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Report No: PAD3720

INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT

PROJECT APPRAISAL DOCUMENT
ON A
PROPOSED LOAN

IN THE AMOUNT OF US$200 MILLION

TO THE

ARAB REPUBLIC OF EGYPT

FOR A

GREATER CAIRO AIR POLLUTION MANAGEMENT AND CLIMATE CHANGE PROJECT

September 13, 2020

Environment, Natural Resources & Blue Economy Global Practice
Middle East and North Africa Region

CURRENCY EQUIVALENTS

(Exchange Rate Effective August 31, 2020)

Currency Unit =	Egyptian Pound (EGP)
EGP 15.81 =	US$1

FISCAL YEAR
January 1 - December 31

ABBREVIATIONS AND ACRONYMS

AfD	French Development Agency (*Agence française de développement*)
AQM	Air Quality Management
CAPEX	Capital Expenditures
CBO	Community-based organization
CBSM	Community-based Social Marketing
CERC	Contingent Emergency Response Component
COED	Cost of Environmental Degradation
CPF	Country Partnership Framework
CSO	Civil Society Organization
CTA	Cairo Transport Authority
CURB	Climate Action for Urban Sustainability
DBO	Design, Build, and Operate
DDS	Detailed Design Study
EEAA	Egyptian Environmental Affairs Agency
EPAP	Egypt Pollution Abatement Project
ERR	Economic Rate of Return
ESF	Environmental and Social Framework
ESCP	Environmental and Social Commitment Plan
ESMF	Environmental and Social Management Framework
GC	Greater Cairo
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GoE	Government of Egypt
GM	Grievance Mechanism
GRS	Grievance Redress Service
IC-AQMP	Integrated Climate and Air Quality Management Plan
ICE	Internal combustion engine
IFC	International Financial Corporation
IMF	International Monetary Fund
INDC	Intended Nationally Determined Contribution
IPF	Investment Project Financing
JICA	Japan International Cooperation Agency
LMP	Labor Management Procedure
M&E	Monitoring and Evaluation
MENA	Middle East and North Africa
MoE	Ministry of Environment
MoERE	Ministry of Electricity and Renewable Energy
MoHP	Ministry of Health and Population
MoIC	Ministry of International Cooperation
MoLD	Ministry of Local Development
MoPED	Ministry of Planning and Economic Development

MoT	Ministry of Transport
MTR	Mid-Term Review
NGO	Nongovernmental Organization
NPV	Net Present Value
NSWMS	National Solid Waste Management Strategy
OMEX	Operations and Maintenance Expenditures
PCU	Project Coordination Unit
PDO	Project Development Objective
PM	Particulate Matter
PMEH	Pollution Management and Environmental Health
PPP	Public-Private Partnership
RF	Resettlement Framework
SC	Steering Committee
SDS	Sustainable Development Strategy
SEP	Stakeholder Engagement Plan
SLCP	Short-lived Climate Pollutant
SME	Small and Medium Enterprise
SWM	Solid Waste Management
TA	Technical Assistance
TIU	Technical Implementation Unit
ToR	Terms of Reference
UNDP	United Nations Development Programme
WHO	World Health Organization
WMRA	Waste Management Regulatory Authority

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DATASHEET

BASIC INFORMATION

Country(ies)	Project Name	
Egypt, Arab Republic of	Greater Cairo Air Pollution Management and Climate Change Project	
Project ID	**Financing Instrument**	**Environmental and Social Risk Classification**
P172548	Investment Project Financing	High

Financing & Implementation Modalities

[ ] Multiphase Programmatic Approach (MPA)	[ ] Contingent Emergency Response Component (CERC)
[ ] Series of Projects (SOP)	[ ] Fragile State(s)
[ ] Performance-Based Conditions (PBCs)	[ ] Small State(s)
[ ] Financial Intermediaries (FI)	[ ] Fragile within a non-fragile Country
[ ] Project-Based Guarantee	[ ] Conflict
[ ] Deferred Drawdown	[ ] Responding to Natural or Man-made Disaster
[ ] Alternate Procurement Arrangements (APA)	[ ] Hands-on Enhanced Implementation Support (HEIS)

Expected Approval Date	Expected Closing Date
29-Sep-2020	31-Dec-2026
Bank/IFC Collaboration	**Joint Level**
Yes	Complementary or Interdependent project requiring active coordination

Proposed Development Objective(s)

To reduce air and climate emissions from critical sectors and increase resilience to air pollution in Greater Cairo.

Components

Component Name	Cost (US$, millions)

Enhancing the Air Quality Management & Response System	17.50
Support the Operationalization of SWM Master Plans in Greater Cairo	126.00
Vehicle Emissions Reduction	40.00
Enhanced Capacity, Behavioral Change and Communication	6.20
Project Management and Monitoring & Evaluation	9.80

Organizations

Borrower:	Arab Republic of Egypt
Implementing Agency:	Ministry of Environment

PROJECT FINANCING DATA (US$, Millions)

SUMMARY

Total Project Cost	200.00
Total Financing	200.00
of which IBRD/IDA	200.00
Financing Gap	0.00

DETAILS

World Bank Group Financing

International Bank for Reconstruction and Development (IBRD)	200.00

Expected Disbursements (in US$, Millions)

WB Fiscal Year	2021	2022	2023	2024	2025	2026	2027
Annual	9.07	26.84	46.19	55.00	36.20	20.30	6.40
Cumulative	9.07	35.91	82.10	137.10	173.30	193.60	200.00

INSTITUTIONAL DATA

Practice Area (Lead) **Contributing Practice Areas**

Environment, Natural Resources & the Blue Economy	Energy & Extractives, Social Sustainabilty & Inclusion, Transport, Urban, Resilience and Land

Climate Change and Disaster Screening

This operation has been screened for short and long-term climate change and disaster risks

SYSTEMATIC OPERATIONS RISK-RATING TOOL (SORT)

Risk Category	Rating
1. Political and Governance	Substantial
2. Macroeconomic	Substantial
3. Sector Strategies and Policies	Substantial
4. Technical Design of Project or Program	Substantial
5. Institutional Capacity for Implementation and Sustainability	High
6. Fiduciary	Substantial
7. Environment and Social	High
8. Stakeholders	High
9. Other	
10. Overall	Substantial

COMPLIANCE

Policy

Does the project depart from the CPF in content or in other significant respects?

[ ] Yes [✓] No

Does the project require any waivers of Bank policies?

[ ] Yes [✓] No

Environmental and Social Standards Relevance Given its Context at the Time of Appraisal

E & S Standards	Relevance
Assessment and Management of Environmental and Social Risks and Impacts	Relevant
Stakeholder Engagement and Information Disclosure	Relevant
Labor and Working Conditions	Relevant
Resource Efficiency and Pollution Prevention and Management	Relevant
Community Health and Safety	Relevant
Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	Relevant
Biodiversity Conservation and Sustainable Management of Living Natural Resources	Not Currently Relevant
Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	Not Currently Relevant
Cultural Heritage	Relevant
Financial Intermediaries	Not Currently Relevant

NOTE: For further information regarding the World Bank's due diligence assessment of the Project's potential environmental and social risks and impacts, please refer to the Project's Appraisal Environmental and Social Review Summary (ESRS).

Legal Covenants

Sections and Description

Schedule 2, Section I. A.1. The Borrower shall, through the Ministry of Environment ("MoE"), not later than thirty (30) days after the Effective Date, or such later date as agreed with the Bank, establish and thereafter maintain at all times during the implementation of the Project, a Project Steering Committee with a composition (comprising, inter alia, the ministries of environment, planning and economic development, local development, transport, health and population, international cooperation, the Cairo, Qalyubia and Giza governorates and the Cairo Transport Authority), mandate, terms of reference and resources satisfactory to the Bank, to be responsible for, inter alia: (a) providing strategic and policy guidance on matters relating to the Project; and (b) coordinating inter-agency and inter-ministerial policies and roles, all in accordance with the provisions of the Project Operational Manual.

Sections and Description

Schedule 2, Section I. A.2. (b) The Borrower shall, through MoE, not later than thirty (30) days after the Effective Date, or such later date as agreed with the Bank, establish and thereafter maintain at all times during the

implementation of the Project, a Project Coordination Unit ("PCU") with a composition, terms of reference and resources acceptable to the Bank. The PCU shall be responsible for the overall coordination of the implementation and management (including technical procurement, financial management, environmental and social aspects, monitoring, evaluation, reporting and communication) of Project activities and results, all in accordance with the provisions of the Project Operational Manual.

Sections and Description

Schedule 2, Section I. A.3. The Borrower shall, through each participating ministry, department or agency, not later than thirty (30) days after the Effective Date, or such later date as agreed with the Bank, establish and thereafter maintain at all times during the implementation of the Project, a Technical Implementation Unit, with a composition, mandate, terms of reference and resources satisfactory to the Bank. Each Technical Implementation Unit shall be responsible for the day to day coordination, implementation and management of activities under its respective part of the Project, all in accordance with the provisions of the Project Operational Manual.

Sections and Description

Schedule 2, Section I. B.1. (a) To facilitate the implementation of the Project, the Borrower shall, through the MoE, not later than thirty (30) days after the Effective Date, or such later date as agreed with the Bank, prepare and adopt a Project Operational Manual in form and substance satisfactory to the Bank ("POM"), and such POM shall include, inter alia, the description of:

(i) detailed institutional arrangements including roles and responsibilities of various agencies for Project implementation;
(ii) procurement arrangements;
(iii) applicable environmental and social arrangements including a grievance redress mechanism;
(iv) detailed financial management and disbursement arrangements and audit procedures; and
(v) reporting, monitoring and evaluation arrangements.

Sections and Description

Schedule 2, Section I. B.2. (a) The Borrower shall, through MoE, not later than thirty (30) days after the Effective Date, enter into an Inter-Ministerial Agreement with inter alia, the MoLD, MoHP, MoT, Cairo governorate, Cairo governorate and Qalyubia governorate, or any other participating ministry, department or agency, in form and substance satisfactory to the Bank.

Conditions

I. STRATEGIC CONTEXT

A. Country Context

1. **The Arab Republic of Egypt (Egypt) has been implementing an important economic reform program, which has resulted in improved macroeconomic conditions.** The reforms, which have led to economic growth, reductions in inflation, and an improved climate for the private sector and competitiveness, have been supported by the international donor community, including through the World Bank Programmatic Development Policy Financing and the International Monetary Fund's (IMF) three-year Extended Fund Facility. Before the outbreak of the coronavirus (COVID-19) pandemic in late 2019, economic growth was robust and macroeconomic imbalances had broadly improved. Growth was 5.6 percent in 2019 (up from 5.3 percent in the previous year), inflation was curbed to return to single digits, and debt-to-GDP ratio was brought to below the 100 percent mark.

2. **The environmental conditions, however, remain challenging, particularly in Greater Cairo (GC).**[1] The main environmental challenges in GC are air and water pollution, as elaborated in the Egypt - Cost of Environmental Degradation (COED) study (2019).[2] Air pollution affects human health significantly leading to respiratory and cardiovascular diseases, morbidities and premature mortalities. The study has estimated that the economic cost of these health effects in GC alone at about 1.4 percent of national Gross Domestic Product (GDP), annually.[3]

3. **Ambient air pollution is the most significant environmental health issue in GC, and despite recent improvements it still weighs heavily on the quality of life of its residents and the economy**. Despite significant improvements in air quality in recent years, with GC's fine particulate matter (PM)—that is, particles with a diameter of 10 micrometers or smaller (PM_{10})—concentrations falling by 25 percent in the last decade, the city's air pollution levels exceed national thresholds by a factor of two and international standards by multiple factors. Recent studies have also shown significant correlations between air pollution and COVID-19, although more research is needed to understand the causal underpinnings as well as the physiological relationships.[4] Pollution management is key to providing safe living conditions for communities while reducing the health burden, fiscal strain and economic costs from environmental degradation. In addition, pollution management also has a significant climate dividend, in that a reduction of emissions is also favorable for the global climate. Further, air pollution and adverse climate impacts individually and jointly threaten the longevity of Egypt's draw for tourism (a sector which contributes about 12 percent to GDP and employs 10 percent of the labor force) by degrading Egypt's rich cultural heritage and creating conditions that discourage tourists from visiting altogether.

[1] Greater Cairo is the largest metropolitan area in Egypt comprising, as per a more recent definition, the entire territories of Cairo, Giza and Qalyubia Governorates. The former administrative definition of Greater Cairo included Cairo Governorate, and the urban cities of Giza and Qalyubia Governorates, housing about 18 percent of the population, that is, approximately 18 million. The area of intervention of the project is limited to the narrower administrative definition of Greater Cairo.
[2] Arab Republic of Egypt - Cost of Environmental Degradation: Air and Water Pollution, 2019.
[3] Arab Republic of Egypt - Cost of Environmental Degradation: Air and Water Pollution, 2019.
[4] A few notable studies from different geographies include: "Exposure to air pollution and COVID-19 mortality in the United States: A nationwide cross-sectional study," "Incidence of COVID-19 and Connections with Air Pollution Exposure: Evidence from the Netherlands," and "Air pollution and case fatality of SARS in the People's Republic of China: an ecologic study."

4. **Climate change will further exacerbate breathing conditions by creating more "natural dust" in GC.** Climate change models project Egypt's mean annual temperature to increase between 2 ºC and 3 ºC by 2050 and an increase in the duration of long-lasting heatwaves, as well as the frequency and intensity of droughts. These described phenomena of a changing climate will increase natural dust and fine particles in the atmosphere, and together with more frequent sandstorms, increase pressures on citizens' health through the prevalence and severity of cardiopulmonary conditions, among other health issues.[5]

5. **Climate change will contribute to more favorable conditions for self-incineration and spread of solid waste fires.** Extreme heat and low humidity boost water evaporation from waste in unregulated dumpsites, increasing the likelihood of self-combustion of dried out organic matter. Self-combusted or sometimes incinerated waste spread more easily and faster in dry conditions, consuming a greater area and volume of waste. Burning waste releases a mix of greenhouse gases (GHGs) and PM, as well as toxic gases, exacerbating air pollution and posing a health hazard, particularly to people with respiratory conditions.

B. Sectoral and Institutional Context

6. **Reducing air pollution and climate pollutant emissions are top priorities for the Government of Egypt (GoE).** As stated in the Sustainable Development Strategy (SDS) Egypt Vision 2030, the declared target is to reduce PM_{10} concentrations by 50 percent by 2030. Similarly, as party to the United Nations Framework Convention on Climate Change, the GoE has committed to the reduction of GHG emissions and has already formulated its Intended Nationally Determined Contribution (INDC). The INDC indicates the importance of taking actions to reduce emissions in the transport and solid waste management (SWM) sectors. As stated in both the SDS Egypt Vision 2030 and reflected in its INDC, the specific goals of the GoE are to 'develop and implement a strong, economically feasible mitigation program which would achieve the proposed emission reductions for 2030.'

7. **Air pollution concentrations, despite a significant reduction in recent years, are still at considerably high levels.** GC air quality has improved since 2010. The opening of metro line 3 in 2012 and its extension in 2014 contributed to reducing the city's PM_{10} air pollution by more than 3 percent.[6] Moreover, the reduction of fuel subsidies under the 2016–2019 World Bank/IMF reform program resulted in a PM reduction of about 4 percent by 2018. Additional environmental and health benefits are expected from the ongoing subsidy reform program. Yet, recent GC pollution levels, which are at an annual average of about 120 $\mu g/m^3$ of PM_{10}, are still several times higher than the World Health Organization (WHO) recommended concentrations (annual average of PM_{10}: 20 $\mu g/m^3$) and are about 50 percent higher than the national guidelines (annual average of PM_{10}: 80 $\mu g/m^3$).

8. **Of all fine particles, short-lived climate pollutants (SLCPs) are of priority concern for this project, due to their dual impact on local air quality and climate change.** SLCPs are linked to waste burning and to solid particles emitted during incomplete combustion. Reducing SLCPs, such as Black Carbon, is important for this project, because this type of pollutant has both strong links to local air pollution (as it is a significant fraction of PM_{10} concentrations) as well as for climate change, as it has a warming potential

[5] Sand and Dust Storms in the Middle East and North Africa (MENA) Region: Sources, Costs, and Solutions. 2020.
[6] Motor Vehicle Density and Air Pollution in Greater Cairo: Fuel Subsidy Removal and Metro Line Extension and their Effect on Congestion and Pollution? 2019.

that is about 900 times stronger than CO_2 over a one hundred year period. Moreover, evidence suggests that Black Carbon has more significant health effects than other particle species.[7]

9. **The open burning of waste and the combustion of fossil fuels in vehicle engines are the primary sources of PM_{10} concentrations in the GC area.** Recent air pollution source attribution studies show that motor vehicle emissions as well as the open burning of waste are the largest contributors to PM_{10} concentrations.[8] Together, these two sources account for about two-thirds of ambient fine particle air pollution concentrations.

10. **Adequate SWM in GC is critical to improving air quality.** Municipal waste in GC is generated at a rate of approximately 0.8 kg/capita/day in urban areas (that is, approximately 5,256 tons per year in the area of intervention, in addition to the special types of industrial, hazardous and construction and demolition waste) and collection coverage is about 70 percent. The area faces significant SWM challenges with respect to collection, transfer and final disposal, many of which are exacerbated by the increasing levels of waste generation, the changing waste characteristics, lack of sufficient infrastructure, uncontrolled spread of urban development and inappropriate disposal practices by communities and individuals. As a result, uncollected waste and poorly treated waste such as unrecycled plastic (which is more than half) are dumped in open sites and are subject to open burning or end up contaminating water bodies. Poor SWM, especially in terms of organic treatment, recycling, and disposal is responsible for human-made or self-igniting waste burning in dumps and contributes to about one-third of GC air pollution in terms of PM_{10}.

11. **The SWM Institutional Framework remains fragmented.** Institutional responsibilities for different aspects of SWM are dispersed among different ministries, governorates, and agencies. The Ministry of Environment (MoE), through its Waste Management Regulatory Authority (WMRA), is responsible for (a) establishing the overall direction of waste management policy, including tariff policies and enhancement of the role of the private sector; (b) overseeing the preparation and provision of guidance for the implementation of the National SWM Strategy and the Governorate SWM Master Plans in collaboration with the Ministry of Local Development (MoLD) and the concerned governorates; and (c) playing a regulatory enforcement role (handled through the Egyptian Environmental Affairs Agency [EEAA]). The MoLD works directly with the governorates responsible for the implementation of these policies on the ground. MoLD also provides technical assistance (TA) to improve service quality in governorates. SWM collection and transfer services are provided by public entities (for example, Cairo and Giza Cleanliness and Beautification Authorities), international private companies, national private companies, small contractor companies, and the informal sector.

12. **A new SWM Strategic and Regulatory Framework is aimed at improving sector performance.** In 2017, the MoE led the preparation of a National Solid Waste Management Strategy (NSWMS) and 27 SWM Master Plans, covering all the Governorates of Egypt. These specify the necessary actions and investments needed for each governorate to improve SWM services. On the regulatory side, on August 19, 2020 the Egyptian Parliament approved in principle a draft law to regulate waste management. The new law sets the general framework for planning and preparing strategies and management of all types of waste and

[7] See for example, forthcoming report, titled "Health Effect Associations with Short- and Long-Term Exposures to $PM_{2.5}$ Constituents and Source Components."
[8] See for example: "PM source apportionment in Cairo: recent measurements and comparison with previous studies." 2014. International Journal of Science and Technology.

ensuring that planning is linked to financing, and that effective cost-recovery mechanisms are developed and applied. The proposed law has specific provisions to attract the private sector to invest in SWM, and entitles them to all the benefits, exemptions and guarantees granted to the private sector under the Investment Law N0. 72 of 2017. The law also defines clearer roles and responsibilities for all stakeholders, as well as the licensing procedures.

13. **The condition of women in the waste sector.** Women are predominantly responsible for the manual sorting of municipal waste in separate piles of recyclables, while the collection process is dominated by men.[9] Women tend to have limited access to safety gear, lack information on health risks from hazardous substances, and on properly handling this type of waste. Their average income is lower than that of men.[10] Further, women also tend to have less access to productive assets such as land, credit, machinery and equipment to conduct their own collection and recycling activities.[11] The lower skill levels of women in solid waste management, mainly those working in the informal sector and have limited access to technical and business training, make them more likely to be excluded from better employment opportunities in the solid waste value chain.[12]

14. **Air Pollution in GC from public transport.** Most motorized trips in GC are by public transport vehicles, making them the priority for potential emission reduction gains. Of the 22 million motorized trips made a day in GC, 63 percent are on public transport: metro, buses, mini-buses, and microbuses. Except for the metro, these vehicles run mainly on very low-quality diesel fuel. Private car ownership remains among the lowest worldwide, at approximately 130 cars per 1,000 people.

