes to water management, reducing pollution, improving sanitation services, and enhancing the resilience of the Greater Cairo area by generating a non-conventional water source for irrigation. It also contributes to climate change mitigation by reducing greenhouse gas emissions through biogas energy generation.   | Financial support is directed at improving the productivity and resilience of smallholder farmers, rehabilitating water infrastructure, and enhancing market access and rural institutions in Upper Egypt.  | Modernizing public transport infrastructure, reducing emissions, and promoting sustainable urban mobility.                          |

|                          |  |  |  |
|--------------------------|--|--|--|
| <b>Impact</b>            | The project will enhance sanitation services for 2.2 million people, reduce pollution, support irrigation with treated wastewater, and contribute to climate change mitigation and adaptation efforts. It also aims to create over 2,000 jobs and improve livelihoods in the region. | The project aims to improve the livelihoods of 240,000 rural households, strengthen climate resilience, and foster sustainable agricultural practices in Upper Egypt, benefiting smallholder farmers, women, and youth.  | Significant reduction in CO <sub>2</sub> emissions, improved urban mobility, and transition to electric and sustainable transport systems. |
| <b>Estimated Results</b> | Significant improvements in water quality, sanitation services, and public health for Helwan, along with enhanced economic prospects for local communities. The project supports Egypt's Vision 2030 and climate resilience efforts.   | Increased smallholder productivity, improved rural infrastructure, strengthened market linkages, and higher income resilience for 240,000 households, including 160,000 smallholder households and 80,000 households benefiting from rehabilitated water infrastructure. | Large-scale deployment of electric transport systems, reduction of urban transport emissions, and improved connectivity in cities.         |

| Information Category                       | Details  |  |  |
|--|--|--|--|
| Title of Activity/Programme/Project        | Transforming Financial Systems for Climate (TFSC) – NBE Second Advance   | USAID Climate Change Adaptation Initiative with Egypt  | Green Sustainable Industries (GSI) – Egypt   |
| <b>Programme/Project Description</b>       | As part of the TFSC programme, AFD and National Bank of Egypt (NBE) signed a credit facility agreement to support climate-compatible projects for SMEs in Egypt. On 19 December 2022, AFD disbursed a second advance of EUR 28.6 million under this EUR 100 million agreement. This credit line finances low-carbon and climate-resilient investments for SMEs, focusing on greenhouse gas mitigation and climate adaptation | This initiative, part of the USAID Climate Change Initiative, was approved by the Egyptian Parliament in July 2023. It includes a USD 15 million grant signed in September 2022. The project focuses on enhancing Egypt's ability to adapt and mitigate the economic, environmental, and social impacts of climate change. The initiative supports the preservation of ecosystems, reducing emissions, and improving climate resilience across critical sectors like the Red Sea and biodiversity. | The GSI project, part of a €271 million agreement between Egypt and the EU, supported by the EIB and NBE, focuses on financing public and private industrial projects for pollution abatement, decarbonization, and resource efficiency. The project aims to assist Egypt's industrial transition to a green economy through climate action, environmental sustainability, and compliance with environmental regulations |
| <b>Channel</b>                             | Bilateral (via AFD, NBE)   | Bilateral (via USAID and Government of Egypt)  | Bilateral (via EIB)  |
| <b>Recipient Entity</b>                    | National Bank of Egypt (NBE)   | Government of Egypt  | Egyptian Environmental Affairs Agency (EEAA), National Bank of Egypt (NBE)   |
| <b>Implementing Entity</b>                 | National Bank of Egypt (NBE), Agence Française de Développement (AFD)  | USAID  | EIB, EEAA, NBE   |
| <b>Amount Received (Domestic Currency)</b> | EGP 1,517,516,000  | EGP 756,135,000  | EGP 8,277,360,000  |
| <b>Amount Received (USD)</b>               | EUR 28.6 million (Second advance under EUR 100 million credit line) or \$30,103,472 USD  | USD 15 million   | €156 million (EIB financing) or \$164,200,754 USD  |
| <b>Time Frame</b>                          | Start Date: 19 December 2022   | Start Date: September 2022   | Start Date: 2023   |
| <b>Financial Instrument</b>                | Loan   | Grant  | Loan   |
| <b>Sector</b>                              | Finance  | Crosscutting   | Industry   |
| <b>Subsector</b>                           | Climate finance, SME investments, low-carbon projects  | Climate adaptation, biodiversity preservation, emissions reduction   | Pollution abatement, decarbonization, energy/resource efficiency   |

|  |   |  |  |
|--|---|--|--|
| Type of Support  | Crosscutting  | Crosscutting   | Crosscutting   |
| Contribution to Technology Development and Transfer<br>Contribution to Capacity-building | UA  | UA   | UA   |
| Status of Activity   | Ongoing   | Ongoing  | Ongoing  |
| Use of Support   | The loan supports the low-carbon and climate-resilient transition of Egyptian SMEs by financing investments that contribute to both greenhouse gas mitigation and climate adaptation.           | The grant is used to support adaptation strategies in Egypt, including the preservation of ecosystems, addressing biodiversity loss, and enhancing climate resilience.   | The project funds climate-friendly industrial projects focusing on pollution reduction, energy efficiency, and resource management, aiding Egypt's transition to a green economy and compliance with national environmental regulations. |
| Impact   | The project promotes the financing of 100% climate-compatible investments in Egypt's SME sector, supporting the low-carbon transition and improving climate resilience in the financial system. | The initiative aims to reduce emissions, preserve ecosystems, and strengthen Egypt's capacity to adapt to climate change by improving climate-related systems and infrastructure, with a particular focus on biodiversity and the Red Sea ecosystem. | The initiative is expected to reduce greenhouse gas emissions, improve industrial sustainability, and mitigate environmental health risks, supporting Egypt's Green Vision 2030 and National Climate Change Strategy 2050.               |
| Estimated Results  | Increased financing for climate-compatible projects, enhanced NBE capacity for climate finance, and improved access to funding for low-carbon SMEs in Egypt.                                    | Enhanced climate resilience, improved biodiversity protection, reduced emissions, and stronger infrastructure for addressing climate risks in Egypt.   | Reduction in pollution load, enhanced energy and resource efficiency, and compliance with environmental regulations in Egypt's industrial sectors.   |

| Information Category                | Details  |  |  |
|-------------------------------------|--|--|--|
| Title of Activity/Programme/Project | Egypt Green Economy Financing Facility (GEFF)  | Alcazar Energy Partners II – Egypt   | Egyptian Pollution Abatement Programme (EPAP) III  |
| Programme/Project Description       | The GEFF supports green economy projects in Egypt, focusing on financing small and medium enterprises (SMEs) involved in energy efficiency, renewable energy, and climate change mitigation. Through a partnership between the EIB and Bank of Alexandria (AlexBank), the programme funds private sector projects that aim to reduce carbon emissions and promote sustainable energy practices across Egypt. | The Alcazar Energy Partners II project focuses on supporting renewable energy projects in Egypt and other regions in the Middle East, North Africa, Eastern Europe, and Central Asia. It addresses the gap in greenfield infrastructure by developing a portfolio of renewable energy assets, including solar, wind, and hydropower projects to support Egypt's green energy transition. | EPAP III is focused on financing pollution abatement in Egypt's industrial sector. The programme provides credit lines to industries for environmental investments aimed at reducing pollution emissions and promoting sustainable practices. In 2022, the programme received an additional €3.975 million in investment grants from the Neighborhood Investment Platform (NIP) to further enhance the scope of pollution reduction efforts. |
| Channel                             | Bilateral (via EIB)  | Bilateral (via EIB)  | Bilateral (via EIB)  |
| Recipient Entity                    | Bank of Alexandria (AlexBank)  | Alcazar Energy Management Services Ltd, Egypt  | Egyptian Environmental Affairs Agency (EEAA)   |
| Implementing Entity                 | EBRD, AlexBank   | EIB, Alcazar Energy Management Services Ltd  | EPAP Project Unit  |
| Amount Received (Domestic Currency) | EGP 756,135,000  | EGP 3,780,675,000  | EGP 210,913,500  |
| Amount Received (USD)               | \$15 million (EIB funding)   | USD 75 million (EIB funding)   | €3.975 million (Investment Grants from NIP) or \$4,183,962 USD   |
| Time Frame                          | Start Date: 2022   | Start Date: 2022   | Start Date: 2022   |
| Financial Instrument                | Concessional Loan  | Concessional Loan  | Grant (NIP Investment Grants)  |
| Status                              | Received   | Received   | Received   |

|   |  |   |  |
|---|--|---|--|
| <b>Sector</b>   | Finance, and Energy  | Energy  | Industry   |
| <b>Subsector</b>  | Renewable energy, SME financing  | Wind energy, solar energy, hydropower   | Energy efficiency, pollution abatement, cleaner production   |
| <b>Type of Support</b>  | Mitigation   | Mitigation  | Mitigation   |
| <b>Contribution to technology development and transfer and / or capacity-building</b> | UA   | UA  | UA   |
| <b>Status of Activity</b>   | Ongoing  | Ongoing   | Ongoing  |
| <b>Use of Support</b>   | The financing supports SMEs in Egypt by promoting energy efficiency and renewable energy investments, contributing to carbon emission reductions and helping Egypt transition to a low-carbon economy. | The project finances renewable energy projects in Egypt and other regions, addressing the gap in greenfield infrastructure and promoting the transition to low-carbon energy generation.  | The support is used to finance pollution reduction investments in Egypt's industrial sector, promoting compliance with environmental standards and reducing harmful emissions. |
| <b>Impact</b>   | The project is expected to promote sustainable energy use and reduce carbon emissions, helping SMEs improve their environmental footprint while advancing Egypt's green energy goals.                  | The project will promote the development of renewable energy capacity in Egypt and reduce reliance on fossil fuels, supporting Egypt's climate goals and those of the broader region.     | The programme reduces pollution emissions from industrial facilities, improves air and water quality, and contributes to Egypt's environmental sustainability goals.           |
| <b>Estimated Results</b>  | Increased deployment of energy efficient and renewable energy technologies   | Increased deployment of renewable energy technologies (wind, solar, and hydropower) in Egypt and target regions, leading to carbon emission reductions and improvements in energy access. | Reduced industrial pollution, enhanced environmental management practices, and compliance with pollution abatement standards across Egypt's industrial sectors.                |

| Information Category                       | Details  |  |
|--|--|--|
| <b>Title of Activity/Programme/Project</b> | <b>CIB Senior Loan for Climate Finance Expansion</b>   | <b>Egypt Sustainable Transport and Digital Infrastructure Guarantee</b>  |
| <b>Programme/Project Description</b>       | The project involves a senior loan of up to \$100 million from IFC to CIB with a tenor of 5 to 7 years to support CIB's growing climate finance business. The loan will help CIB expand its lending to climate-friendly projects and SMEs, with a focus on decarbonization and sustainable growth. The project | This project, supported by the Asian Infrastructure Investment Bank (AIIB), involves providing a \$150 million guarantee to Egypt for sustainable transport and digital infrastructure development. The guarantee will back investments in green, climate-resilient transportation systems and enhance digital infrastructure, contributing to economic growth and environmental sustainability. It supports the |

|   |  |   |
|---|--|---|
|   | also includes advisory services to strengthen CIB's climate risk management capabilities.  | green economy transition in Egypt by improving public transport and digital connectivity.   |
| <b>Channel</b>  | Bilateral via IFC  | Bilateral (via AIIB)  |
| <b>Recipient Entity</b>   | Commercial International Bank (CIB)  | Government of Egypt   |
| <b>Implementing Entity</b>  | International Finance Corporation (IFC), CIB   | Egyptian Government   |
| <b>Amount Received (Domestic Currency)</b>  | EGP 5,040,900,000  | EGP 7,561,350,000   |
| <b>Amount Received (USD)</b>  | \$100 million  | \$150 million (AIIB Guarantee)  |
| <b>Time Frame</b>   | Start Date: 2023   | Start Date: 2023  |
| <b>Financial Instrument</b>   | Senior Loan  | Guarantee   |
| <b>Status</b>   | Received   | Received  |
| <b>Sector</b>   | Finance  | Transport   |
| <b>Subsector</b>  | SME finance, climate risk management, sustainable finance  | Transport, Digital Infrastructure, Climate Change   |
| <b>Type of Support</b>  | Mitigation   | Crosscutting  |
| <b>Contribution to technology development and transfer and / or capacity-building</b> | UA   | UA  |
| <b>Status of Activity</b>   | Ongoing  | Ongoing   |
| <b>Use of Support</b>   | The loan supports CIB's expansion of its climate finance portfolio and facilitates investments in SMEs and sustainable projects aligned with green economy goals.              | The guarantee backs investments in sustainable transport and digital infrastructure, contributing to Egypt's green economy and improving public transport systems and digital connectivity. |
| <b>Impact</b>   | The project is expected to increase CIB's ability to finance climate-friendly projects, improve SME access to finance, and enhance climate risk management practices in Egypt. | The project will enhance sustainable transport and digital infrastructure, supporting Egypt's economic growth and transition to a green economy.  |
| <b>Estimated Results</b>  | Increased financing for SMEs and sustainable projects, enhanced climate risk management capabilities, and improved alignment with Egypt's climate finance objectives.          | Deployment / development of sustainable transport and digital infrastructure  |

| Information Category                       | Details  |   |
|--|--|---|
| <b>Title of Activity/Programme/Project</b> | <b>Eighth Operational Phase of the GEF Small Grants Programme (SGP OP8) – Part 1</b>   | <b>Introducing Systemic Climate Resilience Methodologies in Infrastructure Investment Planning</b>  |
| <b>Programme/Project Description</b>       | The SGP OP8 focuses on empowering local civil society organizations (CSOs) and community-based organizations (CBOs) in 99 countries, including Egypt, by providing access to knowledge, technical assistance, and grant funding for community-driven initiatives. The programme targets socioeconomic development, biodiversity conservation, and climate change | This project focuses on adopting long-term climate-resilient policies in infrastructure investment plans by developing systemic climate resilience methodologies and using the Systemic Risk Assessment and Investment Prioritization Tool (SRAT). It aims to integrate these methodologies within national and municipal planning institutes. The project also provides governments with evidence and experience to demonstrate these resilience |

|   |   |   |
|---|---|---|
|   | adaptation, with a strong emphasis on women, youth, and Indigenous Peoples.   | methodologies and metrics in their infrastructure investment plans, enhancing capacity for future climate challenges.   |
| <b>Channel</b>  | Bilateral via GEF   | Bilateral (via GEF)   |
| <b>Recipient Entity</b>   | Local CSOs, CBOs  | UNIDO   |
| <b>Implementing Entity</b>  | United Nations Development Programme (UNDP)   | United Nations Industrial Development Organization (UNIDO)  |
| <b>Amount Received (Domestic Currency)</b>  | EGP 360,940,470.63  | EGP 57,325,820.53   |
| <b>Amount Received (USD)</b>  | \$126,186,603 (GEF Project Grant)   | \$1,137,214 (GEF Project Grant)   |
| <b>Time Frame</b>   | Start Date: 2024  | Start Date: 2023  |
| <b>Financial Instrument</b>   | Grant   | Grant   |
| <b>Status</b>   | Received  | Received  |
| <b>Sector</b>   | Crosscutting  | Finance   |
| <b>Subsector</b>  | Biodiversity, Climate Change, Land Degradation Ecosystem restoration, landscape management, sustainable livelihoods   | Climate Change, Infrastructure Climate resilience, infrastructure investment  |
| <b>Type of Support</b>  | Crosscutting  | Crosscutting  |
| <b>Contribution to technology development and transfer and / or capacity-building</b> | UA  | UA  |
| <b>Status of Activity</b>   | Ongoing   | Ongoing   |
| <b>Use of Support</b>   | Enhances the capacity of local communities to implement sustainable practices and engage in the green economy.  | Enhances capacity for infrastructure planners and governments to integrate resilience metrics into planning processes, reducing vulnerability to climate impacts. |
| <b>Impact</b>   | The project provides technical and grant assistance to local CSOs and CBOs for biodiversity conservation, ecosystem restoration, and socioeconomic development.               | The project develops resilience methodologies for global infrastructure investments, aiming to improve their ability to withstand climate impacts.                |
| <b>Estimated Results</b>  | Expected results include the restoration of 225,000 hectares of land, the improvement of 3.8 million hectares of landscapes, and better management of marine protected areas. | The project will enhance the resilience of global infrastructure projects, preventing human and financial disasters caused by climate change.                     |

| Information Category                       | Details   |   |
|--|---|---|
| <b>Title of Activity/Programme/Project</b> | Development and Energy Efficiency Improvement at Suez Oil Processing Company  | Development and Energy Efficiency Improvement at Suez Oil Processing Company  |
| <b>Programme/Project Description</b>       | The project focuses on improving energy efficiency at Suez Oil Processing Company through advanced optimization measures. Key initiatives include implementing an Energy Management System, upgrading process units to enhance energy performance, and recovering waste gases for LPG | This grant includes the development of key studies focusing on feasibility assessments for energy efficiency improvements and infrastructure upgrades at Alexandria Petroleum, Nasr Petroleum, and Suez Oil Processing Company, particularly the modernization of Suez Oil Processing Company's boiler. |

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|   | production. Additionally, the project integrates energy-efficient technologies in refining operations, reducing emissions, and optimizing fuel consumption.   | Additionally, the grant supports the development of a low-carbon strategy for the petroleum sector and a detailed economic feasibility study for Sustainable Aviation Fuel (SAF) production.   |
| <b>Channel</b>  | EBRD  | EU   |
| <b>Recipient Entity</b>   | Suez Oil Processing Company affiliated to the ministry of petroleum and mineral resources   | Suez Oil Processing Company affiliated to the ministry of petroleum and mineral resources and the ministry of petroleum and mineral resources  |
| <b>Implementing Entity</b>  | UA  | UA   |
| <b>Amount Received (Domestic Currency)</b>  | EGP 12,602,250,000  | EGP 689,780,048  |
| <b>Amount Received (USD)</b>  | \$250,000,000   | \$13,680,474   |
| <b>Time Frame</b>   | Start Date: 2018  | 2018   |
| <b>Financial Instrument</b>   | Concessional loan   | Grant  |
| <b>Status</b>   | Received  | Recieved   |
| <b>Sector</b>   | Energy  | Energy   |
| <b>Subsector</b>  | Petroleum refining  | Petroleum refining, and energy efficiency  |
| <b>Type of Support</b>  | Mitigation  | Mitigation   |
| <b>Contribution to technology development and transfer and / or capacity-building</b> | UA  | UA   |
| <b>Status of Activity</b>   | Ongoing   | Ongoing  |
| <b>Use of Support</b>   | The funding is utilized for upgrading refining processes, implementing energy efficiency measures, and developing infrastructure for gas recovery and emissions reduction. This includes system upgrades, efficiency audits, and adopting best practices to improve overall energy performance.   | <ul style="list-style-type: none"> <li>• Conducting feasibility assessments for energy efficiency improvements at: Alexandria Petroleum, Nasr Petroleum, Suez Oil Processing Company (including boiler modernization)</li> <li>• Supporting infrastructure upgrades to enhance operational efficiency.</li> <li>• Developing a low-carbon strategy for the petroleum sector.</li> <li>• Conducting a detailed economic feasibility study for Sustainable Aviation Fuel (SAF) production.</li> <li>• Conducting energy efficiency training for sector employees.</li> </ul> |
| <b>Impact</b>   | The project will significantly enhance energy efficiency at Suez Oil Processing Company, reducing fuel consumption and operational costs while improving overall process performance. The achieved energy savings and emissions reductions will contribute to Egypt's climate commitments and decarbonization targets. Additionally, supports sustainable resource utilization, and enhances the competitiveness of the petroleum sector. | The project enhances energy efficiency, reduces emissions, and ensures regulatory compliance. It minimizes energy losses, improves operational efficiency, and lowers carbon emissions.  |
| <b>Estimated Results</b>  | The project is expected to achieve significant energy savings of <b>3,295,000 MMBtu annually</b> by optimizing refining processes and implementing energy   | UA   |

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|  | efficiency measures. These improvements will contribute to a <b>reduction of approximately 214,000 tons of CO<sub>2</sub> equivalent per year.</b> |  |
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| Information Category                       | Details   |
|--|---|
| <b>Title of Activity/Programme/Project</b> | Waste Heat Recovery and Infrastructure Upgrade for Gas Compressors at Dahshour (GASCO)  |
| <b>Programme/Project Description</b>       | The project aims to enhance energy efficiency and improve the reliability of gas compression operations through waste heat recovery, infrastructure upgrades, and regulatory compliance. It includes the implementation of a waste heat recovery system and the addition of three new compressors (Units 5, 6, and 7) at the Dahshour Compression Station to optimize performance and reduce energy losses. Additionally, two electric compressors will be supplied and installed for the Raven Gas Field at the Western Desert Gas Complex, improving operational efficiency and reducing emissions. The project also involves upgrading gas metering systems to comply with the new Gas Market Regulation Law, ensuring accurate measurement and adherence to market standards. |
| <b>Channel</b>                             | EBRD  |
| <b>Recipient Entity</b>                    | GASCO affiliated to the ministry of petroleum and mineral resources   |

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|---|--|--|
| <b>Implementing Entity</b>  | UA   |  |
| <b>Amount Received (Domestic Currency)</b>  | 7,057,260,000 EGP  |  |
| <b>Amount Received (USD)</b>  | \$140,000,000  |  |
| <b>Time Frame</b>   | Start Date: 2018   |  |
| <b>Financial Instrument</b>   | Concessional loan  |  |
| <b>Status</b>   | Received   |  |
| <b>Sector</b>   | Energy   |  |
| <b>Subsector</b>  | Gas processing   |  |
| <b>Type of Support</b>  | Mitigation   |  |
| <b>Contribution to technology development and transfer and / or capacity-building</b> | UA   |  |
| <b>Status of Activity</b>   | Ongoing  |  |
| <b>Use of Support</b>   | The project involves the implementation of a waste heat recovery system and the addition of three new compressors (Units 5, 6, and 7) at the Dahshour Compression Station, optimizing performance and minimizing energy losses. Additionally, the supply and installation of two electric compressors for the Raven Gas Field at the Western Desert Gas Complex will improve operational efficiency and lower carbon emissions. Furthermore, upgrading gas metering systems to comply with the new Gas Market Regulation Law |  |
| <b>Impact</b>   | The waste heat recovery system and new compressors at Dahshour Compression Station will minimize energy losses and optimize performance.   |  |
| <b>Estimated Results</b>  | The project is expected to achieve an annual energy savings of approximately 1,963,000 million British thermal units (BTU) and contribute to reducing greenhouse gas emissions by around 123,000 tons of CO <sub>2</sub> equivalent per year.  |  |

## **5.7 Information on Technology Development and Transfer Support Needed by Egypt under Article 10 of the Paris Agreement**

Egypt emphasizes that its ability to implement ambitious climate action is highly constrained by the availability of appropriate technologies. The country calls for climate know-how to be freely available as a global public good to collectively fast-track the transition towards the target of the Paris Agreement. To achieve its climate goals, Egypt requires substantial support in technology development and transfer, including financial assistance, capacity building, and enhanced access to cutting-edge climate technologies. International cooperation and support will be crucial in addressing these technology needs and enabling Egypt to transition towards a low-carbon, climate-resilient future.

### **5.7.1 Overview of Egypt's Technology Development and Transfer Plans**

Egypt recognizes the critical role of technology in addressing climate change challenges and achieving its climate goals. The country's plans related to technology development and transfer include deploying climate-friendly technologies such as renewable energy sources (solar, wind, and biomass), energy storage solutions, smart grid systems, and water desalination and conservation technologies. Furthermore, Egypt aims to integrate climate-resilient agricultural technologies, low-carbon transportation systems, and waste management and recycling technologies. To support this technological adoption, the government is focused on building administrative capacities and legal frameworks by developing policies to support technology adoption and innovation, enhancing institutional capabilities for technology assessment and implementation, and strengthening intellectual property rights while ensuring technology accessibility. Additionally, fostering partnerships and investments is a priority, which involves creating collaborative models between government entities, the private sector, development organizations, financial institutions, NGOs, and research institutions, encouraging foreign direct investment in climate technologies, and promoting technology transfer through international cooperation. Lastly, to enhance youth participation and entrepreneurship, Egypt plans to provide skills training in climate technologies, support research and innovation initiatives, and facilitate access to business incubators and accelerators for green startups.

### **5.7.2 Primary Needs, Challenges and Priorities for Technology Development and Transfer**

#### **Key sectors and their advanced technologies include:**

The Energy Sector emphasizes renewable energy technologies like high-efficiency solar panels and offshore wind, energy storage solutions, smart grids for renewable integration, and energy-efficient technologies for buildings and industries. The Water Sector focuses on solar-powered desalination, water conservation, wastewater treatment, and resource monitoring technologies.

The Agriculture Sector prioritizes drought-resistant crops, precision agriculture, advanced irrigation systems, and climate-smart livestock management. The Transportation Sector

promotes electric vehicles, efficient public transport, intelligent traffic systems, and low-carbon maritime and aviation technologies.

The Waste Management Sector advances waste-to-energy solutions, recycling technologies, and biodegradable plastics. Finally, the Climate Monitoring and Early Warning Systems Sector focuses on weather forecasting, satellite-based environmental monitoring, and early warning systems for natural disasters.

### **Key challenges for Technology Development and Transfer**

Egypt faces several challenges in advancing climate and environmental technologies. Regulatory constraints, including unclear policies and slow approvals, hinder technology transfer, while limited technical capacity and skilled workforce shortages delay deployment. Infrastructure gaps, such as inadequate smart grids, waste management, and sustainable transport networks, restrict scalability. Data limitations and interoperability issues in climate monitoring weaken decision-making.

Beyond these barriers, market inertia and resistance to change slow adoption, as industries prioritize cost savings over sustainability. Mismatched technology solutions further complicate deployment, as imported technologies may not align with Egypt's environmental conditions or operational needs. Addressing these challenges requires streamlined policies, capacity-building, and tailored investment in enabling infrastructure.

### **5.7.3 Needs for Enhancing Endogenous Capacities**

*Table 83: Needs for Enhancing Endogenous Capacities*

| Category                                   | Details  |
|--|--|
| <b>4.1 Human Resource Development</b>      | <ul style="list-style-type: none"> <li>- Training programmes for technicians, engineers, and managers in climate technologies</li> <li>- Curriculum development in universities to include climate technology courses</li> <li>- Capacity building for policymakers on technology assessment and implementation</li> </ul>   |
| <b>4.2 Institutional Strengthening</b>     | <ul style="list-style-type: none"> <li>- Enhancing research and development capabilities in universities and research institutions</li> <li>- Strengthening technology transfer offices in academic and research institutions</li> <li>- Improving coordination among government agencies for technology-related policies</li> <li>- Upgrading climate change related technical capacities of related institutions such as the Egyptian Meteorological Authority.</li> <li>- Supporting the operation of the practical training facility for the Center of Excellence for Energy Transition, affiliated with the petroleum sector, by providing measurement devices and necessary equipment for conducting technical studies on energy efficiency and carbon reduction.</li> </ul> |
| <b>4.3 Data Management and Analysis</b>    | <ul style="list-style-type: none"> <li>- Developing capabilities for big data analytics related to climate and energy</li> <li>- Improving climate modeling and scenario analysis capabilities</li> <li>- Enhancing GHG inventory and MRV (Monitoring, Reporting, and Verification) systems</li> </ul>   |
| <b>4.4 Policy and Regulatory Framework</b> | <ul style="list-style-type: none"> <li>- Developing supportive policies for technology innovation and adoption</li> <li>- Creating incentives for private sector investment in climate technologies</li> <li>- Enhancing intellectual property rights while ensuring technology accessibility</li> </ul>   |

### **5.7.4 Needs for Enhancing Endogenous Technologies**

- **Localization of Technologies**
  - Adapting international technologies to suit Egypt's specific climate, geographical, and socio-economic context.

- Developing locally-appropriate and affordable versions of key climate technologies.
- Enhancing local manufacturing capabilities for climate technologies.
- Conducting a needs assessment of existing Multi-Hazard Early Warning System (MHEWS) to be able to identify the specification of new more updated and advanced systems.
- Technology transfer in the field of enhancing climate risk forecasting and adaptation through Multi-Hazard Early Warning System (MHEWS).

Specific endogenous technologies are presented in **Table 84**.

- **Innovation and R&D**

- Increasing funding for climate technology research in national institutions.
- Establishing centers of excellence for key climate technologies.
- Promoting collaboration between academia and industry for applied research.

- **Technology Transfer Mechanisms**

- Developing effective mechanisms for technology transfer from international partners.
- Enhancing absorptive capacity for new technologies.
- Promoting joint ventures and licensing agreements with technology providers.

- **Entrepreneurship and Startups:**

- Supporting incubators and accelerators focused on climate technologies.
- Providing funding and mentorship for climate tech startups.
- Facilitating linkages between startups and larger industries for technology commercialization.