15. **Electric buses as the focus for making inroads in e-mobility**. The e-mobility strategy of the MoE argues for prioritizing high-usage and high-occupancy vehicles for maximizing the benefits of emission reductions.[13] Public transport is considered a suitable entry point for e-mobility in Egypt due to the high mileage and possible energy savings and tank-to-wheel consumption savings. Moreover, diesel consumption by the Cairo Transport Authority (CTA) fleet—which uses inferior quality diesel fuel, with a Sulphur content more than 100 times international standards[14]—has doubled over the last 10 years. Analogously, buses with cleaner internal combustion engines, even with filters, will not reduce emissions. Consequently, e-buses are a particularly convincing choice in the context described for GC.

16. **Expectations in Egypt are high for e-mobility to reduce both air pollution and the climate pollution footprint.** The GoE has announced plans to launch an electric vehicle industry master plan. However, Egypt currently lacks a national strategic plan for comprehensive e-mobility. Charging point operators have been allowed to expand their businesses without regulations on service planning, pricing regime, or visibility from the power grid. Regulatory authority over systems relevant to e-mobility is dispersed among several agencies. For instance, registration of personal electric vehicles has been under the Ministry of Interior on an ad hoc basis. The Land Transport Regulatory Authority issues licenses for

[9] CID Consulting, 2008. The informal sector in waste recycling in Egypt. GIZ.
[10] CWG, GIZ 2011. The Economics of the Informal Sector in Solid Waste Management.
[11] GIZ, 2011. Recovering resources, creating opportunities. Integrating the informal sector into solid waste management.
[12] This is in line with data on labor force participation in Egypt, with female rate at 21.9 percent compared to male rate at 70.8 percent (International Labour Organization, ILOSTAT database. Data retrieved on June 21, 2020.)
[13] Mainstreaming Electric Mobility in Egypt. 2019.
[14] Mainstreaming Electric Mobility in Egypt. 2019.

bus routes that could include e-buses. Efforts to streamline the regulatory framework for e-mobility have begun.[15]

17. **A demonstration e-mobility project will provide valuable lessons on operational requirements for successful and scalable e-mobility in all of GC.** International experience shows that without thoughtful testing and assessment of operational requirements on the ground, e-bus deployment can fail. There is a need to identify and address hurdles for the deployment of e-buses, including technological complexity and unclear regulatory regime.[16] The demonstration of e-buses under the project is a sustainable intervention to test the concept and the technologies. The technologies include fast and slow charging, battery sets, and mobile cooling. Cooling is relevant for proper ventilation that prevents the spread of illness.[17] For instance, the demonstration of e-buses in 2019 by the Alexandria Passenger Transport Authority faced implementation challenges. First, the cost of upgrading the power supply grid was significantly higher than expected. Second, the tariff regime charged twice the regular rate, which jeopardized financial viability. Therefore, the demonstration of e-buses in GC requires thoughtful planning and systematic assessment, as proposed in this project. Scale-up will be possible after incorporating the lessons learned.

18. **E-buses will reduce emissions, increase the frequency of service, and improve female rider experience.** Women face greater mobility constraints compared to men as they tend to perceive bus services as unfriendly and insecure.[18] However, the Alexandria Passenger Transport Authority's experience suggests that the enhanced quality of the e-bus fleet (for example, lighting improvements) may have improved women's experience. When women can use public transport safely, they can access economic opportunities. The demonstration in this project also seeks to improve service by increasing service frequency, providing USB charging ports, Wi-Fi, and security cameras inside and outside the buses. E-buses will also have air conditioning and access for disabled people. A better service will attract users, even some who regularly use a car.

C. Relevance to Higher Level Objectives

19. **The project is aligned with GoE's top priorities**. The Egypt Vision 2030 –SDS aims to improve the quality of life around three main dimensions: economic, social and environmental. Acknowledging in particular the detrimental effects that air pollution can have on human health, one of the goals of the SDS is the reduction of PM_{10} pollution concentrations by 50 percent by 2030. "Improving living standards" has also been articulated in the *Egypt takes Off* work program, which was presented by the Prime Minister to parliament in 2018, highlighting the newly formed cabinet's policy priorities. Strengthening GC capacity to abate pollution will positively affect well-being and livelihoods, including those of the poor.

20. **The project is aligned with World Bank Group corporate and regional priorities.** The proposed project aligns closely with the World Bank Group's MENA enlarged strategy (March 2019). It supports the 'resilience to climate shocks pillar' by developing an integrated climate and air quality management plan and improving service delivery in the waste management sector of GC, as well as leveraging the role of the private sector and digital transformation. The project will also contribute to the World Bank Group's

[15] See the 2019 GoE Interministerial Committee to address e-mobility challenges and opportunities and develop a high-level strategy.
[16] Mainstreaming Electric Mobility in Egypt. 2019.
[17] *https://blogs.worldbank.org/transport/fight-against-covid-19-public-transport-should-be-hero-not-villain*.
[18] See UN Women, 2013. Study on ways and methods to eliminate sexual harassment in Egypt.

strategic goals of eradicating extreme poverty and boosting shared prosperity in a sustainable manner by reducing pollution loads, which are a significant drag on the health and productivity of GC residents, in particular poorer residents who are particularly affected by air pollution. The project will also support the World Bank Group COVID-19 Crisis Response Approach Paper's Pillar 1 (Saving Lives), Pillar 3 (Ensuring Sustainable Business Growth and Job Creation), and Pillar 4 (Strengthening Policies, Institutions and Investments for Rebuilding Better), and is in line with the MENA-wide platform supporting a coordinated response. The project is also aligned with the World Bank Group's Gender Strategy FY2016–FY2023 by increasing economic opportunities for women (Pillar 2), with the commitment of the MENA Climate Action Plan 2016–2020 of increasing World Bank Group finance in climate change by 30 percent as well as increasing the share of adaptation financing, and with the MENA Regional Gender Action Plan FY2018–FY2023 by contributing to women's economic empowerment (Priority Area 1).

21. **The project is aligned with the World Bank Group's strategy in Egypt**. The World Bank Group's Systematic Country Diagnostic (2015) found that Egypt's past development path came with serious environmental implications, resulting in air, water and soil pollution and associated human health impacts. The World Bank Group's Egypt Country Partnership Framework (CPF) for FY2015–FY2019,[19] which was extended for two years in 2019, supports transformational changes to the economic and social space in Egypt, in addition to assuring that the country's development is environmentally sustainable, noting that "environmental sustainability, a long-term issue for Egypt, will be integral to World Bank Group initiatives under the CPF." The CPF further recognizes that "environmental degradation negatively affects health as well as prospects for future economic growth," and identifies air pollution as the priority among environmental challenges.

Country Program Adjustment Responding to COVID-19

22. **Approach to Country COVID-19 response and impact on Country Program.** The World Bank Group's CPF for FY2015–FY2019 is organized under three closely interconnected strategic focus areas, supporting transformational changes to the economic and social space in Egypt: (a) improving governance; (b) promoting private sector led job creation and (c) fostering social inclusion. The challenges posed by the COVID-19 crisis reconfirm these CPF pillars with a focus on structural reforms, while supporting the poor and highly impacted sectors through strengthening the social safety net and enabling private sector investment and job creation.

23. **Impact of the COVID-19 pandemic on the country and government response.** The economic and human impact of the COVID-19 pandemic on Egypt will be severe. As of early August 2020, Egypt had recorded 96,336 cases and 5,141 deaths; Egypt's new cases and fatalities began to decline in mid-June. The COVID-19 pandemic and its disruptive repercussions have impacted the macroeconomic environment, which was at a comfortable level of foreign reserves. At the same time, the COVID-19 crisis hit when structural challenges continued to persist, notably the still-elevated government debt-to-GDP ratio feeble revenue-mobilization, sluggish private sector activity and job-creation, and underperformance of critical foreign income-earning activities. The current crisis is causing an uptick in unemployment and threatens to undermine the recent economic recovery and exacerbate the pre-existing structural challenges. Growth is projected to decline from 5.6 percent in FY2019 to 3.4 percent in FY2020. The budget deficit is also forecast to widen to 8.2 percent of GDP in FY2020. Reserves remain ample, at US$38.2 billion end-FY2020, although buoyed by substantial external financing, notably from

[19] Report no. 94554-EG. Discussed by the Board of Executive Directors on December 17, 2015.

the IMF as well as a sovereign Eurobond issuance. Nevertheless, ongoing pressures on Egypt's external accounts are expected to persist due to the disrupted international trade and the global recession which will further weaken Egypt's exports and foreign direct investment. While remittances may initially react countercyclically and rise to support Egyptian households' consumption, they are expected to decline, especially with the downturn in Gulf countries (due to the oil price crash). Thus, the external financing gap for FY2021 remains substantial (around 2 percent of GDP); this gap is being covered by Eurobond issuances as well as loans from development partners.

24. In response to this crisis, Egypt has undertaken measures to curb the spread of COVID-19 and mitigate its adverse implications for the economy. The emergency response included (a) enforcing a partial lockdown and suspending air traffic between mid-March and end-June; (b) allocating an emergency response package worth EGP 100 billion (1.7 percent of GDP), in part to scale up health expenditures; (c) easing monetary policy and liquidity conditions to enable individuals and firms to continue accessing credit at better terms, as well as introducing forbearance measures in the form of delayed tax and loan payments, to alleviate immediate financial pressures on individuals and businesses; (d) augmenting social protection programs, to partially shield the most vulnerable groups from the economic fallout resulting from the pandemic; and (e) providing targeted support to specific sectors, including through the CBE's initiative to allocate resources to extend soft loans at a preferential discount rate, and providing subsidized electricity tariffs to all industries. Furthermore, short term measures to mitigate the health and environmental hazards associated with the handling of waste resulting from COVID-19 extended health care services include: (a) allocation of dedicated transfer stations for health care waste; (b) immediate removal and disposal of health care waste from large hot spots; (c) enforcement of the Occupational Health and Safety guidelines for cleanliness/waste workers; (d) imposing the use of Personal Protective Equipment in public places, administration spaces and in public as well as private mass transportation.

25. **World Bank Group support for responding to the crisis.** To strengthen Egypt's resilience in response to such severe shocks, it will be crucial to sustain macroeconomic stability, and initiate the second wave of structural reforms that would resolve binding constraints to greater private sector activity and job creation. The World Bank Group support for responding to the crisis include the following:

(a) **Support to health for saving lives.** Early in the pandemic, and responding to a GoE request, the World Bank activated a CERC under the Transforming Egypt's Healthcare System Project (P167000), reallocating US$7.09 million to support country preparedness and to finance the non-procurable costs associated with the clinical screening and detection of suspected COVID-19 cases by physicians and nurses. In parallel, International Financial Corporation (IFC) offered a TA grant to advise on contracting the private sector in the COVID-19 response, including through tariff guidelines and contracts.

As part of the Fast Track Facility, the World Bank supported the Egypt COVID-19 Response Project (US$50 million) that will focus on the immediate operational challenges and critical areas of Egypt's national COVID-19 response. Project funds will complement the national response plan through (a) procuring and distributing medical equipment necessary for the COVID-19 response; (b) 'corona incentive pay' for health care personnel working at COVID-19 facilities or COVID-19-related tasks; (c) health worker training; (d) operations of specifically designated quarantine, isolation and treatment centers; (e) mobilization of rapid response teams in contact tracing of COVID-19 cases; (f) development of messaging

platforms and tools; (g) innovative Monitoring and Evaluation (M&E) of social distancing strategies; and (h) adopting proper policy tools to optimize the COVID-19 response.

(b) **Social response for protecting poor and vulnerable people.** The US$400 million "Supporting Egypt's Universal Health Insurance System Project" will provide temporary support for three fiscal years to the most vulnerable segments of the society affected by the COVID-19 pandemic, and finance the costs associated with their utilization of the "Payment on The Expense of the State" (PTES). The PTES is fully funded by the Treasury and covers Egyptians who are not able to afford private treatment and are not affiliated with public and/or private insurance systems. Through the US$500 million "Strengthening Social Safety Nets" Additional Financing Project the government added 160,000 new households to the Takaful and Karama Program (TKP) bringing the total number of people under the TKP to 3.11 million households (approximately 11 million individuals). The TKP budget will also increase from EGP 18.5 billion to EGP 19.3 billion and coverage will reach a total of 3.5 million households. The Bank also prepared a Social Protection Response and Recovery Policy Note including options and innovations in digital payments for the poor and the vulnerable.

(c) **Economic response for saving livelihoods, preserving jobs, and ensuring more sustainable business growth and job creation**. The World Bank has prepared a Country Private Sector Diagnostic assessment which identifies the current constraints and the reforms needed to unlock the potential of the private sector. Under the UK Government supported Strategic Partnership for Egypt's Inclusive Growth Trust Fund, the World Bank is supporting the GoE in drafting the co-existence procedures for some vital economic segments. IFC is supporting the private sector with emergency funding. IFC provided liquidity support to Financial Institutions Group clients under IFC's COVID-19 Fast Track Facility: US$100 million and US$50 million working capital facilities to the Commercial International Bank and Al-Watany Bank of Egypt respectively.

(d) **Strengthening policies, institutions and investments for resilient/sustainable recovery.** The World Bank is discussing reforms for the immediate COVID-19 response, and structural reforms for longer term economic recovery. IFC provided portfolio stress testing advice and training for IFC banking and Monetary Financing Institution clients to assess the resilience of financial institutions. The proposed Greater Cairo Air Pollution and Climate Change Project (US$200 million) will contribute towards resilient and sustainable recovery which includes specific COVID-19 response in support of Government efforts to mitigate health and environmental hazards. The activities are focused on building responsiveness and resilience into institutions and systems with an emphasis on the health sector in treating and minimizing contaminated waste, the service sector in enhancing worker safety as well as awareness raising on the links between increased risk of respiratory infection and air pollution.

26. **Selectivity, complementarity, partnerships.** Plans for portfolio restructuring and new lending have been discussed with authorities and shared with development partners through the existing donor coordination platform led by Ministry of International Cooperation (MoIC). Support to the health sector was closely coordinated with key partners (including WHO, United Nations Development Programme [UNDP], and UK-Foreign Commonwealth and Development Office to ensure complementarity. Dialogue and coordination with UNDP, United Nations Population Fund, and United Nations Children's Fund on the

social response is underway, and the Bank is systematically exploring partnerships for its new operations: Japan International Cooperation Agency (JICA) and the French Development Agency (*Agence française de Développement*, AfD) are expected to join the Universal Health Insurance project, and options for jointly financing the potential follow-up social insurance operation are under discussion with JICA and the African Development Bank. While the European Bank for Reconstruction and Development and the European Investment Bank mobilized emergency lines of credit for small and medium enterprises (SMEs) through commercial banks, the World Bank capitalized on its ongoing operation Catalyzing Entrepreneurship for Job Creation, to accelerate disbursements. The IMF's Executive Board approved Egypt's 12 months US$5.2 billion loan under the Stand-By Agreement (SBA) instrument. The loan program supports the second wave of Egypt's economic reform, with special focus on structural reforms. This includes allocations for health spending, an expansion of the TKP cash transfer social programs, and temporary support for the most harshly impacted sectors. It also targets maintaining Egypt's macroeconomic stability, prioritizing necessary social and spending.

II. PROJECT DESCRIPTION

A. Project Development Objective

PDO Statement

27. The Project Development Objective (PDO) is to reduce air and climate emissions from critical sectors and increase resilience to air pollution in Greater Cairo.

28. The reduced emissions will lower pollution concentrations and improve air quality. Targeted air pollutants include PM_{10}, while climate pollutants include CO_2, and SLCPs, including Black Carbon.

PDO level Indicators

29. PDO-level key results indicators are the following:

(a) Reduction in Greenhouse gas emissions (CO_2 equivalent) from municipal solid waste (percentage);

(b) Reduction of large-scale solid waste fires per annum (percentage);

(c) Greenhouse gas emissions (CO_2 equivalent) from public buses on selected routes (percent change against normalized baseline);

(d) Black Carbon emissions from public buses (percent change against normalized baseline); and

(e) Targeted people taking self-protective action in response to alert of a high pollution event (share of surveyed people adopting avoidance behavior).

B. Project Components

30. The overall approach of the project is to support a critical combination of institutional and investment actions to address the major determinants of air and climate pollutants in GC. The project

comprises five components, which are summarized below (*a more detailed description of the project components, including the integration of climate positive interventions, citizen engagement and gender actions, is provided in Annex 2*).

Component 1: Enhancing the Air Quality Management & Response System (US$17.5 million)

31. This component comprises two subcomponents, which are described below.

32. **Subcomponent 1.1: Reduction of air pollution and GHGs (US$3.5 million)**. This subcomponent will support the carrying out of a program of TA activities on reduction of air pollution and GHGs, namely: (a) development of an Integrated Climate and Air Quality Management Plan (IC-AQMP) including a time-bound action plan for its implementation; (b) strengthening Air Quality Management (AQM) regulatory and policy tools through (i) developing a mobile source emissions inventory including road and nonroad sources, and integrating it with existing inventories and (ii) continuous monitoring of short lived climate pollutants, greenhouse gases, and carbon dioxide monitoring; (c) development and rolling out of a specialized AQM and green jobs skills training program in universities and ministries including curricula such as chemical engineering, atmospheric science, environmental economics and environmental health, renewable energy interventions, energy efficiency and environmental economics, and resource efficiency/circular economy interventions; and (d) strengthening policy dialogue by carrying out assessments of the environmental health and the economic benefits of priority climate and air quality interventions, including cost-benefit and cost-effectiveness of emission abatement investments and capacity-building initiatives such as the trainings program.

33. **Subcomponent 1.2: Strengthening resilience to air pollution (US$4 million).** This subcomponent will strengthen resilience to air pollution through: (a) improving air quality forecasting tools through development of a chemical transport model-based approach and its integration with local air quality monitoring data and dissemination of the forecasting information; (b) establishing institutional response mechanisms for high pollution days such as definition of criteria and protocols for identification of air quality action days and development of emergency plans and applicable decision protocols for said air quality action days; and (c) strengthening the technical capacity of the National Committee for Crisis Management and Risk Reduction for implementation and enforcement of the protocols.

Component 2: Support the Operationalization of SWM Master Plans in Greater Cairo (US$126 million)

34. This component comprises three subcomponents, as described below.

35. **Subcomponent 2.1: Waste Management Infrastructure (US$108 million).** This subcomponent will support the development of new and/or upgrading of existing waste management infrastructure, in particular: (a) construction of an integrated waste management facility at the 10th of Ramadan location including, *inter alia*, common infrastructure such as main and axis roads, water and wastewater connections and electricity connections around and within facility, disposal facilities for healthcare, demolition and construction waste; and provision of technical assistance for associated studies, bidding documents, environmental and social impact assessment; (b) closing and rehabilitation/containment of Abou Zaabal dumpsite (including, *inter alia*, provision of technical assistance for preparation of detailed engineering studies, bidding documents, environmental and social impact assessments and supervision of works); (c) construction of a hazardous waste treatment and final disposal facility based on the findings of a detailed feasibility study and preparation of associated environmental and social impact assessments;

(d) construction of priority environmentally controlled transfer stations (including, *inter alia*, provision of technical assistance for preparation of a detailed engineering designs , bidding documents, environmental and social impact assessments, supervision of works and a comprehensive technical and financial operational manual for the sustainable operations and maintenance of the transfer stations); and (e) provision of technical assistance for the environmental upgrade of El-Akrasha recycling and industrial zone (including, preparation of a detailed engineering study, bidding documents and environmental and social impact assessments)

36. **Public-Private Partnership in SWM**. This subcomponent envisages the involvement of the private sector through Design, Build, and Operate (DBO) contract models, with the government owning the facility and its infrastructure (with financing from the project). Mobile assets such as vehicles, revenue from waste treatment and from recycling, development of additional cells for the landfill after project closure and operating costs will be covered by the operator.