**Table 84: Needs for Enhancing Endogenous Technologies**

| Sector                       | Project   | Technology Needed   | Purpose   |
|------------------------------|---|---|---|
| <b>Renewable Energy</b>      | Decommissioning Inefficient Thermal Power Plants          | Solar and wind power generation, grid integration, energy storage | Replace 5 GW of thermal power with 10 GW of renewables  |
|                              | Solar Energy for Water Desalination                       | Solar-powered desalination technologies                           | Address water scarcity in coastal areas   |
|                              | Solar Irrigation Pumps                                    | Solar-powered water pumps   | Improve water efficiency in agriculture   |
| <b>Energy Efficiency</b>     | Grid Modernization and Energy Storage                     | Advanced energy storage, smart grid technologies                  | Stabilize energy grid with renewable influx   |
|                              | Energy-Efficient Industrial Technologies                  | Advanced industrial manufacturing systems                         | Enhance energy efficiency in industries   |
| <b>Agriculture and Water</b> | Modernizing Irrigation Systems                            | Drip irrigation, climate-resilient irrigation systems             | Conserving water and boost agricultural productivity  |
|                              | Smart Agricultural Practices                              | Precision farming technologies                                    | Increase resilience and productivity in farming   |
| <b>Transport</b>             | Electrification of Railways and Metro Lines               | Electric trains, metro electrification systems                    | Transition to green transport systems   |
| <b>Water Management</b>      | Desalination Plants                                       | Solar-powered desalination technology                             | Mitigate water shortages in high-need areas   |
| <b>Adaptation</b>            | Multi Hazard Early Warning Systems for Climate Adaptation | Climate risk management, early warning systems                    | Improve resilience to climate-related risks   |
| <b>Oil and gas</b>           | Methane Emission Reduction in Oil and Gas Sector          | Advanced Leak Detection and Repair (LDAR) Systems                 | Improve methane monitoring and reduction efforts through cutting-edge infrared cameras, satellite monitoring, and AI-based leak detection.    |
| <b>Oil and gas</b>           | Digitalization and Smart Energy Management                | AI-Based Energy Management and Blockchain for Carbon Accounting   | Enhance energy efficiency and carbon credit trading by implementing AI-driven energy management systems and blockchain-based carbon tracking. |

## 5.7.5 Breakdown of information on technology development and transfer support needed

**Table 85: Breakdown of Information on Technology Development and Transfer Support Needed**

| Category  | Energy Programme   | Water Programme   | Agriculture Programme   |
|---|--|---|---|
| <b>Title (of activity, programme or project)</b>                  | Energy Programme   | Water Programme   | Agriculture Programme   |
| <b>Programme/project description</b>                              | UA   | UA  | UA  |
| <b>Type of support (mitigation, adaptation, or cross-cutting)</b> | Mitigation   | Crosscutting  | Crosscutting  |
| <b>Type of technology</b>   | - Advanced renewable energy technologies (e.g., high-efficiency solar panels, offshore wind) | - Advanced water desalination technologies (e.g., solar-powered desalination)         | - Drought-resistant and salt-tolerant crop varieties  |
|   | - Energy storage solutions (batteries, thermal storage, pumped hydro)                        | - Water conservation and efficiency technologies                                      | - Precision agriculture technologies for optimizing water and input use   |
|   | - Smart grid technologies for renewable integration  | - Wastewater treatment and recycling systems  | - Advanced irrigation systems (e.g., drip irrigation, smart irrigation)   |
|   | - Energy-efficient technologies for buildings and industries                                 | - Technologies for monitoring and managing water resources                            | - Climate-smart livestock management technologies   |
| <b>Expected time frame</b>  | UA   | UA  | UA  |
| <b>Sector</b>   | Energy Sector  | Water Sector  | Agriculture Sector  |
| <b>Expected use, impact, and estimated results</b>                | Deployment of clean & efficient energy technologies  | Deployment of water conservation technologies and improved water resources management | Deployment of smart- technologies in agriculture, improvement in water resources management, and increased resilience and food security |

| Category  | Transportation Programme  | Waste Management Programme  | Climate Monitoring and Early Warning Systems Programme                   |
|---|---|---|--|
| <b>Title (of activity, programme or project)</b>                  | Transportation Programme  | Waste Management Programme  | Climate Monitoring and Early Warning Systems Programme                   |
| <b>Programme/project description</b>                              | UA  | UA  | UA   |
| <b>Type of support (mitigation, adaptation, or cross-cutting)</b> | Mitigation  | Mitigation  | Adaptation   |
| <b>Type of technology</b>   | - Electric vehicle technologies and charging infrastructure   | - Advanced waste-to-energy technologies   | - Advanced weather forecasting and climate modeling technologies         |
|   | - Technologies for improving public transportation efficiency   | - Recycling and material recovery technologies  | - Remote sensing and satellite technologies for environmental monitoring |
|   | - Intelligent transportation systems for traffic management   | - Biodegradable plastics and alternative packaging materials                              | - Early warning systems for extreme weather events and natural disasters |
|   | - Low-carbon technologies for maritime and aviation sectors   |   |  |
| <b>Expected time frame</b>  | UA  | UA  | UA   |
| <b>Sector</b>   | Transportation Sector   | Waste Management  | Climate Monitoring and Early Warning Systems                             |
| <b>Expected use, impact, and estimated results</b>                | Large-scale deployment of electric transport systems, reduction of urban transport emissions, and improved connectivity in cities | Improved waste management infrastructure, and reduction of emissions from waste disposal. | Increased resilience   |

## **5.8 Information on Technology Development and Transfer Support Received by Egypt under Article 10 of the Paris Agreement**

Several large-scale renewable energy infrastructure projects in Egypt have facilitated technology transfer and contributed to the country's clean energy capacity. Projects like the Benban Solar Park have not only increased solar energy production but also introduced new technologies and best practices in solar energy deployment, benefiting local industries. Additionally, other renewable energy initiatives have supported the integration of advanced technologies in areas such as wind power and energy storage. These projects, developed with international collaboration, have enabled Egypt to access, implement, and contribute to deployment of cutting-edge renewable energy technologies, further strengthening the country's transition to a sustainable energy future. Additionally, with assistance from initiatives such as the Green Economy Financing Facility (GEFF), Egypt has integrated energy-efficient technologies into key industrial sectors like oil, gas, and textiles. This support has allowed diffusion of energy efficient technologies promoting sustainability, reducing emissions, and improving energy use in industries crucial to the national economy.

The USAID Center of Excellence for Energy at Ain Shams University is a successful initiative that promotes innovation and capacity-building in Egypt's energy sector. Through international partnerships, the center has facilitated technology transfer in renewable energy, energy management, and efficiency. It provides specialized training and fosters local expertise, bridging the gap between academic research and practical energy solutions. Additionally, the center has strengthened collaboration with the private sector, supporting the development and commercialization of sustainable energy technologies, positioning Egypt as a regional leader in clean energy.

## Contributions of Support to Technology Development, and Transfer:

- **Technology Development and Transfer:** International partnerships have enabled Egypt to adopt advanced technologies in renewable energy and energy efficiency, enhancing local expertise in energy management and storage.
- **Enhancement of Endogenous Capacities:** Programmes like GEF have provided crucial capacity-building, offering training to boost local technical expertise in renewable energy and industrial efficiency.
- **Improvement of Know-How:** Skill-building initiatives linked to technology transfer have empowered Egypt to operate large-scale renewable energy projects like Benban and adopt advanced industrial processes.

**Table 86: Breakdown of Support Received to Technology Development and Transfer**

| Information Category                       | Details   |
|--|---|
| <b>Title of Activity/Programme/Project</b> | <b>Improved Management of E-Waste and Healthcare Waste to Reduce Emissions of Unintentionally Produced POPs (UPOPs)/Greater Cairo Air Pollution Management and Climate Change Project – Expanded Scope</b>  |
| <b>Programme/Project Description</b>       | The project focuses on improving the management of electronic and healthcare waste in Egypt as part of efforts to reduce air pollution and enhance climate resilience. A \$9.13 million grant was provided by the World Bank's Global Environment Facility (GEF) to support the development of waste treatment facilities, enhance public awareness, and promote sustainable waste management practice. |
| <b>Type of technology</b>                  | E-waste and healthcare waste treatment technologies, climate-friendly waste management practices  |
| <b>Channel</b>                             | Bilateral (via GEF)   |
| <b>Recipient Entity</b>                    | Egyptian Environmental Affairs Agency (EEAA)  |
| <b>Implementing Entity</b>                 | World Bank, EEAA  |
| <b>Time Frame</b>                          | Start Date: 2023  |
| <b>Financial Instrument</b>                | Grant   |
| <b>Sector</b>                              | Air Pollution, Climate Change, Waste Management   |
| <b>Subsector</b>                           | Electronic waste, healthcare waste, pollution control   |
| <b>Type of Support</b>                     | Crosscutting  |
| <b>Status of Activity</b>                  | Ongoing   |
| <b>Use of Support</b>                      | Develop and upgrade waste treatment facilities, provide capacity-building and technical assistance, conduct public awareness campaigns, and implement sustainable e-waste and healthcare waste management practices.  |
| <b>Impact</b>                              | The project aims to reduce air pollution from electronic and healthcare waste, promote sustainable waste management practices, and strengthen Egypt's capacity for handling hazardous waste materials, contributing to overall climate resilience.  |
| <b>Estimated Results</b>                   | Enhanced waste management systems, reduced air pollution from e-waste and healthcare waste, and improved public health and climate resilience in Greater Cairo.   |

| Information Category                       | Details  |  |
|--|--|--|
| <b>Title of Activity/Programme/Project</b> | <b>Promoting climate smart agriculture and agricultural biodiversity for enhancing the adaptive capacity of vulnerable rural communities in old and new lands of Upper and Lower Egypt</b>   | <b>Greening Hurghada – Climate Resilience and Biodiversity Conservation</b>  |
| <b>Programme/Project Description</b>       | This project, funded through an \$8 million grant from the Canadian government, focuses on promoting climate-smart agricultural practices and enhancing agrobiodiversity in rural communities in Aswan, Beheira, and Kafr El-Sheikh. The project aims to increase resilience to climate change, support food security, and promote sustainable agricultural practices, with a focus on empowering women and improving soil and plant health. | The Greening Hurghada project aims to reduce GHG emissions and preserve biodiversity by integrating sustainable and climate smart technologies across the tourism, energy, and transport sectors. The project will implement sustainable technology applications and develop a strategic policy framework to de-risk green investments in tourism. It will enhance capacities through trainings, raise awareness, and safeguard biodiversity while reducing GHG emissions. |
| <b>Type of Technology</b>                  | Climate-smart agricultural technologies and innovative farming practices for resilience and sustainability.  | Climate-smart technologies for tourism, energy, and transport infrastructure   |
| <b>Channel</b>                             | Bilateral (via Canada)   | Multilateral (via GEF, Government of Egypt)  |
| <b>Recipient Entity</b>                    | Egyptian Government  | Egyptian Environmental Affairs Agency (EEAA), Organization for Urban Development and Architecture (OUDA)   |
| <b>Implementing Entity</b>                 | Food and Agriculture Organization (FAO)  | UNIDO  |
| <b>Time Frame</b>                          | Start Date: 2023<br>Planned Completion Date: 2027  | 2024-2028  |
| <b>Sector</b>                              | Agriculture  | Tourism  |
| <b>Subsector</b>                           | Sustainable Agriculture, Climate Change, Food Security   | Sustainable Tourism  |
| <b>Type of Support</b>                     | Cross-cutting  | Cross-cutting  |
| <b>Status of Activity</b>                  | Ongoing  | Ongoing  |
| <b>Use of Support</b>                      | Builds capacity for 4,536 farmers to adopt climate-smart agricultural technologies, promoting resilience and improving food security in targeted rural areas, including empowering women and addressing climate challenges.  | Enhances the capacity of Hurghada's sectors to adopt biodiversity conservation practices and integrate eco-friendly technologies, fostering resilience to climate change.  |
| <b>Impact</b>                              | The project supports the implementation of sustainable agricultural practices and promotes biodiversity in rural Egypt, specifically targeting climate resilience for local farming communities.   | Supports the integration of climate-smart technologies in Hurghada's tourism, energy, and transport infrastructure to reduce emissions and enhance sustainability.   |
| <b>Estimated Results</b>                   | Reduce poverty, enhance food security, and increase agricultural productivity by fostering climate adaptation in Egypt's vulnerable rural areas.   | Reduced greenhouse gas emissions from the tourism, energy, and transport sectors; improved biodiversity conservation; increased adoption of sustainable and climate-smart technologies; strengthened resilience of Hurghada's economy and ecosystems to climate change; and enhanced capacity of local stakeholders to implement green practices.  |

| Information Category                       | Details  |  |
|--|--|--|
| <b>Title of Activity/Programme/Project</b> | <b>Red Sea Wind Energy Project – Ras Ghareb Onshore Wind Farm</b>  | <b>Enhancing and Showcasing Egypt's Leadership in Cleantech Innovation for Climate Action and Energy Transition</b>  |
| <b>Programme/Project Description</b>       | The Japan Bank for International Cooperation (JBIC) signed a \$240 million loan agreement with RED SEA WIND ENERGY S.A.E. to finance a 500 MW onshore wind farm in Ras Ghareb, Egypt. The project is co-financed by EBRD, Sumitomo Mitsui Banking Corporation, Norinchukin Bank, and Société Générale, bringing the total co-financing to \$501 million. This wind farm will sell electricity to Egyptian Electricity Transmission Company for 25 years. | The project aims to support cleantech solutions in Egypt through capacity building of SMEs and start-ups, improving their ability to develop and invest in climate and clean energy technologies. The project also focuses on strengthening national expertise and capacities to meet Egypt's NDC commitments through private sector engagement. By enhancing local SMEs' ability to commercialize cleantech solutions and increasing awareness in the financial sector, this project will help Egypt leverage private sector potential to achieve climate and clean energy goals. The project is managed by UNIDO and funded by the Green Climate Fund (GCF). |
| <b>Type of Technology</b>                  | Onshore wind energy technologies.  | Cleantech solutions and clean energy technologies for SMEs and start-ups.  |
| <b>Channel</b>                             | Bilateral (via JBIC)   | Bilateral: Green Climate Fund  |
| <b>Recipient Entity</b>                    | RED SEA WIND ENERGY S.A.E., Egyptian Electricity Transmission Company (EETC)   | Egyptian Private Sector, SMEs, Start-ups   |
| <b>Implementing Entity</b>                 | RED SEA WIND ENERGY S.A.E., EETC   | United Nations Industrial Development Organization (UNIDO)   |
| <b>Time Frame</b>                          | Start Date: 2022   | Start Date: 2024<br>Planned Completion Date: Ongoing   |
| <b>Sector</b>                              | Energy   | Energy   |
| <b>Subsector</b>                           | Electricity Renewable Energy, Climate Change   | Climate Action, Clean Energy, Innovation   |
| <b>Type of Support</b>                     | Mitigation   | Crosscutting   |
| <b>Status of Activity</b>                  | Ongoing  | Ongoing  |
| <b>Use of Support</b>                      | Builds capacity for the operation and management of renewable energy facilities in Egypt, particularly in wind energy generation and grid integration.   | Enhances the capacity of SMEs and start-ups in Egypt to invest in climate and clean energy solutions and strengthens their ability to scale-up cleantech innovations.  |
| <b>Impact</b>                              | The loan is used to finance the construction and operation of a 500 MW onshore wind farm in Ras Ghareb, contributing to Egypt's renewable energy goals.  | The project enhances access to early-stage financing for cleantech solutions and supports the development of a cleantech innovation pipeline, contributing to Egypt's green economy.   |
| <b>Estimated Results</b>                   | The project will significantly increase wind energy generation capacity in Egypt, contribute to carbon emissions reduction, and support Egypt's goal of generating 42% of its energy from renewable sources by 2035.   | The project will strengthen Egypt's cleantech ecosystem, promote sustainable innovation, and enhance the private sector's role in achieving climate and energy goals.  |

## **5.9 Information on Capacity Building Support Needed by Egypt under Article 11 of the Paris Agreement**

### **5.9.1 Egypt's Approach to Enhancing Capacity Building Support**

Egypt has made significant progress in addressing climate change through various capacity-building efforts. Institutional frameworks have been strengthened, with enhancements to the National Climate Change Council (NCCC), increased resources for the Climate Change Central Department (CCCD), and the establishment of climate change units across ministries. Inter-ministerial working groups were also created to address cross-sectoral issues like the water-energy-food nexus. Ministerial capacity has been developed through tailored training programmes, a "train-the-trainers" approach, and integrating climate considerations into national planning and budgeting. International cooperation has been expanded through long-term partnerships, participation in global climate networks, and hosting climate conferences.

### **5.9.2 Egypt's Specific Capacity Building Needs**

Egypt's capacity-building needs focus on strengthening institutions, enhancing technical capabilities, and fostering coordinated climate action. Expanding the Climate Change Coordination Division (CCCD) with expertise in climate finance, adaptation, and mitigation is a priority, alongside developing a climate change law to formalize roles and improve coordination with government entities. Training in climate negotiations and adaptation approaches is essential.

Activating climate change units across ministries with defined responsibilities, standardized training, and resources is key, ensuring alignment with the CCCD and developing sector-specific action plans for agriculture, energy, and industry that can serve as basis for designing viable projects and mobilizing needed climate finance. Institutionalizing a national MRV system with standardized data collection, a centralized climate data platform, and specialist training is critical for compliance with international standards.

Technical capabilities must be enhanced through curricula on climate data management, forecasting, and modeling, with targeted training in multi hazard early warning systems, climate-resilient agriculture, water management, coastal zones, and renewable energy. Strengthening local manufacturing of renewable energy components and aligning with international reporting standards are also vital. These efforts aim to build Egypt's capacity for effective climate action.

### **5.9.3 Constraints and Gaps in Communicating Capacity Building Needs**

Egypt faces significant challenges in effectively communicating its capacity-building needs for climate action. Weak institutional coordination and unclear communication channels between the Climate Change Coordination Division (CCCD) and other government entities result in fragmented messaging. The absence of a formalized climate change law further complicates the articulation of priorities, leaving roles and responsibilities undefined and communication inconsistent.

A lack of standardized reporting frameworks hampers the ability to effectively convey needs to international stakeholders. Without a robust MRV (Monitoring, Reporting, and Verification) system or centralized data platform, the process of gathering and sharing accurate, comprehensive information remains inefficient. This limits the alignment of donor support with Egypt's specific capacity gaps.

Sectoral silos also contribute to poor communication, as individual ministries often lack the training and resources to identify and articulate their specific needs in areas such as agriculture, energy, and industry, and access to potential climate financing options.

### **5.9.4 How Capacity Building Support Would Improve Information Provision**

- **Enhanced MRV System:** A robust MRV system would enable real-time tracking of GHG emissions, provide accurate projections, and facilitate for effective assessment of mitigation and adaptation measures.
- **Improved National Communications:** Enhancing data collection, quality, and frequency of climate data would lead to more comprehensive and accurate national reports, enabling better assessment of climate vulnerabilities and supporting needs.
- **Sectoral Data Improvements:** granular data on sectors such as agriculture, energy, and industry would allow for a deeper analysis of climate risks, facilitating more targeted and effective adaptation and mitigation strategies.
- **Climate Vulnerability Assessments:** Capacity-building initiatives would empower Egypt to conduct detailed, localized vulnerability assessments, improving the identification of vulnerable populations and ecosystems.
- **Evidence-Based Policymaking:** Robust climate data would enable science-driven policy development, allowing Egypt to make informed decisions on climate action and better evaluate the impacts of these policies.
- **Enhancing Climate Adaptation:** through Training on MHEWS and Climate Risk Assessments, Heat Maps, and Advanced Data Visualization Tools.

**Table 87: Breakdown of Specific Capacity building Support Needed**

| Category  | Institutional Strengthening   | Establishing Climate Change Units   | Institutionalizing MRV System  | Enhancing Technical Capabilities   |
|---|---|---|--|--|
| <b>Title (of activity, programme or project)</b>                  | Institutional Strengthening   | Establishing Climate Change Units   | Institutionalizing MRV System  | Enhancing Technical Capabilities   |
| <b>Programme/project description</b>                              | - Expanding the CCCD with experts in climate finance, adaptation, and mitigation. | - Defining clear roles and responsibilities for climate units, with training and resources. | - Designing and implementing a national MRV system.                        | - Developing a curriculum on climate data management, forecasting, and modeling.         |
|   | - Training on climate negotiations and enhancing coordination mechanisms.         | - Regular coordination meetings between ministries and CCCD.                                | - Creating a centralized climate data management platform.                 | - Strengthening capacity for climate-resilient agriculture and water management.         |
|   | - Developing a climate change law to formalize institutional roles.               | - Developing sector-specific climate action plans.  | - Training specialists for MRV implementation.                             | - Providing training for coastal zone and renewable energy management.                   |
|   | - Training on climate adaptation approaches.                                      |   |  | - Enhancing local manufacturing of renewable energy components.                          |
| <b>Expected time frame</b>  | UA  | UA  | UA   | UA   |
| <b>Type of support (mitigation, adaptation, or cross-cutting)</b> | Cross-cutting   | Cross-cutting   | Cross-cutting  | Cross-cutting  |
| <b>Expected use, impact, and estimated results</b>                | Enhanced institutional capacity for climate policy formulation and coordination.  | Improved policy alignment and sector-specific climate actions.                              | Streamlined monitoring and reporting aligned with international standards. | Advanced technical expertise and improved implementation of climate-resilient solutions. |

## 5.10 Information on Capacity Building Support Received by Egypt under Article 11 of the Paris Agreement

### 5.10.1 Key Case Studies of Capacity-Building Support Received

International financial institutions and multilateral development banks have played a key role in supporting Egypt's private sector through programmes such as the **Green Economy Financing Facility (GEFF)** and the **Egyptian Pollution Abatement Project (EPAP)**. These initiatives have empowered private sector companies by providing technical assistance and capacity-building, enabling them to adopt sustainable practices, reduce pollution, and access climate finance. The support offered has helped businesses align with environmental regulations and enhance their role in Egypt's transition to a green economy.

### **5.10.2 Enhancement of Egypt's Capacity to Address Climate Change**

The capacity-building support received has enhanced Egypt's ability to address climate change through:

- **Institutional Strengthening:** Egypt has improved institutional frameworks, leading to stronger governance, coordination, and the ability to implement climate strategies. These efforts have also supported more effective strategy and policy planning, aligning climate actions with national goals.
- **Improved Climate Finance Access:** Enhanced technical expertise and better understanding of climate finance mechanisms have enabled Egypt to mobilize additional resources from international climate funds. Structured approaches to managing climate finance have further strengthened its capacity to secure funding for climate initiatives.

### **5.10.3 Levels of Received Capacity-Building Support**

- **National Level**
  - At the national level, support has been primarily focused on institutional strengthening, particularly of the Ministry of Environment, the National Climate Change Council, and other key agencies.
  - Priorities: Developing, activating and, improving MRV systems, and enhancing access to international climate finance.
- **Sub-Regional Level**
  - Egypt has engaged with subregional initiatives such as the African Adaptation Initiative (AAI), which aims to build the resilience of African countries to climate change. Egypt has been part of knowledge-sharing platforms and joint projects focused on capacity-building in water management and agricultural adaptation.
  - Priorities: Regional collaboration on adaptation, particularly in water resources, agriculture, and disaster risk reduction.
- **Regional Level**
  - Egypt has participated in regional climate initiatives through platforms like the Mediterranean Action Plan and cooperation under the UNFCCC for North African countries.
  - Priorities: At the regional level, priorities include addressing transboundary climate risks, such as water scarcity and desertification, and fostering cooperation on renewable energy projects (e.g., solar and wind energy).

#### **5.10.4 Priorities for Capacity Building Support at Each Level**

- **National Level:** Strengthening institutional frameworks, enhancing climate finance access, and developing comprehensive climate policies and strategies.
- **Subregional Level:** Improving cross-border collaboration on climate adaptation, particularly in the fields of water and agriculture, and sharing best practices for resilience-building.
- **Regional Level:** Strengthening cooperation on climate mitigation, particularly through the development of renewable energy projects and the exchange of technology and expertise in clean energy and sustainable infrastructure.

#### **5.10.5 Stakeholder Participation and Involvement in Capacity Building Activities**

Key sectors in Egypt have been instrumental in capacity-building for climate action. The public sector, led by ministries like the Ministry of Environment, has played a pivotal role in implementing initiatives aimed at enhancing climate resilience and sustainability. The private sector has also been involved, particularly in areas such as renewable energy and environmental protection, contributing to various sustainability projects. Civil society and local communities have actively participated in capacity-building efforts, focusing on sustainable practices and adaptation strategies through awareness campaigns and community engagement. Meanwhile, academia and research institutions have significantly contributed to advancing climate-related research and collaborating with international partners to enhance Egypt's scientific and technical capacities.

## 5.11 Breakdown of Received Capacity Building Support

**Table 88: Breakdown of Received Capacity Building Support**

| Information Category                       | Details   |   |
|--|---|---|
| <b>Title of Activity/Programme/Project</b> | <b>Transforming Financial Systems for Climate in Egypt (TFSC Egypt) I</b>   | <b>Transforming Financial Systems for Climate (TFSC) – Egypt II</b>   |
| <b>Programme/Project Description</b>       | <p>Scaling up financial investments into climate actions in Egypt and strengthen Egypt's capacity to achieve the objectives of the UNFCCC.</p> <p>Establishing a MRV system in the Ministry of Environment, the NCCC and line ministries, and developing focal point units within ministries to share common understanding of challenges and opportunities and maintaining the efficient and sustainable operation of the MRV system.</p> <p>Supporting local Financial Institutions to develop their capacity in assessing opportunities and challenges of potential climate projects.</p> | <p>The TFSC Egypt activity focuses on helping the National Bank of Egypt (NBE) develop its Climate Change Strategy and Environmental and Social Risk Management System (ESRM). It supports climate finance, promotes green growth, and assists NBE in identifying and managing environmental and social risks for climate-related projects. The activity also helps promote gender equality in investment projects.</p> |
| <b>Recipient Entity</b>                    | Egyptian Environmental Affairs Agency (EEAA)  | National Bank of Egypt (NBE)  |
| <b>Implementing Entity</b>                 | United Nations Development Programme (UNDP)   | DAI   |
| <b>Time Frame</b>                          | Start-End Date: January 2023 - December 2026  | Start Date: 2022<br>Planned Completion Date: 2024   |
| <b>Sector</b>                              | Finance, Climate Change   | Finance, Climate Change   |
| <b>Subsector</b>                           | Climate, Environment  | Climate finance, environmental risk management, gender policy   |
| <b>Type of Support</b>                     | Cross-cutting   | Cross-cutting   |
| <b>Status of Activity</b>                  | ongoing   | Ongoing   |
| <b>Impact</b>                              | <p>Capacity building for the industry sector on the MRV data mapping and templates</p> <p>Capacity building on Adaptation M&amp;E for climate change units in the line ministries (8 sectors).</p> <p>Capacity building for climate change units in the line ministries about climate change governance and institutionalization.</p>   | <p>The project helps NBE promote green investments, manage environmental risks, and enhance gender equality within its financial systems, supporting Egypt's National Climate Change Strategy 2050.</p>   |
| <b>Estimated Results</b>                   | <p>Enhance the national climate change governance throughout sustainable climate change units.</p> <p>Enhance the MRV governance</p>  | <p>Implementation of climate finance strategies, enhanced E&amp;S risk management, and identification of bankable climate projects with improved gender equality in investment practices.</p>   |

| Information Category | Details |  |
|----------------------|---------|--|
|----------------------|---------|--|

| Title of Activity/Programme/Project  | National Solid Waste Management Programme (NSWMP) / EU GREEN: EU Support for Growth through Egyptian Environmental Networks  | Green Hydrogen Development in Egypt  |
|--------------------------------------|--|--|
| <b>Programme/Project Description</b> | <p>The project is jointly co-financed by the European Union (EU) and the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) as part of the BMZ project "National Solid Waste Management Programme".</p> <p>The project aims on promoting a climate-sensitive waste management system and transitioning Egypt to a circular economy to improve the quality of life for the Egyptian population. This can be achieved through enhanced environmental performance, and climate change mitigation, adaptation, and mainstreaming in development sectors, in a sustainable and inclusive way.</p> <p>The project builds the capacity of the Ministry of Environment (MoE) to improve the strategic and legislative framework and its effective implementation. This is achieved through a participatory approach with a particular focus on implementing climate-focused waste management strategies and enhancing the capacity of Egypt's Non-Governmental Organizations (NGOs) and Green Entrepreneurs to contribute to the implementation of the Sustainable Development Strategy (SDS), the Egypt Vision 2030.</p> | <p>This project, part of a strategic agreement between Egypt and France, aims to develop the green hydrogen sector in Egypt. The agreement, signed in May 2022, provides €500,000 in funding from the French Development Agency (AFD). The project focuses on launching Egypt's green hydrogen strategy and facilitating technical cooperation between Egypt and France for renewable energy production, with a focus on green hydrogen.</p> |
| <b>Recipient Entity</b>              | Ministry of Environment, Waste Management Regulatory Authority (WMRA)  | Ministry of Electricity and Renewable Energy   |
| <b>Implementing Entity</b>           | GIZ  | French Development Agency (AFD)  |
| <b>Time Frame</b>                    | Start Date: 2022 - Planned Completion Date: 2026   | 2022   |
| <b>Sector</b>                        | Waste Management, Climate Change, Circular Economy   | Renewable Energy, Green Hydrogen   |
| <b>Subsector</b>                     | Waste management, private sector involvement, environmental sustainability, circular economy   | Hydrogen production, renewable energy infrastructure   |
| <b>Type of Support</b>               | Crosscutting   | Mitigation   |
| <b>Status of Activity</b>            | Ongoing  | UA   |
| <b>Impact</b>                        | Enhance the capacities of the staff in EEAA and climate change unit in line ministries in areas such as climate change, circular economy and biodiversity.   | This project supports Egypt's goals to become a leader in green hydrogen production in the global market and helps reduce carbon emissions, improving the country's contribution to climate mitigation efforts.  |
| <b>Estimated Results</b>             | <p>a)Capacity building of the Ministry of Environment and climate change unit in the line ministries in the following topics.</p> <ul style="list-style-type: none"> <li>•Basics of Climate Change Adaptation, Resilience, Vulnerability, and Loss &amp; Damage</li> <li>•Access to Adaptation Climate Finance</li> <li>•In-depth training programme on the carbon footprint of products according to ISO 14067.</li> <li>•MRV of waste sector</li> </ul> <p>-General overview of MRV system in waste sector<br/>-Capacity Building on MRV templates of waste sector. (Data Collection, Templates, QA, QC)</p>   | UA   |

|  |  |  |
|--|--|--|
|  | <p>-In depth training on the calculation of GHG emissions in the waste sector aligned with the 2006 IPCC Guidelines</p> <p>b)Capacity building of the Environmental Impact Assessment department in EEAA in the following topics:</p> <ul style="list-style-type: none"><li>•Community Engagement</li><li>•Strategic Environmental Social Impact Assessment (ESIA)</li><li>•Risk assessment</li></ul> <p>c)Capacity building of the biodiversity department in EEAA in the Carbon credit from biodiversity activities.</p> <p>d)Capacity building for NGOs for proposal writing and guidance in projects' implementation.</p> <p>e)Capacity building measures for startups to implement environmental projects.</p> <p>f)Capacity building of EEAA staff on circular economy notions and responsibilities regarding applying the circular economy strategy</p> <p>g)Capacity building and awareness sessions for WMRA staff and relevant stakeholders (Ministry of Trade and Industry, plastic producers, industrial and commercial institutions, consumers goods industries, others) on how to comply with the technical guidelines for the Green Label for Plastic Products.</p> |  |
|--|--|--|

| Information Category                       | Details  |  |
|--|--|--|
| <b>Title of Activity/Programme/Project</b> | <b>30 by 30 Egypt – Climate Finance Initiative</b>   | <b>IESG Egypt FI – Environmental, Social, and Governance (ESG) Integration</b>   |
| <b>Programme/Project Description</b>       | The 30 by 30 Egypt initiative, led by IFC, is designed to help Egypt's financial sector achieve 30% climate finance by 2030. The project includes partnerships with CIB and Banque du Caire, with activities starting in 2023, focusing on integrating climate risk management and promoting green finance strategies to align with Egypt's National Climate Change Strategy 2050. | The IESG Egypt FI project focuses on strengthening the integration of environmental, social, and governance (ESG) practices in financial institutions (FIs) in Egypt. Supported by IFC, the project offers advisory services aimed at enhancing the capacity of Egyptian financial institutions to manage ESG risks, improve sustainability, and support climate finance and green investments aligned with ESG standards. |
| <b>Recipient Entity</b>                    | FIs  | Egyptian Financial Institutions (FIs)  |
| <b>Implementing Entity</b>                 | International Finance Corporation (IFC)  | International Finance Corporation (IFC)  |
| <b>Time Frame</b>                          | 2023 (CIB & Banque du Caire)   | Start Date: 2023   |
| <b>Sector</b>                              | Finance, Climate Change  | Finance, Environmental, Social, Governance (ESG)   |
| <b>Subsector</b>                           | Climate finance, climate risk management   | ESG risk management, sustainable finance   |
| <b>Type of Support</b>                     | Crosscutting   | Crosscutting   |
| <b>Status of Activity</b>                  | Ongoing  | Ongoing  |
| <b>Impact</b>                              | Contributes to Egypt's National Climate Change Strategy and supports the financial sector in reaching 30% climate finance by 2030, improving resilience to climate risks.  | The project will enhance the capacity of Egyptian financial institutions to manage ESG risks, promote sustainable investments, and contribute to the development of green finance in Egypt.  |
| <b>Estimated Results</b>                   | Enhanced ability to manage climate risks, increased financing for green projects, and alignment with climate finance targets.  | Improved ESG risk management frameworks, enhanced financing for sustainable projects, and increased alignment with international ESG standards in Egypt's financial sector.  |