37. **Subcomponent 2.2: Supporting Response to COVID-19 Pandemic and Improving Healthcare Waste Management (US$10 million).** This component will support response to COVID-19 and improve health care waste management, through: (a) strengthening capacities of hospitals for management of medical waste through (i) provision of technical assistance for establishing and/or improving waste management systems, (ii) provision of autoclaves/steam sterilization equipment and associated technical assistance for decontamination of waster in said hospitals, and (iii) supporting utilization of energy from waste incineration and planting of trees around healthcare facilities so as to improve carbon sequestration; (b) supporting enhanced safety and security of solid waste management staff (including waste picker communities) through (i) identification of target groups and carrying out of a needs assessment, (ii) provision of personal protective gear, and (iii) provision of technical assistance and training on the safe handling, transportation and disposal of healthcare waste; (c) strengthening cleaning and disinfecting systems of waste collection points, waste collection vehicles and public transportation system; and (d) enhancing public awareness on linkages between air pollution and lung health and impact of respiratory infectious diseases through (i) carrying out an assessment of heavily impacted communities and stakeholder groups, (ii) design and implementation of associated targeted public awareness campaigns including identification and design of appropriate communication modalities, and (iii) supporting dissemination of educational campaigns.

38. **Subcomponent 2.3: Enabling activities, capacity building and institutional strengthening (US$8 million).** This subcomponent will support enabling, capacity-building and institutional strengthening activities in particular by (a) strengthening the capacity of the Waste Management Regulatory Authority through (i) development of model bidding documents and performance-based contracts for the collection, transportation and disposal of waste,(ii) development and operationalization of an integrated information management system for monitoring and evaluating effectiveness of various programs, (iii) assessment and improvement of cost recovery and fees collection financial management system including associated by-laws, guidelines, regulations and procedures, (iv) undertaking priority technical and feasibility studies; and (iv) undertaking a comprehensive review of institutional mandates, roles and responsibilities at the national level with a view to improving service delivery and ensuring sustainability of the SWM system; (b) strengthening the capacity of the executive SWM unit at the MoLD through, inter alia, (i) establishment and operationalization of said unit, (ii) provision of training and capacity building for staff of said unit and key stakeholders, and (iii) undertaking a comprehensive review of institutional mandates, roles and responsibilities at the governorate level with a view to improving service delivery; and (c) the establishment and operationalization of the SWM unit in Qalyubia governorate.

Component 3: Vehicle Emission Reduction (US$40 million)

39. This component comprises two subcomponents, which are described below:[20]

40. **Subcomponent 3.1: Electric Bus Fleet and Related Infrastructure (US$36 million).** This subcomponent will finance a low/no emission public bus transport fleet and related infrastructure, including: (a) carrying out of the associated detailed design study; (b) upgrading of existing bus depots to support e-buses, including, among others, provision of equipment for safe e-bus charging and maintenance (including deep cleaning), and key infrastructure improvements to meet power supply requirements for said e-buses and address female and male users' needs;[21] and (c) acquisition of electric buses as specified in said design study through international competitive bidding.

41. **Subcomponent 3.2: Enabling Activities (US$4 million).** This subcomponent will support enabling activities such as: (a) establishing AQM system with a view to improve city-wide transportation planning across GC area; (b) provision of training and capacity building for bus operators on electric bus operations and technology and raising public awareness on utilization of electric buses; and (c) development of a plan for scaling up deployment of e-buses.

Component 4: Enhanced Capacity, Behavioral Change and Communication (US$6.2 million)

42. This component comprises two subcomponents, as described below.

43. **Subcomponent 4.1: Enhanced capacity and behavioral change (US$5 million).** This subcomponent will support strengthening capacity and behavioral change through: (a) establishment of a solid waste educational center at the 10th of Ramadan integrated waste management facility; (b) targeted capacity building and livelihood enhancement activities for informal waste pickers/recyclers in Qalyubia governorate such as provision of training programs on waste recycling, refurbishment of waste into tradable products, support functions including cleaning and upkeep of transfer stations and waste disposal facilities among others, with tailored activities targeting female workers including an assessment of women's needs, interests and relevance to the job market to inform training programs and ensure their employability; (c) adoption and rolling out of a community based social marketing approach with a few to fostering behavioral change; (d) preparation and implementation of a strategy to operationalize best practices in green jobs and circular economy and developing the skills of SMEs in this area; and (e) development of partnerships with civil society organizations with a view to (i) monitoring the performance of solid waste service providers and the delivery of SWM services, (ii) engaging with the public and implementing awareness campaigns as part of the community-based social marketing (CBSM) approach, and (iii) improving the effectiveness and efficiency of the informal waste collectors community (locally known as Zabbaleen community).

44. **Subcomponent 4.2: Communication and outreach (US$1.2 million).** This subcomponent will support communication and outreach through: (a) development and implementation of an information,

[20] A comprehensive review by WRI (2019) has shown just how pivotal a successful pilot is for a city for the scaling up. The studies are "Ryan Sclar, Camron Gorguinpour, Sebastian Castellanos and Xiangyi Li. 2019. Barriers to Adopting Electric Buses. https://www.wri.org/publication/barriers-adopting-electric-buses; and Xiangyi Li, Camron Gorguinpour, Ryan Sclar and Sebastian Castellanos. 2019. "How to Enable Electric Bus Adoption in Cities Worldwide," https://www.wri.org/publication/how-enable-electric-bus-adoption-cities-worldwide.

[21] The study will propose anonymous complaint channels for bus users and will also design the interior of the e-bus to meet the needs for female and male users (including safety and security concerns).

education and communication strategy and action plan focusing on project activities; and (b) development and dissemination of information focusing on behavioral changes for preparedness for high air pollution events as well as adverse climatic events, including, designing a website for the purpose. This subcomponent includes campaigns inducing behavioral changes and awareness campaigns targeting men and women.

Component 5: Project Management and Monitoring & Evaluation (US$9.8 million)

45. This component will support strengthening the operational, fiduciary, and technical capacity of the Project Coordination Unit (PCU) for implementation, coordination, supervision and overall management of the project, including, procurement, financial management, M&E, carrying out of external audits, implementation of the Stakeholder Engagement Plan (SEP), and reporting of project activities and results, all through the provision of goods, non-consulting services, consulting services, training and operating costs for the purpose. It will also support the Technical Implementation Units (TIUs) to be formed in the beneficiary ministries and agencies, for the delivery of their respective tasks.

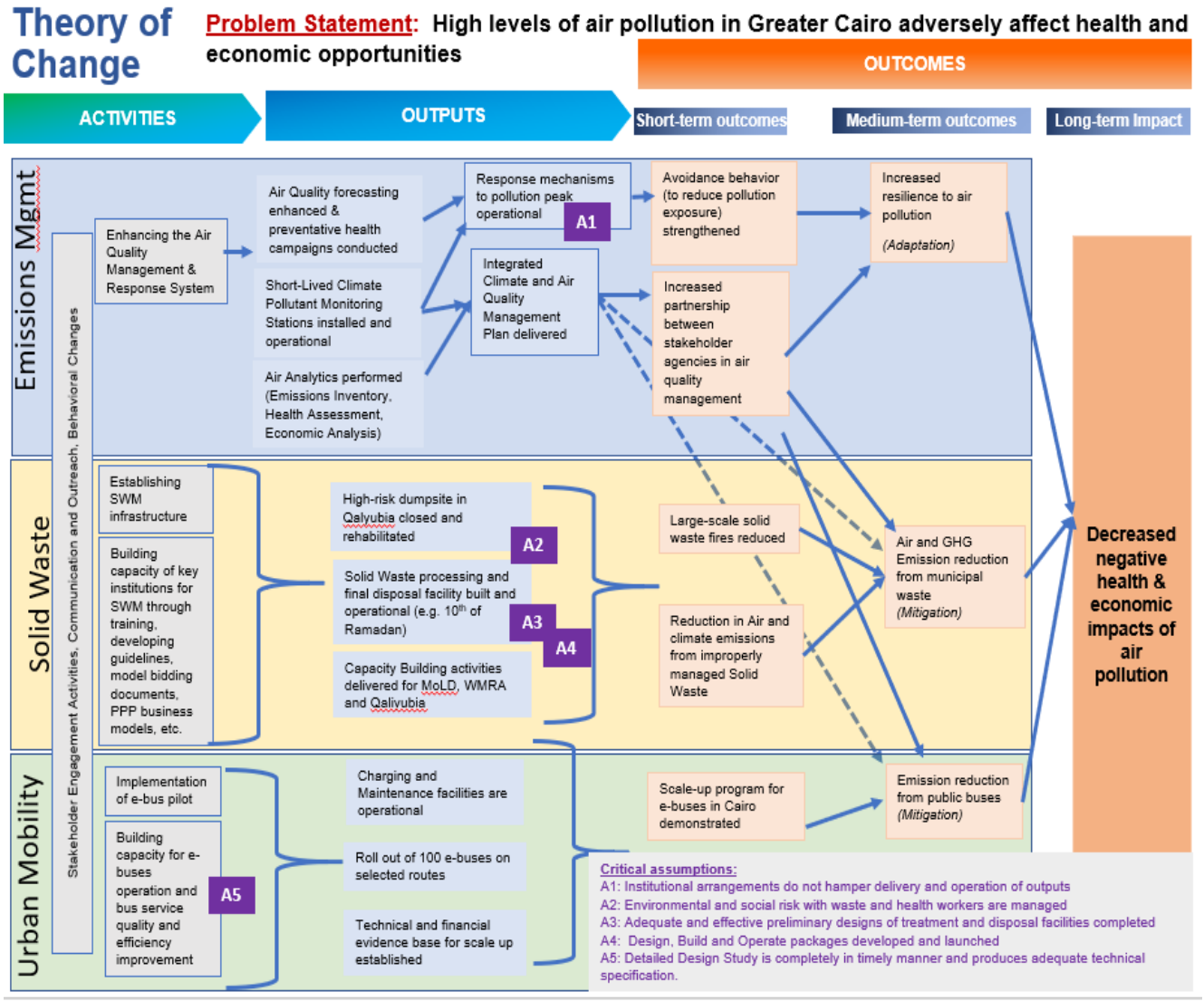
C. Project Beneficiaries

46. The project's contribution to improving air quality will benefit the 18 million people of GC, of whom 48.5 percent are women. Specific categories of direct beneficiaries include (a) SWM value-chain actors such as the garbage collectors, waste recycling dealers, waste management companies will benefit from improvements in SWM; (b) about 25,000 daily e-bus riders, including women and other vulnerable groups, will experience improved bus service; and (c) related governmental entities and related departments, including at the Governorate level, will benefit from capacity building and skills development. The project will also contribute to creating a range of jobs associated with the construction activities, solid waste collection services, recycling, treatment and disposal. Women are expected to benefit from the improved and safer transport experience, creation of economic opportunities and capacity building.

D. Results Chain

47. The project's theory of change elaborated in figure 1 links the activities of the project with the long-term impact, which is the reduction of negative health and economic impacts from air pollution.

Figure 1. Theory of Change



E. Rationale for Bank Involvement and Role of Partners

48. **The World Bank, in collaboration with the MoE and other relevant GoE stakeholders, has worked on the analytical underpinnings for a program to reduce air and climate pollution.** The World Bank was one of the founding donors that supported the long-running Egypt Pollution Abatement Project (EPAP). The World Bank also supported the Vehicle Scrapping and Recycling Project, as part of which about 300,000 vehicles (mostly taxis and minibuses) have been converted since the 1990s to dual-fuel systems (including compressed natural gas). The World Bank has conducted analytical work on air pollution in Egypt/GC over the past four years. This work identified and technically defined priority measures for the reduction of air and climate pollution, including the reduction of solid waste burning and fostering e-mobility, tackling vehicle emissions.

49. **The World Bank has a wealth of pertinent international experience in designing pollution abatement programs as well as complex SWM Programs, which also consider inclusion and private sector mobilization.** The World Bank Group has unique worldwide experience in air pollution management in terms of setting standards, instruments, technical expertise in assessing social costs, climate co-benefits and monitoring, that could help the GoE to efficiently attain its national and international targets on local and global air pollution. The World Bank has supported SWM in developing countries worldwide, including addressing the issue of waste pickers' livelihoods through a holistic and participatory approach, as well as in helping to manage uncertainty and the risks of private sector interventions.

50. **The World Bank is well-positioned to support e-mobility demonstration in GC, because of its focus on public goods and considerable international experience.** The private sector is reluctant to invest in e-mobility, absent a demonstration, as e-mobility related technologies are complex and rapidly evolving. Experience in the MENA region is limited. The World Bank has supported several e-bus projects in East Asia and Latin America. The project will bring this experience to the CTA. While private sector participation and private capital mobilization will eventually be necessary for scale-up, private investors are reluctant due to perceived high risks. Examples of the risks are unclear regulatory regime and unproven advantage of electric vehicles in the total cost of ownership. Therefore, the project will provide the foundation for the GoE to collaborate with the private sector to scale-up e-mobility in Egypt.

51. **The World Bank Group works with a close and extended network of development partners in the relevant sectors in Egypt**. The World Bank works closely with the AfD on reducing air and climate pollutant emissions, particularly with in the transport sector, where AfD is actively engaged with the GoE on several projects to expand the Cairo Metro network. The World Bank also collaborates with the German International Cooperation Agency (GIZ) on strategic SWM issues.

52. **Close partnership with the IFC to expand private sector participation.** Developing Public-Private Partnerships (PPPs) is one of the Government's highest priorities, including investing in SWM and contracting out the e-buses component to private operators. The project will collaborate with the IFC to enhance the role of the private sector and encourage its participation in the implementation of the overall SWM strategy and the Governorate SWM Master Plans. This will be achieved through the establishment of successful PPPs, the development of necessary tools for active private sector participation, and the creation of an enabling regulatory framework for their participation.

F. Lessons Learned and Reflected in the Project Design

53. **Lessons learned for the design of this project come from international and national experiences.** The proposed project design incorporates lessons learned and findings from World Bank supported pollution abatement programs in China, Colombia and Bangladesh. In addition, lessons from pertinent projects in Egypt such as the Upper Egypt Local Development Program-for-Results, and the Alexandria e-mobility pilot project have also been taken into consideration.

54. **Multi-sectoriality is key to addressing air pollution.** Pollution abatement projects in general require a multidimensional and integrated cross-sectoral approach, due to the multiple sources of air pollution. Recent World Bank-financed projects such as the Hebei Air Pollution Prevention and Control Program (P154672) and the Bangladesh Clean Air and Sustainable Environment Project (P098151) have shown the importance of multi- sector interventions to make a significant improvement in air pollution

concentrations. The Hebei project successfully reduced PM_{10} pollution concentrations due to the focus on urban mobility, agriculture, indoor heating, and industries.

55. **Urban mobility demonstration projects should be implemented in the broader context of partnerships, air quality, and climate change.** Recent World Bank-financed operations such as the Colombia "Introduction of E-buses in the Integrated Transport System of the Aburra Valley in Medellin (P169735)", provide evidence that e-buses, introduced through pilot programs and partnerships between governments, automakers, and even the private sector, have accelerated the scaling up of e-mobility in several Latin American cities.[22] Evidence has also shown the importance of framing these demonstration projects within broader air quality and climate change initiatives, rather than purely from a transport perspective.

56. **Institutional strengthening is key to successful implementation in the Solid Waste Management sector**. Challenges can be encountered during the implementation of SWM programs due to limited local institutional capacity and governance issues. The proposed project's design reflects a consensus on the need for strengthening institutional capacity for air quality, SWM and e-mobility. Accordingly, the project includes institutional strengthening and regulatory support to the WMRA and the MoLD as well as the establishment of a dedicated SWM structure in Qalyubia Governorate.

57. **Simple implementation arrangements are key to success**. One of the key lessons learned is to avoid complex project design and implementation arrangements, particularly in a fragile implementation environment. The experience of the Upper Egypt Local Development Program in bringing together the national and local levels in the Governorates, as well as bringing together different implementing entities at each level, has helped in developing the implementation arrangements of the project. As three entities (MoE, MoLD, and Cairo Governorate through CTA) are directly involved in the project, implementation arrangements include the establishment of technical implementation units in each entity to maximize efficiency. This includes, *inter alia*, the establishment of a multisectoral Steering Committee (SC) overseen by the MoE and the MoPED; and defining clear roles and responsibilities to which all entities are committed through an inter-ministerial agreement.

58. **Stakeholder engagement and communication plans and strategies are essential to ensure the inclusion of stakeholders at all stages of the project.** The proposed interventions incorporate a proactive communication plan and CBSM approach to ensure that appropriate project information, including potential risks and impacts, are disclosed in a transparent and timely manner, particularly to vulnerable groups such as the Zabbaleen community, who have either been left out from previous SWM interventions, or integrated in a way that does not take their interests fully into consideration.

III. IMPLEMENTATION ARRANGEMENTS

A. Institutional and Implementation Arrangements

59. **The project will be guided by an inter-ministerial SC** co-chaired by the Minister of Environment and the Minister of Planning and Economic Development and will include the Ministers (or their representatives) of the MoIC, MoLD, MoT, MoHP, the Governorates of Cairo, Qalyubia, and Giza and the

[22] Edwards, Guy, Lisa Viscidi, and Carlos Mojica. "Charging Ahead: The Growth of Electric Car and Bus Markets in Latin American Cities." The Dialogue, September 2018. *https://www.thedialogue.org/wp-content/uploads/2018/09/Charging-Ahead-web.pdf*.

CTA. The SC will provide overall policy and strategic guidance, play an important role in high-level decision making, facilitate the interaction and coordination between the various ministries/agencies, and ensure an enabling environment for reforms to succeed and be sustained. It will also approve the annual work plans and budgets, and monitor progress towards the achievement of the national and project specific target indicators.

60. **A PCU will be established at the MoE to be in-charge of the project's overall implementation and coordination between all stakeholders** (see figure 1.1 in Annex 1). It will ensure that the project is implemented in accordance with the project agreements and documents, including the Project Loan Agreement, the Project Appraisal Document, and the Environmental and Social Framework (ESF) instruments, as well as the Project Operations Manual (POM). It will organize national meetings and workshops, conduct priority awareness and communication activities, and oversee the implementation of the SEP. It will also be responsible for M&E of project activities, based on reports prepared by the TIUs, which will be established to oversee the day-to-day implementation of the project components. The PCU will act as the Technical Secretariat of the SC (see Annex 1 for more details).

61. **The PCU and the TIUs will be established and staffed** with an adequate number of qualified and experienced specialists. Most staff will be designated from within the ministries and implementing entities and will be supplemented by full-time and part-time staff and consultants. These units will be maintained throughout the project's duration.

62. **An Inter-ministerial agreement between the MoE and the implementing parties** (namely the MoLD, Cairo and Qalyubia Governorates) will be signed (and will be witnessed by MoIC and MoPED) to regulate the roles and responsibilities of the implementing entities, including establishment of the TIUs.

B. Results Monitoring and Evaluation Arrangements

63. The PCU will include a dedicated M&E specialist to enable it to perform its M&E role and responsibilities. It will develop the M&E manual that is acceptable to the World Bank, as part of the overall POM. The PCU will also ensure that data and information collected from the working groups, or other sources as indicated in the M&E Plan of the Results Framework, are accurate and reports are produced on a timely basis. It will develop a data quality assurance mechanism and provide technical support to the TIUs. The project Results Framework includes specific gender and citizen engagement indicators as discussed in those sections.

C. Sustainability

64. A key feature of the project in all components, is to support a mix of institutional, analytical and advisory services, and investments. These actions are designed not only to ensure the successful implementation of the project in the short-term, but also its sustainability beyond the lifetime of the project. The proposed enabling activities are intended to develop and operationalize the necessary sustainability tools, and cover the institutional, technical and financial sustainability of the interventions, with due consideration to environmental sustainability as well as social inclusion.

65. The project includes the following elements of sustainability:

(a) The Air Quality Management and Response System is designed around the "institutionalization" of key decision support activities and systems, and the development of plans for "normal" air pollution as well as emergency situations.

(b) The SWM component will help to establish dedicated SW units at the governorate level to ensure management sustainability. The cost recovery mechanism, performance-based contracts and the preparation of business models are priority activities. The project will also provide the necessary technical support for the enactment of regulations of the new Solid Waste Law, which is to be promulgated soon;[23] this is crucial for the scaling up and sustainability of the SWM system.

(c) The vehicle emission reduction component will develop a strategy to scale up the demonstration of the project's e-mobility interventions optimally. The CTA will monitor indicators and processes (such as frequencies, operational capital expenditures, periodic maintenance including cleaning) and use this data to enhance the quality and the efficiency of e-bus services at scale. The scope of the detailed design study (DDS under Component 3) includes analyzing overall sustainability, as international experience suggests that poorly designed e-bus interventions can fail and result in assets being abandoned and resources being wasted. The DDS will determine a technology set feasible to CTA's operational parameters. The project also focuses on retrofitting bus depots and related infrastructure to optimize the power supply, operation and maintenance of e-buses, as well as support a robust set of enabling activities, including training the CTA's workforce.

66. The Government's vision is that integrated and sustainable SWM cannot be financed and supported by public funding alone. Global experience shows that private sector participation in solid waste infrastructure and service provision, if handled properly, can leverage investments and greatly improve service provision. The project's approach to enhance SWM services is to operate in two slightly overlapping phases: the first being a fast track phase to address urgent needs, mainly in terms of infrastructure, removal of accumulations and improved collection services; and the second being a medium-/long-term solution to sustain the investments and preserve improved service delivery. Preparatory work for the medium- and long-term solution will be undertaken in parallel with the implementation of the fast track activities. Plans are also envisaged for expanding the role of the private sector in sustaining, both technically and financially the e-mobility sector and contracting out e-buses to private operators.

IV. PROJECT APPRAISAL SUMMARY

A. Technical, Economic and Financial Analysis

67. **Technical. The project addresses air and climate challenges in GC while focusing on cross-cutting issues (gender, COVID-19, etc.)** through: Component 1 which enables the development and implementation of actions for resilience to air pollution and climate change; Component 2, which supports solid waste master plans, namely waste treatment and disposal investments as well as mitigation measures ; and Component 3, which supports the deployment of e-buses to demonstrate and create the

[23] The Egyptian Parliament has approved in principle, on August 19, 2020, the promulgation of the law.

enabling environment to sustainably scale up e-buses in GC. The technical appraisal of the project was essentially focused on the two main pillars that address the main sources of air pollution, i.e., solid waste and public transport:

(a) For solid waste, the analysis was based on the NSWMS, 27 Governorate Master Plans and other studies conducted by the Government and through donor funded projects.[24] Given that the activities span several waste segments and sectors (municipal, medical, hazardous, construction and debris), waste segment and sector implementation will be sequenced according to readiness (for example, studies, site selection, procurement including various forms of contracts such as DBO, etc.) that are scheduled over the project lifetime. For instance, bidding documents for the procurement of the DBO contractor and selection of the project management consultant have been developed and the procurement process will be ongoing during Year 1, while implementation activities for the closure of municipal solid waste dump site at Abu Zaabal and the development of Hazardous waste facility will be launched during Year 2.

(b) For the transport sector, CTA is finalizing the terms of reference for the DDS under Component 3, which covers the technical, financial, environmental and social feasibility of the proposed demonstration project. This approach incorporates lessons on e-mobility from international experience and in Alexandria that call for detailed design before proceeding to implementation. The selection process of the detailed design consultant has been initiated. The procurement process for the procurement of e-buses and other support infrastructure is expected to be initiated within six months of implementation. Component 3 will demonstrate the introduction of e-buses on the most appropriate routes and optimizing the use of batteries and charging stations. Egypt will thus have a foundation to scale up its e-bus program in a sustainable manner.

68. **Economic analysis.** The proposed project will contribute to the reduction of air pollution, which in turn will affect health outcomes positively, and improve labor productivity and other socio-economic outputs. It will also reduce GHGs. Taking into account the local air quality improvement benefits as well as the global reductions in GHG emissions, the project is expected to have an economic rate of return (ERR) of 5.4 percent at a 4 percent discount rate, and to result in a benefit-to-cost ratio greater than 1. Sensitivity analysis on key parameters confirmed that the project would yield positive net benefits, especially if the benefits flows are extended over 10 and 20 years.[25]

69. **Financial analysis.** The Government and users of the services are leveraging the project through in-cash and in-kind contributions that conservatively amount to about US$65 million over six years. This amount is based on the estimated cost of land for the 10th of Ramadan landfill (US$375,000 for a cell with an area of 15,000 m^2), operating costs of the landfill (US$$57 million for a three-year operating period during project life based on 55 percent landfilling at US$20/ton of waste landfilled) and the Operations and Maintenance Expenditures (OMEX) of e-buses (US$7.6 million, based on the operation of 97 buses

[24] Donor-funded projects include the National Solid Waste Management Project, co-financed by GIZ, KfW, the European Union, and the Swiss State Secretariat for Economic Affairs; the UNDP/GEF Medical and Electronic Waste Management Project; and the UNDP/GEF Sustainable Transport Project.

[25] Details of the economic analysis are abridged in Annex 3 and detailed in the project files.

and an estimated US$0.34/km to operate the e-buses). Other in-kind contributions such as space for bus depots, services, etc., were not quantified, but are significant.

70. For SWM, the authorities should look at possible sustainable sources of financing to cover OMEX (US$3.6 to US$3.7 per capita) which varies according to different discount rates, bearing in mind that the current market interest rate in Egyptian pounds is 17 percent. For e-buses, CTA should look at possible financing to cover the total CAPEX and OMEX during the scaling up. The scope of the DDS under Component 3 includes, inter-alia, financial sustainability aspects.

71. **Climate positive actions.** The project will integrate climate positive measures across all its activities. These include (a) integration of climate change parameters in the proposed improvements to online air quality forecasting system and stimulating industries towards low GHG technologies through the proposed air emergency response plan for activities under Subcomponent 1.2; (b) accounting for climate hazards, including waste to energy investments, afforestation/green cover over closed dumpsites, reduction GHGs through old dump site closure and use of renewable energy sources/energy efficiency measures for activities under Subcomponent 2.1;(c) utilization of energy from health care waste incinerators, plantation of trees around health care facilities and integrating impacts of climate change as part of public awareness campaigns for activities under Subcomponent 2.2; and (d) piloting transition of public transport to e-busses.

72. **GHG accounting.** The GHG accounting carried out for the SWM component indicates that over its 30-year life, the facility will emit 13.45 million tons of CO_2 compared to the 27.28 million tons of CO_2 in the BAU scenario, i.e., savings of about 51 percent. The acquisition of e-buses and associated infrastructure will reduce fossil fuel consumption on selected routes. The project is expected to reduce GHG emissions by 444 tons as a result of fleet replacement and 4,251 tons via modal shift, for a total of 4,695 tons through the project life (i.e., a 23 percent reduction). The estimated reduction in the social cost of GHG emissions is a little over US$250,000. The optimization of pilot electric bus routes will reduce energy consumption of both electric and conventional buses.

73. **Climate change adaptation and mitigation.** The Early Warning and Rapid Response mechanism developed under Component 1 will serve as a critical urban resilience mechanism to protect public health not only from potential changes in extreme anthropogenic air pollution events, but also events driven by extreme heat as well as dust storms and blowing dust events - the frequency and intensity of these have been increasing with climate change. By monitoring and detecting hazardous pollution and related climate events, and warning the population accordingly to take mitigating actions, this component alleviates a critical vulnerability of the GC population, helps increase public health and thus increases their resilience to the adverse impacts of climate change. Investments in SWM facilities under Component 2 will adhere to design principles that ensure climate resilience of the facilities and their operations going forward. The communication campaign in Component 4 to promote awareness and behavioral changes on high pollution and emission days, or other instances of adverse-climate events, will increase the general public's self-protection and reduce adverse impacts (particularly on health), increasing the overall climate resilience of the public and mitigation. Please refer to the Detailed Project Description in Annex 2 for more information on how the investments under individual components will increase climate resilience and mitigation.

74. **Gender related actions.** The project will address gender gaps with respect to accessing economic activities in GC by addressing constraints for females in obtaining for better jobs in the solid waste

sector/value chain and mobility constraints for female users of public transport. The project will support targeted capacity-building and livelihood enhancement for female informal workers (waste pickers/recyclers) operating in Qalyubia Governorate (where solid waste investments are proposed), and support the engagement of women's groups/female-headed NGOs in the monitoring of SWM to ensure that service-delivery meets the demands of the most vulnerable women (e.g., low-income and heads of single-parent households). The project also intends to meet female and male users' needs in transport, and and help avoiding gender related challenges and avoid possible harassment against women and girls in public transportation. Key actions are: (a) focus groups and consultations to understand the transport needs of female and male users in GC to inform infrastructure and bus design; (b) development of an action plan by the CTA to identify harassment issues and suggest corrective actions (including access to stations and sidewalks, route alignment, frequency of services, and station lighting; (c) provision of security measures at stations and in buses (for example, cameras, alarm systems, safe and anonymous channels to report complaints at bus stations or other locations); (d) inducing positive behavioral changes, including campaigns targeting men and boys; and (e) conducting awareness campaigns targeting women on measures to prevent possible harassment on public transport (for example, cameras, alarm systems on public transport, and reporting system). Specific activities targeting female workers and stakeholders will be implemented under Component 4. The project will specifically report progress on closing/narrowing identified gender gaps through the following indicators: (a) increased perception of security among female users of public e-bus (informed through ad-hoc surveys); (b) increased percentage of women employed in the solid waste chain;[26] and (c) number of women's groups/female-headed households engaged in the monitoring of SWM.

75. **Citizen Engagement.** The project is building on a strong citizen engagement pillar with Component 4 dedicated to establishing the principle of beneficiaries' feedback, partnerships with civil society organizing (CSOs) for monitoring the performance of SWM services and the delivery of awareness and sensitization campaigns, as part of the CBSM approach and through direct engagement of citizens. The project will also put in place mechanisms to systematically receive beneficiary feedback to inform and enhance project activities. It will support local or national NGOs and Community-based organization (CBOs), and other organized groups (that meet the specific project criteria) to allow them to actively participate in the implementation of these initiatives. Citizen engagement will also be achieved through the implementation of the SEP, the beneficiary feedback mechanism and the citizens participation in the M&E system; for which resources have been made available under Component 5. The Results Framework includes the following citizen engagement specific indicators: (a) level of satisfaction of stakeholder groups, including project affected parties, in the planning and implementation process; (b) number of CBSM initiatives supporting the project components; and (c) number of CSO/NGOs-led initiatives in collaboration with local authorities and in support of project activities implemented by the Government.

76. **Involvement of the private sector.** The project's cautious approach in working with IFC to attract the private sector to SWM through possible DBO arrangements as detailed under Component 2 description is considered appropriate. Private capital mobilization for the establishment of the 10th of Ramadan Integrated Waste Management Facility is estimated at approximately US$ 40 million. The private sector is currently reluctant to invest in e-buses in GC because of the risk of acquiring them in an

[26] It covers women employed in SWM activities related to the project or in the whole value chain (for example, starting business from reusable and tradable products).

unclear regulatory regime and the unproven total cost of ownership advantage of e-buses in local conditions.

77. **Relationship to COVID-19.** Air pollution is a risk factor for lung diseases (such as pneumonia, COPD, asthma, and lung cancer) as is COVID-19. One of the most effective ways to mitigate the risk of people dying from a corona virus is by reducing air pollution and lower the risk of developing the Acute Respiratory Distress Symptom (ARDS). A recent epidemiological study in Italy suggests that the quality of air is a strong predictor of contagion and mortality from COVID-19.[27]

B. Fiduciary

(i) Financial Management

78. All Project funds will be managed by MoE, including the designated account to be opened at the Central Bank of Egypt for receiving and disbursing the loan proceeds. The PCU will be in charge of coordinating disbursements through MoE's accounting unit, the consolidation of project reporting (in coordination with the other involved agencies where applicable), and the hiring of an external audit firm to conduct annual financial audit of the project financial statements.

79. The MoE has previous experience in implementing World Bank-financed projects, namely the EPAP I and II and the ongoing Sustainable Persistent Organic Pollutants Management Project. The capacity and risk assessment conducted by the World Bank prior to appraisal rated the residual financial management risk as Substantial. More details of FM, including risk assessment and risk management measures are provided in Annex 1.

(ii) Procurement

80. Procurement will be carried out in accordance with the World Bank Procurement Regulations for IPF Borrowers, dated July 2016, revised November 2017 and August 2018, the Loan Agreement and the procurement plan approved by the World Bank. The 'Guidelines on Preventing and Combating Fraud and Corruption in Projects Financed by IBRD Loans and IDA Credits and Grants', dated October 15, 2006, and updated January 2011 and as of July 1, 2016, will apply to the project.

81. The MoE will carry out all procurement activities under the project. Where the project activity overlaps with other entities' mandates, this will be done in collaboration with the relevant ministry/agency based on protocols to be signed between MoE and the respective entity. The protocol will define the specific roles and responsibilities for providing technical specifications and other relevant inputs on technical aspects of procurement, and participation in procurement committees. It will also specify any delegation of authority with respect to contract management and supervision responsibilities, technical acceptance, payment approvals, etc.

82. The procurement risk and capacity assessment of MoE, conducted prior to project appraisal, concluded that procurement capacity requires strengthening in terms of staffing and training and

[27] "Can atmospheric pollution be considered a co-factor in extremely high level of SARS-CoV-2 lethality in Northern Italy?" Environmental Pollution.

substantial capacity building in procurement is required. This may require hiring an implementation support consultant. The detailed risks and related mitigation measures are provided in Annex 1.

C. Legal Operational Policies

	Triggered?
Projects on International Waterways OP 7.50	No
Projects in Disputed Areas OP 7.60	No

D. Environmental and Social

83. The overall environmental and social outcomes of the project are expected to be positive, provided appropriate environmental and social risk mitigation measures are designed and implemented. The environmental benefits include (a) reducing air emissions from open burning of wastes in GC through better SWM and the removal of historically accumulated wastes, as well as through the clean public transport pilot and (b) improving public health by reducing air emissions, avoiding the accumulation of solid wastes in GC, and the closure of dumpsites.

84. The social benefits of the project include (a) enhanced citizen satisfaction as a result of improved SWM services; (b) creation of a large number of temporary jobs from construction activities; (c) stronger and more efficient stakeholder engagement through a dedicated component to take an upstream, systematic and process-oriented approach for engagement; (d) enhanced communication with the general public on air quality and the related response measures to be taken by the Government and the citizens; and (e) better integration of waste management with the informal sector, with potential economic benefits to vulnerable and marginalized groups.

85. The environmental and social risk classification of the project is High due to the nature, scale, and diversity of the proposed interventions.

86. The construction and operation of the IWMF-10R constituents and the hazardous waste treatment facility could, if improperly designed or managed, result in significant adverse impacts on all environmental parameters (air, noise, ground water, soils, landscapes, health and safety, traffic, wastes, and cultural resources). The process of closing uncontrolled dumpsites, despite the positive outcomes, may be accompanied by occupational and community health and safety risks. The associated negative environmental impacts, in the absence of (or poorly implemented) mitigation measures, are expected to be significant, irreversible, large scale and of high economic and social costs. The use of sterilization equipment, PPEs, etc., procured under the project to support combating COVID-19 can entail significant environmental and OHS risks associated with the handling and disposal of medical waste.

87. Social risks, which are rated high, emerge from potential land acquisition, construction risks and potential loss of livelihoods and potential land acquisition (though with very low probability, as the investments are planned on publicly owned lands). The critical social risks of the project are (a) possible loss of livelihoods for the informal waste pickers at the Abou Zaabal dumpsite; (b) uncertainty about the scale and the magnitude of the livelihood impacts on the informal sector (for example, traditional waste collectors, street container waste pickers, and the operators of donkey-carts and tricycles as a result of

the application of improved waste collection and transfer services ; (c) land related negative impacts, as the locations of the two transfer stations and the hazardous waste treatment and final disposal facility; are not known at this stage; (e) inappropriate working conditions for labor, working on large-scale construction activities and hazardous work; (f) community health and safety, including possible community disturbance due to labor influx; (g) inadequate site selection for the landfill and the transfer stations, including the possible unwillingness of individuals or communities to accept their construction nearby as this might affect their quality of life and the value of their property; and (h) financial burden on poor and middle-income families due to the possible increase in service fees to pay for the costs of the improved service.

88. The application of the results of TA activities under Components 2 and 3, such as feasibility studies for the hazardous waste facility and Al-Akrasha, may have adverse environmental and social implications. All project TA activities shall therefore be undertaken in parallel with environmental and social studies to assess the environmental and social impacts associated with the TA outcomes, in accordance with the World Bank's ESF and national laws.

89. An Environmental and Social Management Framework (ESMF) and a Resettlement Framework (RF) have been prepared for the entire project. An Environmental and Social Impact Assessment was also prepared for the Qalyubia Sanitary Landfill, the shared construction and demolition waste treatment facility, and the general access road as well as the infrastructure of the 10th of Ramadan Facility. These instruments set forth the environmental and social management principles, mitigation measures and institutional responsibilities to deal with the identified impacts and risks in link with the relevant Environmental and Social Standards of the World Bank's ESF, as well as the national regulations. Labor Management Procedures (LMPs) and an SEP identifying the project's stakeholders, the type of information to be shared at specific milestones, and other forms of engagement throughout the project's duration were also prepared. The MoE conducted two consultations in March and June 2020. The participants included administrative officials from the governorate level, administrative officials from the local level (Giza, Cairo and Qalyubia governorates), consultants/experts, community members (representatives), civil society organizations, Academic Institutions and the private sector (factories, companies, suppliers and traders working in the waste field). The Governorate of Qalyubia has also been engaged in several consultation activities and field visits since December 2019.

90. The ESCP was also prepared, listing all other assessments and instruments to be prepared during project implementation, the timeframe for their completion, and the assigned responsibilities, as well as commitments for adequate staffing to manage the environmental and social activities.

91. The ESMF, RF, and Environmental and Social Impact Assessment were consulted upon, cleared by the World Bank, and disclosed in-country and on the World Bank's website on May 29, 2020. The ESCP, SEP, and LMP were also cleared and disclosed on the World Bank's website on July 24, and in-country on July 30, 2020.

V. GRIEVANCE REDRESS SERVICES

92. Communities and individuals who believe that they are adversely affected by a World Bank supported project may submit complaints to existing project-level grievance redress mechanisms or the WB's Grievance Redress Service (GRS). The GRS ensures that complaints received are promptly reviewed

to address project-related concerns. Project affected communities and individuals may submit their complaint to the World Bank's independent Inspection Panel which determines whether harm occurred, or could occur, because of World Bank non-compliance with its policies and procedures. Complaints may be submitted at any time after concerns have been brought directly to the World Bank's attention, and Bank Management has been given an opportunity to respond. For information on how to submit complaints to the World Bank's GRS, please visit *www.worldbank.org/en/projects-operations/products-and-services/grievance-redress-service*. For information on how to submit complaints to the World Bank Inspection Panel, please visit www.inspectionpanel.org.

VI. KEY RISKS

93. As indicated in the SORT in the Data Sheet, the overall risk to achieving the PDO is rated Substantial. Risks categories rated Substantial or High and the corresponding risk management measures are summarized in the following paragraphs.

94. **Political and governance risk** is rated Substantial, because of the need to ensure that the commitment of various ministries and entities involved in this multisectoral project translates into concrete measures to ensure effective implementation. The clear delineation of functions across the various stakeholders, as well as the coordination and oversight role of the PCU, will help in managing this risk.

95. **Macroeconomic risk** is rated Substantial. Egypt has completed the World Bank Group and IMF reform programs which have shown positive results in terms of economic recovery. A new IMF program is being discussed to support the continued implementation of critical reforms to support the improvement of the macroeconomic environment.

96. **Sector strategies and policies risk** is rated Substantial, as the setting of tariffs for services delivered, the cost recovery mechanism, and the business models for private sector engagement are not sufficiently well established to ensure financial and technical sustainability. This will be mitigated by the TA component, which will be supplemented by the knowledge and experience of the World Bank Group (including the World Bank and IFC) on economic and financial management and the establishment of PPPs.

97. **Institutional capacity for implementation and sustainability risk** is rated High, as the implementation arrangements are complex and span several ministries and agencies. Moreover, there is insufficient and/or inadequate capacity within these agencies. This will be mitigated through: (a) development of improved coordination mechanisms for enhanced service delivery; (b) TA and capacity-building activities for key stakeholders and the implementing agencies of the four project components; and (c) implementation of M&E mechanisms.