| Information Category                 | Details   |  |  |
|--------------------------------------|---|--|--|
| Title of Activity/Programme/Project  | Climate Finance Accelerator (CFA)   | Green Growth and Jobs Accelerator  | Green Sharm El Sheikh  |
| <b>Programme/Project Description</b> | The Climate Finance Accelerator (CFA) is a technical assistance programme implemented in 10 countries, including Egypt, to help countries mobilize climate finance to meet their Nationally Determined Contributions (NDCs) under the Paris Agreement. The project has provided capacity building support for over 135 low carbon projects worth more than \$2.9 billion. In Egypt, the 16-week accelerator programme targets 8-12 climate mitigation entrepreneurs with innovative and scalable solutions to challenges posed by climate change. The project is implemented by Acumen, Flat6Labs, and PwC. | The Green Growth and Jobs Accelerator is a UNDP initiative aimed at promoting green growth in the Arab States, including Egypt, through the creation of sustainable jobs and innovative business models. The accelerator focuses on driving economic growth while aligning with climate and environmental goals, enhancing youth and women's participation, and supporting green technology and sustainable agriculture solutions. | The project aims to turn Sharm El Sheikh into a model of integrated, ecologically sustainable tourism through the adoption of low-carbon technologies, improved waste management, and enhanced protection of natural capital. It will develop the Sharm El-Sheikh Sustainable Development Strategy (SESSDS) and Action Plan, focusing on technical assistance, capacity building, and pilot investments. The project will promote behavioral change and integrate climate change mitigation and waste management solutions in line with national priorities. |
| <b>Recipient Entity</b>              | Egyptian Government, Financial Institutions, Private Sector   | Egypt, Arab States, Local Governments, Private Sector  | Ministry of Environment, Egypt   |
| <b>Implementing Entity</b>           | Acumen, Flat6Labs, PwC  | United Nations Development Programme (UNDP) in partnership with local Business Development Organizations.  | United Nations Development Programme (UNDP)  |
| <b>Time Frame</b>                    | Started 2022  | 2024   | Start Date: 2022   |
| <b>Sector</b>                        | Finance,  | Crosscutting   | Tourism, , Waste Management  |
| <b>Subsector</b>                     | Climate Finance   | Crosscutting   | Sustainable Tourism  |
| <b>Type of Support</b>               | Crosscutting  | Crosscutting   | Crosscutting   |
| <b>Status of Activity</b>            | The initiative supports mobilizing climate finance and creating pipelines of climate projects in Egypt, focusing on clean energy, sustainable infrastructure, and resilience.   | The programme promotes sustainable economic growth, focusing on the development of green jobs and innovation, supporting countries in achieving climate goals while generating inclusive economic opportunities.   | The project promotes sustainable tourism practices by improving waste management, adopting low-carbon technologies, and protecting Sharm El Sheikh's natural capital.  |
| <b>Impact</b>                        | Increased climate finance mobilization, enhanced project pipelines for green infrastructure, and progress towards meeting Egypt's NDCs.   | Increased creation of green jobs, development of sustainable business models, and enhanced youth and women participation in the green economy.   | The project promotes sustainable tourism practices by improving waste management, adopting low-carbon technologies, and protecting Sharm El Sheikh's natural capital.  |

| Information Category                       | Details   |
|--|---|
| <b>Title of Activity/Programme/Project</b> | <b>Connective Cities Deep Dive: Heat in the City, Heat action planning and mitigation of heat island effects</b>  |
| <b>Programme/Project Description</b>       | <p>Project consists of a series of exchanges aiming at the co-creation of locally-adapted solution options over a 2-year period for each participating municipality. It is an opportunity to six municipalities (Nairobi, Mombasa, Aswan, Lviv, Heidelberg, Lüdenscheid) to exchange in innovative formats, and jointly develop solution options with specialists in this thematic area. The process will comprise a series of events geared towards both German and international municipalities working on solving the challenges posed by climate change of dealing with heat in their territories.</p> <p>The Urban Development Fund (UDF) proposal has been selected to collaborate with Aswan Governorate in preparing the following:</p> <ul style="list-style-type: none"> <li>An urban heat action plan for a small neighborhood</li> <li>Guideline for interventions.</li> <li>Thematic workshop</li> </ul> |
| <b>Recipient Entity</b>                    | Urban Development Fund (UDF)  |
| <b>Implementing Entity</b>                 | Urban Development Fund (UDF) and Aswan Governorate  |
| <b>Time Frame</b>                          | Jul. 2023 – Jun. 2025   |
| <b>Sector</b>                              | Urban Development   |
| <b>Subsector</b>                           | Climate Change (Heat in the City, and Urban Resilience)<br>Public Spaces.   |
| <b>Type of Support</b>                     | Grant Technical Support   |
| <b>Status of Activity</b>                  | Ongoing   |
| <b>Impact</b>                              | <p>General Framework for Heat Measures for Aswan City, Focuses on 4 main tracks:</p> <ul style="list-style-type: none"> <li>• Adaptation Planning and Implementation</li> <li>• Preparedness, Communication, and Workers' Safety</li> <li>• Built Environment, Infrastructure, and Managed Spaces</li> <li>• Ecosystem-based Adaptation</li> <li>• Developing Heat Action Plan for “Elsail Elgadid” – Aswan City</li> </ul>   |
| <b>Estimated Results</b>                   | Helping the local community adapt to extreme heat waves, and reducing the risks of these waves affecting vulnerable groups  |

| Information Category                       | Details   |  |
|--|---|--|
| <b>Title of Activity/Programme/Project</b> | <b>Egyptian German Joint Committee on Renewable Energy, Energy Efficiency and Environmental Protection (JCEE)</b>   | <b>Improving Resilience to Extreme Heat Vulnerabilities: A Case Study of the Greater Cairo Region (GCR)</b>  |
| <b>Programme/Project Description</b>       | <p>JCEE is a platform for policy coordination and implementation support between Egypt and Germany for low-emission development of the electricity sector. From 2023 to 2027, JCEE is jointly implementing activities with its partners in four work fields:</p> <ul style="list-style-type: none"> <li>• Support the implementation of Egypt's National Climate Change Strategy (NCCS) 2050</li> <li>• Dissemination of renewable energy/energy efficiency technologies</li> <li>• Digitalization of the Egyptian electricity grid</li> <li>• Institutional development for sectoral energy efficiency and climate change units (EEUs/CCUs)</li> </ul> <p>JCEE aims to strengthen its partner and member institutions via capacity development measures, educational initiatives, and technology transfer while also providing comprehensive policy advice through a multi-layered, demand-driven approach on different levels.</p> <p>The Egyptian-German Green Hydrogen Partnership is also currently emerging from JCEE, and the programme is entering into its implementation phase.</p> | <p>Many high-density cities remain unprepared to address health risks posed by heat-events challenges due to limited understanding of the broader public health impacts of heat. This Research Project aims to address this gap specifically by generating new evidence and insights on the impacts of climate change on heat-related health issues in the megacity of Cairo.</p> <p>Examining the spatial relationships between heat hazards, urban form, vulnerable urban areas and various public health indicators as a basis for developing heat mitigation strategies in Cairo Participatory design and implementation. The approach includes:</p> <ul style="list-style-type: none"> <li>• Satellite Data Analysis: Mapping heat-exposure across the GCR.</li> <li>• Field-data Collection: Conducting microclimate measurements in July 2024.</li> <li>• Surveys: Collecting data on local heat-perceptions and coping practices.</li> </ul> |
| <b>Recipient Entity</b>                    | The Egyptian Ministry of Electricity and Renewable Energy (MoERE) - New and Renewable Energy Authority (NREA); Egyptian Electric Utility and Consumer Protection Regulatory Agency (EgyptERA); Egyptian Electricity Holding Company (EEHC); Egyptian Electricity Transmission Company (EETC); Electricity Distribution Companies (DISCOs), The Egyptian Ministry of Environment (MoE) - Egyptian Environmental Affairs Agency (EEAA), The Egyptian Industrial Development Authority (IDA)   | UA   |
| <b>Implementing Entity</b>                 | JCEE Secretariat (Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), The Egyptian Ministry of Electricity and Renewable Energy (MoERE))   | This project is a collaboration between: Urban Development Fund (UDF), Cairo University, Cardiff University, and Habitat for Humanity.   |
| <b>Time Frame</b>                          | Start Date: 07/2023 - Planned Completion Date: 06/2027  | Apr. 2024 – May. 2025  |
| <b>Sector</b>                              | Renewable Energy, Energy Efficiency, Climate Change   | Urban Development  |

|                           |  |   |
|---------------------------|--|---|
| <b>Subsector</b>          | Climate Change Mitigation, Environmental Sustainability and Protection   | Urban Resilience, Health Risks, Community Participation   |
| <b>Type of Support</b>    | Mitigation   | Grant for technical support   |
| <b>Status of Activity</b> | Ongoing  | Ongoing   |
| <b>Impact</b>             | <p>Strengthening the institutional and technical capacities for reducing (GHG) emissions from the Egyptian electricity sector; executive planning and capacity development for implementation of Egypt's National Climate Change Strategy (NCCS) 2050; governmental tracking/reporting of NDC implementation and national carbon markets; institutional and capacity development of sectoral Energy Efficiency Units and Climate Change Units (EEUs/CCUs); assessment and planning of RE resources and deployment; establishing a digital licensing system and inventory for RE projects; implementation of the smart grid roadmap priority actions; and digitalization of services for electricity customers.</p> | <p>The research will contribute to the generation of impact for the GCR and specifically, for Mohandeseen Community by offering evidence of heat-health issues and enhancing understanding of heat-risks.</p> <p>For local authorities, it will provide valuable insights to support the identification and prioritization of issues that require policy attention and selection of suitable urban planning and design interventions tailored to the local context.</p> <p>Supporting the UDF for conducting several studies to mainstream climate-resilient development within various national and sub-national actions.</p> <p>The project will generate evidence and identify research gaps on heat-health for the international community and facilitate the allocation of international funding for heat-resilience initiatives.</p> <p>The project's scientific knowledge and evidence-based practices, integrated with considerations for equality, participation, co-production and sustainability, can be applied in future projects in healthcare settings, communities, and public health programs.</p> |
| <b>Estimated Results</b>  | UA   | <p>The research aims to enhance economic development and welfare by promoting heat-health awareness among vulnerable communities in Cairo. This will prepare stakeholders to tackle heat-health-related challenges, ultimately decreasing heat-related mortality rates and easing the burden on healthcare facilities and government health-expenditure.</p> <p>The research will impact decision-making processes in local authorities and benefit local communities by raising heat-health awareness, identifying localized mitigation strategies within the proposed research framework and implementing them through participatory processes in future funding activities.</p>  |

## **5.12 Information on Support Needed and Received by Egypt for the Implementation of Article 13 of the Paris Agreement and Transparency Related Activities, including Transparency Related Capacity Building**

Egypt's access to support for the implementation of Article 13 of the Paris Agreement has been critical in strengthening its transparency framework. Transparency-related assistance, particularly in capacity-building, has enabled the development of institutional arrangements, tools, and methodologies that improve the accuracy and consistency of climate data. This support has enhanced Egypt's ability to prepare national GHG inventories, track progress on NDC implementation, and report on support needed and received, in line with the requirements of the Enhanced Transparency Framework.

### **5.12.1 Support Needed for Preparing Reports Pursuant to Article 13 of the Paris Agreement**

#### **Support Needed for Preparing Reports Pursuant to Article 13 of the Paris Agreement**

Egypt requires support to enhance its capacity for preparing reports under Article 13 of the Paris Agreement. Key priorities include institutionalizing MRV systems to track emissions and NDC progress through strengthened inter-ministerial collaboration, sector-specific training, and improved data-sharing mechanisms. Capacity building is essential for data collection, QA/QC protocols, and the use of advanced tools for GHG inventory preparation, emissions tracking, and scenario modeling aligned with IPCC guidelines.

Financial and technical assistance is needed to establish standardized methodologies and secure resources for maintaining robust MRV systems. Training for CCCD, CAPMAS, and ministerial climate units is critical for effective data management and reporting, supported by the development of a centralized climate data platform.

Additional resources are required for workshops, national reports, country-specific emission factors, and enhanced climate modeling to improve vulnerability and adaptation reporting. These efforts aim to ensure Egypt meets its reporting obligations under the Paris Agreement effectively and transparently.

**Table 89: Breakdown of Support Needed Related Capacity Building Under Article 13**

| Category  | Institutionalizing MRV Systems   | Capacity Building for Data Collection and QA/QC  | Access to Advanced Climate Data Tools  | Financial and Technical Assistance                        |
|---|--|--|--|---|
| <b>Objectives and description</b>                                 | - Institutionalize MRV systems across key sectors (energy, agriculture, transportation, industry, waste management). | - Enhance data collection systems and QA/QC protocols for national climate data reliability. | - Acquire advanced tools for GHG inventory preparation and emissions tracking aligned with IPCC. | - Secure resources to establish and maintain MRV systems. |
| <b>Recipient entity</b>   | UA   | UA   | UA   | UA  |
| <b>Channel</b>  | UA   | UA   | UA   | UA  |
| <b>Amount (in domestic currency and in United States dollars)</b> | UA   | UA   | UA   | UA  |
| <b>Time frame</b>   | UA   | UA   | UA   | UA  |
| <b>Status of activity (planned, ongoing or completed)</b>         | UA   | UA   | UA   | UA  |
| <b>Use, impact and estimated results</b>                          | Consistent GHG accounting and emissions tracking aligned with NDC goals.   | Improved reliability and accuracy of national climate data.                                  | Enhanced GHG projections and reporting.  | Sustained MRV systems and enhanced climate reporting.     |

| Category  | Capacity Building for Key Institutions                             | Centralized Climate Data Management                         | Workshops and National Reports                                  | Country-Specific Emission Factors                                | Climate Modeling and Projections                                     |
|---|--|---|---|--|--|
| <b>Objectives and description</b>                                 | - Train CCCD, CAPMAS, and ministerial staff in data management.    | - Develop and maintain a centralized climate data platform. | - Provide resources for national communications workshops.      | - Develop country-specific emission factors for GHG inventories. | - Enhance climate modeling and projections for adaptation reporting. |
| <b>Recipient entity</b>   | UA   | UA  | UA  | UA   | UA   |
| <b>Channel</b>  | UA   | UA  | UA  | UA   | UA   |
| <b>Amount (in domestic currency and in United States dollars)</b> | UA   | UA  | UA  | UA   | UA   |
| <b>Time frame</b>   | UA   | UA  | UA  | UA   | UA   |
| <b>Status of activity (planned, ongoing or completed)</b>         | UA   | UA  | UA  | UA   | UA   |
| <b>Use, impact and estimated results</b>                          | Improved institutional capacity for data management and reporting. | Efficient and accessible data management.                   | Strengthening reporting capacity for international obligations. | Better GHG inventories and accurate activity data.               | Improved adaptation and vulnerability reporting.                     |



### **5.12.2 Support Received for Preparing Reports Pursuant to Article 13 of the Paris Agreement**

Egypt has received support for its climate reporting obligations under Article 13 of the Paris Agreement, particularly through projects funded by the Global Environment Facility (GEF). One notable project is **Development of Egypt's First Biennial Transparency Report (1BTR) and Combined Second Biennial Transparency and Fifth National Communication Report (2BTR + 5NC)**. Under the umbrella of the project, **Preparation of Egypt's First Biennial Transparency Report (BTR1) Capacity-Building Workshop**

**Upon the request of the Egyptian Ministry of Environment, and with support from the Capacity-Building Initiative for Transparency – Global Support Programme of the United Nations Environment Programme Copenhagen Climate Centre (CBIT-GSP/UNEP-CCC), the workshop was organized in collaboration with UNDP in Cairo from October 28 to 30, 2024. The workshop gathered 64 participants, including government officials at both national and sectoral levels, as well as specialists from organizations engaged in climate reporting.**

**The training was designed to strengthen the capacity of national teams to meet the reporting requirements of the Modalities, Procedures, and Guidelines (MPGs) under the Enhanced Transparency Framework (ETF) of the Paris Agreement. Its objectives were to:**

- Enhance national transparency teams' ability to report to the UNFCCC by providing knowledge and sharing global best practices.**
- Facilitate practical application of ETF reporting through exercises on NDC tracking, Support Common Tabular Format (CTF) tables, and compilation of the national inventory.**
- Promote peer learning and knowledge sharing on inventory data reporting, NDC tracking, and Support Needed and Received.**

**Over three days, participants engaged in interactive sessions that combined theoretical insights with practical exercises. The training covered preparation of NIRs, methodologies for calculating GHG emissions and removals in line with IPCC guidelines, tracking NDC progress through indicators, and procedures for reporting financial, technological, and capacity-building support. Real data were used in hands-on exercises to fill CTF tables, while cross-sector collaboration fostered a deeper understanding of the coordinated efforts needed for effective ETF reporting.**

**By the conclusion of the workshop, participants had gained enhanced technical expertise and practical tools for BTR preparation. The training improved their understanding of:**

- Collecting and analyzing GHG inventory data.
- Calculating GHG emissions and removals in line with IPCC guidelines.
- Tracking NDC progress through indicators and data-driven reporting.
- Using CTF tables to report Support Needed and Received.

**Table 90: Breakdown of Support Received Related Capacity Building under Article 13**

| Information Category                       | Details   |
|--|---|
| <b>Title of Activity/Programme/Project</b> | <b>Development of Egypt’s First Biennial Transparency Report (1BTR) and Combined Second Biennial Transparency and Fifth National Communication Report (2BTR + 5NC)</b>  |
| <b>Programme/Project Description</b>       | The project aims to assist the Government of Egypt in the preparation and submission of its First Biennial Transparency Report (1BTR) and a combined Second Biennial Transparency and Fifth National Communication Report (2BTR + 5NC) for fulfilling obligations under the UNFCCC and Paris Agreement. This project will improve Egypt’s climate reporting and enhance transparency on its climate change mitigation and adaptation actions. |
| <b>Channel</b>                             | GEF   |
| <b>Recipient Entity</b>                    | Egyptian Environmental Affairs Agency (EEAA)  |
| <b>Implementing Entity</b>                 | United Nations Development Programme (UNDP)   |
| <b>Amount Received (Domestic Currency)</b> | EGP 62,154,297  |
| <b>Amount Received (USD)</b>               | \$1,233,000 (GEF Project Grant)   |
| <b>Time Frame</b>                          | Start Date: 2024  |
| <b>Status of Activity</b>                  | Ongoing   |
| <b>Impact</b>                              | The project will improve Egypt's climate change reporting, strengthen national capacity, and enhance global transparency on Egypt's climate actions.  |
| <b>Estimated Results</b>                   | Improved climate reporting and transparency, enhanced capacity to fulfill UNFCCC obligations, and better alignment with the Paris Agreement goals.  |

| Information Category                       | Details   |  |
|--|---|--|
| <b>Title of Activity/Programme/Project</b> | <b>Transforming Financial Systems for Climate in Egypt (TFSC Egypt) I</b>   | <b>Development of a national NDC tracking tool</b>   |
| <b>Programme/Project Description</b>       | <ul style="list-style-type: none"> <li>•Scaling up financial investments into climate actions in Egypt and strengthen Egypt's capacity to achieve the objectives of the UNFCCC.</li> <li>•Establishing a MRV system in the Ministry of Environment, the NCCC and line ministries, and developing focal point units within ministries to share common understanding of challenges and opportunities and maintaining the efficient and sustainable operation of the MRV system.</li> <li>•Supporting local Financial Institutions to develop their capacity in assessing opportunities and challenges of potential climate projects.</li> </ul> | The NDC tracking tool's main objective is to streamline the BTR reporting process and ensure progress on Egypt's NDC targets. The tool was designed with data entry and collection, analysis, and reporting functionalities for the relevant NDC sectors and in alignment with the ETF requirements and MPGs, and compatible with the national Climate MRV and covering all sectors, both quantitative and qualitative targets, as outlined in Egypt's NDC |
| <b>Channel</b>                             | The Agence Française de Développement (AFD)   | Bilateral: (via Egyptian German Joint Committee of Renewable Energy and Energy Efficiency (JCEE) / GIZ)  |
| <b>Recipient Entity</b>                    | Egyptian Environmental Affairs Agency (EEAA)  | Egyptian Environmental Affairs Agency (EEAA)   |
| <b>Implementing Entity</b>                 | United Nations Development Programme (UNDP)   | UA   |
| <b>Amount Received (Domestic Currency)</b> | EGP 80,654,400  | UA   |
| <b>Amount Received (USD)</b>               | 1.6 M   | UA   |
| <b>Time Frame</b>                          | Start-End Date: January 2023 - December 2026  | Feb 2024- Feb 2025   |
| <b>Status of Activity</b>                  | Ongoing   | Completed  |
| <b>Impact</b>                              | <ul style="list-style-type: none"> <li>•Design the institutional and governance framework of the climate change units in the line ministries.</li> <li>•MRV institutional and governance framework design.</li> <li>•MRV data mapping and templates design for the industrial sector.</li> </ul>  | Tracks the progress of the implementation of the NDC targets, streamlines data entry and analysis across all sectors, meets ETF transparency reporting standards, facilitates BTR reporting process.   |
| <b>Estimated Results</b>                   | <ul style="list-style-type: none"> <li>•Enhance the national climate change governance throughout sustainable climate change units.</li> <li>•Enhance the MRV governance.</li> </ul>  | UA   |

| Information Category  | Details   |  |   |
|---|---|--|---|
| <b>Title of Activity/Programme/Project</b>                        | <b>Diagnostic Assessment of National MRV System of Egypt</b>  | <b>Assessment of Data and Procedures for MRV of GHG Inventory and Emissions Estimation in Electricity, Oil and Gas and Transport Sectors of Egypt</b>  | <b>Assessment of Capacity Improvements for MRV of GHG Inventory and Emissions Estimation in Electricity, Oil and Gas, and Transport Sectors in Egypt</b>  |
| <b>Programme/Project Description</b>                              | This project evaluated Egypt's MRV system by identifying key gaps in regulatory frameworks, institutional structures, and technical capacity. It compared Egypt's system with five countries, including China and Germany, focusing on automated digital MRV solutions. It assessed Egypt's readiness for emissions trading schemes (ETS) and crediting mechanisms while identifying best practices for automating data collection, processing, and reporting. It provided recommendations to improve Egypt's MRV framework, enhance climate data accuracy, and align with international transparency requirements under the Paris Agreement. | This project focuses on strengthening Egypt's MRV system for GHG emissions in the electricity, oil and gas, and transport sectors by evaluating existing data collection, monitoring, and reporting practices. It includes a review of international MRV experiences, identification of gaps, and recommendations for enhancing data accuracy and transparency. The project will also develop IT-based solutions and standardized QA/QC procedures to support compliance with IPCC guidelines and the Enhanced Transparency Framework (ETF) of the Paris Agreement, ensuring improved emissions estimation and reporting efficiency. | This project aims to enhance Egypt's institutional capacity for MRV by focusing on technical improvements in data collection, emissions estimation, and digital reporting tools in the electricity, oil and gas, and transport sectors. It will refine MRV procedures, harmonize IT systems, and develop sector-specific guidance to enhance reporting accuracy. Additionally, the project will assess the integration of automated reporting solutions and improve quality control frameworks to ensure compliance with international climate reporting standards. |
| <b>Recipient Entity</b>   | Government of Egypt   | Government of Egypt  | Government of Egypt   |
| <b>Implementing Entity</b>  | World Bank (WB)   | World Bank (WB)  | World Bank (WB)   |
| <b>Time Frame</b>   | Start Date: 2023  | Start Date: 2024   | Start Date: 2024  |
| <b>Sector</b>   | Climate Change  | Climate Change   | Climate Change  |
| <b>Subsector</b>  | Cross-Sector  | Electricity, Oil and Gas, and Transport Sectors  | Electricity, Oil and Gas, and Transport Sectors   |
| <b>Type of Support (mitigation, adaptation, or cross-cutting)</b> | Cross-cutting   | Cross-cutting  | Cross-cutting   |
| <b>Status of Activity</b>   | Ended   | Ongoing  | Ongoing   |
| <b>Impact</b>   | The assessment strengthened Egypt's capacity to track and report greenhouse gas emissions by identifying regulatory and institutional improvements for an effective MRV system. It facilitated digital MRV integration, improved institutional coordination, and enhanced Egypt's ability to meet climate transparency commitments. The project's insights support the development of a cost-effective, modern MRV system that aligns with global climate policies.   | The project will enhance Egypt's climate reporting capabilities by improving MRV methodologies, ensuring precise and verifiable emissions data, and supporting institutional coordination. It will align Egypt's reporting framework with international best practices, contributing to effective policymaking, emissions reduction strategies, and compliance with global climate commitments.  | By strengthening technical expertise and digital reporting capabilities, the project will enable more efficient and standardized MRV processes, ensuring consistency in emissions data across sectors. It will support informed decision-making, enhance national climate transparency, and facilitate better alignment with international reporting obligations under the Paris Agreement.   |

|                                  |  |  |  |
|----------------------------------|--|--|--|
| <b>Estimated Results</b>         | By analyzing MRV systems in China, Germany, and other countries, the project highlighted best practices for automation, data accuracy, and transparent reporting. The findings helped to improve Egypt's readiness for a digital MRV system, strengthened institutional coordination, and aligned national processes with international standards, ensuring compliance with the Paris Agreement and enhanced climate reporting.  | The project will establish a more robust MRV system by implementing standardized reporting templates, automating data processes, and strengthening QA/QC mechanisms. These improvements will facilitate reliable emissions estimation, increase transparency in national climate reporting, and improve inter-agency coordination for more effective climate governance.   | The project will introduce advanced digital tools and standardized procedures for MRV, improving data accuracy and reporting efficiency. By integrating international best practices and strengthening institutional collaboration, it will contribute to a more transparent, structured, and accountable national emissions reporting framework.  |
| <b>Outputs Achieved/Expected</b> | <ul style="list-style-type: none"> <li>• Diagnostic assessment report outlining Egypt's MRV system, regulatory gaps, and technical needs.</li> <li>• Comparative analysis of five countries, including China and Germany, showcasing best practices for Egypt.</li> <li>• Roadmap for digital MRV implementation, detailing infrastructure requirements, automation strategies, and regulatory improvements.</li> <li>• Stakeholder workshops and technical training sessions to build capacity within national institutions.</li> </ul> | <ul style="list-style-type: none"> <li>• Developed sector-specific MRV guidelines for electricity, oil and gas, and transport.</li> <li>• Established standardized data collection templates and reporting formats.</li> <li>• Designed an MRV automation framework to improve emissions tracking.</li> <li>• Conducted capacity-building workshops for national stakeholders on MRV procedures.</li> <li>• Implemented QA/QC measures to enhance data reliability.</li> </ul> | <ul style="list-style-type: none"> <li>• Developed harmonized MRV data collection procedures for key sectors.</li> <li>• Implemented a digital based system for emissions tracking and reporting.</li> <li>• Conducted specialized training sessions for MRV stakeholders.</li> <li>• Created regulatory guidance documents for institutionalizing MRV improvements.</li> <li>• Established cross-sectoral coordination mechanisms for data exchange.</li> </ul> |

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## **Chapter 2:**

- Central Agency for Public Mobilization and Statistics, Egypt.
- Egyptian Environmental Affairs Agency, Egypt.
- Holding Company for Water and Wastewater, Egypt.
- Ministry of Electricity and Renewable Energy, Egypt.
- Ministry of Health and Populations, Egypt.
- Ministry of Petroleum and Mineral Resources, Egypt.
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## Annexes

## Annex I: GHGI Summary Tables

# 2022

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES                  | CO <sub>2</sub>   | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs            | SF <sub>6</sub> | Total                |
|--|-------------------|-----------------|------------------|----------------------|-----------------|-----------------|----------------------|
|  | Gg                |                 |                  | Gg CO <sub>2</sub> e |                 |                 | Gg CO <sub>2</sub> e |
| <b>Total National Emissions and Removals</b>               | <b>291,526.88</b> | <b>1,913.15</b> | <b>108.38</b>    | <b>7,632.11</b>      | <b>4,213.52</b> | <b>314.18</b>   | <b>385,975.30</b>    |
| <b>1 - Energy</b>  | <b>250,879.05</b> | <b>60.41</b>    | <b>4.12</b>      | -                    | -               | -               | <b>253,661.21</b>    |
| <b>1.A - Fuel Combustion Activities</b>                    | <b>242,269.28</b> | <b>29.20</b>    | <b>3.82</b>      | -                    | -               | -               | <b>244,099.18</b>    |
| 1.A.1 - Energy Industries                                  | 105,226.08        | 2.29            | 0.30             |                      |                 |                 | 105,370.78           |
| 1.A.2 - Manufacturing Industries and Construction          | 55,781.07         | 3.18            | 0.32             |                      |                 |                 | 55,954.66            |
| 1.A.3 - Transport  | 62,193.93         | 17.61           | 3.14             |                      |                 |                 | 63,518.17            |
| 1.A.4 - Other Sectors                                      | 19,068.20         | 6.11            | 0.06             |                      |                 |                 | 19,255.56            |
| 1.A.5 - non-specified                                      | -                 | -               | -                |                      |                 |                 | -                    |
| <b>1.B - Fugitive emissions from fuels</b>                 | <b>8,609.76</b>   | <b>31.21</b>    | <b>0.30</b>      | -                    | -               | -               | <b>9,562.03</b>      |
| 1.B.1 - Solid Fuels  | -                 | -               | -                |                      |                 |                 | -                    |
| 1.B.2 - Oil and Natural Gas                                | 8,609.76          | 31.21           | 0.30             |                      |                 |                 | 9,562.03             |
| 1.B.3 - Other emissions from Energy Production             | -                 | -               | -                |                      |                 |                 | -                    |
| <b>1.C - Carbon dioxide Transport and Storage</b>          | <b>-</b>          | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>-</b>             |
| 1.C.1 - Transport of CO <sub>2</sub>                       | -                 |                 |                  |                      |                 |                 | -                    |
| 1.C.2 - Injection and Storage                              | -                 |                 |                  |                      |                 |                 | -                    |
| 1.C.3 - Other  | -                 |                 |                  |                      |                 |                 | -                    |
| <b>2 - Industrial Processes and Product Use</b>            | <b>39,120.88</b>  | <b>5.98</b>     | <b>3.50</b>      | <b>7,632.11</b>      | <b>4,213.52</b> | <b>314.18</b>   | <b>52,375.76</b>     |
| <b>2.A - Mineral Industry</b>                              | <b>26,241.60</b>  | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>26,241.60</b>     |
| 2.A.1 - Cement production                                  | 25,276.12         |                 |                  |                      |                 |                 | 25,276.12            |
| 2.A.2 - Lime production                                    | 294.75            |                 |                  |                      |                 |                 | 294.75               |
| 2.A.3 - Glass Production                                   | 347.53            |                 |                  |                      |                 |                 | 347.53               |
| 2.A.4 - Other Process Uses of Carbonates                   | 323.20            |                 |                  |                      |                 |                 | 323.20               |
| 2.A.5 - Other (please specify)                             | -                 | -               | -                |                      |                 |                 | -                    |
| <b>2.B - Chemical Industry</b>                             | <b>6,897.95</b>   | <b>5.86</b>     | <b>3.50</b>      | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>7,989.55</b>      |
| 2.B.1 - Ammonia Production                                 | 5,340.58          |                 |                  |                      |                 |                 | 5,340.58             |
| 2.B.2 - Nitric Acid Production                             |                   |                 | 3.50             |                      |                 |                 | 927.50               |
| 2.B.3 - Adipic Acid Production                             |                   |                 | -                |                      |                 |                 | -                    |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production |                   |                 | -                |                      |                 |                 | -                    |
| 2.B.5 - Carbide Production                                 | -                 | -               |                  |                      |                 |                 | -                    |
| 2.B.6 - Titanium Dioxide Production                        | -                 |                 |                  |                      |                 |                 | -                    |
| 2.B.7 - Soda Ash Production                                | -                 |                 |                  |                      |                 |                 | -                    |
| 2.B.8 - Petrochemical and Carbon Black Production          | 1,557.37          | 5.86            |                  |                      |                 |                 | 1,721.48             |
| 2.B.9 - Fluorochemical Production                          | -                 |                 |                  | -                    | -               | -               | -                    |
| 2.B.10 - Hydrogen Production                               | -                 | -               | -                |                      |                 |                 | -                    |