98. **Environmental and social risk** is rated High, for the reasons highlighted in the earlier section. Environmental and social risks will be mitigated by the various measures described in the section on environmental and social appraisal summary.

99. **Stakeholders risk** is rated High. The project involves multiple agencies with a diverse range of expertise and capacities, and coordination among the different agencies is essential for the successful implementation of the project. In addition, the project will need to engage with NGOs, informal sector and community groups in different areas. The MoE and other key players (for example, the Governorate

of Qalyubia) have been playing an active role in engaging with stakeholders (including but not limited to NGOs, informal sector groups and other groups of key informants) during the design stage of the project. The project will take into account the vulnerability of groups such as traditional garbage collectors and other informal groups (for example, waste pickers in disposal sites that will be closed) during the implementation stage and will implement measures to address issues that impact them negatively.

100. **Fiduciary risk** is rated Substantial. The capacity and risk assessments for procurement and financial management have identified the key risks and the agreed risk management measures. These are described in Annex 1.

VII. RESULTS FRAMEWORK AND MONITORING[28]

Results Framework

COUNTRY: Egypt, Arab Republic of

Greater Cairo Air Pollution Management and Climate Change Project

Project Development Objectives(s)

To reduce air and climate emissions from critical sectors and increase resilience to air pollution in Greater Cairo.

Project Development Objective Indicators

Indicator Name	PBC	Baseline	End Target
Emission reduction from municipal waste			
Reduction in Greenhouse gas emissions (CO2 equiv.) from municipal solid waste (Percentage)		0.00	30.00
Reduction of large-scale solid waste fires per annum (Percentage)		0.00	20.00
Black carbon and greenhouse gas emission reduction from public buses			
Greenhouse gas emissions (CO2 equiv.) from public buses on selected routes (Percentage)		100.00	77.00
Black Carbon emissions from public buses (Percentage)		100.00	98.00

[28] Detailed methodology on data collection are/will be described in the project's M&E Manual..
The Detailed Design Study for the e-mobility component (Component 3) will establish the baselines and the target values of the Intermediate Results Indicators.

Indicator Name	PBC	Baseline	End Target
Increased resilience to air pollution			
Targeted people taking self-protective action in response to alert of a high pollution event (Share of surveyed people adopting avoidance behavior) (Percentage)		0.00	5.00

Intermediate Results Indicators by Components

Indicator Name	PBC	Baseline	End Target
Enhancing the Air Quality Management & Response System			
Climate pollutant monitors (including Short Lived Climate Pollutants and GHGs) installed and operational in a select number of locations (Number)		0.00	12.00
Institutional Air Quality response mechanism established and operational (Yes/No)		No	Yes
Greater Cairo Climate and Air Quality Management Plan developed and submitted to the Council of Ministers (Yes/No)		No	Yes
Support the operationalization of SWM Master Plans in Greater Cairo			
Integrated municipal solid waste facility established in Greater Cairo (Yes/No)		No	Yes
Healthcare waste facility established and operational in the 10th of Ramadan Site (Yes/No)		No	Yes
Municipal Solid Waste Dump Sites Closed and Rehabilitated (Number)		0.00	1.00
Solid Waste Management Unit in Qalyubia Governorate established with Operations Manual, monitoring and reporting systems (data bases, IT infrastructure and other tools) for solid waste management (Yes/No)		No	Yes

Indicator Name	PBC	Baseline	End Target
Vehicle emission reduction			
User satisfaction with bus service (percentage) (Text)		TBD	TBD
Female user satisfaction with bus service (percentage) (Text)		TBD	TBD
Male user satisfaction with bus service (percentage) (Text)		TBD	TBD
Bus service quality action plan elaborated, consulted and disclosed (Yes/No)		No	Yes
Perception of security among users of public e-bus (Text)		TBD	TBD
Perception of security among female users of public e-bus (Text)		TBD	TBD
Perception of security among male users of public e-bus (Text)		TBD	TBD
E-bus pilot implementation progress (Text)		N/A	Satisfactory
Electric buses in operation (Yes/No)		No	Yes
Charging stations in operation (percentage) (Yes/No)		No	Yes
E-bus maintenance facilities in operation (Yes/No)		No	Yes
CTA staff trained for operation and maintenance efficiency improvement (Yes/No)		No	Yes
Monitoring of Key Performance Indicators (KPIs) for e-buses (Yes/No)		No	Yes
Average daily business day ridership on selected e-bus routes (Text)		TBD	TBD
Enhanced capacity, behavioral change and communication			
Pilot Community-based Social Marketing (CBSM) initiatives implemented (Number)		0.00	2.00
Improving municipal solid waste segragation at source at households level (Number)		0.00	1.00
Number of NGOs/CBOs led initiatives in collabration with local		0.00	10.00

Indicator Name	PBC	Baseline	End Target
authorites (Number)			
Number of women groups or CSOs engaged in monitoring SWM services (Number)		0.00	4.00
Increased percentage of women employed in the solid waste chain (Percentage)		0.00	10.00
People reached out with air quality and climate change information (Text)		TBD	TBD
Project Management and Monitoring & Evaluation			
Level of satisfaction of stakeholders with the quality of project's engagement (Text)		This is a project management related indicator, and no baseline exists.	The end target of the level of satisfaction will be determined during preparation of the M&E manual.
Percentage of grievances received and addressed in a timely manner (Percentage)		0.00	80.00

Monitoring & Evaluation Plan: PDO Indicators

Indicator Name	Definition/Description	Frequency	Datasource	Methodology for Data Collection	Responsibility for Data Collection
Reduction in Greenhouse gas emissions (CO2 equiv.) from municipal solid waste	This indicator measures cumulative GHG emissions from the waste generated in Qalyubia governorate during the project period (2022-2036) without the waste disposal facility and emissions in the same period with disposal facility.	Half-yearly	The emissions are calculated through the Climate Action for Urban Sustainability (CURB) or	Actual waste receipt data recorded at the waste disposal facility. Data Collected daily at the facility (starting from 2022, which is the expected date of commencement of operation) and	Qalyubia Governorate and Waste Management Regulatory Authority, Ministry of Environment, Government of Egypt.

			other suitable model, on the basis of the quantity and characteristics of the waste received annually at the waste disposal facility.	reported on half yearly basis to the project	
Reduction of large-scale solid waste fires per annum	This measure assesses whether the number of large solid waste fires has been reduced in the governorate of Qalyubias and Cairo.	Yearly	Satellite images and possibly other remote sensing technologies to be confirmed during the preparation of the M&E manual.	The satellite enabled fire monitoring system of EEAA. The possibility exists to bring in additional satellite images, remote sensing technology, and spatial analysis to enhance the current system, if the need arises.	EEAA will be responsible for the data collection.
Greenhouse gas emissions (CO2 equiv.) from public buses on selected routes	This indicator measures the change in GHG emissions due to the introduction of e-buses, compared to the	Once at end of Project	Emissions model.	The methodology is based on the ASIF Framework.	Egyptian Environmental Affairs Agency in collaboration with Cairo

	business as usual using internal combustion engines (ICE) buses. The project expects to reduce the GHG emissions.The baseline is normalized to equal 100% and the target shows the expected reduction against this base.				Transport Authority.
Black Carbon emissions from public buses	This indicator measures the change in GHG emissions due to the introduction of e-buses, compared to the business as usual using ICE buses. The project expects to reduce the GHG emissions. The baseline is normalized to equal 100% and the target shows the expected reduction against this base.	Yearly	*Measurement with either dynamometer chassis emissions monitoring from tailpipes, portable emissions monitoring system from tailpipes, or estimates from literature values.*	Tailpipe BC emissions will be estimated for in-use diesel buses from the CTA fleet and compared to e-bus emissions.	EEAA in collaboration with CTA.
Targeted people taking self-protective action in response to alert of a high pollution event (Share of surveyed people adopting avoidance behavior)	This measure assesses whether the resilience to air pollution has been increased, by showing whether more people report	Yearly	Surveys conducted on an annual basis by EEAA	Surveys of targeted people.	EEAA (Air Quality Department, in close collaboration with Communications

	to have changed their avoidance behavior in response to high pollution events.		through the project.		Department).

Monitoring & Evaluation Plan: Intermediate Results Indicators					
Indicator Name	**Definition/Description**	**Frequency**	**Datasource**	**Methodology for Data Collection**	**Responsibility for Data Collection**
Climate pollutant monitors (including Short Lived Climate Pollutants and GHGs) installed and operational in a select number of locations	This measures the number of Aethalometers installed and operating (measuring samples of ambient fine particles).	At mid-term and at the end of the project.	EEAA reports	Sampling ambient air quality.	EEAA.
Institutional Air Quality response mechanism established and operational	A national system is established and operational, that allows the Government to take decisions during high pollution days based on air quality forecasting.	Yearly	Reports of the Ministry of Environment and of the Air Quality Dept of the Egyptian Environmental Affairs Agency.	Daily AQ forecasts for at least 24hrs in advance will be recorded.	The Egyptian Environmental Affairs Agency of the Ministry of Environment.
Greater Cairo Climate and Air Quality Management Plan developed and submitted to the Council of Ministers	An Integrated Climate and Air Quality Management Plan (IC-AQMP) will be developed to serve as the	At mid-term and at the end of the	Reports from the Egyptian Environmental Affairs	An Integrated Climate an broader vision for scaling Ministers for adoption.	EEAA.

lan (IC-AQM
act through

	overarching framework for government action to reduce the sources and amounts of pollutants responsible for the degradation of urban ambient air quality and regional and global warming. Plan will present options with estimated budget requirements in the form of a time-bound action plan with clear roles and responsibilities delineated.	project.	Agency (EEAA).		
Integrated municipal solid waste facility established in Greater Cairo	The indicator measures the construction and operation of is means that the a facility to treat, process and dispose the waste generated by Qalyubiya Governorate in Greater Cairo, including the construction of a disposal and treatment facility for municipal waste. This would involve selection of eligible contractor/ operator, signing of contract signed with a private operator(s), and regular receipt of waste at the facility.	Once after the facility is operational .	Signed contract with the operator and evidence of waste processing at the facility.	Report from WMRA with evidence on regular processing of waste at the facility.	Waste Management Regulatory Authority with inputs from Qaliyubia Governorate.
Healthcare waste facility established and	The indicator measures the	Yearly	Progress	The data to be	The Project Coordination

operational in the 10th of Ramadan Site	effective construction and operation of a healthcare waste facility at the 10th of Ramadan site.		reports of EEAA and Qalyubiya Governorate, and reports from the private operator.	collected is basic information on the progress in the design, construction, signature of a contract with a private operator, and the operationalization of the healthcare waste facility, i.e. that the facility starts to receive healthcare waste from the different health establishments. Data is collected on a yearly basis to monitor the progress of contract award, construction and commencement of facility operation.	Unit, in collaboration with the concerned departments in EEAA and at the Governorate.
Municipal Solid Waste Dump Sites Closed and Rehabilitated	The indicator measures whether the Abu Zaabal dumpsite is closed and contained by the project, as per the approved plan. The benefits of GHG emission reduction from this closure however will be measured by the outcome indicator on 'GHG emission reduction from the municipal solid waste.	Once after completion of closure and rehabilitation activities with regular progress reports.	Completion Report on the closure and rehabilitation activities from the implementing agency	Completion report as per the activities envisaged in the project report and the contract	WMRA with inputs from Qaliyubia Governorate

Solid Waste Management Unit in Qalyubia Governorate established with Operations Manual, monitoring and reporting systems (data bases, IT infrastructure and other tools) for solid waste management	The indicator measures the capacity building of Qalyubia Governorate for solid waste management	Half-yearly	Regular Progress and Monitoring reports of the PCU.	Involves reviewing the progress on establishment/ strengthening of SWM Unit, its staffing, preparation of operations manual, its implementation along with necessary infrastructure.	WMRA with inputs from Qaliyubia Governorate.
User satisfaction with bus service (percentage)	Indicator measures satisfaction with public transport service provided by e-buses, which will operate with the project at higher frequency, have air conditioning, USB charging and CCTV cameras inside and outside. User satisfaction should increase thanks to the project. Survey findings will be addressed to improve service provision. This indicator has a sub-indicator by gender to capture female and male perceptions.	Yearly	From survey.	User satisfaction will be measured with a survey, asking users whether they are satisfied with the public transport service.	CTA
Female user satisfaction with bus service (percentage)	Sub-indicator measures the satisfaction of female users with public transport services. User satisfaction	Yearly	From survey.	This sub-indicator will report the answers by females to the survey described above for the	CTA.

	should increase with the project.			parent indicator.	
Male user satisfaction with bus service (percentage)	Sub-indicator measures the satisfaction of male users with public transport services. User satisfaction should increase with the project.	Yearly	From survey.	This sub-indicator will report the answers by males to the survey described above for the parent indicator.	CTA.
Bus service quality action plan elaborated, consulted and disclosed	This sub-indicator measures the citizen engagement in improving bus services quality.	Every 2 years	Data source: from survey and focus group	The sub-indicator will measure to what extend were the public transport users and the broader civil society involved and consulted in improving the e-bus services.	CTA
Perception of security among users of public e-bus	Sub-indicator measures the variation of the proportion of e-bus services users satisfied with their personal security while using public transport services. Surveys will allow to collect a baseline data (sex-disaggregated) and based on that also target will be set that allows to monitor the improved satisfaction/ security for female and male users. Personal security perception should increase	Every 2 years	From survey and focus group.	This sub-indicator will report the answers by female and male public transport users to a specific question on the aspects that might generate insecurity during their trip.	CTA.

	with the project.				
Perception of security among female users of public e-bus	Sub-indicator measures the variation of the proportion of e-bus services female users satisfied with their personal security while using public transport services. Surveys will allow to collect a baseline data and based on that also target will be set that allows to monitor the improved satisfaction/ security for female and male users. Personal security perception should increase with the project.	Every 2 years	From survey and focus group	Methodology: see above the parent indicator.	CTA.
Perception of security among male users of public e-bus	Sub-indicator measures the variation of the proportion of e-bus services male users satisfied with their personal security while using public transport services. Surveys will allow to collect a baseline data and based on that also target will be set that allows to monitor the improved satisfaction/ security for female and male users. Personal security perception should increase with the project.	Every 2 years	From survey and focus group.	See above the methodology of the parent indicator.	CTA

E-bus pilot implementation progress	This indicator measures the e-bus pilot infrastructure and operation implementation progress including the 3 major components of the pilot: connection to power supply and charger installation, maintenance facilities, e-bus supply and operation.	Yearly	CTA, qualitative aggregation of the following 4 sub-indicators	The indicator will be assessed in a qualitative manner.	CTA.
Electric buses in operation	Indicator measures the number of electric buses that enter operation in CTA bus-routes (component 3).	Yearly	CTA	The percentage reflects a number of activities achieved each year.	CTA
Charging stations in operation (percentage)	Indicator measures the percentage of charging stations installed compared to optimum number as defined per the feasibility study to be conducted (component 3).	Yearly	CTA	The percentage reflects a number of activities achieved each year.	CTA
E-bus maintenance facilities in operation	Indicator measures the percentage of dedicated e-bus maintenance facilities in operation, that provide maintenance services to the 100 e-buses.	Yearly.	CTA	The percentage reflects a number of activities achieved each year.	CTA
CTA staff trained for operation and maintenance efficiency improvement	This sub-indicator measures the number of CTA staff (disaggregated by gender) that were trained for e-bus operation and maintenance	Yearly	CTA	The targets reflect different profile of staff to be trained.	CTA

	in order to implement the e-bus pilot and to increase operation efficiency.				
Monitoring of Key Performance Indicators (KPIs) for e-buses	Indicator follows how CTA is measuring the key performance indicators that assess the performance of the e-buses. Examples are: revenue, costs, km travelled, ridership and a combination or ratio of these indicators that are meaningful to assess the performance and efficiency of the operation.	Half-yearly	Operational data to be recorded by CTA.	A performance indicator will be considered as monitored if the data is made available continuously from the day its collection starts.	CTA.
Average daily business day ridership on selected e-bus routes	This sub-indicator measures the ridership of e-bus services. Project expects to increase the ridership on the buses in the selected routes.	Yearly	Survey	The ridership will be determined by in bus boarding counts surveys.	CTA
Pilot Community-based Social Marketing (CBSM) initiatives implemented	This indicator tracks the successful design and implementation of pilot Community Based Social Marketing activities aiming at inducing behavioral changes in support of air quality and solid waste management. Scale up activities based on the pilots need to take place to affect	Before and after implement ation of each pilot CBSM.	Reports on the results of surveys.	Surveys using specific questionnaires for each type of initiative.	See sub-indicators level.

	change at Greater Cairo level or larger groups of population.				
Improving municipal solid waste segragation at source at households level	This indicator will assess the successful design and implementation of a pilot CBSM promoting proper segregation at source of municipal at the households level in selected districts.	Yearly	Progress reports.		
Number of NGOs/CBOs led initiatives in collabration with local authorites	This indicator measures the collaboration between governmental and non-governmental entities in the form of NGOs/CBOs led initiatives (e.g. clean up campaigns, SWM collection, awareness campaigns including for the beneficiaries of different project components) that demonstrate contribution of the project to stronger partnerships with public actors	Mid-term and end of project.	Technical and financial progress reports.	The participating civil society associations and organizations will prepare and submit quarterly progress reports on the state of implementation of the activities. Both Qalyubia Governorate and the NGO's Dept of EEAA will monitor the performance of these initiatives.	The NGOs dept in EAAA.
Number of women groups or CSOs engaged in monitoring SWM services	This indicator measures the increased role of women groups and NGOs in monitoring service delivery of SWM activities under component 2.	Half-yearly	Technical and financial progress reports.	The participating Women civil society associations and organizations will prepare and submit quarterly progress reports on the state of	

				implementation of the activities. Both Qalyubia Governorate and the NGO's Dept of EEAA will monitor the performance of these initiatives.	
Increased percentage of women employed in the solid waste chain	Indicator measures the increase in percentage of women who, got jobs in carrying out activities in the solid waste chain, due to the training and capacity building activities of the project.	Yearly	Technical and financial progress reports, including data from targeted beneficiaries database and results of surveys.	A database of the targeted beneficiaries for training will be developed; and surveys will be conducted to assess the percentage of women employed in various solid waste management activities.	WMRA with the support of the Technical Implementation Unit of Component 4.
People reached out with air quality and climate change information	People provided with enhanced air quality information, including real-time and forecast air pollution information, and guidance on actions to be taken in case of extreme weather situation. This indicator will measure the extent to which the project succeeded in reaching out to a larger audience with	Yearly	Number of people signin g to EEAA website and other means of social media, surveys and progress reports.	The data collection will be conducted on an annual basis, using project reports and a review of the number of people accessing social media, or people targeted through awareness and communication campaigns. Surveys will be conducted at mid-	EEAA, through the Communication Dept and the Air Quality Dept.

	enhanced information in order to induce a behavioral change and increase the people's resilience to air pollution.			term and at the end of the project. The baseline and the end value of this indicator will be determined by EEAA during the first six month of implementation.	
Level of satisfaction of stakeholders with the quality of project's engagement	This indicator measures the degree of satisfaction of the stakeholder groups, including project affected parties, with regards to the quality of the consultation process, integrating consultation results in the design, quality and timeliness of information sharing.	At mid-term and end of project.	Results of surveys.	Surveys will be conducted targeting stakeholder groups, including project affected parties, project beneficiaries and other interested groups as identified in the Stakeholders Engagement Plan. Data will be disaggregated by gender and age groups. Questionnaires will be developed during implementation and included in the project's M&E Manual.	The PCU.
Percentage of grievances received and addressed in a timely manner	This indicator refers to the percentage of grievances that are addressed and responded to within a timeline that has been	Quarterly	Reports of the Project Coordination Unit.	Quality of the GRM will be measured against timeliness, nature of the response, feedback loop, systems and	The Project Coordination Unit at the Ministry of Environment in collaboration with other related entities (e.g. the

	specified and publicly communicated by the project. It also assesses the functionality of the GRM system against the following specific parameters: (i) Standard operational guidelines for the system are developed; (ii) Qualified staff has been appointed to deal with the complaints; and (iii) Reporting system is in place to document and track complaints.			people in place.	Governorates).