# 2022

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES                               | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs     | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|----------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |          |                 | Gg CO <sub>2</sub> e |
| 2.B.11 - Other (Please specify)   | -               | -               | -                | -                    | -        | -               | -                    |
| <b>2.C - Metal Industry</b>   | 5,664.18        | 0.12            | -                | -                    | 4,213.44 | -               | 9,881.08             |
| 2.C.1 - Iron and Steel Production                                       | 4,984.00        | 0.06            |                  |                      |          |                 | 4,985.75             |
| 2.C.2 - Ferroalloys Production  | 219.60          | 0.06            |                  |                      |          |                 | 221.31               |
| 2.C.3 - Aluminum production   | 448.00          |                 |                  |                      | 4,213.44 |                 | 4,661.44             |
| 2.C.4 - Magnesium production  | -               |                 |                  |                      |          | -               | -                    |
| 2.C.5 - Lead Production   | 10.00           |                 |                  |                      |          |                 | 10.00                |
| 2.C.6 - Zinc Production   | 2.58            |                 |                  |                      |          |                 | 2.58                 |
| 2.C.7 - Rare Earths Production  | -               |                 |                  |                      | -        |                 | -                    |
| 2.C.8 - Other (please specify)  | -               | -               | -                | -                    | -        | -               | -                    |
| <b>2.D - Non-Energy Products from Fuels and Solvent Use</b>             | 317.15          | -               | -                | -                    | -        | -               | 317.15               |
| 2.D.1 - Lubricant Use   | 275.47          |                 |                  |                      |          |                 | 275.47               |
| 2.D.2 - Paraffin Wax Use  | 41.68           |                 |                  |                      |          |                 | 41.68                |
| 2.D.3 - Solvent Use   | -               |                 |                  |                      |          |                 | -                    |
| 2.D.4 - Other (please specify)  | -               | -               | -                |                      |          |                 | -                    |
| <b>2.E - Electronics Industry</b>                                       | -               | -               | -                | -                    | -        | -               | -                    |
| 2.E.1 - Integrated Circuit or Semiconductor                             |                 |                 | -                | -                    | -        | -               | -                    |
| 2.E.2 - TFT Flat Panel Display  |                 |                 | -                | -                    | -        | -               | -                    |
| 2.E.3 - Photovoltaics   |                 |                 |                  | -                    | -        | -               | -                    |
| 2.E.4 - Heat Transfer Fluid   |                 |                 |                  |                      | -        |                 | -                    |
| 2.E.5 - Other (please specify)  | -               | -               | -                | -                    | -        | -               | -                    |
| <b>2.F - Product Uses as Substitutes for Ozone Depleting Substances</b> | -               | -               | -                | 7,632.11             | 0.08     | -               | 7,632.20             |
| 2.F.1 - Refrigeration and Air Conditioning                              |                 |                 |                  | 6,730.98             | 0.08     |                 | 6,731.06             |
| 2.F.2 - Foam Blowing Agents   |                 |                 |                  | 543.43               | -        |                 | 543.43               |
| 2.F.3 - Fire Protection   |                 |                 |                  | 293.69               | -        |                 | 293.69               |
| 2.F.4 - Aerosols  |                 |                 |                  | -                    | -        |                 | -                    |
| 2.F.5 - Solvents  |                 |                 |                  | -                    | -        |                 | -                    |
| 2.F.6 - Other Applications (please specify)                             |                 |                 |                  | 64.01                | -        | -               | 64.01                |
| <b>2.G - Other Product Manufacture and Use</b>                          | -               | -               | -                | -                    | -        | 314.18          | 314.18               |
| 2.G.1 - Electrical Equipment  |                 |                 |                  |                      | -        | 314.18          | 314.18               |
| 2.G.2 - SF6 and PFCs from Other Product Uses                            |                 |                 |                  | -                    | -        | -               | -                    |
| 2.G.3 - N2O from Product Uses   |                 |                 | -                |                      |          |                 | -                    |
| 2.G.4 - Other (Please specify)  | -               | -               | -                | -                    | -        | -               | -                    |
| <b>2.H - Other</b>  | -               | -               | -                | -                    | -        | -               | -                    |
| 2.H.1 - Pulp and Paper Industry   | -               | -               | -                |                      |          |                 | -                    |
| 2.H.2 - Food and Beverages Industry                                     | -               | -               | -                |                      |          |                 | -                    |
| 2.H.3 - Other (please specify)  | -               | -               | -                | -                    | -        | -               | -                    |

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|   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>  |                 |                 |                  |                      |      |                 |                      |
| <b>3 - Agriculture, Forestry, and Other Land Use</b>                                      | 1,472.53        | 563.87          | 91.70            | -                    | -    | -               | 41,560.65            |
| <b>3.A - Livestock</b>  | -               | 402.92          | 26.18            | -                    | -    | -               | 18,218.85            |
| 3.A.1 - Enteric Fermentation  |                 | 367.52          |                  |                      |      |                 | 10,290.67            |
| 3.A.2 - Manure Management   |                 | 35.40           | 26.18            |                      |      |                 | 7,928.19             |
| <b>3.B - Land</b>   | (2.65)          | -               | -                | -                    | -    | -               | (2.65)               |
| 3.B.1 - Forest land   | -               |                 |                  |                      |      |                 | -                    |
| 3.B.2 - Cropland  | -               |                 |                  |                      |      |                 | -                    |
| 3.B.3 - Grassland   | -               |                 |                  |                      |      |                 | -                    |
| 3.B.4 - Wetlands  | -               |                 |                  |                      |      |                 | -                    |
| 3.B.5 - Settlements   | (2.65)          |                 |                  |                      |      |                 | (2.65)               |
| 3.B.6 - Other Land  | -               |                 |                  |                      |      |                 | -                    |
| <b>3.C - Aggregate sources and non-CO2 emissions sources on land</b>                      | 1,475.18        | 160.95          | 65.52            | -                    | -    | -               | 23,344.46            |
| 3.C.1 - Burning   | -               | -               | -                |                      |      |                 | -                    |
| 3.C.2 - Liming  | -               |                 |                  |                      |      |                 | -                    |
| 3.C.3 - Urea application  | 1,475.18        |                 |                  |                      |      |                 | 1,475.18             |
| 3.C.4 - Direct N2O Emissions from managed soils   |                 |                 | 48.37            |                      |      |                 | 12,819.17            |
| 3.C.5 - Indirect N2O Emissions from managed soils   |                 |                 | 6.20             |                      |      |                 | 1,643.82             |
| 3.C.6 - Indirect N2O Emissions from manure management                                     |                 |                 | 10.94            |                      |      |                 | 2,899.73             |
| 3.C.7 - Rice cultivation  |                 | 160.95          |                  |                      |      |                 | 4,506.56             |
| 3.C.8 - CH4 from Drained Organic Soils  |                 | -               |                  |                      |      |                 | -                    |
| 3.C.9 - CH4 from Drainage Ditches on Organic Soils  |                 | -               |                  |                      |      |                 | -                    |
| 3.C.10 - CH4 from Rewetting of Organic Soils  |                 | -               |                  |                      |      |                 | -                    |
| 3.C.11 - CH4 Emissions from Rewetting of Mangroves and Tidal Marshes                      |                 | -               |                  |                      |      |                 | -                    |
| 3.C.12 - N2O Emissions from Aquaculture   |                 |                 | -                |                      |      |                 | -                    |
| 3.C.13 - CH4 Emissions from Rewetted and Created Wetlands on Inland Wetland Mineral Soils |                 | -               |                  |                      |      |                 | -                    |
| 3.C.14 - Other (please specify)   | -               | -               | -                |                      |      |                 | -                    |
| <b>3.D - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 3.D.1 - Harvested Wood Products   | -               |                 |                  |                      |      |                 | -                    |
| 3.D.2 - Other (please specify)  | -               | -               | -                |                      |      |                 | -                    |
| <b>4 - Waste</b>  | 54.43           | 1,282.88        | 9.07             | -                    | -    | -               | 38,377.67            |
| <b>4.A - Solid Waste Disposal</b>   |                 | 668.94          |                  |                      |      |                 | 18,730.22            |
| 4.B - Biological Treatment of Solid Waste   |                 | 25.58           | 1.92             |                      |      |                 | 1,224.76             |
| 4.C - Incineration and Open Burning of Waste  | 54.43           | 10.85           | 0.14             |                      |      |                 | 396.56               |
| 4.D - Wastewater Treatment and Discharge  |                 | 577.51          | 7.00             |                      |      |                 | 18,026.13            |
| 4.E - Other (please specify)  | -               | -               | -                |                      |      |                 | -                    |
| <b>5 - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3   |                 |                 | -                |                      |      |                 | -                    |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES  | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|--|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|  | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| 5.B - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                          | -               | -               | -                | -                    | -    | -               | -                    |
| 5.C - Other  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>Memo Items (5)</b>  |                 |                 |                  |                      |      |                 |                      |
| International Bunkers  | 3,852.08        | 0.16            | 0.11             | -                    | -    | -               | 3,884.73             |
| 1.A.3.a.i - International Aviation (International Bunkers)   | 2,324.07        | 0.02            | 0.07             |                      |      |                 | 2,342.13             |
| 1.A.3.a.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.a.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                    | -               |                 |                  |                      |      |                 | -                    |
| 1.A.3.d.i - International water-borne navigation (International bunkers)   | 1,528.01        | 0.14            | 0.04             |                      |      |                 | 1,542.60             |
| 1.A.3.d.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.d.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                    | -               |                 |                  |                      |      |                 | -                    |
| 1.A.5.c - Multilateral Operations  | -               | -               | -                | -                    | -    | -               | -                    |
| 1.A.5.c - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub>   |                 |                 | -                |                      |      |                 | -                    |
| 1.A.5.c - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                      | -               |                 |                  |                      |      |                 | -                    |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES         | CO <sub>2</sub>  | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs           | SF <sub>6</sub> | Total                |
|---|------------------|-----------------|------------------|----------------------|----------------|-----------------|----------------------|
|   | Gg               |                 |                  | Gg CO <sub>2</sub> e |                |                 | Gg CO <sub>2</sub> e |
| <b>Total National Emissions and Removals</b>      | <b>273,641.1</b> | <b>1,882.3</b>  | <b>110.9</b>     | <b>5,985.5</b>       | <b>3,912.5</b> | <b>316.4</b>    | <b>365,960.1</b>     |
|   | 4                | 9               | 3                | 2                    | 6              | 2               | 0                    |
| <b>1 - Energy</b>                                 | <b>232,112.2</b> | <b>59.47</b>    | <b>3.49</b>      | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>234,701.6</b>     |
|   | 6                |                 |                  |                      |                |                 | 5                    |
| <b>1.A - Fuel Combustion Activities</b>           | <b>223,447.7</b> | <b>24.63</b>    | <b>3.19</b>      | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>224,983.1</b>     |
|   | 9                |                 |                  |                      |                |                 | 3                    |
| 1.A.1 - Energy Industries                         | 101,935.2        | 1.98            | 0.24             |                      |                |                 | 102,054.6            |
|   | 7                |                 |                  |                      |                |                 | 9                    |
| 1.A.2 - Manufacturing Industries and Construction | 48,851.81        | 1.50            | 0.20             |                      |                |                 | 48,945.81            |
| 1.A.3 - Transport                                 | 54,048.76        | 15.10           | 2.69             |                      |                |                 | 55,185.30            |
| 1.A.4 - Other Sectors                             | 18,611.95        | 6.05            | 0.06             |                      |                |                 | 18,797.32            |
| 1.A.5 - non-specified                             | -                | -               | -                |                      |                |                 | -                    |
| <b>1.B - Fugitive emissions from fuels</b>        | <b>8,664.47</b>  | <b>34.84</b>    | <b>0.30</b>      | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>9,718.52</b>      |
|   |                  |                 |                  |                      |                |                 |                      |
| 1.B.1 - Solid Fuels                               | -                | -               | -                |                      |                |                 | -                    |
| 1.B.2 - Oil and Natural Gas                       | 8,664.47         | 34.84           | 0.30             |                      |                |                 | 9,718.52             |
| 1.B.3 - Other emissions from Energy Production    | -                | -               | -                |                      |                |                 | -                    |
| <b>1.C - Carbon dioxide Transport and Storage</b> | <b>-</b>         | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>-</b>             |

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|   | CO <sub>2</sub>  | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs            | SF <sub>6</sub> | Total                |
|---|------------------|-----------------|------------------|----------------------|-----------------|-----------------|----------------------|
|   | Gg               |                 |                  | Gg CO <sub>2</sub> e |                 |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>            |                  |                 |                  |                      |                 |                 |                      |
| 1.C.1 - Transport of CO <sub>2</sub>                        | -                |                 |                  |                      |                 |                 | -                    |
| 1.C.2 - Injection and Storage                               | -                |                 |                  |                      |                 |                 | -                    |
| 1.C.3 - Other   | -                |                 |                  |                      |                 |                 | -                    |
| <b>2 - Industrial Processes and Product Use</b>             | <b>39,958.83</b> | <b>5.80</b>     | <b>3.50</b>      | <b>5,985.52</b>      | <b>3,912.56</b> | <b>316.42</b>   | <b>51,263.28</b>     |
| <b>2.A - Mineral Industry</b>                               | <b>27,611.03</b> | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>27,611.03</b>     |
| 2.A.1 - Cement production                                   | 26,661.91        |                 |                  |                      |                 |                 | 26,661.91            |
| 2.A.2 - Lime production                                     | 291.00           |                 |                  |                      |                 |                 | 291.00               |
| 2.A.3 - Glass Production                                    | 344.31           |                 |                  |                      |                 |                 | 344.31               |
| 2.A.4 - Other Process Uses of Carbonates                    | 313.81           |                 |                  |                      |                 |                 | 313.81               |
| 2.A.5 - Other (please specify)                              | -                | -               | -                |                      |                 |                 | -                    |
| <b>2.B - Chemical Industry</b>                              | <b>6,823.50</b>  | <b>5.69</b>     | <b>3.50</b>      | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>7,910.20</b>      |
| 2.B.1 - Ammonia Production                                  | 5,294.96         |                 |                  |                      |                 |                 | 5,294.96             |
| 2.B.2 - Nitric Acid Production                              |                  |                 | 3.50             |                      |                 |                 | 927.50               |
| 2.B.3 - Adipic Acid Production                              |                  |                 | -                |                      |                 |                 | -                    |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production  |                  |                 | -                |                      |                 |                 | -                    |
| 2.B.5 - Carbide Production                                  | -                | -               |                  |                      |                 |                 | -                    |
| 2.B.6 - Titanium Dioxide Production                         | -                |                 |                  |                      |                 |                 | -                    |
| 2.B.7 - Soda Ash Production                                 | -                |                 |                  |                      |                 |                 | -                    |
| 2.B.8 - Petrochemical and Carbon Black Production           | 1,528.54         | 5.69            |                  |                      |                 |                 | 1,687.74             |
| 2.B.9 - Fluorochemical Production                           |                  |                 |                  | -                    | -               | -               | -                    |
| 2.B.10 - Hydrogen Production                                | -                | -               | -                |                      |                 |                 | -                    |
| 2.B.11 - Other (Please specify)                             | -                | -               | -                | -                    | -               | -               | -                    |
| <b>2.C - Metal Industry</b>                                 | <b>5,216.60</b>  | <b>0.12</b>     | <b>-</b>         | <b>-</b>             | <b>3,912.48</b> | <b>-</b>        | <b>9,132.32</b>      |
| 2.C.1 - Iron and Steel Production                           | 4,572.02         | 0.06            |                  |                      |                 |                 | 4,573.58             |
| 2.C.2 - Ferroalloys Production                              | 216.00           | 0.06            |                  |                      |                 |                 | 217.68               |
| 2.C.3 - Aluminum production                                 | 416.00           |                 |                  |                      | 3,912.48        |                 | 4,328.48             |
| 2.C.4 - Magnesium production                                | -                |                 |                  |                      |                 | -               | -                    |
| 2.C.5 - Lead Production                                     | 10.00            |                 |                  |                      |                 |                 | 10.00                |
| 2.C.6 - Zinc Production                                     | 2.58             |                 |                  |                      |                 |                 | 2.58                 |
| 2.C.7 - Rare Earths Production                              | -                |                 |                  |                      | -               |                 | -                    |
| 2.C.8 - Other (please specify)                              | -                | -               | -                | -                    | -               | -               | -                    |
| <b>2.D - Non-Energy Products from Fuels and Solvent Use</b> | <b>307.71</b>    | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>307.71</b>        |
| 2.D.1 - Lubricant Use                                       | 266.02           |                 |                  |                      |                 |                 | 266.02               |
| 2.D.2 - Paraffin Wax Use                                    | 41.68            |                 |                  |                      |                 |                 | 41.68                |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES                               | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| 2.D.3 - Solvent Use   |                 |                 |                  |                      |      |                 | -                    |
| 2.D.4 - Other (please specify)  | -               | -               | -                |                      |      |                 | -                    |
| <b>2.E - Electronics Industry</b>                                       | -               | -               | -                | -                    | -    | -               | -                    |
| 2.E.1 - Integrated Circuit or Semiconductor                             |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.2 - TFT Flat Panel Display  |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.3 - Photovoltaics   |                 |                 |                  | -                    | -    | -               | -                    |
| 2.E.4 - Heat Transfer Fluid   |                 |                 |                  |                      | -    |                 | -                    |
| 2.E.5 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.F - Product Uses as Substitutes for Ozone Depleting Substances</b> | -               | -               | -                | 5,985.5              | 0.08 | -               | 5,985.60             |
| 2.F.1 - Refrigeration and Air Conditioning                              |                 |                 |                  | 5,011.0              | 0.08 |                 | 5,011.13             |
| 2.F.2 - Foam Blowing Agents   |                 |                 |                  | 530.25               | -    |                 | 530.25               |
| 2.F.3 - Fire Protection   |                 |                 |                  | 238.35               | -    |                 | 238.35               |
| 2.F.4 - Aerosols  |                 |                 |                  | -                    | -    |                 | -                    |
| 2.F.5 - Solvents  |                 |                 |                  | 149.03               | -    |                 | 149.03               |
| 2.F.6 - Other Applications (please specify)                             |                 |                 |                  | 56.85                | -    | -               | 56.85                |
| <b>2.G - Other Product Manufacture and Use</b>                          | -               | -               | -                | -                    | -    | 316.4           | 316.42               |
| 2.G.1 - Electrical Equipment  |                 |                 |                  |                      | -    | 316.4           | 316.42               |
| 2.G.2 - SF6 and PFCs from Other Product Uses                            |                 |                 |                  | -                    | -    | -               | -                    |
| 2.G.3 - N2O from Product Uses   |                 |                 | -                |                      |      |                 | -                    |
| 2.G.4 - Other (Please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.H - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 2.H.1 - Pulp and Paper Industry   | -               | -               | -                |                      |      |                 | -                    |
| 2.H.2 - Food and Beverages Industry                                     | -               | -               | -                |                      |      |                 | -                    |
| 2.H.3 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>3 - Agriculture, Forestry, and Other Land Use</b>                    | 1,512.74        | 533.19          | 95.25            | -                    | -    | -               | 41,684.49            |
| <b>3.A - Livestock</b>  | -               | 378.48          | 26.94            | -                    | -    | -               | 17,735.65            |
| 3.A.1 - Enteric Fermentation  |                 | 342.02          |                  |                      |      |                 | 9,576.66             |
| 3.A.2 - Manure Management   |                 | 36.45           | 26.94            |                      |      |                 | 8,159.00             |
| <b>3.B - Land</b>   | (2.65)          | -               | -                | -                    | -    | -               | (2.65)               |
| 3.B.1 - Forest land   | -               |                 |                  |                      |      |                 | -                    |
| 3.B.2 - Cropland  | -               |                 |                  |                      |      |                 | -                    |
| 3.B.3 - Grassland   | -               |                 |                  |                      |      |                 | -                    |
| 3.B.4 - Wetlands  | -               |                 |                  |                      |      |                 | -                    |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs     | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|----------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |          |                 | Gg CO <sub>2</sub> e |
| 3.B.5 - Settlements   | (2.65)          |                 |                  |                      |          |                 | (2.65)               |
| 3.B.6 - Other Land  | -               |                 |                  |                      |          |                 | -                    |
| <b>3.C - Aggregate sources and non-CO2 emissions sources on land</b>                      | <b>1,515.40</b> | <b>154.71</b>   | <b>68.32</b>     | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>23,951.49</b>     |
| 3.C.1 - Burning   | -               | -               | -                |                      |          |                 | -                    |
| 3.C.2 - Liming  | -               |                 |                  |                      |          |                 | -                    |
| 3.C.3 - Urea application  | 1,515.40        |                 |                  |                      |          |                 | 1,515.40             |
| 3.C.4 - Direct N2O Emissions from managed soils   |                 |                 | 50.60            |                      |          |                 | 13,409.77            |
| 3.C.5 - Indirect N2O Emissions from managed soils   |                 |                 | 6.43             |                      |          |                 | 1,703.92             |
| 3.C.6 - Indirect N2O Emissions from manure management                                     |                 |                 | 11.29            |                      |          |                 | 2,990.57             |
| 3.C.7 - Rice cultivation  |                 | 154.71          |                  |                      |          |                 | 4,331.84             |
| 3.C.8 - CH4 from Drained Organic Soils  |                 | -               |                  |                      |          |                 | -                    |
| 3.C.9 - CH4 from Drainage Ditches on Organic Soils  |                 | -               |                  |                      |          |                 | -                    |
| 3.C.10 - CH4 from Rewetting of Organic Soils  |                 | -               |                  |                      |          |                 | -                    |
| 3.C.11 - CH4 Emissions from Rewetting of Mangroves and Tidal Marshes                      |                 | -               |                  |                      |          |                 | -                    |
| 3.C.12 - N2O Emissions from Aquaculture   |                 |                 | -                |                      |          |                 | -                    |
| 3.C.13 - CH4 Emissions from Rewetted and Created Wetlands on Inland Wetland Mineral Soils |                 | -               |                  |                      |          |                 | -                    |
| 3.C.14 - Other (please specify)   | -               | -               | -                |                      |          |                 | -                    |
| <b>3.D - Other</b>  | <b>-</b>        | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>-</b>             |
| 3.D.1 - Harvested Wood Products   | -               |                 |                  |                      |          |                 | -                    |
| 3.D.2 - Other (please specify)  | -               | -               | -                |                      |          |                 | -                    |
| <b>4 - Waste</b>  | <b>57.30</b>    | <b>1,283.93</b> | <b>8.69</b>      | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>38,310.68</b>     |
| <b>4.A - Solid Waste Disposal</b>   |                 | <b>676.95</b>   |                  |                      |          |                 | <b>18,954.71</b>     |
| 4.B - Biological Treatment of Solid Waste   |                 | 21.80           | 1.63             |                      |          |                 | 1,043.66             |
| 4.C - Incineration and Open Burning of Waste  | 57.30           | 12.06           | 0.16             |                      |          |                 | 437.39               |
| 4.D - Wastewater Treatment and Discharge  |                 | 573.12          | 6.90             |                      |          |                 | 17,874.92            |
| 4.E - Other (please specify)  | -               | -               | -                |                      |          |                 | -                    |
| <b>5 - Other</b>  | <b>-</b>        | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>-</b>             |
| 5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3   |                 |                 | -                |                      |          |                 | -                    |
| 5.B - Indirect CO2 emissions from the atmospheric oxidation of CH4, CO and NMVOC          | -               |                 |                  |                      |          |                 | -                    |
| 5.C - Other   | -               | -               | -                | -                    | -        | -               | -                    |
| <b>Memo Items (5)</b>   |                 |                 |                  |                      |          |                 | <b>-</b>             |
| International Bunkers   | 3,589.14        | 0.13            | 0.10             | -                    | -        | -               | 3,619.27             |
| 1.A.3.a.i - International Aviation (International Bunkers)                                | 2,324.07        | 0.02            | 0.07             |                      |          |                 | 2,342.13             |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES  | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|--|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|  | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| 1.A.3.a.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NOX and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.a.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC        | -               |                 |                  |                      |      |                 | -                    |
| 1.A.3.d.i - International water-borne navigation (International bunkers)   | 1,265.07        | 0.12            | 0.03             |                      |      |                 | 1,277.14             |
| 1.A.3.d.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NOX and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.d.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC        | -               |                 |                  |                      |      |                 | -                    |
| 1.A.5.c - Multilateral Operations  | -               | -               | -                | -                    | -    | -               | -                    |
| 1.A.5.c - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NOX and NH <sub>3</sub>   |                 |                 | -                |                      |      |                 | -                    |
| 1.A.5.c - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC          | -               |                 |                  |                      |      |                 | -                    |

# 2020

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES         | CO <sub>2</sub>       | CH <sub>4</sub>     | N <sub>2</sub> O | HFCs                 | PFCs                | SF <sub>6</sub>   | Total                 |
|---|-----------------------|---------------------|------------------|----------------------|---------------------|-------------------|-----------------------|
|   | Gg                    |                     |                  | Gg CO <sub>2</sub> e |                     |                   | Gg CO <sub>2</sub> e  |
| <b>Total National Emissions and Removals</b>      | <b>251,978.1</b><br>2 | <b>1,875.8</b><br>5 | <b>99.5</b><br>4 | <b>5,455.2</b><br>4  | <b>3,912.5</b><br>6 | <b>310.8</b><br>8 | <b>340,559.8</b><br>7 |
| <b>1 - Energy</b>                                 | 215,569.3<br>1        | 57.53               | 3.15             | -                    | -                   | -                 | 218,015.4<br>5        |
| <b>1.A - Fuel Combustion Activities</b>           | 207,665.4<br>2        | 22.66               | 2.88             | -                    | -                   | -                 | 209,063.8<br>3        |
| 1.A.1 - Energy Industries                         | 96,540.34             | 1.86                | 0.23             |                      |                     |                   | 96,652.16             |
| 1.A.2 - Manufacturing Industries and Construction | 43,913.60             | 1.12                | 0.14             |                      |                     |                   | 43,983.23             |
| 1.A.3 - Transport                                 | 49,071.92             | 13.68               | 2.46             |                      |                     |                   | 50,105.55             |
| 1.A.4 - Other Sectors                             | 18,139.56             | 5.99                | 0.06             |                      |                     |                   | 18,322.89             |
| 1.A.5 - non-specified                             | -                     | -                   | -                |                      |                     |                   | -                     |
| <b>1.B - Fugitive emissions from fuels</b>        | 7,903.89              | 34.87               | 0.27             | -                    | -                   | -                 | 8,951.62              |
| 1.B.1 - Solid Fuels                               | -                     | -                   | -                |                      |                     |                   | -                     |
| 1.B.2 - Oil and Natural Gas                       | 7,903.89              | 34.87               | 0.27             |                      |                     |                   | 8,951.62              |
| 1.B.3 - Other emissions from Energy Production    | -                     | -                   | -                |                      |                     |                   | -                     |
| <b>1.C - Carbon dioxide Transport and Storage</b> | -                     | -                   | -                | -                    | -                   | -                 | -                     |
| 1.C.1 - Transport of CO <sub>2</sub>              | -                     |                     |                  |                      |                     |                   | -                     |
| 1.C.2 - Injection and Storage                     | -                     |                     |                  |                      |                     |                   | -                     |
| 1.C.3 - Other                                     | -                     |                     |                  |                      |                     |                   | -                     |

# 2020

|   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs     | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|----------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |          |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>            |                 |                 |                  |                      |          |                 |                      |
| <b>2 - Industrial Processes and Product Use</b>             | 34,894.22       | 5.98            | 3.50             | 5,455.24             | 3,912.56 | 310.88          | 45,667.98            |
| <b>2.A - Mineral Industry</b>                               | 22,547.53       | -               | -                | -                    | -        | -               | 22,547.53            |
| 2.A.1 - Cement production                                   | 21,614.74       |                 |                  |                      |          |                 | 21,614.74            |
| 2.A.2 - Lime production                                     | 287.25          |                 |                  |                      |          |                 | 287.25               |
| 2.A.3 - Glass Production                                    | 341.12          |                 |                  |                      |          |                 | 341.12               |
| 2.A.4 - Other Process Uses of Carbonates                    | 304.42          |                 |                  |                      |          |                 | 304.42               |
| 2.A.5 - Other (please specify)                              | -               | -               | -                |                      |          |                 | -                    |
| <b>2.B - Chemical Industry</b>                              | 7,155.86        | 5.86            | 3.50             | -                    | -        | -               | 8,247.42             |
| 2.B.1 - Ammonia Production                                  | 5,596.37        |                 |                  |                      |          |                 | 5,596.37             |
| 2.B.2 - Nitric Acid Production                              |                 |                 | 3.50             |                      |          |                 | 927.50               |
| 2.B.3 - Adipic Acid Production                              |                 |                 | -                |                      |          |                 | -                    |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production  |                 |                 | -                |                      |          |                 | -                    |
| 2.B.5 - Carbide Production                                  | -               | -               |                  |                      |          |                 | -                    |
| 2.B.6 - Titanium Dioxide Production                         | -               |                 |                  |                      |          |                 | -                    |
| 2.B.7 - Soda Ash Production                                 | -               |                 |                  |                      |          |                 | -                    |
| 2.B.8 - Petrochemical and Carbon Black Production           | 1,559.49        | 5.86            |                  |                      |          |                 | 1,723.54             |
| 2.B.9 - Fluorochemical Production                           |                 |                 |                  | -                    | -        | -               | -                    |
| 2.B.10 - Hydrogen Production                                | -               | -               | -                |                      |          |                 | -                    |
| 2.B.11 - Other (Please specify)                             | -               | -               | -                | -                    | -        | -               | -                    |
| <b>2.C - Metal Industry</b>                                 | 4,892.58        | 0.13            | -                | -                    | 3,912.48 | -               | 8,808.58             |
| 2.C.1 - Iron and Steel Production                           | 4,248.00        | 0.07            |                  |                      |          |                 | 4,249.84             |
| 2.C.2 - Ferroalloys Production                              | 216.00          | 0.06            |                  |                      |          |                 | 217.68               |
| 2.C.3 - Aluminum production                                 | 416.00          |                 |                  |                      | 3,912.48 |                 | 4,328.48             |
| 2.C.4 - Magnesium production                                | -               |                 |                  |                      |          | -               | -                    |
| 2.C.5 - Lead Production                                     | 10.00           |                 |                  |                      |          |                 | 10.00                |
| 2.C.6 - Zinc Production                                     | 2.58            |                 |                  |                      |          |                 | 2.58                 |
| 2.C.7 - Rare Earths Production                              | -               |                 |                  |                      | -        |                 | -                    |
| 2.C.8 - Other (please specify)                              | -               | -               | -                | -                    | -        | -               | -                    |
| <b>2.D - Non-Energy Products from Fuels and Solvent Use</b> | 298.25          | -               | -                | -                    | -        | -               | 298.25               |
| 2.D.1 - Lubricant Use                                       | 256.56          |                 |                  |                      |          |                 | 256.56               |
| 2.D.2 - Paraffin Wax Use                                    | 41.68           |                 |                  |                      |          |                 | 41.68                |
| 2.D.3 - Solvent Use   |                 |                 |                  |                      |          |                 | -                    |
| 2.D.4 - Other (please specify)                              | -               | -               | -                |                      |          |                 | -                    |
| <b>2.E - Electronics Industry</b>                           | -               | -               | -                | -                    | -        | -               | -                    |

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|   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>                        |                 |                 |                  |                      |      |                 |                      |
| 2.E.1 - Integrated Circuit or Semiconductor                             |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.2 - TFT Flat Panel Display  |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.3 - Photovoltaics   |                 |                 |                  | -                    | -    | -               | -                    |
| 2.E.4 - Heat Transfer Fluid   |                 |                 |                  |                      | -    |                 | -                    |
| 2.E.5 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.F - Product Uses as Substitutes for Ozone Depleting Substances</b> | -               | -               | -                | 5,455.24             | 0.08 | -               | 5,455.32             |
| 2.F.1 - Refrigeration and Air Conditioning                              |                 |                 |                  | 4,565.20             | 0.08 |                 | 4,565.29             |
| 2.F.2 - Foam Blowing Agents   |                 |                 |                  | 511.81               | -    |                 | 511.81               |
| 2.F.3 - Fire Protection   |                 |                 |                  | 213.82               | -    |                 | 213.82               |
| 2.F.4 - Aerosols  |                 |                 |                  | -                    | -    |                 | -                    |
| 2.F.5 - Solvents  |                 |                 |                  | 150.67               | -    |                 | 150.67               |
| 2.F.6 - Other Applications (please specify)                             |                 |                 |                  | 13.73                | -    | -               | 13.73                |
| <b>2.G - Other Product Manufacture and Use</b>                          | -               | -               | -                | -                    | -    | 310.88          | 310.88               |
| 2.G.1 - Electrical Equipment  |                 |                 |                  |                      | -    | 310.88          | 310.88               |
| 2.G.2 - SF6 and PFCs from Other Product Uses                            |                 |                 |                  | -                    | -    | -               | -                    |
| 2.G.3 - N2O from Product Uses   |                 |                 | -                |                      |      |                 | -                    |
| 2.G.4 - Other (Please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.H - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 2.H.1 - Pulp and Paper Industry   | -               | -               | -                |                      |      |                 | -                    |
| 2.H.2 - Food and Beverages Industry                                     | -               | -               | -                |                      |      |                 | -                    |
| 2.H.3 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>3 - Agriculture, Forestry, and Other Land Use</b>                    | 1,454.09        | 517.77          | 84.49            | -                    | -    | -               | 38,341.77            |
| <b>3.A - Livestock</b>  | -               | 351.35          | 26.08            | -                    | -    | -               | 16,749.23            |
| 3.A.1 - Enteric Fermentation  |                 | 316.09          |                  |                      |      |                 | 8,850.62             |
| 3.A.2 - Manure Management   |                 | 35.25           | 26.08            |                      |      |                 | 7,898.61             |
| <b>3.B - Land</b>   | (7.05)          | -               | -                | -                    | -    | -               | (7.05)               |
| 3.B.1 - Forest land   | -               |                 |                  |                      |      |                 | -                    |
| 3.B.2 - Cropland  | -               |                 |                  |                      |      |                 | -                    |
| 3.B.3 - Grassland   | -               |                 |                  |                      |      |                 | -                    |
| 3.B.4 - Wetlands  | -               |                 |                  |                      |      |                 | -                    |

# 2020

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| 3.B.5 - Settlements   | (7.05)          |                 |                  |                      |      |                 | (7.05)               |
| 3.B.6 - Other Land  | -               |                 |                  |                      |      |                 | -                    |
| <b>3.C - Aggregate sources and non-CO2 emissions sources on land</b>                      | 1,461.15        | 166.42          | 58.41            | -                    | -    | -               | 21,599.59            |
| 3.C.1 - Burning   | -               | -               | -                |                      |      |                 | -                    |
| 3.C.2 - Liming  | -               |                 |                  |                      |      |                 | -                    |
| 3.C.3 - Urea application  | 1,461.15        |                 |                  |                      |      |                 | 1,461.15             |
| 3.C.4 - Direct N2O Emissions from managed soils   |                 |                 | 41.07            |                      |      |                 | 10,883.43            |
| 3.C.5 - Indirect N2O Emissions from managed soils   |                 |                 | 6.39             |                      |      |                 | 1,694.55             |
| 3.C.6 - Indirect N2O Emissions from manure management                                     |                 |                 | 10.95            |                      |      |                 | 2,900.79             |
| 3.C.7 - Rice cultivation  |                 | 166.42          |                  |                      |      |                 | 4,659.67             |
| 3.C.8 - CH4 from Drained Organic Soils  |                 | -               |                  |                      |      |                 | -                    |
| 3.C.9 - CH4 from Drainage Ditches on Organic Soils  |                 | -               |                  |                      |      |                 | -                    |
| 3.C.10 - CH4 from Rewetting of Organic Soils  |                 | -               |                  |                      |      |                 | -                    |
| 3.C.11 - CH4 Emissions from Rewetting of Mangroves and Tidal Marshes                      |                 | -               |                  |                      |      |                 | -                    |
| 3.C.12 - N2O Emissions from Aquaculture   |                 |                 | -                |                      |      |                 | -                    |
| 3.C.13 - CH4 Emissions from Rewetted and Created Wetlands on Inland Wetland Mineral Soils |                 | -               |                  |                      |      |                 | -                    |
| 3.C.14 - Other (please specify)   | -               | -               | -                |                      |      |                 | -                    |
| <b>3.D - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 3.D.1 - Harvested Wood Products   | -               |                 |                  |                      |      |                 | -                    |
| 3.D.2 - Other (please specify)  | -               | -               | -                |                      |      |                 | -                    |
| <b>4 - Waste</b>  | 60.50           | 1,294.57        | 8.40             | -                    | -    | -               | 38,534.68            |
| <b>4.A - Solid Waste Disposal</b>   |                 | 684.27          |                  |                      |      |                 | 19,159.45            |
| 4.B - Biological Treatment of Solid Waste   |                 | 19.21           | 1.44             |                      |      |                 | 919.69               |
| 4.C - Incineration and Open Burning of Waste  | 60.50           | 13.40           | 0.18             |                      |      |                 | 482.76               |
| 4.D - Wastewater Treatment and Discharge  |                 | 577.69          | 6.78             |                      |      |                 | 17,972.78            |
| 4.E - Other (please specify)  | -               | -               | -                |                      |      |                 | -                    |
| <b>5 - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3   |                 |                 | -                |                      |      |                 | -                    |
| 5.B - Indirect CO2 emissions from the atmospheric oxidation of CH4, CO and NMVOC          | -               |                 |                  |                      |      |                 | -                    |
| 5.C - Other   | -               | -               | -                | -                    | -    | -               | -                    |
| <b>Memo Items (5)</b>   |                 |                 |                  |                      |      |                 | -                    |

# 2020

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES  | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|--|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|  | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| International Bunkers  | 2,123.01        | 0.12            | 0.06             | -                    | -    | -               | 2,141.51             |
| 1.A.3.a.i - International Aviation (International Bunkers)   | 914.49          | 0.01            | 0.03             |                      |      |                 | 921.44               |
| 1.A.3.a.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.a.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                    | -               |                 |                  |                      |      |                 | -                    |
| 1.A.3.d.i - International water-borne navigation (International bunkers)   | 1,208.53        | 0.11            | 0.03             |                      |      |                 | 1,220.07             |
| 1.A.3.d.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.d.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                    | -               |                 |                  |                      |      |                 | -                    |
| 1.A.5.c - Multilateral Operations  | -               | -               | -                | -                    | -    | -               | -                    |
| 1.A.5.c - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub>   |                 |                 | -                |                      |      |                 | -                    |
| 1.A.5.c - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                      | -               |                 |                  |                      |      |                 | -                    |

# 2019

| GREENHOUSE GAS SOURCE AND SINK CATEGORIES         | CO <sub>2</sub>  | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs           | SF <sub>6</sub> | Total                |
|---|------------------|-----------------|------------------|----------------------|----------------|-----------------|----------------------|
|   | Gg               |                 |                  | Gg CO <sub>2</sub> e |                |                 | Gg CO <sub>2</sub> e |
| <b>Total National Emissions and Removals</b>      | <b>260,294.9</b> | <b>1,933.5</b>  | <b>89.5</b>      | <b>4,279.9</b>       | <b>4,514.4</b> | <b>314.6</b>    | <b>347,274.8</b>     |
|   | 4                | 1               | 6                | 1                    | 0              | 5               | 6                    |
| <b>1 - Energy</b>                                 | <b>223,061.5</b> | <b>56.75</b>    | <b>3.18</b>      | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>225,492.6</b>     |
|   | 8                |                 |                  |                      |                |                 | 9                    |
| <b>1.A - Fuel Combustion Activities</b>           | <b>214,691.8</b> | <b>22.15</b>    | <b>2.89</b>      | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>216,078.6</b>     |
|   | 0                |                 |                  |                      |                |                 | 6                    |
| 1.A.1 - Energy Industries                         | 100,438.3        | 2.01            | 0.26             |                      |                |                 | 100,562.4            |
|   | 3                |                 |                  |                      |                |                 | 6                    |
| 1.A.2 - Manufacturing Industries and Construction | 49,425.09        | 1.65            | 0.23             |                      |                |                 | 49,531.66            |
| 1.A.3 - Transport                                 | 47,033.23        | 12.54           | 2.35             |                      |                |                 | 48,007.24            |
| 1.A.4 - Other Sectors                             | 17,795.16        | 5.95            | 0.06             |                      |                |                 | 17,977.30            |
| 1.A.5 - non-specified                             | -                | -               | -                |                      |                |                 | -                    |
| <b>1.B - Fugitive emissions from fuels</b>        | <b>8,369.77</b>  | <b>34.59</b>    | <b>0.29</b>      | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>9,414.03</b>      |
| 1.B.1 - Solid Fuels                               | -                | -               | -                |                      |                |                 | -                    |
| 1.B.2 - Oil and Natural Gas                       | 8,369.77         | 34.59           | 0.29             |                      |                |                 | 9,414.03             |
| 1.B.3 - Other emissions from Energy Production    | -                | -               | -                |                      |                |                 | -                    |
| <b>1.C - Carbon dioxide Transport and Storage</b> | <b>-</b>         | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>       | <b>-</b>        | <b>-</b>             |
| 1.C.1 - Transport of CO <sub>2</sub>              | -                |                 |                  |                      |                |                 | -                    |

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|   | CO <sub>2</sub>  | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs            | SF <sub>6</sub> | Total                |
|---|------------------|-----------------|------------------|----------------------|-----------------|-----------------|----------------------|
|   | Gg               |                 |                  | Gg CO <sub>2</sub> e |                 |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>            |                  |                 |                  |                      |                 |                 |                      |
| 1.C.2 - Injection and Storage                               | -                |                 |                  |                      |                 |                 | -                    |
| 1.C.3 - Other   | -                |                 |                  |                      |                 |                 | -                    |
| <b>2 - Industrial Processes and Product Use</b>             | <b>35,855.61</b> | <b>6.05</b>     | <b>3.50</b>      | <b>4,279.91</b>      | <b>4,514.40</b> | <b>314.65</b>   | <b>46,061.43</b>     |
| <b>2.A - Mineral Industry</b>                               | <b>23,684.90</b> | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>23,684.90</b>     |
| 2.A.1 - Cement production                                   | 22,768.41        |                 |                  |                      |                 |                 | 22,768.41            |
| 2.A.2 - Lime production                                     | 283.50           |                 |                  |                      |                 |                 | 283.50               |
| 2.A.3 - Glass Production                                    | 337.96           |                 |                  |                      |                 |                 | 337.96               |
| 2.A.4 - Other Process Uses of Carbonates                    | 295.03           |                 |                  |                      |                 |                 | 295.03               |
| 2.A.5 - Other (please specify)                              | -                | -               | -                |                      |                 |                 | -                    |
| <b>2.B - Chemical Industry</b>                              | <b>7,174.14</b>  | <b>5.92</b>     | <b>3.50</b>      | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>8,267.40</b>      |
| 2.B.1 - Ammonia Production                                  | 5,596.37         |                 |                  |                      |                 |                 | 5,596.37             |
| 2.B.2 - Nitric Acid Production                              |                  |                 | 3.50             |                      |                 |                 | 927.50               |
| 2.B.3 - Adipic Acid Production                              |                  |                 | -                |                      |                 |                 | -                    |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production  |                  |                 | -                |                      |                 |                 | -                    |
| 2.B.5 - Carbide Production                                  | -                | -               |                  |                      |                 |                 | -                    |
| 2.B.6 - Titanium Dioxide Production                         | -                |                 |                  |                      |                 |                 | -                    |
| 2.B.7 - Soda Ash Production                                 | -                |                 |                  |                      |                 |                 | -                    |
| 2.B.8 - Petrochemical and Carbon Black Production           | 1,577.77         | 5.92            |                  |                      |                 |                 | 1,743.53             |
| 2.B.9 - Fluorochemical Production                           |                  |                 |                  | -                    | -               | -               | -                    |
| 2.B.10 - Hydrogen Production                                | -                | -               | -                |                      |                 |                 | -                    |
| 2.B.11 - Other (Please specify)                             | -                | -               | -                | -                    | -               | -               | -                    |
| <b>2.C - Metal Industry</b>                                 | <b>4,707.76</b>  | <b>0.13</b>     | <b>-</b>         | <b>-</b>             | <b>4,514.40</b> | <b>-</b>        | <b>9,225.77</b>      |
| 2.C.1 - Iron and Steel Production                           | 3,995.58         | 0.07            |                  |                      |                 |                 | 3,997.49             |
| 2.C.2 - Ferroalloys Production                              | 219.60           | 0.06            |                  |                      |                 |                 | 221.31               |
| 2.C.3 - Aluminum production                                 | 480.00           |                 |                  |                      | 4,514.40        |                 | 4,994.40             |
| 2.C.4 - Magnesium production                                | -                |                 |                  |                      |                 | -               | -                    |
| 2.C.5 - Lead Production                                     | 10.00            |                 |                  |                      |                 |                 | 10.00                |
| 2.C.6 - Zinc Production                                     | 2.58             |                 |                  |                      |                 |                 | 2.58                 |
| 2.C.7 - Rare Earths Production                              | -                |                 |                  |                      | -               |                 | -                    |
| 2.C.8 - Other (please specify)                              | -                | -               | -                | -                    | -               | -               | -                    |
| <b>2.D - Non-Energy Products from Fuels and Solvent Use</b> | <b>288.80</b>    | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>288.80</b>        |
| 2.D.1 - Lubricant Use                                       | 247.12           |                 |                  |                      |                 |                 | 247.12               |
| 2.D.2 - Paraffin Wax Use                                    | 41.68            |                 |                  |                      |                 |                 | 41.68                |
| 2.D.3 - Solvent Use   |                  |                 |                  |                      |                 |                 | -                    |

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|   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>                        |                 |                 |                  |                      |      |                 |                      |
| 2.D.4 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.E - Electronics Industry</b>                                       | -               | -               | -                | -                    | -    | -               | -                    |
| 2.E.1 - Integrated Circuit or Semiconductor                             |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.2 - TFT Flat Panel Display  |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.3 - Photovoltaics   |                 |                 |                  | -                    | -    | -               | -                    |
| 2.E.4 - Heat Transfer Fluid   |                 |                 |                  |                      | -    |                 | -                    |
| 2.E.5 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.F - Product Uses as Substitutes for Ozone Depleting Substances</b> | -               | -               | -                | 4,279.91             | -    | -               | 4,279.91             |
| 2.F.1 - Refrigeration and Air Conditioning                              |                 |                 |                  | 3,432.26             | -    |                 | 3,432.26             |
| 2.F.2 - Foam Blowing Agents   |                 |                 |                  | 507.10               | -    |                 | 507.10               |
| 2.F.3 - Fire Protection   |                 |                 |                  | 113.15               | -    |                 | 113.15               |
| 2.F.4 - Aerosols  |                 |                 |                  | -                    | -    |                 | -                    |
| 2.F.5 - Solvents  |                 |                 |                  | 163.39               | -    |                 | 163.39               |
| 2.F.6 - Other Applications (please specify)                             |                 |                 |                  | 64.01                | -    | -               | 64.01                |
| <b>2.G - Other Product Manufacture and Use</b>                          | -               | -               | -                | -                    | -    | 314.65          | 314.65               |
| 2.G.1 - Electrical Equipment  |                 |                 |                  |                      | -    | 314.65          | 314.65               |
| 2.G.2 - SF6 and PFCs from Other Product Uses                            |                 |                 |                  | -                    | -    | -               | -                    |
| 2.G.3 - N2O from Product Uses   |                 |                 | -                |                      |      |                 | -                    |
| 2.G.4 - Other (Please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.H - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 2.H.1 - Pulp and Paper Industry   | -               | -               | -                |                      |      |                 | -                    |
| 2.H.2 - Food and Beverages Industry                                     | -               | -               | -                |                      |      |                 | -                    |
| 2.H.3 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>3 - Agriculture, Forestry, and Other Land Use</b>                    | 1,313.70        | 526.50          | 74.76            | -                    | -    | -               | 35,866.75            |
| <b>3.A - Livestock</b>  | -               | 343.69          | 17.51            | -                    | -    | -               | 14,263.08            |
| 3.A.1 - Enteric Fermentation  |                 | 320.06          |                  |                      |      |                 | 8,961.82             |
| 3.A.2 - Manure Management   |                 | 23.62           | 17.51            |                      |      |                 | 5,301.26             |
| <b>3.B - Land</b>   | (5.82)          | -               | -                | -                    | -    | -               | (5.82)               |
| 3.B.1 - Forest land   | -               |                 |                  |                      |      |                 | -                    |
| 3.B.2 - Cropland  | -               |                 |                  |                      |      |                 | -                    |

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|   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs     | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|----------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |          |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>  |                 |                 |                  |                      |          |                 |                      |
| 3.B.3 - Grassland   | -               |                 |                  |                      |          |                 | -                    |
| 3.B.4 - Wetlands  | -               |                 |                  |                      |          |                 | -                    |
| 3.B.5 - Settlements   | (5.82)          |                 |                  |                      |          |                 | (5.82)               |
| 3.B.6 - Other Land  | -               |                 |                  |                      |          |                 | -                    |
| <b>3.C - Aggregate sources and non-CO2 emissions sources on land</b>                      | <b>1,319.53</b> | <b>182.81</b>   | <b>57.25</b>     | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>21,609.49</b>     |
| 3.C.1 - Burning   | -               | -               | -                |                      |          |                 | -                    |
| 3.C.2 - Liming  | -               |                 |                  |                      |          |                 | -                    |
| 3.C.3 - Urea application  | 1,319.53        |                 |                  |                      |          |                 | 1,319.53             |
| 3.C.4 - Direct N2O Emissions from managed soils   |                 |                 | 44.67            |                      |          |                 | 11,837.72            |
| 3.C.5 - Indirect N2O Emissions from managed soils   |                 |                 | 5.32             |                      |          |                 | 1,409.40             |
| 3.C.6 - Indirect N2O Emissions from manure management                                     |                 |                 | 7.26             |                      |          |                 | 1,924.21             |
| 3.C.7 - Rice cultivation  |                 | 182.81          |                  |                      |          |                 | 5,118.63             |
| 3.C.8 - CH4 from Drained Organic Soils  |                 | -               |                  |                      |          |                 | -                    |
| 3.C.9 - CH4 from Drainage Ditches on Organic Soils  |                 | -               |                  |                      |          |                 | -                    |
| 3.C.10 - CH4 from Rewetting of Organic Soils  |                 | -               |                  |                      |          |                 | -                    |
| 3.C.11 - CH4 Emissions from Rewetting of Mangroves and Tidal Marshes                      |                 | -               |                  |                      |          |                 | -                    |
| 3.C.12 - N2O Emissions from Aquaculture   |                 |                 | -                |                      |          |                 | -                    |
| 3.C.13 - CH4 Emissions from Rewetted and Created Wetlands on Inland Wetland Mineral Soils |                 | -               |                  |                      |          |                 | -                    |
| 3.C.14 - Other (please specify)   | -               | -               | -                |                      |          |                 | -                    |
| <b>3.D - Other</b>  | <b>-</b>        | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>-</b>             |
| 3.D.1 - Harvested Wood Products   | -               |                 |                  |                      |          |                 | -                    |
| 3.D.2 - Other (please specify)  | -               | -               | -                |                      |          |                 | -                    |
| <b>4 - Waste</b>  | <b>64.05</b>    | <b>1,344.22</b> | <b>8.12</b>      | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>39,853.99</b>     |
| <b>4.A - Solid Waste Disposal</b>   |                 | <b>690.88</b>   |                  |                      |          |                 | <b>19,344.50</b>     |
| 4.B - Biological Treatment of Solid Waste   |                 | 16.80           | 1.26             |                      |          |                 | 804.13               |
| 4.C - Incineration and Open Burning of Waste  | 64.05           | 14.88           | 0.20             |                      |          |                 | 533.17               |
| 4.D - Wastewater Treatment and Discharge  |                 | 621.66          | 6.66             |                      |          |                 | 19,172.20            |
| 4.E - Other (please specify)  | -               | -               | -                |                      |          |                 | -                    |
| <b>5 - Other</b>  | <b>-</b>        | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>-</b>             |
| 5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3   |                 |                 | -                |                      |          |                 | -                    |
| 5.B - Indirect CO2 emissions from the atmospheric oxidation of CH4, CO and NMVOC          | -               |                 |                  |                      |          |                 | -                    |
| 5.C - Other   | -               | -               | -                | -                    | -        | -               | -                    |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES  | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|--|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|  | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| <b>Memo Items (5)</b>  |                 |                 |                  |                      |      |                 | -                    |
| International Bunkers  | 3,198.97        | 0.13            | 0.09             | -                    | -    | -               | 3,225.79             |
| 1.A.3.a.i - International Aviation (International Bunkers)   | 1,918.85        | 0.01            | 0.05             |                      |      |                 | 1,933.44             |
| 1.A.3.a.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.a.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                    | -               |                 |                  |                      |      |                 | -                    |
| 1.A.3.d.i - International water-borne navigation (International bunkers)   | 1,280.12        | 0.12            | 0.03             |                      |      |                 | 1,292.34             |
| 1.A.3.d.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.d.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                    | -               |                 |                  |                      |      |                 | -                    |
| 1.A.5.c - Multilateral Operations  | -               | -               | -                | -                    | -    | -               | -                    |
| 1.A.5.c - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NO <sub>x</sub> and NH <sub>3</sub>   |                 |                 | -                |                      |      |                 | -                    |
| 1.A.5.c - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC                      | -               |                 |                  |                      |      |                 | -                    |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES         | CO <sub>2</sub>   | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs            | SF <sub>6</sub> | Total                |
|---|-------------------|-----------------|------------------|----------------------|-----------------|-----------------|----------------------|
|   | Gg                |                 |                  | Gg CO <sub>2</sub> e |                 |                 | Gg CO <sub>2</sub> e |
| <b>Total National Emissions and Removals</b>      | <b>272,467.15</b> | <b>2,115.70</b> | <b>93.29</b>     | <b>3,272.33</b>      | <b>4,514.40</b> | <b>308.43</b>   | <b>364,524.03</b>    |
| <b>1 - Energy</b>                                 | <b>232,990.95</b> | <b>58.62</b>    | <b>3.43</b>      | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>235,540.40</b>    |
| <b>1.A - Fuel Combustion Activities</b>           | <b>225,079.78</b> | <b>23.01</b>    | <b>3.16</b>      | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>226,560.79</b>    |
| 1.A.1 - Energy Industries                         | 106,096.51        | 2.20            | 0.29             |                      |                 |                 | 106,235.18           |
| 1.A.2 - Manufacturing Industries and Construction | 50,762.65         | 1.99            | 0.29             |                      |                 |                 | 50,894.64            |
| 1.A.3 - Transport                                 | 50,734.70         | 12.91           | 2.52             |                      |                 |                 | 51,764.41            |
| 1.A.4 - Other Sectors                             | 17,485.92         | 5.91            | 0.06             |                      |                 |                 | 17,666.56            |
| 1.A.5 - non-specified                             | -                 | -               | -                |                      |                 |                 | -                    |
| <b>1.B - Fugitive emissions from fuels</b>        | <b>7,911.16</b>   | <b>35.62</b>    | <b>0.27</b>      | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>8,979.62</b>      |
| 1.B.1 - Solid Fuels                               | -                 | -               | -                |                      |                 |                 | -                    |
| 1.B.2 - Oil and Natural Gas                       | 7,911.16          | 35.62           | 0.27             |                      |                 |                 | 8,979.62             |
| 1.B.3 - Other emissions from Energy Production    | -                 | -               | -                |                      |                 |                 | -                    |
| <b>1.C - Carbon dioxide Transport and Storage</b> | <b>-</b>          | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>-</b>             |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES                   | CO <sub>2</sub>  | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs            | SF <sub>6</sub> | Total                |
|---|------------------|-----------------|------------------|----------------------|-----------------|-----------------|----------------------|
|   | Gg               |                 |                  | Gg CO <sub>2</sub> e |                 |                 | Gg CO <sub>2</sub> e |
| 1.C.1 - Transport of CO <sub>2</sub>                        | -                |                 |                  |                      |                 |                 | -                    |
| 1.C.2 - Injection and Storage                               | -                |                 |                  |                      |                 |                 | -                    |
| 1.C.3 - Other   | -                |                 |                  |                      |                 |                 | -                    |
| <b>2 - Industrial Processes and Product Use</b>             | <b>38,062.41</b> | <b>6.31</b>     | <b>3.50</b>      | <b>3,272.33</b>      | <b>4,514.40</b> | <b>308.43</b>   | <b>47,261.69</b>     |
| <b>2.A - Mineral Industry</b>                               | <b>25,034.29</b> | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>25,034.29</b>     |
| 2.A.1 - Cement production                                   | 24,134.07        |                 |                  |                      |                 |                 | 24,134.07            |
| 2.A.2 - Lime production                                     | 279.75           |                 |                  |                      |                 |                 | 279.75               |
| 2.A.3 - Glass Production                                    | 334.83           |                 |                  |                      |                 |                 | 334.83               |
| 2.A.4 - Other Process Uses of Carbonates                    | 285.63           |                 |                  |                      |                 |                 | 285.63               |
| 2.A.5 - Other (please specify)                              | -                | -               | -                |                      |                 |                 | -                    |
| <b>2.B - Chemical Industry</b>                              | <b>7,119.40</b>  | <b>6.17</b>     | <b>3.50</b>      | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>8,219.60</b>      |
| 2.B.1 - Ammonia Production                                  | 5,482.33         |                 |                  |                      |                 |                 | 5,482.33             |
| 2.B.2 - Nitric Acid Production                              |                  |                 | 3.50             |                      |                 |                 | 927.50               |
| 2.B.3 - Adipic Acid Production                              |                  |                 | -                |                      |                 |                 | -                    |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production  |                  |                 | -                |                      |                 |                 | -                    |
| 2.B.5 - Carbide Production                                  | -                | -               |                  |                      |                 |                 | -                    |
| 2.B.6 - Titanium Dioxide Production                         | -                |                 |                  |                      |                 |                 | -                    |
| 2.B.7 - Soda Ash Production                                 | -                |                 |                  |                      |                 |                 | -                    |
| 2.B.8 - Petrochemical and Carbon Black Production           | 1,637.06         | 6.17            |                  |                      |                 |                 | 1,809.77             |
| 2.B.9 - Fluorochemical Production                           |                  |                 |                  | -                    | -               | -               | -                    |
| 2.B.10 - Hydrogen Production                                | -                | -               | -                |                      |                 |                 | -                    |
| 2.B.11 - Other (Please specify)                             | -                | -               | -                | -                    | -               | -               | -                    |
| <b>2.C - Metal Industry</b>                                 | <b>5,629.38</b>  | <b>0.14</b>     | <b>-</b>         | <b>-</b>             | <b>4,514.40</b> | <b>-</b>        | <b>10,147.70</b>     |
| 2.C.1 - Iron and Steel Production                           | 4,917.20         | 0.08            |                  |                      |                 |                 | 4,919.41             |
| 2.C.2 - Ferroalloys Production                              | 219.60           | 0.06            |                  |                      |                 |                 | 221.31               |
| 2.C.3 - Aluminum production                                 | 480.00           |                 |                  |                      | 4,514.40        |                 | 4,994.40             |
| 2.C.4 - Magnesium production                                | -                |                 |                  |                      |                 | -               | -                    |
| 2.C.5 - Lead Production                                     | 10.00            |                 |                  |                      |                 |                 | 10.00                |
| 2.C.6 - Zinc Production                                     | 2.58             |                 |                  |                      |                 |                 | 2.58                 |
| 2.C.7 - Rare Earths Production                              | -                |                 |                  |                      | -               |                 | -                    |
| 2.C.8 - Other (please specify)                              | -                | -               | -                | -                    | -               | -               | -                    |
| <b>2.D - Non-Energy Products from Fuels and Solvent Use</b> | <b>279.34</b>    | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b>        | <b>-</b>        | <b>279.34</b>        |
| 2.D.1 - Lubricant Use                                       | 237.66           |                 |                  |                      |                 |                 | 237.66               |
| 2.D.2 - Paraffin Wax Use                                    | 41.68            |                 |                  |                      |                 |                 | 41.68                |

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|   | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|---|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|   | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>                        |                 |                 |                  |                      |      |                 |                      |
| 2.D.3 - Solvent Use   |                 |                 |                  |                      |      |                 | -                    |
| 2.D.4 - Other (please specify)  | -               | -               | -                |                      |      |                 | -                    |
| <b>2.E - Electronics Industry</b>                                       | -               | -               | -                | -                    | -    | -               | -                    |
| 2.E.1 - Integrated Circuit or Semiconductor                             |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.2 - TFT Flat Panel Display  |                 |                 | -                | -                    | -    | -               | -                    |
| 2.E.3 - Photovoltaics   |                 |                 |                  | -                    | -    | -               | -                    |
| 2.E.4 - Heat Transfer Fluid   |                 |                 |                  |                      | -    |                 | -                    |
| 2.E.5 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.F - Product Uses as Substitutes for Ozone Depleting Substances</b> | -               | -               | -                | 3,272.3              | -    | -               | 3,272.33             |
| 2.F.1 - Refrigeration and Air Conditioning                              |                 |                 |                  | 2,521.0              | -    |                 | 2,521.03             |
| 2.F.2 - Foam Blowing Agents   |                 |                 |                  | 505.69               | -    |                 | 505.69               |
| 2.F.3 - Fire Protection   |                 |                 |                  | 113.15               | -    |                 | 113.15               |
| 2.F.4 - Aerosols  |                 |                 |                  | -                    | -    |                 | -                    |
| 2.F.5 - Solvents  |                 |                 |                  | 80.79                | -    |                 | 80.79                |
| 2.F.6 - Other Applications (please specify)                             |                 |                 |                  | 51.68                | -    | -               | 51.68                |
| <b>2.G - Other Product Manufacture and Use</b>                          | -               | -               | -                | -                    | -    | 308.4           | 308.43               |
| 2.G.1 - Electrical Equipment  |                 |                 |                  |                      | -    | 308.4           | 308.43               |
| 2.G.2 - SF6 and PFCs from Other Product Uses                            |                 |                 |                  | -                    | -    | -               | -                    |
| 2.G.3 - N2O from Product Uses   |                 |                 | -                |                      |      |                 | -                    |
| 2.G.4 - Other (Please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>2.H - Other</b>  | -               | -               | -                | -                    | -    | -               | -                    |
| 2.H.1 - Pulp and Paper Industry   | -               | -               | -                |                      |      |                 | -                    |
| 2.H.2 - Food and Beverages Industry                                     | -               | -               | -                |                      |      |                 | -                    |
| 2.H.3 - Other (please specify)  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>3 - Agriculture, Forestry, and Other Land Use</b>                    | 1,345.79        | 721.78          | 78.5             | -                    | -    | -               | 42,361.23            |
| <b>3.A - Livestock</b>  | -               | 601.45          | 18.9             | -                    | -    | -               | 21,853.42            |
| 3.A.1 - Enteric Fermentation  |                 | 575.93          |                  |                      |      |                 | 16,126.08            |
| 3.A.2 - Manure Management   |                 | 25.51           | 18.9             |                      |      |                 | 5,727.34             |
| <b>3.B - Land</b>   | (10.01)         | -               | -                | -                    | -    | -               | (10.01)              |
| 3.B.1 - Forest land   | -               |                 |                  |                      |      |                 | -                    |