ANNEX 1: Implementation Arrangements

Institutional Arrangements

1. The project will be implemented through a partnership between the MoE, the MoLD, the MoHP, the MoT, and other ministries as needed. Execution on the ground will be through the EEAA, the WMRA, the MoLD's Central and Regional SWM Units of Qalyubia Governorate, and CTA. An Inter-ministerial agreement will be signed between the MoE and the implementing parties, with MoIC and MoPED as witnesses.

2. The project will be guided by an inter-ministerial SC co-chaired by the Minister of Planning and Economic Development and the Minister of Environment and will include the Ministers (or their representatives) of the MoIC, MoLD, MoT, MoHP, the Governorates of Cairo, Qalyubia and Giza, and CTA. The SC will provide overall policy and strategic guidance, play an important role in high-level decision making, facilitate the interaction and coordination between the various ministries/agencies, and ensure an enabling environment for reforms to succeed and be sustained. It will also approve the annual work plans and budgets and monitor progress towards the achievement of national and project specific target indicators.

3. The MoE will be responsible for overall project implementation and for overall coordination with all implementing agencies. A PCU will be established at the MoE to ensure that the project is implemented in accordance with the Legal Agreement, the Project Appraisal Document, and the project implementation manuals (POM, M&E Manual, etc.) The PCU will prepare annual work plans and budgets, coordinate M&E activities with the other executing agencies, and will be responsible for financial management, procurement, and environmental and social safeguard compliance. It will also be responsible for implementing Component 5: Project Management and Monitoring & Evaluation. The key positions in the PCU include a National Project Director; a Project Coordinator; a Financial and Administrative Manager; Accountants and Accounting Assistants; an Internal Auditor; a Procurement Specialist; an M&E Specialist; a Social Development and Gender Specialist; an Environmental Specialist; and a Communications Specialist.

4. TIUs will be established for each of the components or subcomponents to oversee their implementation (as shown in Table 1.1). Each TIU will be led by a responsible agency, a co-lead agency, and will include members from other relevant agencies.

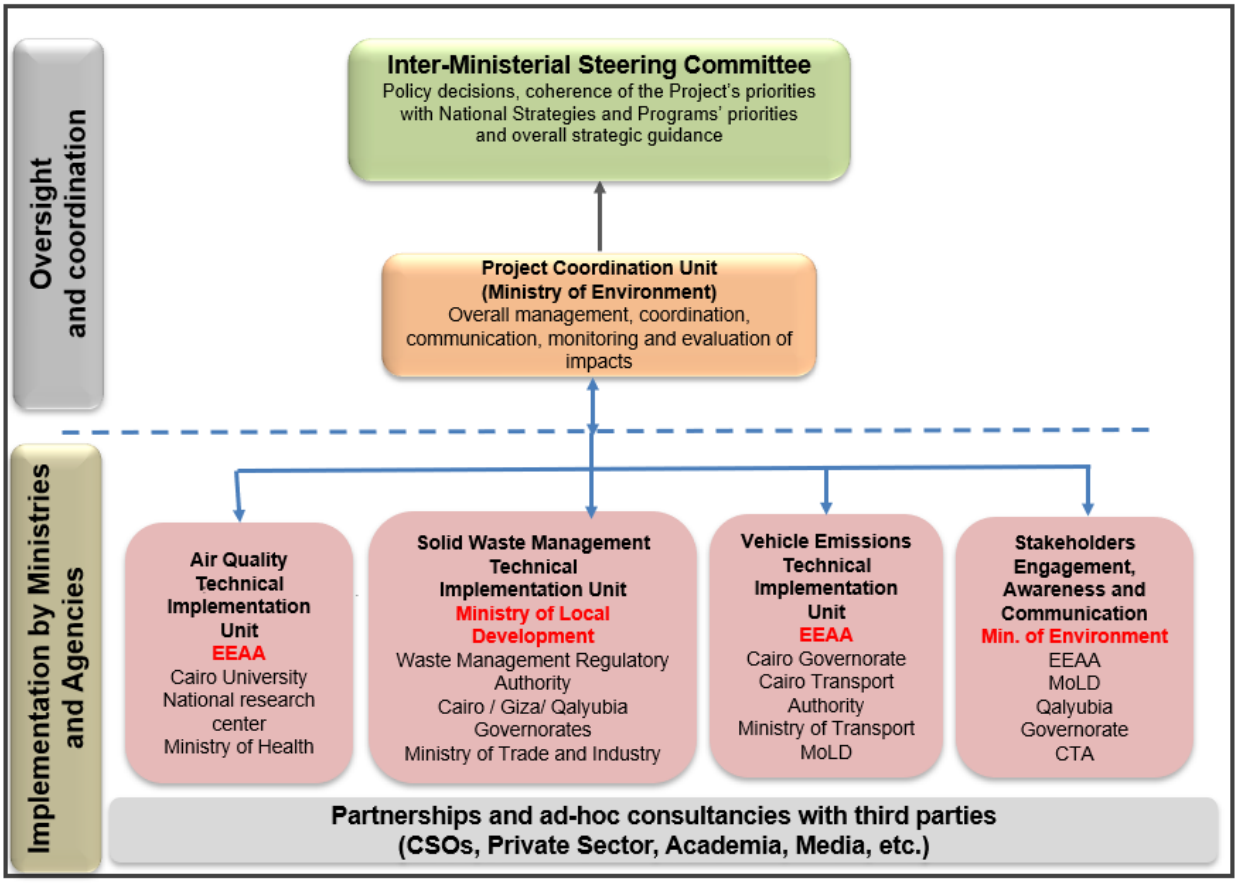
Table 1.1. Technical Implementation Units of the Project

Technical Implementation Unit	Responsible Agency	Members
1. Air Quality Management (Component 1)	Egyptian Environmental Affairs Agency (EEAA, Air Quality Dept.)	Cairo University, National Research Center, and MoHP
2. Solid Waste Management (Component 2)	SW Executive Unit, MoLD	WMRA, Governorates of Cairo, Giza and Qalyubia, MoHP
3. Vehicle Emissions Reduction (Component 3)	EEAA in collaboration with Cairo Governorate (through CTA)	CTA, MoT, and MoLD
4. Stakeholder Engagement (Component 4)	Ministry of Environment	MoLD, EEAA, WMRA, Governorates of Cairo, Giza and Qalyubia, CTA, and MoT

5. Each TIU will be responsible for the preparation of its annual work plan and estimated budget, and for the day-to-day implementation of its component in accordance with the approved workplans. The TIUs will ensure that these activities adhere to the technical, environmental and social standards (as agreed with the World Bank in various project documents). The TIUs will be staffed by specialists from the ministries and implementing entities and will be supplemented by full-time and part-time staff and consultants as needed.

6. Figure 1.1 shows the implementation arrangements for the project.

Figure 1.1. Institutional Arrangements for the Project



Financial Management

7. **Risk assessment.** The project will adopt the government financial management systems, which are governed by the Egyptian laws regulating the state budget, government accounting and procurement. The MoE, which will host the PCU, has previous experience in implementing World Bank financed projects, namely the EPAP I and II, and the ongoing Sustainable Persistent Organic Pollutants Management Project. The PCU will oversee project financial management, prepare combined semi-annual financial reports, and liaise with the external auditor on the audit of project annual financial statements. It will be in charge of budget preparation, disbursement of funds and reporting.

8. The envisaged involvement of several entities (MoE, MoLD, Governorates, Governorate Cleanliness and Beautification Authorities, and MoT) poses challenges in terms of funds flow, coordination and accountability. The inter-ministerial agreement(s) mentioned earlier will define the responsibility of the respective entities in procurement, contract management, technical and financial approvals of works, goods and services. The residual project FM risk is assessed to be substantial.

9. **Budget.** Preliminary cost estimates have been prepared for project activities broken down by subcomponent. The PCU will share the annual cash forecast with the Bank ahead of each fiscal year.

10. **Flow of funds.** All project funds will be managed by MoE, including the designated account to be opened at the Central Bank of Egypt for the purpose of receiving and disbursing the loan proceeds. Payments out of the designated account will apply the typical accounting and payment procedures applicable for government accounting units, based on procurement procedures and document packages completed by the PCU staff and transmitted to the accounting unit. To facilitate project implementation and supervision activities by the agencies in charge of the different components, advances from the designated account can be extended to the respective agencies to finance the day-to-day operational expenses related to the project activities. The ceilings and the settlement arrangements for such advances will be reflected in the POM and the respective record-keeping and documentation will follow government accounting rules. Funding of activities aiming at establishing partnerships with CSOs under Subcomponent 4.1 will have a ceiling of US$50,000 and will be implemented by NGOs and CBOs, recruited as service providers. Up to an aggregate amount not to exceed $20,000,000 may be made for payments made prior to the signature date of the Loan Agreement but on or after July 1, 2020 for eligible expenditure.

11. **Internal control.** A Project Implementation Manual will be prepared to describe the project operational procedures and responsibilities. An inter-ministerial agreement is envisaged to be signed between MoE and each of the involved ministries/agencies. The manual and the agreement should specify the role of each entity, the responsibilities for different activities/tasks including preparing bid documents, providing technical specifications and other relevant inputs on technical aspects of procurement, advertising, participation in procurement evaluation committees. They should also specify any delegation of authority with respect to contract management and supervision responsibilities, technical acceptance, payment approvals, etc. Ex-ante reviews will be carried out by MoF controllers at the respective Ministry's accounting unit to authorize payments. Implementation of Subcomponent 4.1 activities by NGOs/CBOs will follow the arrangements specified in the terms of reference and service provision contracts.

12. **Auditing.** An external auditor will be hired competitively to audit the annual financial statements of the project. The terms of reference for the auditor will be agreed with the Bank and will reflect any special arrangements (such as the use of experts) or extended scope needed to address the identified project risks, such as complex procurement transactions, internal controls, etc.

Procurement

13. The new GoE procurement law and regulations are aligned with international good practices. The MoE/EEAA has some experience in implementing World Bank projects, and a qualified project manager, who is currently in place will be responsible and accountable for project activities, including procurement.

14. The project will finance Works, Goods, Non-Consulting Services and Consultant Services. The main envisaged Works contracts would include the establishment of two integrated waste processing and final disposal facilities and upgrading bus depots (existing facilities). Goods contracts would include procuring electric buses, retrofitting of old diesel buses with low-emission technology, and procuring monitoring equipment. The project will also finance capacity-building activities, development of emergency response plans, training, development of a mobile source system, raising public awareness through information dissemination, development and adoption of model bid documents, systems to monitor and evaluate the effectiveness of the SWM activities being implemented, technical studies and auditing services.

15. The selection of NGOs/CBOs for the implementation of activities under Subcomponent 4.1, will follow standard World Bank procurement procedures.

16. **Risk rating**. A Procurement capacity assessment of MoE was carried out as part of project preparation. The assessment evaluated the institutional capacity to implement procurement for the project under the World Bank Procurement Regulations for IPF Borrowers, and recommended mitigation measures. Procurement risk was rated Substantial, and the World Bank prior review thresholds for Substantial risk rated operations will apply to the project. In addition to contracts estimated to be above those thresholds, ToR for all consultants' services and TA packages will be subject to the World Bank's technical review and clearance. The World Bank will carry out two supervision missions a year, including an ex-post procurement review that would cover at least 10 percent of the contracts awarded during the review period.

17. Table 1.2 provides a summary of the identified procurement risks and mitigation measures.

Table 1.2. Identified Procurement Risks and Mitigation Measures

Risk	Mitigation Measures
Limited procurement experience mainly in works contracts and moderate experience in goods contracts and Selection of Consultants.	• The MoE/EEAA capacity would be strengthened by hiring an additional senior procurement expert and a procurement assistant at the PCU with good experience in World Bank procurement procedures. These staff would work closely with the MoE purchasing department. In addition to day to-day implementation of project procurement, the procurement expert would provide on-the-job training to the ministry procurement staff, and other executing agencies. • Procurement training will be provided to concerned ministry staff prior to the loan being declared effective. • Prepare a Procurement Guide as part of the Operation Manual which (a) defines the roles and responsibilities of all executing agencies that will be involved in procurement during project implementation; (b) sets out the sequence and timeframe for the completion of procurement decisions of all individual players, including the delegation of authority; and (c) establishes service standards for processing payments to contractors and suppliers.
Limited exposure to the procurement procedures of International Finance Institutions (including World Bank).	

Poor quality procurement and outcomes due to limited procurement and contract administration capacity. Technical specifications/TORs are vague. Project delays due to poor quality bidding documents/RFPs.	• Hiring an implementation support consulting firm to provide procurement support during the entire procurement cycle for all major contracts, from preparing technical specifications to contract management. • Ongoing training on procurement and contract management will be provided to the staff of the ministry and other executing agencies by the World Bank. The training will focus on project procurement arrangements as indicated in the POM and will provide a detailed explanation of the critical steps in procurement and contract management process. • Technical specification and ToR of complex packages to be reviewed by the World Bank. • The MoE prepared a Project Procurement Strategy for Development and a Procurement Plan for project implementation, which provide the basis for the procurement methods. These were agreed with the World Bank. The Procurement Plan will be updated in agreement with the World Bank annually or as required to reflect the project implementation needs and improvements in institutional capacity.

Implementation Support Strategy and Approach

18. The strategy for supporting project implementation follows a two-prong approach: (a) provision of continued, face-to-face or virtual, TA and on-the-job training, mainly in areas of weakness or where new approaches and/or technologies are introduced and (b) ensuring the successful and timely implementation of the proposed mitigation measures in SORT. The strategy is also to ensure maximum benefit to the implementing agencies and its broader staff, rather than merely to the TIUs and the PCU. Support activities will be provided either by short and long-term consultants hired by the project or by the World Bank and supplemented by other resource persons as needed.

19. **Technical support.** A specialized TA consultant (firm or individual) will be hired by the PCU (on the basis of ToRs prepared by the TIUs, with guidance from the PCU and World Bank specialists) to support each TIU. The Consultant will provide support in the following areas:

(a) Overall planning, management and monitoring of the works at the 10th of Ramadan Integrated Facility.

(b) Helping the CTA beyond the detail design study, including but not limited to the evaluation of offers, day-to-day planning and implementation, and monitoring the pilot (including the financial aspects).

(c) Helping Qalyubia Governorate with the establishment of the newly created (but not yet operational) SWM Unit. This includes TA for the development of the unit's mandate, preparation of the organizational structure, identification of staffing and budget needs, formulation of annual workplans, and providing on the-job training and operational support.

20. The World Bank's core implementation support team will provide technical support on an ongoing basis, and the Bank may mobilize additional expertise periodically to provide expert advice on key activities.

21. **Fiduciary support.** Procurement and financial specialists based in the World Bank Cairo office will

closely supervise the project's fiduciary management. They will participate in the twice-yearly implementation support missions and facilitate capacity building. The procurement staff will organize a post review of procurement activities at least once a year. Specific areas of FM and procurement support are as follows:

- Review the project FM system, including the capacity for continued adequacy; evaluate the quality of the budgets and adherence of the PCU thereto; review the cycle of transaction recording; review IFRs and/or annual Financial Statements; follow up on both internal and external audit reports; and periodically assess the project's compliance with the POM and its FM Section, as well as with the Loan Agreement and the Disbursement Letter.

- On the procurement front, the World Bank will provide implementation support through a combination of prior and post reviews, procurement training to the PCU and relevant staff in the TIUs, and periodic assessment of the project's compliance with the procurement manual. Implementation support missions will be geared toward (a) reviewing procurement documents, (b) providing detailed guidance on the World Bank's Procurement Guidelines, (c) monitoring procurement progress against the detailed Procurement Plan, and (d) following-up on the recommendations of the fiduciary assessments. The project implementation support missions may include field visits.

22. **Procurement support.** The procurement specialist in the PCU, under the supervision of the Project Coordinator and in collaboration with the Financial Management specialist, will coordinate the design and provision of the following support activities:

- Build the capacity of all parties involved in the procurement process in drafting procurement notices, bid documents, evaluation reports and contracts.

- Technical support in tendering, selecting contractors, and completing contract agreements for successful construction.

- On job training to stakeholders in the implementation of procurement for works, goods and services.

- Advice the technical selection committees in the technical evaluation of bids.

- Training and capacity building to project stakeholders in contract administration, e.g., measurement of works, certification and payment of contractors' bills, release of security deposits, approval of variations, time extensions, contractors' claims, issue of completion certificates, financial closure of the contract, management during the defect liability period, preparation of contract completion reports, reporting on progress and performance of contractors.

23. **Implementation support missions.** The Bank implementation support missions will be on a semi-annual basis. These may be complemented by short visits by individual specialists to follow up on specific thematic or technical issues as needed. The first two years of implementation will be more on technical support, and later the focus will change to ensuring the implementation of enabling activities and sustainability of the interventions. A Mid-Term Review (MTR) will be carried out midway during

implementation, that is, around Year-3. It will include a comprehensive assessment of progress in achieving the project's objectives as laid out in the Results Framework. The MTR will also serve as a mechanism for revisiting design issues that may require adjustments to ensure satisfactory achievement of the project's objective.

24. **ESF.** The World Bank Environmental and Social Development Specialists will provide support to the PCU and to the TIUs to ensure proper implementation of the ESF instruments. They will join the implementation support missions, or undertake separate missions as needed, to (a) assess the level of compliance with the ESCP, (b) assess the level of compliance with the cleared environmental and social instruments (including mitigation, monitoring, and management measures), (c) review environmental and social progress reports, and (d) ensure that procurement arrangements are consistent with the ESF requirements set out in the project legal agreements. The specialists will also discuss the findings with the implementing agencies to help identify and address any shortcomings, share lessons learned from other projects and other countries, and propose good practices to the implementing agencies to help improve ESF compliance as well as environmental and social sustainability.

Table 1.3. Scope and Focus of Implementation Support

Time	Focus of Implementation Support	Skills Needed

First 18 to 24 months	• Project start-up
	• Support to preparatory activities (sensitization, community consultations and stakeholder engagement, institutional building, strengthening implementation capacity including planning and monitoring of progress)
	• Technical support
	• Guidance on applying ESF instruments
	• Support on M&E and impact evaluation methodology
	• Procurement, FM, M&E, and ESF training of staff at all levels
	• Establishing and re-enforcing the coordination mechanisms between the implementing agencies
		• Task team
		• Technical specialists
		  ○ AQM
		  ○ SWM
		  ○ Transport
		  ○ Construction engineers
		• Financial management
		• Procurement
		• Environmental and Social ESF specialists
		• Social development
		• External Affairs specialist
		• Communications
		• M&E
		• Leadership and institutional development
		• Business development and PPPs.

24 to 60 months	• Review and enhancement of the institutional and regulatory framework
	• Improvement of service delivery
	• Testing the effectiveness of the proposed PPPs and business models developed for the private sector
	• Monitoring implementation performance including progress
	• Review of annual work plans and disbursement schedule; and periodic reports
	• Review of audit reports and IFRs
		• Task team
		• Technical specialists
		  ○ Air quality management
		  ○ Solid waste management
		  ○ Transport
		  ○ Construction engineers
		• Financial management
		• Procurement

	• Review adequacy of the FM system and compliance with financial management procedures	• Environmental and Social ESF specialists • Social development • Communications • M&E • Leadership and institutional development • Business development and PPPs

ANNEX 2: Detailed Project Description

1. The overall approach of the project is to support a mix of institutional and investment actions to address air pollution in GC. The project comprises five components, as described in the following paragraphs.

Component 1: Enhancing the Air Quality Management (AQM) & Response System (US$17.5 million)

2. This component will support the enhancement of the AQM system in Egypt with a focus on GC. It will strengthen AQM infrastructure (monitoring and analytical), capacity-building activities, emergency response plans, and raise public awareness through information dissemination. It will build on trust fund supported activities on Pollution Management and Environmental Health (PMEH), which are helping EEAA to strengthen monitoring (including through procuring monitoring equipment, training on the equipment and on analysis), health impact assessments and carry out a foundational assessment of key sources contributing to air pollution in GC. The project design retains flexibility to complete certain PMEH analyses (e.g., source apportionment, inventory needs assessment) as part of this component. This component will also provide evidence-based solutions for pollution abatement, deepen EEAA's capacity for decision support and regulatory design, and develop a rapid response system that enables the GoE to respond with plans for emergency situations and for the public to take protective actions during high pollution days.