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|  | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs     | SF <sub>6</sub> | Total                |
|--|-----------------|-----------------|------------------|----------------------|----------|-----------------|----------------------|
|  | Gg              |                 |                  | Gg CO <sub>2</sub> e |          |                 | Gg CO <sub>2</sub> e |
| <b>GREENHOUSE GAS SOURCE AND SINK CATEGORIES</b>   |                 |                 |                  |                      |          |                 |                      |
| 3.B.2 - Cropland   | -               |                 |                  |                      |          |                 | -                    |
| 3.B.3 - Grassland  | -               |                 |                  |                      |          |                 | -                    |
| 3.B.4 - Wetlands   | -               |                 |                  |                      |          |                 | -                    |
| 3.B.5 - Settlements  | (10.01)         |                 |                  |                      |          |                 | (10.01)              |
| 3.B.6 - Other Land   | -               |                 |                  |                      |          |                 | -                    |
| <b>3.C - Aggregate sources and non-CO2 emissions sources on land</b>                         | <b>1,355.80</b> | <b>120.33</b>   | <b>59.60</b>     | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>20,517.81</b>     |
| 3.C.1 - Burning  | -               | -               | -                |                      |          |                 | -                    |
| 3.C.2 - Liming   | -               |                 |                  |                      |          |                 | -                    |
| 3.C.3 - Urea application   | 1,355.80        |                 |                  |                      |          |                 | 1,355.80             |
| 3.C.4 - Direct N2O Emissions from managed soils  |                 |                 | 46.24            |                      |          |                 | 12,254.12            |
| 3.C.5 - Indirect N2O Emissions from managed soils  |                 |                 | 5.68             |                      |          |                 | 1,505.60             |
| 3.C.6 - Indirect N2O Emissions from manure management  |                 |                 | 7.67             |                      |          |                 | 2,033.00             |
| 3.C.7 - Rice cultivation   |                 | 120.33          |                  |                      |          |                 | 3,369.29             |
| 3.C.8 - CH4 from Drained Organic Soils   |                 | -               |                  |                      |          |                 | -                    |
| 3.C.9 - CH4 from Drainage Ditches on Organic Soils   |                 | -               |                  |                      |          |                 | -                    |
| 3.C.10 - CH4 from Rewetting of Organic Soils   |                 | -               |                  |                      |          |                 | -                    |
| 3.C.11 - CH4 Emissions from Rewetting of Mangroves and Tidal Marshes                         |                 | -               |                  |                      |          |                 | -                    |
| 3.C.12 - N2O Emissions from Aquaculture  |                 |                 | -                |                      |          |                 | -                    |
| 3.C.13 - CH4 Emissions from Rewetted and Created Wetlands on Inland Wetland<br>Mineral Soils |                 | -               |                  |                      |          |                 | -                    |
| 3.C.14 - Other (please specify)  | -               | -               | -                |                      |          |                 | -                    |
| <b>3.D - Other</b>   | <b>-</b>        | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>-</b>             |
| 3.D.1 - Harvested Wood Products  | -               |                 |                  |                      |          |                 | -                    |
| 3.D.2 - Other (please specify)   | -               |                 |                  |                      |          |                 | -                    |
| <b>4 - Waste</b>   | <b>68.00</b>    | <b>1,328.99</b> | <b>7.85</b>      | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>39,360.71</b>     |
| <b>4.A - Solid Waste Disposal</b>  |                 | <b>696.78</b>   |                  |                      |          |                 | <b>19,509.88</b>     |
| 4.B - Biological Treatment of Solid Waste  |                 | 14.54           | 1.09             |                      |          |                 | 696.30               |
| 4.C - Incineration and Open Burning of Waste   | 68.00           | 16.54           | 0.22             |                      |          |                 | 589.17               |
| 4.D - Wastewater Treatment and Discharge   |                 | 601.13          | 6.54             |                      |          |                 | 18,565.36            |
| 4.E - Other (please specify)   | -               | -               | -                |                      |          |                 | -                    |
| <b>5 - Other</b>   | <b>-</b>        | <b>-</b>        | <b>-</b>         | <b>-</b>             | <b>-</b> | <b>-</b>        | <b>-</b>             |
| 5.A - Indirect N2O emissions from the atmospheric deposition of nitrogen in NOx and NH3      |                 |                 | -                |                      |          |                 | -                    |
| 5.B - Indirect CO2 emissions from the atmospheric oxidation of CH4, CO and NMVOC             | -               |                 |                  |                      |          |                 | -                    |

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| GREENHOUSE GAS SOURCE AND SINK CATEGORIES  | CO <sub>2</sub> | CH <sub>4</sub> | N <sub>2</sub> O | HFCs                 | PFCs | SF <sub>6</sub> | Total                |
|--|-----------------|-----------------|------------------|----------------------|------|-----------------|----------------------|
|  | Gg              |                 |                  | Gg CO <sub>2</sub> e |      |                 | Gg CO <sub>2</sub> e |
| 5.C - Other  | -               | -               | -                | -                    | -    | -               | -                    |
| <b>Memo Items (5)</b>  |                 |                 |                  |                      |      |                 | -                    |
| International Bunkers  | 3,568.68        | 0.14            | 0.10             | -                    | -    | -               | 3,598.46             |
| 1.A.3.a.i - International Aviation (International Bunkers)   | 2,149.36        | 0.02            | 0.06             |                      |      |                 | 2,165.71             |
| 1.A.3.a.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NOX and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.a.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC        | -               |                 |                  |                      |      |                 | -                    |
| 1.A.3.d.i - International water-borne navigation (International bunkers)   | 1,419.31        | 0.13            | 0.04             |                      |      |                 | 1,432.75             |
| 1.A.3.d.i - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NOX and NH <sub>3</sub> |                 |                 | -                |                      |      |                 | -                    |
| 1.A.3.d.i - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC        | -               |                 |                  |                      |      |                 | -                    |
| 1.A.5.c - Multilateral Operations  | -               | -               | -                | -                    | -    | -               | -                    |
| 1.A.5.c - Indirect N <sub>2</sub> O emissions from the atmospheric deposition of nitrogen in NOX and NH <sub>3</sub>   |                 |                 | -                |                      |      |                 | -                    |
| 1.A.5.c - Indirect CO <sub>2</sub> emissions from the atmospheric oxidation of CH <sub>4</sub> , CO and NMVOC          | -               |                 |                  |                      |      |                 | -                    |

## Annex II: Key Categories Analysis

### Approach 1 - Level Assessment (2022)

| Category Code | IPCC Category   | GHG                               | Ex.t<br>Gg CO <sub>2</sub> e | Ex.t <br>Gg CO <sub>2</sub> e | Lx,t   | Cumulative total |
|---------------|---|-----------------------------------|------------------------------|-------------------------------|--------|------------------|
| 1.A.1         | Energy Industries - Gaseous Fuels                         | CARBON DIOXIDE (CO <sub>2</sub> ) | 86,562.27                    | 86,562.27                     | 0.2243 | 0.224265859      |
| 1.A.3.b       | Road Transportation - Liquid Fuels                        | CARBON DIOXIDE (CO <sub>2</sub> ) | 59,728.11                    | 59,728.11                     | 0.1547 | 0.379009678      |
| 1.A.2         | Manufacturing Industries and Construction - Gaseous Fuels | CARBON DIOXIDE (CO <sub>2</sub> ) | 39,049.95                    | 39,049.95                     | 0.1012 | 0.480180425      |
| 2.A.1         | Cement production   | CARBON DIOXIDE (CO <sub>2</sub> ) | 25,276.12                    | 25,276.12                     | 0.0655 | 0.545665884      |
| 4.A           | Solid Waste Disposal                                      | METHANE (CH <sub>4</sub> )        | 18,730.22                    | 18,730.22                     | 0.0485 | 0.594192219      |
| 1.A.1         | Energy Industries - Liquid Fuels                          | CARBON DIOXIDE (CO <sub>2</sub> ) | 18,663.81                    | 18,663.81                     | 0.0484 | 0.64254649       |
| 4.D           | Wastewater Treatment and Discharge                        | METHANE (CH <sub>4</sub> )        | 16,170.42                    | 16,170.42                     | 0.0419 | 0.684440866      |
| 3.C.4         | Direct N <sub>2</sub> O Emissions from managed soils      | NITROUS OXIDE (N <sub>2</sub> O)  | 12,819.17                    | 12,819.17                     | 0.0332 | 0.717652809      |
| 1.A.4         | Other Sectors - Liquid Fuels                              | CARBON DIOXIDE (CO <sub>2</sub> ) | 11,863.79                    | 11,863.79                     | 0.0307 | 0.748389558      |
| 1.A.2         | Manufacturing Industries and Construction - Solid Fuels   | CARBON DIOXIDE (CO <sub>2</sub> ) | 10,762.38                    | 10,762.38                     | 0.0279 | 0.77627276       |
| 3.A.1         | Enteric Fermentation                                      | METHANE (CH <sub>4</sub> )        | 10,290.67                    | 10,290.67                     | 0.0267 | 0.802933854      |
| 1.A.4         | Other Sectors - Gaseous Fuels                             | CARBON DIOXIDE (CO <sub>2</sub> ) | 7,204.41                     | 7,204.41                      | 0.0187 | 0.821599059      |
| 1.B.2.b       | Natural Gas   | CARBON DIOXIDE (CO <sub>2</sub> ) | 7,033.89                     | 7,033.89                      | 0.0182 | 0.839822495      |
| 3.A.2         | Manure Management   | NITROUS OXIDE (N <sub>2</sub> O)  | 6,937.06                     | 6,937.06                      | 0.0180 | 0.857795064      |
| 2.F.1         | Refrigeration and Air Conditioning                        | HFCs, PFCs                        | 6,731.06                     | 6,731.06                      | 0.0174 | 0.875233928      |
| 1.A.2         | Manufacturing Industries and Construction - Liquid Fuels  | CARBON DIOXIDE (CO <sub>2</sub> ) | 5,968.75                     | 5,968.75                      | 0.0155 | 0.890697795      |
| 2.B.1         | Ammonia Production  | CARBON DIOXIDE (CO <sub>2</sub> ) | 5,340.58                     | 5,340.58                      | 0.0138 | 0.90453418       |
| 2.C.1         | Iron and Steel Production                                 | CARBON DIOXIDE (CO <sub>2</sub> ) | 4,984.00                     | 4,984.00                      | 0.0129 | 0.917446746      |
| 3.C.7         | Rice cultivation  | METHANE (CH <sub>4</sub> )        | 4,506.56                     | 4,506.56                      | 0.0117 | 0.929122362      |
| 2.C.3         | Aluminium production                                      | PFCs (PFCs)                       | 4,213.44                     | 4,213.44                      | 0.0109 | 0.940038558      |

|                |  |                      |          |          |        |             |
|----------------|--|----------------------|----------|----------|--------|-------------|
| <b>3.C.6</b>   | Indirect N2O Emissions from manure management  | NITROUS OXIDE (N2O)  | 2,899.73 | 2,899.73 | 0.0075 | 0.947551183 |
| <b>1.A.3.b</b> | Road Transportation - Gaseous Fuels            | CARBON DIOXIDE (CO2) | 2,465.82 | 2,465.82 | 0.0064 | 0.953939633 |
| <b>4.D</b>     | Wastewater Treatment and Discharge             | NITROUS OXIDE (N2O)  | 1,855.71 | 1,855.71 | 0.0048 | 0.958747416 |
| <b>3.C.5</b>   | Indirect N2O Emissions from managed soils      | NITROUS OXIDE (N2O)  | 1,643.82 | 1,643.82 | 0.0043 | 0.96300623  |
| <b>1.B.2.a</b> | Oil  | CARBON DIOXIDE (CO2) | 1,575.87 | 1,575.87 | 0.0041 | 0.967089003 |
| <b>2.B.8</b>   | Petrochemical and Carbon Black Production      | CARBON DIOXIDE (CO2) | 1,557.37 | 1,557.37 | 0.0040 | 0.971123846 |
| <b>3.C.3</b>   | Urea application                               | CARBON DIOXIDE (CO2) | 1,475.18 | 1,475.18 | 0.0038 | 0.974945755 |
| <b>3.A.2</b>   | Manure Management                              | METHANE (CH4)        | 991.12   | 991.12   | 0.0026 | 0.977513564 |
| <b>2.B.2</b>   | Nitric Acid Production                         | NITROUS OXIDE (N2O)  | 927.50   | 927.50   | 0.0024 | 0.979916535 |
| <b>1.B.2.a</b> | Oil  | METHANE (CH4)        | 802.84   | 802.84   | 0.0021 | 0.981996534 |
| <b>1.A.3.b</b> | Road Transportation - Liquid Fuels             | NITROUS OXIDE (N2O)  | 795.89   | 795.89   | 0.0021 | 0.984058518 |
| <b>4.B</b>     | Biological Treatment of Solid Waste            | METHANE (CH4)        | 716.31   | 716.31   | 0.0019 | 0.985914333 |
| <b>2.F.2</b>   | Foam Blowing Agents                            | HFCs (HFCs)          | 543.43   | 543.43   | 0.0014 | 0.987322255 |
| <b>4.B</b>     | Biological Treatment of Solid Waste            | NITROUS OXIDE (N2O)  | 508.45   | 508.45   | 0.0013 | 0.988639553 |
| <b>2.C.3</b>   | Aluminium production                           | CARBON DIOXIDE (CO2) | 448.00   | 448.00   | 0.0012 | 0.989800233 |
| <b>1.A.3.b</b> | Road Transportation - Liquid Fuels             | METHANE (CH4)        | 379.12   | 379.12   | 0.0010 | 0.990782449 |
| <b>2.A.3</b>   | Glass Production                               | CARBON DIOXIDE (CO2) | 347.53   | 347.53   | 0.0009 | 0.991682837 |
| <b>2.A.4</b>   | Other Process Uses of Carbonates               | CARBON DIOXIDE (CO2) | 323.20   | 323.20   | 0.0008 | 0.99252019  |
| <b>2.D</b>     | Non-Energy Products from Fuels and Solvent Use | CARBON DIOXIDE (CO2) | 317.15   | 317.15   | 0.0008 | 0.993341869 |
| <b>2.G</b>     | Other Product Manufacture and Use              | SF6, PFCs            | 314.18   | 314.18   | 0.0008 | 0.994155851 |
| <b>4.C</b>     | Incineration and Open Burning of Waste         | METHANE (CH4)        | 303.81   | 303.81   | 0.0008 | 0.994942973 |
| <b>2.A.2</b>   | Lime production                                | CARBON DIOXIDE (CO2) | 294.75   | 294.75   | 0.0008 | 0.995706613 |
| <b>2.F.3</b>   | Fire Protection                                | HFCs, PFCs           | 293.69   | 293.69   | 0.0008 | 0.996467505 |
| <b>2.C.2</b>   | Ferroalloys Production                         | CARBON DIOXIDE (CO2) | 219.60   | 219.60   | 0.0006 | 0.997036446 |
| <b>2.B.8</b>   | Petrochemical and Carbon Black Production      | METHANE (CH4)        | 164.11   | 164.11   | 0.0004 | 0.99746161  |
| <b>1.A.4</b>   | Other Sectors - Biomass - solid                | METHANE (CH4)        | 124.59   | 124.59   | 0.0003 | 0.997784395 |

|                |   |                      |        |        |        |             |
|----------------|---|----------------------|--------|--------|--------|-------------|
| <b>1.A.3.b</b> | Road Transportation - Gaseous Fuels                         | METHANE (CH4)        | 114.04 | 114.04 | 0.0003 | 0.998079863 |
| <b>1.B.2.b</b> | Natural Gas   | METHANE (CH4)        | 71.15  | 71.15  | 0.0002 | 0.998264198 |
| <b>1.B.2.b</b> | Natural Gas   | NITROUS OXIDE (N2O)  | 66.25  | 66.25  | 0.0002 | 0.998435838 |
| <b>2.F.6</b>   | Other Applications (please specify)                         | HFCs, PFCs           | 64.01  | 64.01  | 0.0002 | 0.99860168  |
| <b>4.C</b>     | Incineration and Open Burning of Waste                      | CARBON DIOXIDE (CO2) | 54.43  | 54.43  | 0.0001 | 0.998742689 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Solid Fuels     | NITROUS OXIDE (N2O)  | 43.52  | 43.52  | 0.0001 | 0.998855441 |
| <b>1.A.1</b>   | Energy Industries - Gaseous Fuels                           | METHANE (CH4)        | 43.52  | 43.52  | 0.0001 | 0.998968184 |
| <b>1.A.1</b>   | Energy Industries - Gaseous Fuels                           | NITROUS OXIDE (N2O)  | 41.19  | 41.19  | 0.0001 | 0.999074888 |
| <b>1.A.1</b>   | Energy Industries - Liquid Fuels                            | NITROUS OXIDE (N2O)  | 39.26  | 39.26  | 0.0001 | 0.999176599 |
| <b>4.C</b>     | Incineration and Open Burning of Waste                      | NITROUS OXIDE (N2O)  | 38.32  | 38.32  | 0.0001 | 0.999275883 |
| <b>1.A.3.b</b> | Road Transportation - Gaseous Fuels                         | NITROUS OXIDE (N2O)  | 35.20  | 35.20  | 0.0001 | 0.999367069 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Solid Fuels     | METHANE (CH4)        | 30.66  | 30.66  | 0.0001 | 0.999446492 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Biomass - solid | METHANE (CH4)        | 28.84  | 28.84  | 0.0001 | 0.999521211 |
| <b>1.A.4</b>   | Other Sectors - Liquid Fuels                                | METHANE (CH4)        | 28.25  | 28.25  | 0.0001 | 0.999594406 |
| <b>1.A.1</b>   | Energy Industries - Liquid Fuels                            | METHANE (CH4)        | 20.74  | 20.74  | 0.0001 | 0.99964814  |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Gaseous Fuels   | METHANE (CH4)        | 19.63  | 19.63  | 0.0001 | 0.999699001 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Gaseous Fuels   | NITROUS OXIDE (N2O)  | 18.58  | 18.58  | 0.0000 | 0.999747137 |
| <b>1.A.4</b>   | Other Sectors - Gaseous Fuels                               | METHANE (CH4)        | 18.11  | 18.11  | 0.0000 | 0.999794054 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Liquid Fuels    | NITROUS OXIDE (N2O)  | 12.60  | 12.60  | 0.0000 | 0.999826692 |
| <b>1.B.2.a</b> | Oil   | NITROUS OXIDE (N2O)  | 12.03  | 12.03  | 0.0000 | 0.999857851 |
| <b>2.C.5</b>   | Lead Production   | CARBON DIOXIDE (CO2) | 10.00  | 10.00  | 0.0000 | 0.999883759 |
| <b>1.A.4</b>   | Other Sectors - Liquid Fuels                                | NITROUS OXIDE (N2O)  | 7.09   | 7.09   | 0.0000 | 0.999902137 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Liquid Fuels    | METHANE (CH4)        | 6.66   | 6.66   | 0.0000 | 0.999919404 |
| <b>1.A.4</b>   | Other Sectors - Biomass - solid                             | NITROUS OXIDE (N2O)  | 5.90   | 5.90   | 0.0000 | 0.999934679 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Biomass - solid | NITROUS OXIDE (N2O)  | 5.46   | 5.46   | 0.0000 | 0.999948822 |

|              |   |                      |             |             |        |             |
|--------------|---|----------------------|-------------|-------------|--------|-------------|
| 1.A.2        | Manufacturing Industries and Construction - Biomass - other | NITROUS OXIDE (N2O)  | 4.26        | 4.26        | 0.0000 | 0.999959859 |
| 1.A.4        | Other Sectors - Gaseous Fuels                               | NITROUS OXIDE (N2O)  | 3.43        | 3.43        | 0.0000 | 0.99996874  |
| 1.A.2        | Manufacturing Industries and Construction - Biomass - other | METHANE (CH4)        | 3.38        | 3.38        | 0.0000 | 0.999977486 |
| 3.B.5.a      | Settlements Remaining Settlements                           | CARBON DIOXIDE (CO2) | (2.65)      | 2.65        | 0.0000 | 0.999984364 |
| 2.C.6        | Zinc Production   | CARBON DIOXIDE (CO2) | 2.58        | 2.58        | 0.0000 | 0.999991048 |
| 2.C.1        | Iron and Steel Production                                   | METHANE (CH4)        | 1.75        | 1.75        | 0.0000 | 0.999995575 |
| <b>Total</b> |   |                      | 385,975.297 | 385,980.606 | 1      |             |

### Approach 1 - Trend Assessment (2022)

| Category Code | IPCC Category   | GHG                  | 1990 Ex.t<br>Gg CO <sub>2</sub> e | 2022 Ex.t<br>Gg CO <sub>2</sub> e | Trend Assessment<br>Txt | Contribution to trend (%) | Cumulative total |
|---------------|---|----------------------|-----------------------------------|-----------------------------------|-------------------------|---------------------------|------------------|
| 1.A.1         | Energy Industries - Gaseous Fuels                         | CARBON DIOXIDE (CO2) | 9,329.54220                       | 86,562.27231                      | 0.42746                 | 0.18258                   | 0.18258          |
| 1.A.2         | Manufacturing Industries and Construction - Liquid Fuels  | CARBON DIOXIDE (CO2) | 20,311.94286                      | 5,968.75288                       | 0.33907                 | 0.14483                   | 0.32741          |
| 1.A.2         | Manufacturing Industries and Construction - Gaseous Fuels | CARBON DIOXIDE (CO2) | 3,100.47870                       | 39,049.94646                      | 0.21360                 | 0.09124                   | 0.41865          |
| 3.C.4         | Direct N2O Emissions from managed soils                   | NITROUS OXIDE (N2O)  | 13,700.60331                      | 12,819.16555                      | 0.16752                 | 0.07156                   | 0.49021          |
| 1.A.1         | Energy Industries - Liquid Fuels                          | CARBON DIOXIDE (CO2) | 15,113.61876                      | 18,663.81059                      | 0.15334                 | 0.06550                   | 0.55570          |
| 1.A.3.b       | Road Transportation - Liquid Fuels                        | CARBON DIOXIDE (CO2) | 15,098.96808                      | 59,728.11275                      | 0.13265                 | 0.05666                   | 0.61236          |
| 3.A.1         | Enteric Fermentation                                      | METHANE (CH4)        | 8,812.03680                       | 10,290.66510                      | 0.09352                 | 0.03994                   | 0.65231          |
| 2.A.1         | Cement production   | CARBON DIOXIDE (CO2) | 4,433.19642                       | 25,276.11715                      | 0.09280                 | 0.03964                   | 0.69194          |

|                |   |                      |             |              |         |         |         |
|----------------|---|----------------------|-------------|--------------|---------|---------|---------|
| <b>1.A.4</b>   | Other Sectors - Liquid Fuels                            | CARBON DIOXIDE (CO2) | 9,325.74283 | 11,863.78901 | 0.09220 | 0.03938 | 0.73133 |
| <b>4.A</b>     | Solid Waste Disposal                                    | METHANE (CH4)        | 9,556.50269 | 18,730.22434 | 0.04875 | 0.02082 | 0.75215 |
| <b>1.A.4</b>   | Other Sectors - Gaseous Fuels                           | CARBON DIOXIDE (CO2) | 151.47000   | 7,204.40695  | 0.04729 | 0.02020 | 0.77235 |
| <b>2.F.1</b>   | Refrigeration and Air Conditioning                      | HFCs, PFCs           | -           | 6,731.06333  | 0.04683 | 0.02000 | 0.79235 |
| <b>1.B.2.b</b> | Natural Gas   | CARBON DIOXIDE (CO2) | 533.59290   | 7,033.89310  | 0.03894 | 0.01663 | 0.80898 |
| <b>1.B.2.a</b> | Oil   | CARBON DIOXIDE (CO2) | 2,530.81536 | 1,575.87141  | 0.03646 | 0.01557 | 0.82455 |
| <b>2.B.1</b>   | Ammonia Production                                      | CARBON DIOXIDE (CO2) | (202.77356) | 5,340.57627  | 0.03618 | 0.01545 | 0.84001 |
| <b>3.A.2</b>   | Manure Management                                       | NITROUS OXIDE (N2O)  | 677.76409   | 6,937.06304  | 0.03557 | 0.01519 | 0.85520 |
| <b>3.C.7</b>   | Rice cultivation  | METHANE (CH4)        | 3,469.27632 | 4,506.56118  | 0.03365 | 0.01437 | 0.86957 |
| <b>3.C.3</b>   | Urea application  | CARBON DIOXIDE (CO2) | 2,317.33913 | 1,475.18287  | 0.03316 | 0.01416 | 0.88374 |
| <b>2.C.1</b>   | Iron and Steel Production                               | CARBON DIOXIDE (CO2) | 3,579.66000 | 4,984.00000  | 0.03240 | 0.01384 | 0.89757 |
| <b>4.D</b>     | Wastewater Treatment and Discharge                      | METHANE (CH4)        | 7,419.14483 | 16,170.41688 | 0.02651 | 0.01132 | 0.90890 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Solid Fuels | CARBON DIOXIDE (CO2) | 2,763.24500 | 10,762.37550 | 0.02310 | 0.00987 | 0.91877 |
| <b>2.C.3</b>   | Aluminium production                                    | PFCs (PFCs)          | 2,674.02960 | 4,213.44000  | 0.02079 | 0.00888 | 0.92765 |
| <b>1.B.2.a</b> | Oil   | METHANE (CH4)        | 1,289.34273 | 802.83942    | 0.01857 | 0.00793 | 0.93558 |
| <b>1.A.1</b>   | Energy Industries - Biomass - solid                     | METHANE (CH4)        | 980.96544   | -            | 0.01838 | 0.00785 | 0.94343 |
| <b>1.A.3.b</b> | Road Transportation - Gaseous Fuels                     | CARBON DIOXIDE (CO2) | -           | 2,465.81758  | 0.01716 | 0.00733 | 0.95076 |

|                |  |                      |             |             |         |         |         |
|----------------|--|----------------------|-------------|-------------|---------|---------|---------|
| <b>3.C.6</b>   | Indirect N2O Emissions from manure management  | NITROUS OXIDE (N2O)  | 183.97411   | 2,899.72771 | 0.01673 | 0.00715 | 0.95790 |
| <b>3.C.5</b>   | Indirect N2O Emissions from managed soils      | NITROUS OXIDE (N2O)  | 1,423.73134 | 1,643.81963 | 0.01524 | 0.00651 | 0.96441 |
| <b>2.B.2</b>   | Nitric Acid Production                         | NITROUS OXIDE (N2O)  | 927.50000   | 927.50000   | 0.01093 | 0.00467 | 0.96908 |
| <b>2.B.8</b>   | Petrochemical and Carbon Black Production      | CARBON DIOXIDE (CO2) | -           | 1,557.37100 | 0.01084 | 0.00463 | 0.97371 |
| <b>1.A.1</b>   | Energy Industries - Solid Fuels                | CARBON DIOXIDE (CO2) | 415.82376   | -           | 0.00779 | 0.00333 | 0.97704 |
| <b>4.D</b>     | Wastewater Treatment and Discharge             | NITROUS OXIDE (N2O)  | 938.47155   | 1,855.71092 | 0.00467 | 0.00200 | 0.97903 |
| <b>3.A.2</b>   | Manure Management                              | METHANE (CH4)        | 591.18814   | 991.12443   | 0.00418 | 0.00179 | 0.98082 |
| <b>2.F.2</b>   | Foam Blowing Agents                            | HFCs (HFCs)          | -           | 543.43033   | 0.00378 | 0.00162 | 0.98243 |
| <b>4.B</b>     | Biological Treatment of Solid Waste            | METHANE (CH4)        | 86.64627    | 716.30887   | 0.00336 | 0.00144 | 0.98387 |
| <b>4.C</b>     | Incineration and Open Burning of Waste         | METHANE (CH4)        | 281.89265   | 303.81412   | 0.00317 | 0.00135 | 0.98522 |
| <b>3.C.1</b>   | Burning  | METHANE (CH4)        | 169.04883   | -           | 0.00317 | 0.00135 | 0.98658 |
| <b>2.A.3</b>   | Glass Production                               | CARBON DIOXIDE (CO2) | -           | 347.53230   | 0.00242 | 0.00103 | 0.98761 |
| <b>4.B</b>     | Biological Treatment of Solid Waste            | NITROUS OXIDE (N2O)  | 61.50338    | 508.45139   | 0.00239 | 0.00102 | 0.98863 |
| <b>1.A.4</b>   | Other Sectors - Biomass - solid                | METHANE (CH4)        | 168.33880   | 124.58880   | 0.00229 | 0.00098 | 0.98960 |
| <b>2.A.4</b>   | Other Process Uses of Carbonates               | CARBON DIOXIDE (CO2) | -           | 323.20207   | 0.00225 | 0.00096 | 0.99057 |
| <b>2.C.3</b>   | Aluminium production                           | CARBON DIOXIDE (CO2) | 284.32000   | 448.00000   | 0.00221 | 0.00094 | 0.99151 |
| <b>2.F.3</b>   | Fire Protection                                | HFCs, PFCs           | -           | 293.68983   | 0.00204 | 0.00087 | 0.99238 |
| <b>1.A.3.b</b> | Road Transportation - Liquid Fuels             | NITROUS OXIDE (N2O)  | 199.18378   | 795.88576   | 0.00181 | 0.00077 | 0.99315 |
| <b>2.D</b>     | Non-Energy Products from Fuels and Solvent Use | CARBON DIOXIDE (CO2) | 28.62288    | 317.15200   | 0.00167 | 0.00071 | 0.99387 |

|                |  |                      |           |           |         |         |         |
|----------------|--|----------------------|-----------|-----------|---------|---------|---------|
| <b>2.C.2</b>   | Ferroalloys Production                                   | CARBON DIOXIDE (CO2) | -         | 219.60000 | 0.00153 | 0.00065 | 0.99452 |
| <b>2.B.7</b>   | Soda Ash Production                                      | CARBON DIOXIDE (CO2) | 65.36204  | -         | 0.00122 | 0.00052 | 0.99504 |
| <b>2.B.8</b>   | Petrochemical and Carbon Black Production                | METHANE (CH4)        | -         | 164.10513 | 0.00114 | 0.00049 | 0.99553 |
| <b>2.A.2</b>   | Lime production  | CARBON DIOXIDE (CO2) | 53.25000  | 294.75000 | 0.00105 | 0.00045 | 0.99598 |
| <b>2.G</b>     | Other Product Manufacture and Use                        | SF6, PFCs            | 71.79250  | 314.18110 | 0.00084 | 0.00036 | 0.99634 |
| <b>1.A.3.b</b> | Road Transportation - Gaseous Fuels                      | METHANE (CH4)        | -         | 114.04467 | 0.00079 | 0.00034 | 0.99668 |
| <b>3.C.1</b>   | Burning  | NITROUS OXIDE (N2O)  | 41.47957  | -         | 0.00078 | 0.00033 | 0.99701 |
| <b>1.A.3.b</b> | Road Transportation - Liquid Fuels                       | METHANE (CH4)        | 101.33147 | 379.11657 | 0.00074 | 0.00032 | 0.99733 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Liquid Fuels | NITROUS OXIDE (N2O)  | 41.98037  | 12.59794  | 0.00070 | 0.00030 | 0.99762 |
| <b>1.B.2.b</b> | Natural Gas  | METHANE (CH4)        | 0.19138   | 71.14970  | 0.00049 | 0.00021 | 0.99783 |
| <b>1.B.2.b</b> | Natural Gas  | NITROUS OXIDE (N2O)  | 0.05146   | 66.24978  | 0.00046 | 0.00020 | 0.99803 |
| <b>2.F.6</b>   | Other Applications (please specify)                      | HFCs, PFCs           | -         | 64.01207  | 0.00045 | 0.00019 | 0.99822 |
| <b>1.A.4</b>   | Other Sectors - Liquid Fuels                             | METHANE (CH4)        | 32.42141  | 28.25186  | 0.00041 | 0.00018 | 0.99840 |
| <b>4.C</b>     | Incineration and Open Burning of Waste                   | NITROUS OXIDE (N2O)  | 35.10832  | 38.32166  | 0.00039 | 0.00017 | 0.99856 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Liquid Fuels | METHANE (CH4)        | 22.22202  | 6.66478   | 0.00037 | 0.00016 | 0.99872 |
| <b>1.A.1</b>   | Energy Industries - Liquid Fuels                         | NITROUS OXIDE (N2O)  | 31.16177  | 39.25853  | 0.00031 | 0.00013 | 0.99885 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Solid Fuels  | NITROUS OXIDE (N2O)  | 2.32092   | 43.52029  | 0.00026 | 0.00011 | 0.99897 |
| <b>1.A.4</b>   | Other Sectors - Liquid Fuels                             | NITROUS OXIDE (N2O)  | 16.45785  | 7.09339   | 0.00026 | 0.00011 | 0.99908 |
| <b>1.A.3.b</b> | Road Transportation - Gaseous Fuels                      | NITROUS OXIDE (N2O)  | -         | 35.19624  | 0.00024 | 0.00010 | 0.99918 |
| <b>1.A.1</b>   | Energy Industries - Gaseous Fuels                        | METHANE (CH4)        | 4.65646   | 43.51659  | 0.00022 | 0.00009 | 0.99927 |

|                |  |                            |          |           |         |         |         |
|----------------|--|----------------------------|----------|-----------|---------|---------|---------|
| <b>1.A.1</b>   | Energy Industries - Gaseous Fuels                              | NITROUS<br>OXIDE (N2O)     | 4.40700  | 41.18535  | 0.00020 | 0.00009 | 0.99936 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction -<br>Biomass - solid | METHANE<br>(CH4)           | -        | 28.84000  | 0.00020 | 0.00009 | 0.99945 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction - Solid<br>Fuels     | METHANE<br>(CH4)           | 1.71380  | 30.65580  | 0.00018 | 0.00008 | 0.99952 |
| <b>1.A.1</b>   | Energy Industries - Liquid Fuels                               | METHANE<br>(CH4)           | 16.46282 | 20.74036  | 0.00016 | 0.00007 | 0.99959 |
| <b>1.A.4</b>   | Other Sectors - Gaseous Fuels                                  | METHANE<br>(CH4)           | 0.37800  | 18.10900  | 0.00012 | 0.00005 | 0.99964 |
| <b>1.B.2.a</b> | Oil  | NITROUS<br>OXIDE (N2O)     | 10.48509 | 12.02671  | 0.00011 | 0.00005 | 0.99969 |
| <b>1.A.4</b>   | Other Sectors - Biomass - solid                                | NITROUS<br>OXIDE (N2O)     | 7.96603  | 5.89572   | 0.00011 | 0.00005 | 0.99974 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction -<br>Gaseous Fuels   | METHANE<br>(CH4)           | 1.54748  | 19.63119  | 0.00011 | 0.00005 | 0.99978 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction -<br>Gaseous Fuels   | NITROUS<br>OXIDE (N2O)     | 1.46458  | 18.57952  | 0.00010 | 0.00004 | 0.99983 |
| <b>4.C</b>     | Incineration and Open Burning of Waste                         | CARBON<br>DIOXIDE<br>(CO2) | 24.88985 | 54.42654  | 0.00009 | 0.00004 | 0.99986 |
| <b>2.C.1</b>   | Iron and Steel Production                                      | METHANE<br>(CH4)           | 4.68032  | 1.74720   | 0.00008 | 0.00003 | 0.99990 |
| <b>2.C.5</b>   | Lead Production  | CARBON<br>DIOXIDE<br>(CO2) | -        | 10.00000  | 0.00007 | 0.00003 | 0.99993 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction -<br>Biomass - solid | NITROUS<br>OXIDE (N2O)     | -        | 5.45900   | 0.00004 | 0.00002 | 0.99994 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction -<br>Biomass - other | NITROUS<br>OXIDE (N2O)     | -        | 4.26014   | 0.00003 | 0.00001 | 0.99996 |
| <b>1.A.2</b>   | Manufacturing Industries and Construction -<br>Biomass - other | METHANE<br>(CH4)           | -        | 3.37596   | 0.00002 | 0.00001 | 0.99997 |
| <b>1.A.4</b>   | Other Sectors - Gaseous Fuels                                  | NITROUS<br>OXIDE (N2O)     | 0.07155  | 3.42778   | 0.00002 | 0.00001 | 0.99998 |
| <b>3.B.5.a</b> | Settlements Remaining Settlements                              | CARBON<br>DIOXIDE<br>(CO2) | -        | (2.65470) | 0.00002 | 0.00001 | 0.99998 |
| <b>2.C.6</b>   | Zinc Production  | CARBON<br>DIOXIDE<br>(CO2) | -        | 2.58000   | 0.00002 | 0.00001 | 0.99999 |
| <b>2.C.2</b>   | Ferroalloys Production   | METHANE<br>(CH4)           | -        | 1.70800   | 0.00001 | 0.00001 | 1.00000 |

|              |                                 |                     |             |             |         |         |         |
|--------------|---------------------------------|---------------------|-------------|-------------|---------|---------|---------|
| 1.A.1        | Energy Industries - Solid Fuels | METHANE (CH4)       | 0.26223     | -           | 0.00000 | 0.00000 | 1.00000 |
| 1.A.1        | Energy Industries - Solid Fuels | NITROUS OXIDE (N2O) | 0.24818     | -           | 0.00000 | 0.00000 | 1.00000 |
| <b>Total</b> |                                 |                     | 143,321.114 | 385,975.297 | 2.34115 | 100     |         |

### Annex III: Uncertainty Assessment

| A  | B   | C         | D  | E                             | F     | G                        | H      | I      | J      | K  | L  | M      |
|--|-----|-----------|--|-------------------------------|-------|--------------------------|--------|--------|--------|--|--|--------|
|  |     |           | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |       | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.A - Fuel Combustion Activities                   |     |           |  |                               |       |                          |        |        |        |  |  |        |
| 1.A.1.a.i - Electricity Generation - Liquid Fuels  | CO2 | 12,946.94 | 16,233.83  | 2.0                           | 2.0   | 2.8284                   | 0.0140 | 0.1317 | 0.1134 | 0.3208   | 0.3208   | 0.2058 |
| 1.A.1.a.i - Electricity Generation - Liquid Fuels  | CH4 | 0.50      | 0.64   | 2.0                           | 4.0   | 4.4721                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.a.i - Electricity Generation - Liquid Fuels  | N2O | 0.10      | 0.13   | 2.0                           | 6.0   | 6.3246                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.a.i - Electricity Generation - Gaseous Fuels | CO2 | 9,329.54  | 75,044.13  | 2.0                           | 2.0   | 2.8284                   | 0.2992 | 0.3474 | 0.5243 | 1.4829   | 1.4829   | 4.3983 |
| 1.A.1.a.i - Electricity Generation - Gaseous Fuels | CH4 | 0.17      | 1.35   | 2.0                           | 4.0   | 4.4721                   | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 1.A.1.a.i - Electricity Generation - Gaseous Fuels | N2O | 0.02      | 0.13   | 2.0                           | 6.0   | 6.3246                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.b - Petroleum Refining - Liquid Fuels        | CO2 | 2,166.68  | 1,612.64   | 2.0                           | 2.0   | 2.8284                   | 0.0001 | 0.0298 | 0.0113 | 0.0319   | 0.0319   | 0.0020 |
| 1.A.1.b - Petroleum Refining - Liquid Fuels        | CH4 | 0.09      | 0.07   | 2.0                           | 4.0   | 4.4721                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.b - Petroleum Refining - Liquid Fuels        | N2O | 0.02      | 0.01   | 2.0                           | 6.0   | 6.3246                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.b - Petroleum Refining - Gaseous Fuels       | CO2 | 0.00      | 2,024.08   | 5.0                           | 2.0   | 5.3852                   | 0.0008 | 0.0141 | 0.0141 | 0.0400   | 0.1000   | 0.0116 |
| 1.A.1.b - Petroleum Refining - Gaseous Fuels       | CH4 | 0.00      | 0.04   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |

| A  | B   | C      | D  | E                             | F     | G                        | H      | I      | J      | K  | L  | M      |
|--|-----|--------|--|-------------------------------|-------|--------------------------|--------|--------|--------|--|--|--------|
|  |     |        | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |       | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.A.1.b - Petroleum Refining - Gaseous Fuels             | N2O | 0.00   | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.i - Manufacture of Solid Fuels - Solid Fuels     | CO2 | 831.65 | 0.00   | 5.0                           | 2.0   | 5.3852                   | 0.0000 | 0.0158 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.i - Manufacture of Solid Fuels - Solid Fuels     | CH4 | 981.24 | 0.00   | 5.0                           | 4.0   | 6.4031                   | 0.0000 | 0.0186 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.i - Manufacture of Solid Fuels - Solid Fuels     | N2O | 0.25   | 0.00   | 5.0                           | 6.0   | 7.8102                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.i - Manufacture of Solid Fuels - Biomass - solid | CO2 | 0.00   | 0.00   | 2.0                           | 5.0   | 5.3852                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.i - Manufacture of Solid Fuels - Biomass - solid | CH4 | 35.03  | 0.00   | 2.0                           | 10.0  | 10.1980                  | 0.0000 | 0.0007 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.i - Manufacture of Solid Fuels - Biomass - solid | N2O | 0.00   | 0.00   | 2.0                           | 15.0  | 15.1327                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.a - Commercial/Institutional - Liquid Fuels        | CO2 | 0.00   | 1,866.54   | 2.0                           | 2.0   | 2.8284                   | 0.0002 | 0.0130 | 0.0130 | 0.0369   | 0.0369   | 0.0027 |
| 1.A.4.a - Commercial/Institutional - Liquid Fuels        | CH4 | 0.00   | 0.16   | 2.0                           | 4.0   | 4.4721                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.a - Commercial/Institutional - Liquid Fuels        | N2O | 0.00   | 0.00   | 2.0                           | 6.0   | 6.3246                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.a - Commercial/Institutional - Gaseous Fuels       | CO2 | 0.00   | 1,967.16   | 5.0                           | 3.9   | 6.3544                   | 0.0010 | 0.0137 | 0.0137 | 0.0762   | 0.0972   | 0.0153 |
| 1.A.4.a - Commercial/Institutional - Gaseous Fuels       | CH4 | 0.00   | 0.18   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0003   | 0.0000   | 0.0000 |
| 1.A.4.a - Commercial/Institutional - Gaseous Fuels       | N2O | 0.00   | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A  | B   | C        | D  | E                             | F   | G                        | H      | I      | J      | K  | L  | M      |
|--|-----|----------|--|-------------------------------|-----|--------------------------|--------|--------|--------|--|--|--------|
|  |     |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |     | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.A.4.a - Commercial/Institutional - Biomass - solid | CO2 | 0.00     | 0.00   | 2.0                           | 3.0 | 3.6056                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.a - Commercial/Institutional - Biomass - solid | CH4 | 0.60     | 0.00   | 2.0                           | 6.0 | 6.3246                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.a - Commercial/Institutional - Biomass - solid | N2O | 0.00     | 0.00   | 2.0                           | 9.0 | 9.2195                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.b - Residential - Liquid Fuels                 | CO2 | 9,325.74 | 8,974.78   | 2.0                           | 2.0 | 2.8284                   | 0.0043 | 0.1139 | 0.0627 | 0.1774   | 0.1774   | 0.0629 |
| 1.A.4.b - Residential - Liquid Fuels                 | CH4 | 1.16     | 0.71   | 2.0                           | 4.0 | 4.4721                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.b - Residential - Liquid Fuels                 | N2O | 0.06     | 0.01   | 2.0                           | 6.0 | 6.3246                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.b - Residential - Gaseous Fuels                | CO2 | 151.47   | 5,237.24   | 2.0                           | 2.0 | 2.8284                   | 0.0015 | 0.0337 | 0.0366 | 0.1035   | 0.1035   | 0.0214 |
| 1.A.4.b - Residential - Gaseous Fuels                | CH4 | 0.01     | 0.47   | 2.0                           | 4.0 | 4.4721                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.b - Residential - Gaseous Fuels                | N2O | 0.00     | 0.01   | 2.0                           | 6.0 | 6.3246                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.b - Residential - Biomass - solid              | CO2 | 0.00     | 0.00   | 2.0                           | 3.0 | 3.6056                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.b - Residential - Biomass - solid              | CH4 | 5.41     | 4.45   | 2.0                           | 6.0 | 6.3246                   | 0.0000 | 0.0001 | 0.0000 | 0.0003   | 0.0001   | 0.0000 |
| 1.A.4.b - Residential - Biomass - solid              | N2O | 0.03     | 0.02   | 2.0                           | 9.0 | 9.2195                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.c.i - Stationary - Liquid Fuels                | CO2 | 0.00     | 1,022.47   | 2.0                           | 4.0 | 4.4721                   | 0.0001 | 0.0071 | 0.0071 | 0.0404   | 0.0202   | 0.0020 |
| 1.A.4.c.i - Stationary - Liquid Fuels                | CH4 | 0.00     | 0.14   | 2.0                           | 4.0 | 4.4721                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.4.c.i - Stationary - Liquid Fuels                | N2O | 0.00     | 0.01   | 2.0                           | 8.0 | 8.2462                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.ii - Other Energy Industries - Liquid Fuels  | CO2 | 0.00     | 817.34   | 5.0                           | 6.1 | 7.9153                   | 0.0003 | 0.0057 | 0.0057 | 0.0496   | 0.0404   | 0.0041 |

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|--|-----|-----------|--|-------------------------------|-------|--------------------------|--------|--------|--------|--|--|--------|
|  |     |           | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |       | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.A.1.c.ii - Other Energy Industries - Liquid Fuels  | CH4 | 0.00      | 0.03   | 5.0                           | 228.8 | 228.8425                 | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 1.A.1.c.ii - Other Energy Industries - Liquid Fuels  | N2O | 0.00      | 0.01   | 5.0                           | 228.8 | 228.8425                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.1.c.ii - Other Energy Industries - Gaseous Fuels | CO2 | 0.00      | 9,494.05   | 5.0                           | 3.9   | 6.3544                   | 0.0242 | 0.0663 | 0.0663 | 0.3679   | 0.4690   | 0.3553 |
| 1.A.1.c.ii - Other Energy Industries - Gaseous Fuels | CH4 | 0.00      | 0.17   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0003   | 0.0000   | 0.0000 |
| 1.A.1.c.ii - Other Energy Industries - Gaseous Fuels | N2O | 0.00      | 0.02   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Liquid Fuels      | CO2 | 20,311.94 | 5,968.75   | 5.0                           | 6.1   | 7.9153                   | 0.0148 | 0.3425 | 0.0417 | 0.3619   | 0.2949   | 0.2179 |
| 1.A.2.m - Non-specified Industry - Liquid Fuels      | CH4 | 0.79      | 0.24   | 5.0                           | 228.8 | 228.8425                 | 0.0000 | 0.0000 | 0.0000 | 0.0005   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Liquid Fuels      | N2O | 0.16      | 0.05   | 5.0                           | 228.8 | 228.8425                 | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Solid Fuels       | CO2 | 2,763.25  | 10,762.38  | 5.0                           | 12.5  | 13.4258                  | 0.1387 | 0.0229 | 0.0752 | 1.3250   | 0.5317   | 2.0383 |
| 1.A.2.m - Non-specified Industry - Solid Fuels       | CH4 | 0.06      | 1.09   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0022   | 0.0001   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Solid Fuels       | N2O | 0.01      | 0.16   | 5.0                           | 222.2 | 222.2785                 | 0.0000 | 0.0000 | 0.0000 | 0.0004   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Gaseous Fuels     | CO2 | 3,100.48  | 39,049.95  | 5.0                           | 3.9   | 6.3544                   | 0.4089 | 0.2141 | 0.2728 | 1.5131   | 1.9292   | 6.0111 |
| 1.A.2.m - Non-specified Industry - Gaseous Fuels     | CH4 | 0.06      | 0.70   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0014   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Gaseous Fuels     | N2O | 0.01      | 0.07   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Biomass - solid   | CO2 | 0.00      | 0.00   | 5.0                           | 17.6  | 18.2690                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Biomass - solid   | CH4 | 0.00      | 1.03   | 5.0                           | 222.2 | 222.2785                 | 0.0000 | 0.0000 | 0.0000 | 0.0023   | 0.0001   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Biomass - solid   | N2O | 0.00      | 0.02   | 5.0                           | 275.0 | 275.0455                 | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 1.A.2.m - Non-specified Industry - Biomass - other   | CO2 | 0.00      | 0.00   | 5.0                           | 17.0  | 17.7200                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B   | C         | D  | E                             | F      | G                        | H      | I      | J      | K  | L  | M       |
|---|-----|-----------|--|-------------------------------|--------|--------------------------|--------|--------|--------|--|--|---------|
|   |     |           | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |        | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |         |
| 1.A.2.m - Non-specified Industry - Biomass - other                                      | CH4 | 0.00      | 0.12   | 5.0                           | 233.3  | 233.3869                 | 0.0000 | 0.0000 | 0.0000 | 0.0003   | 0.0000   | 0.0000  |
| 1.A.2.m - Non-specified Industry - Biomass - other                                      | N2O | 0.00      | 0.02   | 5.0                           | 62.5   | 62.6997                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels               | CO2 | 0.00      | 2,324.07   | 2.0                           | 5.0    | 5.3852                   | 0.0010 | 0.0162 | 0.0162 | 0.1148   | 0.0459   | 0.0153  |
| 1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels               | CH4 | 0.00      | 0.02   | 2.0                           | 10.0   | 10.1980                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 1.A.3.a.i - International Aviation (International Bunkers) - Liquid Fuels               | N2O | 0.00      | 0.07   | 2.0                           | 15.0   | 15.1327                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 1.A.3.b.i - Cars - Liquid Fuels   | CO2 | 15,098.97 | 59,728.11  | 5.0                           | 3.1    | 5.8664                   | 0.8154 | 0.1312 | 0.4173 | 1.8107   | 2.9507   | 11.9855 |
| 1.A.3.b.i - Cars - Liquid Fuels   | CH4 | 3.62      | 13.54  | 5.0                           | 244.7  | 244.7438                 | 0.0001 | 0.0000 | 0.0001 | 0.0327   | 0.0007   | 0.0011  |
| 1.A.3.b.i - Cars - Liquid Fuels   | N2O | 0.75      | 3.00   | 5.0                           | 209.9  | 209.9971                 | 0.0000 | 0.0000 | 0.0000 | 0.0062   | 0.0001   | 0.0000  |
| 1.A.3.b.i - Cars - Gaseous Fuels  | CO2 | 0.00      | 2,465.82   | 5.0                           | 3.9    | 6.3544                   | 0.0016 | 0.0172 | 0.0172 | 0.0955   | 0.1218   | 0.0240  |
| 1.A.3.b.i - Cars - Gaseous Fuels  | CH4 | 0.00      | 4.07   | 5.0                           | 1573.9 | 1573.9210                | 0.0003 | 0.0000 | 0.0000 | 0.0633   | 0.0002   | 0.0040  |
| 1.A.3.b.i - Cars - Gaseous Fuels  | N2O | 0.00      | 0.13   | 5.0                           | 2466.7 | 2466.6717                | 0.0000 | 0.0000 | 0.0000 | 0.0032   | 0.0000   | 0.0000  |
| 1.A.3.b.vi - Urea-based catalysts   | CO2 | 0.00      | 0.00   | 0.0                           | 0.0    | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels | CO2 | 0.00      | 1,528.01   | 5.0                           | 4.3    | 6.5956                   | 0.0007 | 0.0107 | 0.0107 | 0.0649   | 0.0755   | 0.0099  |
| 1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels | CH4 | 0.00      | 0.14   | 5.0                           | 50.0   | 50.2494                  | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000  |

| A   | B   | C    | D  | E                             | F     | G                        | H      | I      | J      | K  | L  | M      |
|---|-----|------|--|-------------------------------|-------|--------------------------|--------|--------|--------|--|--|--------|
|   |     |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |       | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.A.3.d.i - International water-borne navigation (International bunkers) - Liquid Fuels | N2O | 0.00 | 0.04   | 5.0                           | 140.0 | 140.0893                 | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 1.B.1 - Fugitive Emissions from Fuels - Solid Fuels                                     |     |      |  |                               |       | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.1 - Mining  | CO2 | 0.00 | 0.00   | 5.0                           | 100.0 | 100.1249                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.1 - Mining  | CH4 | 0.00 | 0.00   | 5.0                           | 100.0 | 100.1249                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.2 - Post-mining seam gas emissions  | CO2 | 0.00 | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.2 - Post-mining seam gas emissions  | CH4 | 0.00 | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.3 - Abandoned underground mines   | CH4 | 0.00 | 0.00   | 5.0                           | 0.0   | 5.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.3 - Abandoned underground mines   | CO2 | 0.00 | 0.00   | 0.0                           | 0.0   | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.4 - Flaring of drained methane or conversion of methane to CO2                | CO2 | 0.00 | 0.00   | 0.0                           | 0.0   | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.i.4 - Flaring of drained methane or conversion of methane to CO2                | CH4 | 0.00 | 0.00   | 0.0                           | 0.0   | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.ii.1 - Mining   | CO2 | 0.00 | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.ii.1 - Mining   | CH4 | 0.00 | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.ii.2 - Post-mining seam gas emissions   | CO2 | 0.00 | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.ii.2 - Post-mining seam gas emissions   | CH4 | 0.00 | 0.00   | 5.0                           | 200.0 | 200.0625                 | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.ii.3 - Abandoned surface mines  | CO2 | 0.00 | 0.00   | 0.0                           | 0.0   | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.a.ii.3 - Abandoned surface mines  | CH4 | 0.00 | 0.00   | 0.0                           | 0.0   | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.i - Charcoal and Biochar production   | CO2 | 0.00 | 0.00   | 0.0                           | 0.0   | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

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|---|-----|----------|--|-------------------------------|-----|--------------------------|--------|--------|--------|--|--|--------|
|   |     |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |     | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.B.1.c.i - Charcoal and Biochar production                 | CH4 | 0.00     | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.i - Charcoal and Biochar production                 | N2O | 0.00     | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.ii - Coke production                                | CO2 | 0.00     | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.ii - Coke production                                | CH4 | 0.00     | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.ii - Coke production                                | N2O | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.iv - Gasification transformation                    | CO2 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.iv - Gasification transformation                    | CH4 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.1.c.iv - Gasification transformation                    | N2O | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2 - Fugitive Emissions from Fuels - Oil and Natural Gas |     |          |  |                               |     |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.i - Venting   | CO2 | 5.86     | 3.65   | 2.0                           | 2.0 |                          | 0.0000 | 0.0001 | 0.0000 | 0.0001   | 0.0001   | 0.0000 |
| 1.B.2.a.i - Venting   | CH4 | 1,246.34 | 776.06   | 2.0                           | 4.0 |                          | 0.0000 | 0.0182 | 0.0054 | 0.0307   | 0.0153   | 0.0012 |
| 1.B.2.a.i - Venting   | N2O | 0.00     | 5.50   | 2.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0001   | 0.0000 |
| 1.B.2.a.ii - Flaring  | CO2 | 2,524.96 | 1,572.22   | 2.0                           | 2.0 |                          | 0.0000 | 0.0368 | 0.0110 | 0.0311   | 0.0311   | 0.0019 |
| 1.B.2.a.ii - Flaring  | CH4 | 43.00    | 26.78  | 2.0                           | 4.0 |                          | 0.0000 | 0.0006 | 0.0002 | 0.0011   | 0.0005   | 0.0000 |
| 1.B.2.a.ii - Flaring  | N2O | 10.49    | 6.53   | 2.0                           | 6.0 |                          | 0.0000 | 0.0002 | 0.0000 | 0.0004   | 0.0001   | 0.0000 |
| 1.B.2.a.iii.1 - Exploration                                 | CO2 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.1 - Exploration                                 | CH4 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.1 - Exploration                                 | N2O | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.2 - Production and Upgrading                    | CO2 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.2 - Production and Upgrading                    | CH4 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.2 - Production and Upgrading                    | N2O | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.3 - Transport                                   | CO2 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.3 - Transport                                   | CH4 | 0.00     | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

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|--|-----|--------|--|-------------------------------|-----|--------------------------|--------|--------|--------|--|--|--------|
|  |     |        | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |     | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.B.2.a.iii.3 - Transport                    | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.4 - Refining                     | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.4 - Refining                     | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.4 - Refining                     | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.5 - Distribution of oil products | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.5 - Distribution of oil products | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.5 - Distribution of oil products | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.6 - Other                        | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.6 - Other                        | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.a.iii.6 - Other                        | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.i - Venting                          | CO2 | 524.27 | 6,942.63   | 2.0                           | 2.0 |                          | 0.0000 | 0.0386 | 0.0485 | 0.1372   | 0.1372   | 0.0376 |
| 1.B.2.b.i - Venting                          | CH4 | 0.00   | 69.54  | 2.0                           | 4.0 |                          | 0.0000 | 0.0005 | 0.0005 | 0.0027   | 0.0014   | 0.0000 |
| 1.B.2.b.i - Venting                          | N2O | 0.00   | 65.82  | 2.0                           | 0.0 |                          | 0.0000 | 0.0005 | 0.0005 | 0.0000   | 0.0013   | 0.0000 |
| 1.B.2.b.ii - Flaring                         | CO2 | 9.32   | 91.26  | 2.0                           | 2.0 |                          | 0.0000 | 0.0005 | 0.0006 | 0.0018   | 0.0018   | 0.0000 |
| 1.B.2.b.ii - Flaring                         | CH4 | 0.19   | 1.61   | 2.0                           | 4.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 1.B.2.b.ii - Flaring                         | N2O | 0.05   | 0.43   | 2.0                           | 6.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.1 - Exploration                  | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.1 - Exploration                  | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.1 - Exploration                  | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.2 - Production                   | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.2 - Production                   | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.2 - Production                   | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.3 - Processing                   | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.3 - Processing                   | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.3 - Processing                   | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.4 - Transmission and Storage     | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.4 - Transmission and Storage     | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.4 - Transmission and Storage     | N2O | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.5 - Distribution                 | CO2 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.5 - Distribution                 | CH4 | 0.00   | 0.00   | 0.0                           | 0.0 |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B   | C        | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|---|-----|----------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|   |     |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 1.B.2.b.iii.5 - Distribution                    | N2O | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.6 - Other                           | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.6 - Other                           | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.2.b.iii.6 - Other                           | N2O | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.3 - Other emissions from Energy Production  | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.3 - Other emissions from Energy Production  | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.B.3 - Other emissions from Energy Production  | N2O | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.C - CO2 Transport Injection and Storage       |     |          |  |                               |      |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.C.1.a - Pipelines                             | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.C.1.b - Ships                                 | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.C.1.c - Other (please specify)                | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.C.2.a - Injection                             | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.C.2.b - Storage                               | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 1.C.3 - Other                                   | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.A - Mineral Industry                          |     |          |  |                               |      |                          | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.A.1 - Cement production                       | CO2 | 4,433.20 | 25,276.12  | 10.0                          | 5.0  | 11.1803                  | 0.5304 | 0.0926 | 0.1766 | 1.2487   | 2.4974   | 7.7963 |
| 2.A.2 - Lime production                         | CO2 | 53.25    | 294.75   | 20.0                          | 6.0  | 20.8806                  | 0.0003 | 0.0011 | 0.0021 | 0.0175   | 0.0582   | 0.0037 |
| 2.A.3 - Glass Production                        | CO2 | 0.00     | 347.53   | 20.0                          | 60.0 | 63.2456                  | 0.0032 | 0.0024 | 0.0024 | 0.2060   | 0.0687   | 0.0472 |
| 2.A.4.a - Ceramics                              | CO2 | 0.00     | 323.20   | 30.0                          | 5.0  | 30.4138                  | 0.0006 | 0.0023 | 0.0023 | 0.0160   | 0.0958   | 0.0094 |
| 2.A.4.b - Other Uses of Soda Ash                | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.A.4.c - Non Metallurgical Magnesia Production | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.A.4.d - Other (please specify)                | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.A.5 - Other (please specify)                  | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.A.5 - Other (please specify)                  | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A  | B   | C       | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|--|-----|---------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|  |     |         | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.A.5 - Other (please specify)                             | N2O | 0.00    | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B - Chemical Industry                                    |     |         |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.1 - Ammonia Production                                 | CO2 | -202.77 | 5,340.58   | 5.0                           | 7.0  | 8.6023                   | 0.0140 | 0.0412 | 0.0373 | 0.3694   | 0.2638   | 0.2060 |
| 2.B.2 - Nitric Acid Production                             | N2O | 927.50  | 927.50   | 30.0                          | 20.0 | 36.0555                  | 0.0074 | 0.0111 | 0.0065 | 0.1833   | 0.2749   | 0.1092 |
| 2.B.3 - Adipic Acid Production                             | N2O | 0.00    | 0.00   | 2.0                           | 0.0  | 2.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.4 - Caprolactam, Glyoxal and Glyoxylic Acid Production | N2O | 0.00    | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.5 - Carbide Production                                 | CO2 | 0.00    | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.5 - Carbide Production                                 | CH4 | 0.00    | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.6 - Titanium Dioxide Production                        | CO2 | 0.00    | 0.00   | 7.1                           | 0.0  | 7.0711                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.7 - Soda Ash Production                                | CO2 | 65.36   | 0.00   | 5.0                           | 0.0  | 5.0000                   | 0.0000 | 0.0012 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.8.a - Methanol   | CO2 | 0.00    | 549.68   | 30.0                          | 30.0 | 42.4264                  | 0.0036 | 0.0038 | 0.0038 | 0.1629   | 0.1629   | 0.0531 |
| 2.B.8.a - Methanol   | CH4 | 0.00    | 71.23  | 30.0                          | 30.0 | 42.4264                  | 0.0001 | 0.0005 | 0.0005 | 0.0211   | 0.0211   | 0.0009 |
| 2.B.8.b - Ethylene   | CO2 | 0.00    | 680.49   | 5.0                           | 30.0 | 30.4138                  | 0.0028 | 0.0048 | 0.0048 | 0.2017   | 0.0336   | 0.0418 |
| 2.B.8.b - Ethylene   | CH4 | 0.00    | 92.57  | 5.0                           | 30.0 | 30.4138                  | 0.0001 | 0.0006 | 0.0006 | 0.0274   | 0.0046   | 0.0008 |
| 2.B.8.c - Ethylene Dichloride and Vinyl Chloride Monomer   | CO2 | 0.00    | 39.00  | 2.0                           | 50.0 | 50.0400                  | 0.0000 | 0.0003 | 0.0003 | 0.0193   | 0.0008   | 0.0004 |
| 2.B.8.c - Ethylene Dichloride and Vinyl Chloride Monomer   | CH4 | 0.00    | 0.13   | 2.0                           | 50.0 | 50.0400                  | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000 |
| 2.B.8.d - Ethylene Oxide                                   | CO2 | 0.00    | 0.00   | 14.1                          | 0.0  | 14.1421                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.8.d - Ethylene Oxide                                   | CH4 | 0.00    | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.8.e - Acrylonitrile                                    | CO2 | 0.00    | 0.00   | 14.1                          | 0.0  | 14.1421                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.8.e - Acrylonitrile                                    | CH4 | 0.00    | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.8.f - Carbon Black                                     | CO2 | 0.00    | 288.20   | 10.0                          | 0.0  | 10.0000                  | 0.0001 | 0.0020 | 0.0020 | 0.0000   | 0.0285   | 0.0008 |
| 2.B.8.f - Carbon Black                                     | CH4 | 0.00    | 0.18   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A  | B    | C        | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|--|------|----------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|  |      |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.B.8.x - Other petrochemical production | CO2  | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.8.x - Other petrochemical production | CH4  | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.9.a - By-product emissions           | CHF3 | 0.00     | 0.00   | 14.1                          | 0.0  | 14.1421                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.10 - Hydrogen Production             | CO2  | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.10 - Hydrogen Production             | CH4  | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.B.10 - Hydrogen Production             | N2O  | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.C - Metal Industry                     |      |          |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.C.1 - Iron and Steel Production        | CO2  | 3,579.66 | 4,984.00   | 10.0                          | 25.0 | 26.9258                  | 0.1196 | 0.0330 | 0.0348 | 1.2311   | 0.4924   | 1.7581 |
| 2.C.1 - Iron and Steel Production        | CH4  | 4.68     | 1.75   | 10.0                          | 25.0 | 26.9258                  | 0.0000 | 0.0001 | 0.0000 | 0.0004   | 0.0002   | 0.0000 |
| 2.C.2 - Ferroalloys Production           | CO2  | 0.00     | 219.60   | 5.0                           | 25.0 | 25.4951                  | 0.0002 | 0.0015 | 0.0015 | 0.0542   | 0.0108   | 0.0031 |
| 2.C.2 - Ferroalloys Production           | CH4  | 0.00     | 1.71   | 5.0                           | 25.0 | 25.4951                  | 0.0000 | 0.0000 | 0.0000 | 0.0004   | 0.0001   | 0.0000 |
| 2.C.3 - Aluminium production             | CO2  | 284.32   | 448.00   | 2.0                           | 10.0 | 10.1980                  | 0.0001 | 0.0023 | 0.0031 | 0.0443   | 0.0089   | 0.0020 |
| 2.C.3 - Aluminium production             | CF4  | 1,885.04 | 2,970.24   | 2.0                           | 10.0 | 10.1980                  | 0.0061 | 0.0150 | 0.0208 | 0.2935   | 0.0587   | 0.0896 |
| 2.C.3 - Aluminium production             | C2F6 | 788.99   | 1,243.20   | 2.0                           | 10.0 | 10.1980                  | 0.0011 | 0.0063 | 0.0087 | 0.1228   | 0.0246   | 0.0157 |
| 2.C.4 - Magnesium production             | CO2  | 0.00     | 0.00   | 14.1                          | 0.0  | 14.1421                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.C.4 - Magnesium production             | SF6  | 0.00     | 0.00   | 14.1                          | 0.0  | 14.1421                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.C.5 - Lead Production                  | CO2  | 0.00     | 10.00  | 10.0                          | 20.0 | 22.3607                  | 0.0000 | 0.0001 | 0.0001 | 0.0020   | 0.0010   | 0.0000 |
| 2.C.6 - Zinc Production                  | CO2  | 0.00     | 2.58   | 10.0                          | 20.0 | 22.3607                  | 0.0000 | 0.0000 | 0.0000 | 0.0005   | 0.0003   | 0.0000 |
| 2.C.7 - Rare Earths Production           | CO2  | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A  | B       | C     | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|--|---------|-------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|  |         |       | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.C.7 - Rare Earths Production                       | CF4     | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.C.7 - Rare Earths Production                       | C2F6    | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.C.7 - Rare Earths Production                       | C3F8    | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.D - Non-Energy Products from Fuels and Solvent Use |         |       |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.D.1 - Lubricant Use                                | CO2     | 26.08 | 275.47   | 15.0                          | 50.0 | 52.2015                  | 0.0014 | 0.0014 | 0.0019 | 0.1361   | 0.0408   | 0.0202 |
| 2.D.2 - Paraffin Wax Use                             | CO2     | 2.55  | 41.68  | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0002 | 0.0003 | 0.0000   | 0.0041   | 0.0000 |
| 2.D.4 - Other (please specify)                       | CO2     | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.D.4 - Other (please specify)                       | CH4     | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.D.4 - Other (please specify)                       | N2O     | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E - Electronics Industry                           |         |       |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | CHF3    | 0.00  | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | CF4     | 0.00  | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | C2F6    | 0.00  | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | C3F8    | 0.00  | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | SF6     | 0.00  | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | NF3     | 0.00  | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | CH2F2   | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | CHF2CF3 | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor          | c-C4F8  | 0.00  | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B          | C    | D  | E                             | F   | G                        | H      | I      | J      | K  | L  | M      |
|---|------------|------|--|-------------------------------|-----|--------------------------|--------|--------|--------|--|--|--------|
|   |            |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |     | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.E.1 - Integrated Circuit or Semiconductor | NF3 Remote | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.1 - Integrated Circuit or Semiconductor | N2O        | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | CF4        | 0.00 | 0.00   | 10.0                          | 0.0 | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | SF6        | 0.00 | 0.00   | 10.0                          | 0.0 | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | NF3        | 0.00 | 0.00   | 10.0                          | 0.0 | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | CHF3       | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | CH2F2      | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | CHF2CF3    | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | C2F6       | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | C3F8       | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | c-C4F8     | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | NF3 Remote | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.2 - TFT Flat Panel Display              | N2O        | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | CF4        | 0.00 | 0.00   | 10.0                          | 0.0 | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | C2F6       | 0.00 | 0.00   | 10.0                          | 0.0 | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | CHF3       | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | CH2F2      | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | CHF2CF3    | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | C3F8       | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | c-C4F8     | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | SF6        | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | NF3        | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.3 - Photovoltaics                       | NF3 Remote | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A  | B               | C    | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|--|-----------------|------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|  |                 |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.E.4 - Heat Transfer Fluid                                      | n-C6F14         | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.5 - Other (please specify)                                   | CF4             | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.5 - Other (please specify)                                   | c-C4F8          | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.E.5 - Other (please specify)                                   | SF6             | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F - Product Uses as Substitutes for Ozone Depleting Substances |                 |      |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CHF3            | 0.00 | 1.32   | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0000 | 0.0000 | 0.0003   | 0.0007   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CH2F2           | 0.00 | 367.42   | 50.0                          | 20.0 | 53.8516                  | 0.0026 | 0.0026 | 0.0026 | 0.0726   | 0.1815   | 0.0382 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CHF2CF3         | 0.00 | 2,105.76   | 50.0                          | 20.0 | 53.8516                  | 0.0854 | 0.0147 | 0.0147 | 0.4161   | 1.0403   | 1.2554 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CH2FCF3         | 0.00 | 2,506.93   | 50.0                          | 20.0 | 53.8516                  | 0.1210 | 0.0175 | 0.0175 | 0.4954   | 1.2385   | 1.7793 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CH3CHF2         | 0.00 | 3.29   | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0000 | 0.0000 | 0.0007   | 0.0016   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CH3CF3          | 0.00 | 1,746.26   | 50.0                          | 20.0 | 53.8516                  | 0.0587 | 0.0122 | 0.0122 | 0.3451   | 0.8627   | 0.8633 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CF3CHFCHFCF2CF3 | 0.00 | 0.08   | 50.0                          | 0.0  | 50.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning          | CF3CHFCF3       | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B            | C    | D  | E                             | F   | G                        | H      | I      | J      | K  | L  | M      |
|---|--------------|------|--|-------------------------------|-----|--------------------------|--------|--------|--------|--|--|--------|
|   |              |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |     | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | CF3CH2CF3    | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | CHF2CH2CF3   | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | CH3CF2CH2CF3 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | CF4          | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | C2F6         | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | C3F8         | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | C4F10        | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | c-C4F8       | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | n-C5F12      | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.a - Refrigeration and Stationary Air Conditioning | n-C6F14      | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning                       | CH2FCF3      | 0.00 | 0.00   | 5.0                           | 0.0 | 5.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning                       | CH3CHF2      | 0.00 | 0.00   | 5.0                           | 0.0 | 5.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning                       | CHF3         | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A                                 | B               | C    | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|-----------------------------------|-----------------|------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|                                   |                 |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.F.1.b - Mobile Air Conditioning | CH2F2           | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CF3CHFCHFCF2CF3 | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CHF2CF3         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CH3CF3          | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CF3CHF3         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CF3CH2CF3       | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CHF2CH2CF3      | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CH3CF2CH2CF3    | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | CF4             | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | C2F6            | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | C3F8            | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | C4F10           | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | c-C4F8          | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | n-C5F12         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.1.b - Mobile Air Conditioning | n-C6F14         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents       | CH2FCF3         | 0.00 | 481.38   | 50.0                          | 20.0 | 53.8516                  | 0.0045 | 0.0034 | 0.0034 | 0.0951   | 0.2378   | 0.0656 |
| 2.F.2 - Foam Blowing Agents       | CH3CHF2         | 0.00 | 17.13  | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0001 | 0.0001 | 0.0034   | 0.0085   | 0.0001 |
| 2.F.2 - Foam Blowing Agents       | CF3CHF3         | 0.00 | 22.61  | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0002 | 0.0002 | 0.0045   | 0.0112   | 0.0001 |