Subcomponent 1.1: Reduction of air pollution and GHGs (US$13.5 million)

3. **Integrated Climate and Air Quality Management Plan.** To maintain the GoE's advancement towards reducing emissions and to identify further abatement actions, building on Component 2 (SWM) and Component 3 (urban mobility), an Integrated Climate and Air Quality Management Plan (IC-AQMP) will be prepared. This plan will present an array of actions for continued emission reduction based on robust observations and sound analytical methods. The IC-AQMP aims to reduce the sources and amounts of pollutants responsible for the degradation of urban ambient air quality and regional and global warming, thereby improving the quality of life of GC resident. It will build on the foundational assessment of key pollution sources in GC identified through prior PMEH work (that is, urban transportation and the burning of solid waste) and ongoing work by EEAA, to develop pathways to reduce GHGs, SLCPs and local air pollutant emissions in a context of sustainable economic development. Specifically, this activity will synthesize and assess the environmental health and economic benefits (including tourism) of priority climate and air quality interventions, and evaluate the measures based on analysis of financial costs and cost-effectiveness. The Plan will present mitigation actions with estimated budget requirements in the form of a time-bound action plan with clear roles and responsibilities for implementation. The IC-AQMP will serve as the overarching framework for government action and will lay out the vision for further scaling-up.

4. Critical to the success of an IC-AQMP is effective stakeholder engagement. Key sectors will be involved upstream in the preparation of the IC-AQMP to build trust, ownership, and a sense of shared responsibility. Stakeholder engagement activities will be held regularly to solicit inputs, update stakeholders on progress, and to obtain feedback, particularly on the proposed sectoral mitigation

strategies and abatement options. The goal is to develop the abatement options elaborated in the IC-AQMP and to present them to the Council of Ministers for action.[29]

5. **Enhance regulatory and policy tools.** AQM information systems will be strengthened in three principal ways. First, an expanded emission inventory for GC – first developed in 2020 for point and area source categories – will include mobile sources (including auto, heavy duty truck and bus sources as well as nonroad sources such as marine, rail and construction vehicles) with the potential for detailed emission factor development (that is, through emission testing) of Cairo-specific vehicle technologies. However, if local emissions testing cannot be carried out as part of this operation, emission factors will be sourced from reference values in the literature and technical documentation. Given the important contributions from the urban mobility sector, the mobile source emissions inventory will serve the IC-AQMP as a fine-grained policy tracking and analysis framework for city-wide transportation planning. The completed air pollutant emission inventory will also be integrated with national GHG inventories and supplemented by an SLCP inventory so that the GoE will have a single database that provides a comprehensive point of reference for air pollution policy tracking, national reporting (that is, UNFCC) and policy development (that is, NDCs). This activity's development efforts will also afford the opportunity to integrate criteria pollutants (that is, PM and O3 precursors), GHG and SLCP inventories in a single database that can serve multiple regulatory functions including: (i) future regulatory compliance tracking across multiple sectors; (ii) INDC check-ins; and (iii) air quality dispersion modelling for developing control strategies. As part of the inventory verification process, this activity will also deploy a system to monitor traffic flows along key public transit routes before and after the deployment of electric buses and launch of a public campaign around mode shift (see Component 4 on behavior change). This will enhance the capacity of the MoE to monitor GHG emissions, track and eventually credit emission reductions from this project, and will require working with the Ministry of Interior, MoT, and other ministries as necessary.

6. This activity will also expand the existing capacity of the Air Quality Department of EEAA. It will expand the department's capacity to continuously monitor SLCPs such as Black Carbon, which is an important pollutant both for climate change and local air quality (but which is currently not being monitored). Appropriate monitoring sites will be identified to include the measurement of SLCPs using a multi-wavelength aethalometer that has the added advantage of a built-in CO_2 sensor. This monitoring of SLCPs and GHGs will serve a critical role in achieving the INDC priority initiative of establishing "national monitoring, reporting and verification systems." This observation network will provide a foundation for validating the emission inventory, enable future monitoring/accountability for transport sector and solid waste initiatives that address city-wide emissions of diesel or waste burning, and provide a database to support regional scale chemical transport modelling (in line with Component 1.2.A on air quality forecasting).

7. A focus on training and skills development within Component 1.1 will build on existing University capacity (for example, Helwan University, University of Cairo and Aim-shams University) to improve

[29] The Council of Ministers is headed by the Prime Minister, and includes line ministries necessary to implement the Action Plan and other crucial sector Ministries Stakeholders. Following a multi-level governance model (see http://e-lib.iclei.org/wp-content/uploads/2017/11/GIZ-ICLEI-UNHabitat_2017_EN_Enabling-subnational-climate-action.pdf) will require that the Climate Change Committee add key air pollutants to their emission reduction portfolio, add key affected industries and ministries (from an air pollution perspective) to their stakeholder base and add key regional and municipal authorities to their membership to enable solutions that address air and climate pollution in both a horizontally and vertically integrated framework. The committee should also regularize its agenda to coincide with the IC-AQMP update cycle that will be inclusive of the NDC check-in cycle. These aspects are covered in Component 4.

capacity of ministry staffs and sustainable development units to undertake integrated climate and air quality management planning, and implementation of mitigation actions. This will be done through a series of training programs, initially focused on several aspects of AQM, including chemical engineering, atmospheric science, resource economics and environmental health curricula. The program will comprise executive training programs for both ministry officials (for example, Ministries of Energy, Environment, and Transportation) and staffs of the new Sustainable. Development Units in each of these Ministries. These officials are expected to be charged with carrying out elements of the new Integrated Climate and Air Quality Management 'Action' Plan (the "Action Plan"), yet may be unfamiliar with the types of actions or policies that are commonly employed (for example, emission reporting or accounting, inspections and maintenance programs). Skills training will include face-to-face training opportunities, technical exchange programs or e-learning to familiarize officials with international best practice. Universities will be engaged to enhance curricula that provide the needed workforce to maintain institutional knowledge for Action Plan implementation and eventually to fill the needed Green Jobs skills-gap anticipated as elements of the Action Plan are implemented and there is increased demand for professionals with new skills (for example, resource efficiency/circular economy interventions, renewable energy interventions, energy efficiency and environmental economics).

8. **Support to the policy dialogue.** This activity will synthesize and assess the environmental health and economic benefits of priority climate and air quality interventions to be implemented in Components 2 and 3. It will support detailed cost-benefit and cost-effectiveness analyses of priority emission abatement investments in both technologies and program implementation costs of the PMEH-identified interventions. These will be followed by subsequent detailed studies of the multiple benefits that would accrue as a result of these programs and interventions (for example, energy savings, public health benefits in terms of welfare benefits, economic stimulus of patterns of technology investments and employment/wage benefits, congestion mitigation benefits and time savings, and potential agricultural/tourism/recreation sectoral benefits). Economic analyses carried out under this activity will be synthesized in the IC-AQMP. Environmental economics capacity-building workshops will be carried out (under the skills training described in the previous paragraph) to train the MoT in quantifying the environmental benefits of transport interventions.

Subcomponent 1.2: Strengthening resilience to air pollution (US$4 million)

9. This subcomponent will strengthen the resilience of the GC population to cope with high pollution events, including those exacerbated by climate extremes and emissions, and will be achieved through two activities:

(a) **Improving Air Quality Forecasting.** This activity will improve the current air quality forecasting tools, and the integration of these tools with local air quality monitoring data. With a comprehensive emission inventory, EEAA will be supported to develop a chemical transport model-based (CTM-based) approach to forecasting that has been shown to provide improved reliability of air quality forecasts. The strengthened forecasting system will include a quality management system to allow QA/QC of predicted extreme air pollution episodes, regardless of whether they are associated with increased anthropogenic activity, changes in meteorological phenomena or increased dust events (all of which are, among others, related to climate change). It will also include dissemination of improved forecasting information - on a newly designed website displaying air pollution information - along with pertinent health messages. On-line forecasts of low-air-quality events can include

information describing how emissions reduce air quality and cause climate change (median annual temperature increase, higher volatility of extreme climate events). This will serve as a passive and constant awareness-raising campaign and will promote climate change mitigation efforts.

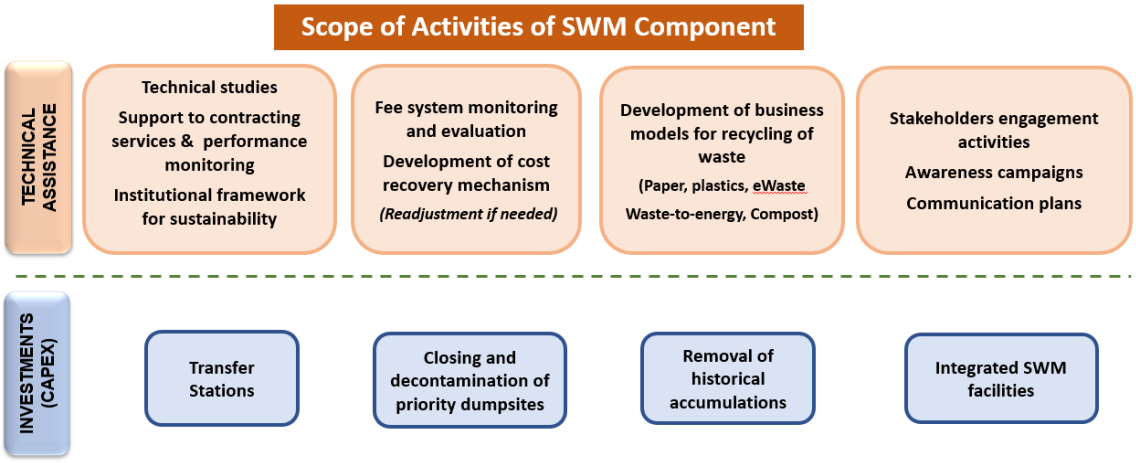
(b) **Establishing institutional response mechanisms to high pollution days.** "Air Quality Action Days", that is, days during which extreme air pollution is forecasted, will be defined. This activity will strengthen the institutional response to high pollution days by (i) creating emergency plans to be enacted and decision protocols to be followed when AQ Action Days are identified; and (ii) enhancing and improving the functioning of the existing National Committee for Crisis and Management and Risk Reduction by adding officials from the environmental, meteorological, emergency response and public health departments who will be charged with implementing these protocols, along with enforcement officials from departments who may need to implement adaptive responses (for example, school closures, alternative transportation patterns, and industry closure). These plans will allow the GC to take adaptive actions in the face of forecast high pollution days to significantly reduce human exposure to the worst air pollution and adverse climate hazards, as well as take measures to shut down certain human emission activities in the short-term to manage pollution and air quality levels. This mechanism will enable broader public health action, as outlined in Component 4. Carefully crafted emergency plans in the short-run will result in temporary GHG emission reductions, and in the long-run will lead to steady GHG emission reductions by stimulating the transition of industries to cleaner processes and technologies, and by stimulating modal change in urban transport.

Component 2: Support the Operationalization of SWM Master Plans in Greater Cairo *(US$126 million)*

10. This component will support the operationalization of Governorate SWM master plans, which specify the full range of necessary actions and investments needed for each governorate to improve SWM services in accordance with the specific needs of each Governorate. In view of the complexity and the magnitude of the SWM system in GC, a phased and gradual approach is being proposed to achieve tangible results on the ground. This approach involves providing technical support to the central agencies such as MoE, WMRA, MoLD, the Executive SWM Unit and the Regional SWM Units to be established in the Governorates on the technical, financial and project development aspects of SWM in GC, and in parallel support the southern zone of Qalyubia Governorate (adjacent to Cairo Governorate) on the entire waste management chain from collection and transportation to final disposal.

11. Activities proposed under this component include a combination of enabling activities and infrastructure investments. The overall scope of this component is summarized in Figure 2.1.

Figure 2.1. Scope of the SWM Component



Subcomponent 2.1: Waste Management Infrastructure (US$108 million)

12. This subcomponent will be implemented jointly by WMRA, the MoLD and Qalyubia Governorate and will support the development and upgrading of waste management infrastructure, including the closing of substandard landfills (which are crucial for reducing Black Carbon from waste burning, methane and the emissions of SLCPs).

13. **Development and/or upgrading of existing waste management infrastructure constitutes a national SWM strategy priority** and is an essential element for the implementation of the SWM Master plans of the three GC Governorates. The project will finance the following works, services and activities:

- **Integrated Waste Management Facility at the 10th of Ramadan.** The project will finance the capital investments for the main surrounding infrastructure in the facility and the main axes, which serve both Cairo Governorate and Qalyubia Governorate. This includes: the main road around the facility; main internal axis roads; fences; water and wastewater connections and electricity connections from the utilities to the facility and to the entrance of the first cell. The project will also finance the construction of Cell number 1 of the landfill section serving Qalyubia governorate. By collecting and properly disposing of waste, it will reduce waste burning and the emissions of Black Carbon, as well as minimize the emissions of methane and other SLCPs that also are strong contributors to climate change. Facility design will account for climate hazards to ensure the sustainability of operation and minimize operational disruptions in the future, as well as energy conservation and the use of renewable energy sources to minimize climate impact.

- In addition to municipal solid waste, this facility is also being designed to handle special types of waste, such as health care waste and construction and demolition waste, and will include waste-to-energy investments. The project will support the preparation of bid documents, contracts for each waste management facility using the DBO modality, and to supervise the infrastructure works of the 10th of Ramadan site. Appropriate PPP contracts will be developed for the establishment and financing of recycling facilities for revenue-generating

waste streams, such as plastics, paper, metals, and so on. Appropriate provisions for landfill gas extraction and its utilization will also be included to mitigate GHG emissions from the landfill and to enhance climate co-benefits of the project. Over the 30-year lifetime of the project, the project will reduce open dumping and open burning of waste from 60 percent to 5 percent and 20 percent to 5 percent, and increase the share of composting from 0 percent to 20 percent and sanitary landfills from 0 percent to 55 percent (please see table 2.1 for waste treatment disaggregated by waste type for the BAU and w/project scenarios), resulting in total lifecycle emissions of 13,449,969 tons CO_2eq and unlock emission savings of 27,286,300 tons CO_2eq, a 67 percent reduction to the business as usual case.

Table 2.1. Waste Treatment Disaggregated by Composition in BAU and w/Project Scenarios

Waste Treatment	Composition	Open Burning (%)	Sanitary Landfill (%)	Recycling (%)	Compost (%)	Open Dump (%)
BAU Scenario:		20	0	15	—	60
Paper/cardboard	10	2.00	0.00	2.00	—	6.00
Textiles	0	0.00	0.00	0.00	—	0.00
Organic waste	56	14.00	0.00	0.00	—	42.00
Wood	0	0.00	0.00	0.00	—	0.00
Rubber and leather	0	0.00	0.00	0.02	—	0.00
Plastics	13	3.00	0.00	2.00	—	8.00
Metal	2	0.50	0.00	0.30	—	1.20
Glass	4	1.00	0.00	0.60	—	2.40
Other	15	3.00	0.00	3.00	—	9.00
Project Scenario		5	55	15	20	5
Paper/cardboard	9	0.44	4.81	1.31	—	0.44
Textiles	2	0.10	1.12	0.30	—	0.10
Organic waste	63	3.16	34.75	—	12.64	3.16
Wood	7	0.35	3.83	—	—	0.35
Rubber and leather	0	0.01	0.06	—	—	0.01
Plastics	13	0.66	7.24	1.97	—	0.66
Metal	1	0.05	0.58	0.16	—	0.05
Glass	1	0.05	0.54	0.15	—	0.05
Other	4	0.20	2.20	0.60	—	0.20

- **Closing and rehabilitation/containment of priority dumpsites.** The project will finance the closure and containment of the Abou-Zaabal dumpsite of Qalyubia, which has regular occurrences of waste burning throughout the year. Priority will be given to afforestation or covering these sites with other vegetation to establish new carbon sinks, retain water from precipitation, including heavy rainfall events, and act as a natural buffer against flash floods. Initially, this activity will support the preparation of a detailed engineering study, bid documents, safeguard documents and the supervision of works for the closure of the dump site. Based on the results of the studies, the closed and rehabilitated dumpsites will be equipped with methane capture; combustion for energy production may also be considered. The dumpsite closure will take place after the new controlled landfill of the 10th of Ramadan is constructed and is operational. Re-routing waste from unregulated dumpsites to the new landfill(s) will minimize the incidents of self-combustion and waste burning. These will

reduce GHG and particle matter release, which will remove short-term health hazards for beneficiaries suffering from respiratory conditions, as well as unlock long-term health benefits by eliminating toxic and carcinogenic fumes.

- **Hazardous waste treatment and final disposal facility.** The project will finance the establishment of a hazardous waste facility. The site of this facility will be determined based on studies to be conducted and taking into consideration that the hazardous waste facility can serve several governorates, and will be followed by a detailed feasibility study. The project will also finance the environmental and social assessments needed for the development of the facility. Facility design will take account of climate hazards to ensure operational resilience in the face of climate change, as well as energy conservation efficiency and renewable energy sources to minimize climate impact.

- **Construction of environmentally controlled transfer stations.** The project will support the establishment of environmentally controlled transfer stations in Qalyubia or Giza. The location of these transfer stations, and the type of station (fixed or mobile) will be determined during implementation to take into consideration the contractual arrangements with the private operators for SW collection and transportation. The project will support the preparation of a detailed engineering study, bid documents, safeguard documents and the supervision of the construction of the transfer stations. Design will incorporate climate considerations and seek to minimize emission impact, such as by sourcing power from renewables and maximizing energy conservation. The project will also develop a technical and financial operational manual for the sustainable operations and maintenance of transfer stations. It will include capable and willing informal waste pickers (including women) for operating the transfer station.

- **Planning and design for the environmental upgrade of El-Akrasha in Qalyubia.** The project will provide TA for the environmental upgrade of the El-Akrasha recycling and industrial zone, where informal recycling and industrial activities pose environmental challenges, such as waste burning, water pollution and unhygienic conditions. It will support an institutional, technical and financial assessment to identify interventions that could be funded by other sources, such as the donor funded EPAP III.

14. The project envisages the involvement of the private sector through a DBO modality for the new waste management system. The Project funds will cover fixed assets, or CAPEX, that will remain Government's property (mainly civil works and basic fixed equipment), while the private operators will finance vehicles and additional waste treatment. The proposed arrangement envisions that private operators for municipal waste, HCW, construction/demolition waste and hazardous waste (there will be a separate contract for each category of waste) will receive the waste from waste collectors contracted by the responsible authorities for each type of waste.

Subcomponent 2.2: Supporting Response to COVID-19 Pandemic and Improving Healthcare Waste Management (US$10 million)

15. This subcomponent will support TA, training, communications and public awareness activities, as well as investments in sterilization equipment, personal protective equipment and other supplies for hospitals, sanitation workers, and workers responsible for cleaning and maintaining public transport and

waste transport vehicles. It will also finance activities to enhance public awareness of air pollution, in conjunction with lung health and epidemics.

Subcomponent 2.2.1: Strengthening capacity in the healthcare and waste management sectors to appropriately manage potentially contaminated materials and waste

16. The treatment of coronavirus patients in hospitals has led to an increase in contaminated and potentially contaminated waste and has placed additional pressure on waste management systems within hospitals and in municipalities at large. This subcomponent will complement activities being undertaken in the COVID-19 response program and other health care management initiatives, and will focus on:

(a) Select underserved university hospitals to strengthen their capacity to effectively manage waste. A priority list of hospitals will be developed based on a series of agreed criteria, including infrastructure capacity, number of patients and populations served, and the level of financial and training support from other projects or institutions.

(b) Essential support for these hospitals to respond effectively, safely and efficiently to the increased load of contaminated waste and materials, and will include:

- TA for establishing and/or improving waste management systems, including training in waste segregation, collection, sterilization and disposal.

- Provision of steam sterilization equipment (autoclaves) to improve the capacity for decontamination of waste and materials at select hospitals. This will include, among others, TA: in the assessment of electricity, water and waste-water disposal capacity and needs; for technology choice, for example, size and model of autoclave; for developing bid documents; and for the procurement of steam sterilization equipment, including maintenance and training contracts.

- Support for utilization of energy from waste incineration towards powering health care facilities, and planting trees around health care facilities to improve carbon sequestration.