| A                           | B               | C    | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|-----------------------------|-----------------|------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|                             |                 |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.F.2 - Foam Blowing Agents | CHF2CH2CF3      | 0.00 | 17.03  | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0001 | 0.0001 | 0.0034   | 0.0084   | 0.0001 |
| 2.F.2 - Foam Blowing Agents | CH3CF2CH2CF3    | 0.00 | 5.28   | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0000 | 0.0000 | 0.0010   | 0.0026   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | CHF3            | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | CH2F2           | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | CF3CHFCHFCF2CF3 | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | CHF2CF3         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | CH3CF3          | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | CF3CH2CF3       | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | CF4             | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | C2F6            | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | C3F8            | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | C4F10           | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | c-C4F8          | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | n-C5F12         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.2 - Foam Blowing Agents | n-C6F14         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.3 - Fire Protection     | CHF2CF3         | 0.00 | 95.30  | 50.0                          | 20.0 | 53.8516                  | 0.0002 | 0.0007 | 0.0007 | 0.0188   | 0.0471   | 0.0026 |
| 2.F.3 - Fire Protection     | CH2FCF3         | 0.00 | 0.00   | 50.0                          | 0.0  | 50.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.3 - Fire Protection     | CH3CHF2         | 0.00 | 0.00   | 50.0                          | 0.0  | 50.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.3 - Fire Protection     | CF3CHF2CF3      | 0.00 | 196.05   | 50.0                          | 20.0 | 53.8516                  | 0.0007 | 0.0014 | 0.0014 | 0.0387   | 0.0969   | 0.0109 |
| 2.F.3 - Fire Protection     | CF3CH2CF3       | 0.00 | 0.58   | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0003   | 0.0000 |
| 2.F.5 - Solvents            | CF3CHFCHFCF2CF3 | 0.00 | 0.77   | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0000 | 0.0000 | 0.0002   | 0.0004   | 0.0000 |

| A   | B            | C    | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|---|--------------|------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|   |              |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.F.5 - Solvents                              | CH3CF2CH2CF3 | 0.00 | 0.98   | 50.0                          | 20.0 | 53.8516                  | 0.0000 | 0.0000 | 0.0000 | 0.0002   | 0.0005   | 0.0000 |
| 2.F.5 - Solvents                              | n-C6F14      | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.6 - Other Applications (please specify)   | CHF3         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.F.6 - Other Applications (please specify)   | CH3CF3       | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G - Electrical Equipment                    |              | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1 - Electrical Equipment                  | CF4          | 0.00 | 4.46   | 10.0                          | 50.0 | 50.9902                  | 0.0000 | 0.0000 | 0.0000 | 0.0022   | 0.0004   | 0.0000 |
| 2.G.1 - Electrical Equipment                  | C2F6         | 0.00 | 5.49   | 10.0                          | 50.0 | 50.9902                  | 0.0000 | 0.0000 | 0.0000 | 0.0027   | 0.0005   | 0.0000 |
| 2.G.1 - Electrical Equipment                  | C3F8         | 0.00 | 32.10  | 10.0                          | 50.0 | 50.9902                  | 0.0000 | 0.0002 | 0.0002 | 0.0159   | 0.0032   | 0.0003 |
| 2.G.1 - Electrical Equipment                  | C4F10        | 0.00 | 21.96  | 10.0                          | 50.0 | 50.9902                  | 0.0000 | 0.0002 | 0.0002 | 0.0108   | 0.0022   | 0.0001 |
| 2.G.1 - Electrical Equipment                  | c-C4F8       |      |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1 - Electrical Equipment                  | n-C5F12      | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1 - Electrical Equipment                  | n-C6F14      | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1 - Electrical Equipment                  | SF6          | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.a - Manufacture of Electrical Equipment | CF4          | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.a - Manufacture of Electrical Equipment | C2F6         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.a - Manufacture of Electrical Equipment | C3F8         | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.a - Manufacture of Electrical Equipment | C4F10        | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.a - Manufacture of Electrical Equipment | c-C4F8       | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.a - Manufacture of Electrical Equipment | n-C5F12      | 0.00 | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B       | C     | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|---|---------|-------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|   |         |       | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.G.1.a - Manufacture of Electrical Equipment | n-C6F14 | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.a - Manufacture of Electrical Equipment | SF6     | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | CF4     | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | C2F6    | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | C3F8    | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | C4F10   | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | c-C4F8  | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | n-C5F12 | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | n-C6F14 | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.b - Use of Electrical Equipment         | SF6     | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.c - Disposal of Electrical Equipment    | CF4     | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.c - Disposal of Electrical Equipment    | C2F6    | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.c - Disposal of Electrical Equipment    | C3F8    | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.c - Disposal of Electrical Equipment    | C4F10   | 0.00  | 0.00   | 30.0                          | 30.0 | 42.4264                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.c - Disposal of Electrical Equipment    | c-C4F8  | 71.79 | 314.18   | 30.0                          | 30.0 | 42.4264                  | 0.0012 | 0.0008 | 0.0022 | 0.0931   | 0.0931   | 0.0173 |
| 2.G.1.c - Disposal of Electrical Equipment    | n-C5F12 | 0.00  | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.c - Disposal of Electrical Equipment    | n-C6F14 | 0.00  | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.1.c - Disposal of Electrical Equipment    | SF6     | 0.00  | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A                                | B       | C    | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|----------------------------------|---------|------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|                                  |         |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.G.2.a - Military Applications  | CF4     | 0.00 | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.a - Military Applications  | C2F6    | 0.00 | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.a - Military Applications  | C3F8    | 0.00 | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.a - Military Applications  | C4F10   | 0.00 | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.a - Military Applications  | c-C4F8  | 0.00 | 0.00   | 40.0                          | 40.0 | 56.5685                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.a - Military Applications  | n-C5F12 | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.a - Military Applications  | n-C6F14 | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.a - Military Applications  | SF6     | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | CF4     | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | C2F6    | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | C3F8    | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | C4F10   | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | c-C4F8  | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | n-C5F12 | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | n-C6F14 | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.b - Accelerators           | SF6     | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify) | CF4     | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify) | C2F6    | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify) | c-C3F6  | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify) | C3F8    | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify) | C4F10   | 0.00 | 0.00   | 10.0                          | 0.0  | 10.0000                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify) | c-C4F8  | 0.00 | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A  | B       | C        | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|--|---------|----------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|  |         |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 2.G.2.c - Other (please specify)                       | n-C5F12 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify)                       | n-C6F14 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify)                       | SF6     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.2.c - Other (please specify)                       | CHF3    | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.3.a - Medical Applications                         | N2O     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.3.b - Propellant for pressure and aerosol products | N2O     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.G.3.c - Other (Please specify)                       | N2O     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.H - Other  |         | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.H.1 - Pulp and Paper Industry                        | CO2     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.H.1 - Pulp and Paper Industry                        | CH4     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.H.1 - Pulp and Paper Industry                        | N2O     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.H.2 - Food and Beverages Industry                    | CO2     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.H.2 - Food and Beverages Industry                    | CH4     |          |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 2.H.2 - Food and Beverages Industry                    | N2O     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A - Livestock  |         | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.1.a.i - Dairy Cows                                 | CH4     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.1.a.ii - Other Cattle                              | CH4     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.1.b - Buffalo                                      | CH4     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.1.c - Sheep  | CH4     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.1.d - Goats  | CH4     |          |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.1.e - Camels                                       | CH4     | 1,653.79 | 1,545.29   | 20.0                          | 20.0 | 28.2843                  | 0.0127 | 0.0205 | 0.0108 | 0.3054   | 0.3054   | 0.1865 |
| 3.A.1.f - Horses                                       | CH4     | 1,183.95 | 4,194.61   | 20.0                          | 20.0 | 28.2843                  | 0.0935 | 0.0069 | 0.0293 | 0.8289   | 0.8289   | 1.3741 |

| A   | B   | C        | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|---|-----|----------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|   |     |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 3.A.1.g - Mules and Asses                       | CH4 | 4,660.04 | 3,442.16   | 20.0                          | 20.0 | 28.2843                  | 0.0630 | 0.0642 | 0.0240 | 0.6802   | 0.6802   | 0.9254 |
| 3.A.1.h - Swine                                 | CH4 | 535.36   | 298.49   | 20.0                          | 30.0 | 36.0555                  | 0.0008 | 0.0081 | 0.0021 | 0.0885   | 0.0590   | 0.0113 |
| 3.A.1.i - Poultry                               | CH4 | 378.14   | 174.11   | 20.0                          | 30.0 | 36.0555                  | 0.0003 | 0.0059 | 0.0012 | 0.0516   | 0.0344   | 0.0038 |
| 3.A.1.j - Other (please specify)                | CH4 | 177.87   | 338.62   | 20.0                          | 30.0 | 36.0555                  | 0.0010 | 0.0010 | 0.0024 | 0.1004   | 0.0669   | 0.0146 |
| 3.A.2.a.i - Dairy cows                          | CH4 | 15.12    | 43.00  | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0003 | 0.0127   | 0.0085   | 0.0002 |
| 3.A.2.a.i - Dairy cows                          | N2O | 207.76   | 250.82   | 20.0                          | 30.0 | 36.0555                  | 0.0005 | 0.0022 | 0.0018 | 0.0743   | 0.0496   | 0.0080 |
| 3.A.2.a.ii - Other cattle                       | CH4 | 0.00     | 0.59   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0000 | 0.0002   | 0.0001   | 0.0000 |
| 3.A.2.a.ii - Other cattle                       | N2O | 0.00     | 0.00   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.b - Buffalo                               | CH4 | 0.00     | 2.99   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0000 | 0.0009   | 0.0006   | 0.0000 |
| 3.A.2.b - Buffalo                               | N2O | 71.90    | 12.41  | 20.0                          | 20.0 | 28.2843                  | 0.0000 | 0.0013 | 0.0001 | 0.0025   | 0.0025   | 0.0000 |
| 3.A.2.c - Sheep                                 | CH4 | 450.83   | 246.44   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0068 | 0.0017 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.c - Sheep                                 | N2O | 38.19    | 6.66   | 20.0                          | 20.0 | 28.2843                  | 0.0000 | 0.0007 | 0.0000 | 0.0013   | 0.0013   | 0.0000 |
| 3.A.2.d - Goats                                 | CH4 | 71.84    | 115.79   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0006 | 0.0008 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.d - Goats                                 | N2O | 423.64   | 7.09   | 20.0                          | 20.0 | 28.2843                  | 0.0000 | 0.0080 | 0.0000 | 0.0014   | 0.0014   | 0.0000 |
| 3.A.2.e - Camels                                | CH4 | 111.86   | 173.14   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0009 | 0.0012 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.e - Camels                                | N2O | 16.06    | 8.95   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0002 | 0.0001 | 0.0027   | 0.0018   | 0.0000 |
| 3.A.2.f - Horses                                | CH4 | 11.53    | 6.43   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0002 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.f - Horses                                | N2O | 12.86    | 5.92   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0002 | 0.0000 | 0.0018   | 0.0012   | 0.0000 |
| 3.A.2.g - Mules and Asses                       | CH4 | 6.70     | 3.08   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0001 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.g - Mules and Asses                       | N2O | 7.42     | 14.13  | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0001 | 0.0042   | 0.0028   | 0.0000 |
| 3.A.2.h - Swine                                 | CH4 | 3.28     | 6.24   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.h - Swine                                 | N2O | 1.38     | 3.92   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0000 | 0.0012   | 0.0008   | 0.0000 |
| 3.A.2.i - Poultry                               | CH4 | 1.00     | 2.84   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.i - Poultry                               | N2O | 18.70    | 22.57  | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0002 | 0.0002 | 0.0067   | 0.0045   | 0.0001 |
| 3.A.2.j - Other (please specify)                | CH4 | 13.49    | 16.28  | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0001 | 0.0001 | 0.0000   | 0.0000   | 0.0000 |
| 3.A.2.j - Other (please specify)                | N2O | 0.00     | 0.59   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0000 | 0.0002   | 0.0001   | 0.0000 |
| 3.B - Land                                      |     | 0.00     | 2.16   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.1.a - Forest land Remaining Forest land     | CO2 | 1.03     | 905.89   | 20.0                          | 30.0 | 36.0555                  | 0.0071 | 0.0063 | 0.0063 | 0.2685   | 0.1790   | 0.1041 |
| 3.B.1.b.i - Cropland converted to Forest Land   | CO2 | 7.24     | 6,343.64   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0442 | 0.0443 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.1.b.ii - Grassland converted to Forest Land | CO2 | 0.00     | 2.99   | 20.0                          | 30.0 | 36.0555                  | 0.0000 | 0.0000 | 0.0000 | 0.0009   | 0.0006   | 0.0000 |

| A   | B   | C    | D  | E                             | F   | G                        | H      | I      | J      | K  | L  | M      |
|---|-----|------|--|-------------------------------|-----|--------------------------|--------|--------|--------|--|--|--------|
|   |     |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |     | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 3.B.1.b.iii - Wetlands converted to Forest Land       | CO2 | 0.00 | 21.01  | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0001 | 0.0001 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.1.b.iv - Settlements converted to Forest Land     | CO2 |      |  |                               |     | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.1.b.v - Other Land converted to Forest Land       | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.2.a - Cropland Remaining Cropland                 | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.2.b.i - Forest Land converted to Cropland         | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.2.b.ii - Grassland converted to Cropland          | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.2.b.iii - Wetlands converted to Cropland          | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.2.b.iv - Settlements converted to Cropland        | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.2.b.v - Other Land converted to Cropland          | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.3.a - Grassland Remaining Grassland               | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.3.b.i - Forest Land converted to Grassland        | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.3.b.ii - Cropland converted to Grassland          | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.3.b.iii - Wetlands converted to Grassland         | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.3.b.iv - Settlements converted to Grassland       | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.3.b.v - Other Land converted to Grassland         | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.4.a.i - Peat Extraction remaining Peat Extraction | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.4.a.iii - Other Wetlands Remaining Other Wetlands | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B   | C    | D  | E                             | F   | G                        | H      | I      | J      | K  | L  | M      |
|---|-----|------|--|-------------------------------|-----|--------------------------|--------|--------|--------|--|--|--------|
|   |     |      | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |     | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 3.B.4.b.i - Land converted for Peat Extraction                | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.4.b.ii - Land converted to Flooded Land                   | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.4.b.iii - Land converted to Other Wetlands                | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.5.a - Settlements Remaining Settlements                   | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.5.b.i - Forest Land converted to Settlements              | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.5.b.ii - Cropland converted to Settlements                | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.5.b.iii - Grassland converted to Settlements              | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.5.b.iv - Wetlands converted to Settlements                | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.5.b.v - Other Land converted to Settlements               | CO2 | 0.00 | -2.65  | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.6.b.i - Forest Land converted to Other Land               | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.6.b.ii - Cropland converted to Other Land                 | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.6.b.iii - Grassland converted to Other Land               | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.6.b.iv - Wetlands converted to Other Land                 | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.B.6.b.v - Settlements converted to Other Land               | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.C - Aggregate sources and non-CO2 emissions sources on land |     | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.C.1.a - Burning in Forest Land                              | CO2 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.C.1.a - Burning in Forest Land                              | CH4 | 0.00 | 0.00   | 0.0                           | 0.0 | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B   | C         | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M       |
|---|-----|-----------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|---------|
|   |     |           | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |         |
| 3.C.1.a - Burning in Forest Land                      | N2O | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.b - Burning in Cropland                         | CO2 | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.b - Burning in Cropland                         | CH4 |           |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.b - Burning in Cropland                         | N2O | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.c - Burning in Grassland                        | CO2 | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.c - Burning in Grassland                        | CH4 | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.c - Burning in Grassland                        | N2O | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.d - Burning in all other land uses              | CO2 | 169.05    | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0032 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.d - Burning in all other land uses              | CH4 | 41.48     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0008 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.1.d - Burning in all other land uses              | N2O | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.2 - Liming  | CO2 | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.3 - Urea application                              | CO2 | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.4 - Direct N2O Emissions from managed soils       | N2O | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.5 - Indirect N2O Emissions from managed soils     | N2O | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.6 - Indirect N2O Emissions from manure management | N2O | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.7 - Rice cultivation                              | CH4 | 0.00      | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 3.C.8 - CH4 from Drained Organic Soils                | CH4 | 2,317.34  | 1,475.18   | 20.0                          | 50.0 | 53.8516                  | 0.0419 | 0.0336 | 0.0103 | 0.7288   | 0.2915   | 0.6161  |
| 3.C.9 - CH4 from Drainage Ditches on Organic Soils    | CH4 | 13,700.60 | 12,819.17  | 20.0                          | 50.0 | 53.8516                  | 3.1651 | 0.1698 | 0.0896 | 6.3330   | 2.5332   | 46.5240 |

| A   | B   | C        | D  | E                             | F    | G                        | H      | I      | J      | K  | L  | M      |
|---|-----|----------|--|-------------------------------|------|--------------------------|--------|--------|--------|--|--|--------|
|   |     |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |        |
| 3.C.10 - CH4 from Rewetting of Organic Soils  | CH4 | 1,423.73 | 1,643.82   | 20.0                          | 80.0 | 82.4621                  | 0.1220 | 0.0155 | 0.0115 | 1.2993   | 0.3248   | 1.7938 |
| 3.C.11 - CH4 Emissions from Rewetting of Mangroves and Tidal Marshes                      | CH4 | 183.97   | 2,899.73   | 20.0                          | 80.0 | 82.4621                  | 0.3797 | 0.0168 | 0.0203 | 2.2921   | 0.5730   | 5.5819 |
| 3.C.12 - N2O Emissions from Aquaculture   | N2O | 3,469.28 | 4,506.56   | 20.0                          | 34.0 | 39.4462                  | 0.2099 | 0.0342 | 0.0315 | 1.5139   | 0.8905   | 3.0850 |
| 3.C.13 - CH4 Emissions from Rewetted and Created Wetlands on Inland Wetland Mineral Soils | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.C.14 - Other (please specify)   | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.C.14 - Other (please specify)   | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.C.14 - Other (please specify)   | N2O | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.D - Other   |     | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.D.1 - Harvested Wood Products   | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.D.2 - Other (please specify)  | CO2 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.D.2 - Other (please specify)  | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 3.D.2 - Other (please specify)  | N2O | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 4.A - Solid Waste Disposal  |     |          |  |                               |      | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 4.A.1 - Managed Waste Disposal Sites  | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 4.A.2 - Unmanaged Waste Disposal Sites  | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |
| 4.A.3 - Uncategorised Waste Disposal Sites  | CH4 | 0.00     | 0.00   | 0.0                           | 0.0  | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000 |

| A   | B   | C        | D  | E                             | F     | G                        | H      | I      | J      | K  | L  | M       |
|---|-----|----------|--|-------------------------------|-------|--------------------------|--------|--------|--------|--|--|---------|
|   |     |          | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |       | Combined Uncertainty (%) |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |         |
| 4.B - Biological Treatment of Solid Waste             |     | 0.00     | 0.00   | 0.0                           | 0.0   | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 4.B - Biological Treatment of Solid Waste             | CH4 |          |  |                               |       | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 4.B - Biological Treatment of Solid Waste             | N2O | 1,104.80 | 2,316.52   | 30.0                          | 50.0  | 58.3095                  | 0.1212 | 0.0047 | 0.0162 | 1.1444   | 0.6867   | 1.7812  |
| 4.C - Incineration and Open Burning of Waste          |     | 3,645.83 | 7,148.92   | 30.0                          | 50.0  | 58.3095                  | 1.1541 | 0.0191 | 0.0499 | 3.5318   | 2.1191   | 16.9637 |
| 4.C.1 - Waste Incineration                            | CO2 | 4,805.87 | 9,264.78   | 30.0                          | 50.0  | 58.3095                  | 1.9383 | 0.0263 | 0.0647 | 4.5770   | 2.7462   | 28.4911 |
| 4.C.1 - Waste Incineration                            | CH4 |          |  |                               |       | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 4.C.1 - Waste Incineration                            | N2O | 86.65    | 716.31   | 30.0                          | 100.0 | 104.4031                 | 0.0371 | 0.0034 | 0.0050 | 0.7078   | 0.2123   | 0.5460  |
| 4.C.2 - Open Burning of Waste                         | CO2 | 61.50    | 508.45   | 30.0                          | 150.0 | 152.9706                 | 0.0402 | 0.0024 | 0.0036 | 0.7536   | 0.1507   | 0.5906  |
| 4.C.2 - Open Burning of Waste                         | CH4 |          |  |                               |       | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 4.C.2 - Open Burning of Waste                         | N2O | 0.86     | 28.53  | 30.0                          | 40.0  | 50.0000                  | 0.0000 | 0.0002 | 0.0002 | 0.0113   | 0.0085   | 0.0002  |
| 4.D - Wastewater Treatment and Discharge              |     | 0.00     | 0.06   | 30.0                          | 100.0 | 104.4031                 | 0.0000 | 0.0000 | 0.0000 | 0.0001   | 0.0000   | 0.0000  |
| 4.D.1 - Domestic Wastewater Treatment and Discharge   | CH4 | 0.02     | 0.51   | 30.0                          | 100.0 | 104.4031                 | 0.0000 | 0.0000 | 0.0000 | 0.0005   | 0.0002   | 0.0000  |
| 4.D.1 - Domestic Wastewater Treatment and Discharge   | N2O | 24.03    | 25.90  | 50.0                          | 40.0  | 64.0312                  | 0.0000 | 0.0003 | 0.0002 | 0.0102   | 0.0128   | 0.0003  |
| 4.D.2 - Industrial Wastewater Treatment and Discharge | CH4 | 281.89   | 303.76   | 50.0                          | 100.0 | 111.8034                 | 0.0077 | 0.0032 | 0.0021 | 0.3001   | 0.1501   | 0.1126  |
| 4.D.2 - Industrial Wastewater Treatment and Discharge | N2O | 35.09    | 37.82  | 50.0                          | 100.0 | 111.8034                 | 0.0001 | 0.0004 | 0.0003 | 0.0374   | 0.0187   | 0.0017  |
| 4.E - Other (please specify)                          |     |          |  |                               |       | 0.0000                   | 0.0000 | 0.0000 | 0.0000 | 0.0000   | 0.0000   | 0.0000  |
| 4.E - Other (please specify)                          | CO2 | 4,230.72 | 8,098.02   | 10.0                          | 30.0  | 31.6228                  | 0.4355 | 0.0235 | 0.0566 | 2.4004   | 0.8001   | 6.4020  |

| A                            | B   | C                     | D  | E                             | F    | G                                   | H      | I      | J      | K  | L  | M       |
|------------------------------|-----|-----------------------|--|-------------------------------|------|-------------------------------------|--------|--------|--------|--|--|---------|
|                              |     |                       | Year T emissions or removals (Gg CO2 equivalent) | Activity Data Uncertainty (%) |      | Combined Uncertainty (%)            |        |        |        | Uncertainty in trend in national emissions introduced by emission factor uncertainty (%) | Uncertainty in trend in national emissions introduced by activity data uncertainty (%) |         |
| 4.E - Other (please specify) | CH4 | 938.47                | 1,855.71   | 0.0                           | 0.0  | 0.0000                              | 0.0000 | 0.0048 | 0.0130 | 0.0000   | 0.0000   | 0.0000  |
| 4.E - Other (please specify) | N2O | 3,188.42              | 8,072.39   | 50.0                          | 30.0 | 58.3095                             | 1.4715 | 0.0040 | 0.0564 | 2.3928   | 3.9880   | 21.6293 |
| <b>Total</b>                 |     | Sum(C):<br>143,131.52 | Sum(D):<br><b>388,030.77</b>                     |                               |      | Sum(H): <b>11.996</b>               |        |        |        |  | Sum(M): <b>176.4</b>   |         |
|                              |     |                       |  |                               |      | Uncertainty in total inventory: 3.5 |        |        |        |  | Trend uncertainty: 13.3  |         |

**Annex IV: Common Tabular Formats (CTF Tables)**