(c) Support to SWM staff, including the waste picker community for enhanced safety and security, with a focus on: (i) identifying target groups and needs assessment; (ii) provision of personal protective equipment (PPEs) for solid waste staff, including the waste picker community; and (iii) TA and training as necessary for waste management staff and other identified stakeholders, in safe handling, transport, and disposal of health care waste. These activities will be integrated with training for operation and management of the expected 10th of Ramadan facility for hazardous waste treatment and final disposal.

(d) Strengthening cleaning and disinfecting systems for waste collection points, vehicles and public transportation. This activity will undertake the necessary steps for systematizing the disinfection process, including the assessment of processes and timing, training in safety and effective methodologies, and provision of PPEs and other disinfecting equipment, as needed.

Subcomponent 2.2.2: Enhancing public awareness of air pollution, lung health and epidemics which target the respiratory system *(SARS, MERS, and COVID-19) (to be implemented in conjunction with Component 4)*

17. Activities under this subcomponent will be centered on: (a) the assessment of heavily impacted communities and stakeholder groups; (b) design of public awareness campaigns for the general public as well as particular stakeholder groups, including women, youth, children and the Zabaleen; (c) TA for the identification and design of appropriate communication modalities, for example, social media, print campaigns (including posters and comics), and television/radio; and (d) support for the dissemination of education campaigns, including ensuring alignment with activities under Subcomponent 1.1 on strengthening resilience to air pollution.

Subcomponent 2.3: Enabling activities, capacity building and institutional strengthening (US$8 million)

18. This subcomponent finances the necessary enabling activities for the implementation of SWM waste master plans developed by WMRA in collaboration with the MoLD and the Governorates, as well as the effectiveness of the entire SWM system. It includes putting in place and/or strengthening the institutional and regulatory frameworks for SWM, developing financial sustainability and cost recovery mechanisms, the design and adoption of planning, M&E instruments, capacity building, advisory services for waste operators, and relevant studies and assessments needed for the identification, design and implementation of the proposed investments. This subcomponent also aims at strengthening the institutions involved in the planning and operations at the governorate level and building their capacities.

Subcomponent 2.3.1. Enabling Activities by the Waste Management Regulatory Authority (WMRA)

19. The following activities will be supported and financed by the project:

- Development and adoption of model bid documents and performance-based contracts for the different stages of waste management (collection, transportation and disposal).
- Development and operationalization of an integrated information system to monitor and evaluate the effectiveness of various programs, initiatives and contracts being implemented across governorates, including cost-recovery mechanisms.
- Formulation of recommendations for channeling collected fees and other earmarked funds to the relevant authorities and developing a proper financial management system and the modus operandi of these funds (including internal by-laws/guidelines, regulations, and planning procedures).
- Support for initiating activities to minimize the volumes of waste requiring final disposal and reaching the dumpsites/landfills, such as maximizing solid waste recycling by the introduction of new organized recycling streams and recovery of some raw material (including from e-waste), and the introduction of financial incentives for avoiding the use of plastic and regulatory controls for single use plastics.
- Development of financially viable business models, model bid documents, and model performance-based contracts.

- Support the GoE in structuring and procurement strategies for the establishment of treatment and disposal facilities, including waste-to-energy (WtE) facilities.

- Other additional technical studies (feasibility studies, engineering designs) to support new interventions such as the development of a national strategy for private sector participation in SWM, Waste-to-Energy, waste volume minimization, and waste reuse/recycling.

- Undertake a review of the institutional mandates, roles and responsibilities at the central level to improve service delivery, monitoring and oversight, and ensure the sustainability of the SWM system.

Subcomponent 2.3.2 Enabling activities by the Executive SWM Unit at the MoLD[30]

20. The following activities will be financed:

- Support for the establishment and operation of the newly established Executive SWM Unit at the MoLD through equipment, information systems, a vehicle, training, part-time and full-time expertise.

- Delivery of training and capacity-building programs for the central and regional staff of the SWM unit, officials of the governorates, and all other stakeholders.

- A review of the institutional mandates, roles and responsibilities at the governorate level to improve service delivery, taking the Master Plan into consideration. This will consider, among others, the restructuring of the Cleanliness and Beautification Agencies and the enhancement of the role of the SWM Units in the Governorates.

Subcomponent 2.3.3 Support the establishment of Qalyubia Regional SWM Unit

21. Activities to be financed include:

- Full-time in-house TA.

- Definition of staff requirements based on the activities performed within the governorate.

- Capacity development for management and operational staff.

- Contribution to a part of the operational expenses.

- Provision of IT equipment.

[30] The Executive Unit for Management of Waste Sector in the MOLD was established through Ministerial Decree No. 551 for the Year 2019. The unit's mandate is to ensure the execution of planned projects in light of the national strategy for integrated SWM and the master plans of the governorates; build capacities for SWM departments in the governorates to perform their dedicated tasks; and provide periodic M&E reports on the implementation of the national plan.

Component 3: Vehicle Emission Reduction (US$40 million)

22. The project will support activities aimed at reducing vehicle emissions from the public transport sector. About 100 of a roughly 3,000 strong bus fleet will be replaced to assess the viability of the technology to be tested through this project.[31] e-buses will replace diesel buses serving on existing routes, and only e-buses will operate on those routes so that the emission reduction impact of e-buses will be measurable. The pilot will be designed to achieve market competitiveness through service quality improvements and addressing the needs of female and male users, including: higher service frequency, stopping at designated stops, well-lit stations, and better-quality fleet (for example, air conditioning, USB charging, wi-fi, security features to deter harassment, alarm system, anonymous safe channels for complaints, branding measures such as unique colour paint, and promotional activities to increase public awareness). Investments and enabling activities will also feature measures to prevent the spread of infectious diseases (for example, COVID-19). Activities under this component will occur over two phases: Detail Design Study; and upgrade of CTA facilities with chargers and the purchase of approximately 100 e-buses.

Subcomponent 3.1: Electric Bus Fleet and Related Infrastructure (US$36 million)

23. The project will finance the following activities and goods:

- **Detail design study.** The study will determine the specifications of e-buses to be procured, retrofitting of bus depots to accommodate operational and maintenance activities of e-buses as well as associated infrastructure improvements, and conduct operational planning of e-buses. It will prepare bid documents, which will address aspects such as the type of battery and charging technology, features that attract modal shift from cars (for example, air conditioning) while addressing gender gaps (for example, security enhancement), and measures to prevent the spread of infectious diseases (for example, antibacterial coating of interior surfaces and ventilation). The study will also assess existing power supply and asset conditions, and the design for retrofitting bus depots to accommodate charging stations, maintenance facilities, and power supply (including needed improvements to infrastructure), while also addressing the deep cleaning equipment needs for the fleet to prevent the spread of infectious diseases (linked to Subcomponent 2.2.1). The design and engineering will take into consideration disaster resilience based on international best practices, with support from the Global Facility for Disaster Reduction and Recovery. The study will propose anonymous complaint channels for bus users and will also design the interior of the e-bus to meet the needs for female and male users (including safety and security concerns). The study will also develop a scale-up strategy for e-bus deployment, should this pilot establish the viability of the technology in the GC context. It will also design the methodology to measure the indicators for GHG emissions, black carbon emissions, and the air quality inside buses.

[31] A comprehensive review by WRI (2019) has shown just how pivotal a successful pilot is for a city for the scaling up. The studies are "Ryan Sclar, Camron Gorguinpour, Sebastian Castellanos and Xiangyi Li. 2019. Barriers to Adopting Electric Buses. *https://www.wri.org/publication/barriers-adopting-electric-buses*; and Xiangyi Li, Camron Gorguinpour, Ryan Sclar and Sebastian Castellanos. 2019. "How to Enable Electric Bus Adoption in Cities Worldwide," *https://www.wri.org/publication/how-enable-electric-bus-adoption-cities-worldwide*.

- **Upgrading of existing bus depots owned by CTA to support e-buses.** Improvements will include equipment for safe e-bus charging and maintenance, and for deep cleaning to prevent the spread of viruses (linked to Subcomponent 2.2.1). The works will also include local power infrastructure improvements to meet power supply requirements for the e-buses.

- **Procurement of approximately 100 electric buses. e**-buses will be procured as per the specifications determined in the detailed design study, using international competitive bidding. Subject to findings from further technical analyses, CTA may contract out aspects of maintenance of these electric buses to a private operator (in particular for spare parts).

Subcomponent 3.2: Enabling Activities (US$4 million)

24. The enabling activities to be supported under this subcomponent will include:

- Continuous Air Quality Measurement (AQM) data – from equipment that will be supported under Component 1 of the project – will be used to enable city-wide transportation planning across the GC area. AQM information such as SLCPs (including Black Carbon) will be particularly useful (for example, in supporting the strategy and planning aspects of CTA) as CTA plans to move to a 100 percent e-bus and natural gas fleet in the future.

- Awareness raising and capacity development for electric bus technology - Recognizing the need for significant capacity development of CTA employees and the broader audience to properly handle new technologies, the project will support training, awareness raising and promotion activities.

- Awareness raising and capacity development for service quality and efficiency improvement to optimize E-bus operation - Training will be provided to enhance energy efficiency in operating buses, while ensuring high quality experience for riders. Explicit accounting and operational record keeping of electric buses will enable comparison against the general CTA fleet, so as to assess gains in operational efficiency, service quality, financial viability, and other KPIs.

Component 4: Enhanced capacity, behavioral change and communication (US$6.2 million)

25. This component aims at enhancing the capacity of major stakeholders who either affect or are affected by project activities, including those at risk of exclusion from project benefits. As part of establishing the principle of beneficiary feedback, partnerships with CSOs will be introduced for monitoring the performance and the delivery of the SWM services will be introduced.

26. This component will also contribute to the implementation of the Communication and Visibility Plan of 2019 of the MoE, by supporting activities directly relevant to the components of this project, such as the Air Pollution and Waste Management Program, with a differentiated approach for different stakeholders (decision makers; technical staff; the general public; CSOs and NGOs; and the formal as well as informal service providers in all sectors of concern).

27. Specific gaps/disparities between female and male stakeholders, including but not limited to informal waste pickers/recyclers and bus riders, will be assessed and taken into consideration during the implementation of all project components.

28. The following activities will be implemented under this component:

Subcomponent 4.1: Enhanced capacity and behavioral change (US$5 million)

- **The establishment of a Solid Waste Educational Center, possibly through partnerships with NGOs,** for the general public at the 10th of Ramadan Integrated Waste Management Facility to promote improved waste handling, segregation at source, re-use and recycling, with special recreational and educational material and activities for children and adults.

- **Targeted capacity-building and livelihood enhancement activities** for informal waste pickers/recyclers in Qalyubia Governorate, with tailored activities targeting female workers. Trainings will enhance the capacity of the informal waste pickers, including those who have lost their livelihoods due to project activities, to enable them to be either included in the solid waste chain or find alternative income generation/livelihoods. This includes but will not be limited to (a) waste reuse/recycling; (b) refurbishment of waste components into useful/tradable products; and (c) support functions, such as cleaning and upkeep of transfer stations and waste disposal facilities, weigh bridge operation and other semi-skilled activities. An assessment of women's needs (for example, childcare arrangements), interests and relevance to the job market will be carried out to inform training programs and ensure the employability of participants. Consultations with affected waste pickers will be conducted and a livelihood restoration plan will be prepared to ensure alternative income generation or livelihoods.

- **Adoption and rolling out a CBSM approach** which emphasizes personal contacts between community members, with the goal of fostering change.[32] Behavior change sought by the project includes: (a) increased adoption of self-protective measures in response to an alert of a high pollution event; (b) promotion and increase of source segregation practice (at the household level); and (c) increased perception of security among female users of public e-buses.

- **Green jobs, circular economy and developing the skills of SMEs.** In the first phase the project will support the following actions:

    - Identify the potential of solid waste climbing up the value chain and recycling channels.

    - Determine the potential sources of waste that can be recycled.

[32] This approach is task, time and resource-intensive and involves a combination of desk research, quantitative surveys, web surveys, series of focus groups, comprehension of social norms, development of prototypes, testing of messaging and visuals, communication materials, social diffusion, monetary and non-monetary incentives, prompts (nudge), door-to-door engagement, workshops and community events for awareness and/or orientation, building coalitions and partnerships, measuring effectiveness of pilot activities, scale up to implement across a community, measuring overall effectiveness.

- Evaluate the economic potential of value chain channels deemed more relevant through the review of the local private sector, and opportunities in the local and the export market.

- Development of a strategy to operationalize best practices in waste reduction, recycling, and the circular economy in the context of GC.

- In a second phase, focusing on the most profitable and relevant value chains, this activity will focus on developing the skills of SMEs. SMEs will be selected through expression of their interest and will be professionalized under a training program that will include technical content, such as learning modern recycling tools and techniques for specific value chains, as well as entrepreneurial skills. The objective is to develop a more professional and larger recycling economy to reduce the volume of waste reaching the landfill and to develop job opportunities.

- **Strengthening the collaboration between the Government and the Civil society in SWM, through activities implemented by NGOs and CBOs, in the following areas:** (a) monitoring the performance of the solid waste service providers; (b) engaging with the population at the street and district levels, and implementing awareness and sensitization campaigns as part of the CBSM approach; and (c) working with the Zabbaleen to improve their effectiveness/formalization. The project will promote and support the engagement of women's groups NGOs in these activities to ensure that service-delivery meets the needs of most vulnerable women (low-income, heads of single-parent households, etc.) and will promote their participation in SWM decision-making. The project will support local or national associations, NGOs, CBOs, and/or beneficiary groups organized in a recognized structure for the implementation of these initiatives.

Subcomponent 4.2: Communication and outreach (US$1.2 million)

- Communication plans and execution of activities to support the project components. A central focus of the public awareness campaign will be air pollution information dissemination. It will also include issues of SWM, reduction of emissions from vehicles and waste, and gender related issues. The campaign will use several channels to disseminate information to targeted beneficiary groups, including: a dedicated social media page; radio campaigns in national and local channels to reach the traditional audience in lagging regions who are not users of social media; partnerships with media outlets (TV channels, newspapers, online news websites) to regularly publish awareness products; and partnerships with mobile medical applications used by patients. Targeted geographical social media campaigns will also be organized to reach the public in the most polluted areas and allow the most vulnerable groups to take protective actions on high pollution days.

- The objectives of this public awareness campaign are to: (a) communicate the challenges of air pollution, its health implications, key sources of pollution and actions that people can take to reduce pollution, as well as self-protective measures that the public can take on high pollution days that will increase societal resilience; (b) create a basic understanding of the SWM master plans and of the vehicle emissions reduction plan; (c) reach consensus and receive the endorsement of targeted beneficiary groups; (d) induce positive behavioral

changes through campaigns targeting men and boys as potential perpetrators of harassment against women and girls on public transport; and (e) conduct awareness campaigns targeting women on measures to prevent harassment on public transport (for example, cameras, alarm systems on public transport, and reporting system). This subcomponent will also address and track the range of knowledge and behavior indicators.

- Communication for behavioral changes on preparedness for high air pollution days as well as adverse climate events, including, among others, a newly designed website to communicate high-pollution alerts, associated recommendations, and outreach campaigns on social media. This will more specifically allow the most vulnerable groups to take protective actions on high pollution days. Public campaigns will also be implemented to support mode-shift to enhance the benefits of electric bus deployments.

Component 5: Project Management and Monitoring & Evaluation (US$9.8 million)

29. This component will support project management functions, including fiduciary management, M&E, technical reporting and audits, environmental and social risk management, and community and awareness raising functions. It will also contribute to the operational costs of the PCU to be established but will not pay salaries or top-up salaries of government officials. This component will specifically oversee and finance the overall implementation of the SEP's activities, and new activities as identified throughout the project's life. Such activities include:

- Dedicated events for the continuous engagement, consultation and information sharing with the identified stakeholder groups, in particular of vulnerable groups, including for sharing environmental and social risks, mitigation measures, responsibilities.

- Implementation of gender disaggregated beneficiary feedback.

- The establishment and management of a Grievance Mechanism.

Table 2.2. Summary of Deliverables and Project Cost by Component

Component	Subcomponent	Deliverables	Cost (US$, million)
Component 1: Enhancing the Air Quality Management and Response System	Subcomponent 1.1: Reduction of air pollution and greenhouse gases	• Integrated Climate and Air Quality Management Plan (IC-AQMP) for reducing air emissions in Greater Cairo • Periodic mobile source emission inventory and Inventory Integration • Monitoring Short-Lived Climate Pollutants and GHG • AQM Training Module Development and Implementation for Universities/Ministries • Estimation of health and economic benefit and cost of pollution abatement; and build the environmental economics capacity in key ministries and agencies	13.50
	Subcomponent 1.2: Strengthening resilience to air pollution	• Updating Air Quality Forecasting system and its dissemination to public • Response Plan to High Pollution days: Establishing institutional response mechanisms to high pollution days • Public action protocols	4.00
		Sub-total Component 1	**17.50**

Component 2: Support the operationalization of SWM Master Plans in Greater Cairo	Subcomponent 2.1: Waste Management Infrastructure *	• Infrastructure construction works for 10th of Ramadan Integrated Waste Management Facility: main infrastructure; Cell number 1 for Qalyubia municipal waste; health care waste facility; construction and demolition waste facility; and associated studies:
		• Establishing contracts for treatment and disposal facility using a DBO modality.
		• Preparation of the bidding documents and contracts for each waste management facility: municipal waste, health care waste and construction/demolition waste, using the DBO modality.
		• Monitoring and supervision of the infrastructure works of the 10th of Ramadan site.
		• Closing and rehabilitation works of Abou Zaabal dumpsite
		  ○ Preparation of the detailed engineering study and bidding documents for the closing and rehabilitation of Abou Zaabal dumpsite
		  ○ Preparation of the safeguard documents for the closing and rehabilitation of Abou Zaabal dumpsite
		  ○ Monitoring and supervision of the closing and rehabilitation of Abou Zaabal dumpsite
		• Hazardous waste treatment and final disposal facility (exact location either at 10th of Ramadan or Kuraimat, to be determined during implementation based on detailed feasibility study and the environmental and social assessments (all financed by the project).
		• Construction of environmentally controlled transfer stations and associated studies:
		  ○ Preparation of the detailed engineering study and bidding documents for the construction of the
			108.00**

Component	Subcomponent	Deliverables	Cost (US$, million)
		transfer stations. ○ Prepare of the safeguard documents for the construction of the transfer stations. ○ Monitoring and supervision of the works • TA for the environmental upgrade of El-Akrasha recycling and industrial zone, Qalyubia: technical, environmental and financial assessment; detailed workplan; implementation of priority air pollution and solid waste actions	
	Subcomponent 2.2: Supporting Response to COVID-19 Pandemic and Improving Healthcare Waste management	• Purchase of autoclaves for select university hospitals (approximate number to be agreed in light of budget) • Provision of health care support personal protective equipment (PPEs) for solid waste staff • Periodic disinfection of waste collection points and vehicles – (number and area covered in line with existing health initiatives) • Establishment of health care waste management systems in select hospitals to increase collection, segregation and disposal efficiency, train health care waste officers and other staff, provide equipment to support the system Public health campaigns on effect of air pollution during "normal" times and epidemics targeting the respiratory system (SARS, MERS, and COVID-19)	10.00
	Subcomponent 2.3 Enabling activities, capacity building and institutional strengthening	• Development and adoption of model bidding documents and performance-based contracts for waste management (collection, transportation and disposal). • Establishment and operationalization of a management information system • Assessment and improvement of cost recovery and fees collections system and financial management system (internal by-laws/guidelines, regulations, planning procedures, etc.). • Design and implement activities to minimize the volumes of waste requiring final disposal and reaching the dumpsites/landfills such as maximizing solid waste recycling by the introduction of new organized recycling streams and recovery of some raw material (including from e-waste), and introduction of financial incentives for avoiding plastic use and regulatory controls for single use plastics, etc.; • Development of financially viable business models, model bidding documents, model performance-based contracts, etc. • Support the GoE in structuring and procurement strategies for the establishment of treatment and disposal facilities including waste-to-energy (WtE) and other such facilities. • Other additional technical studies (feasibility studies, engineering designs, etc.) to support new interventions such as development of national strategy for private sector participation in SWM, Waste-to-Energy, waste volume minimization waste reuse/recycling, etc.;	8.00

Component	Subcomponent	Deliverables	Cost (US$, million)
		• To undertake a review of the institutional mandates, roles and responsibilities at the central level to improve service delivery, monitoring and oversight on the long-term and ensure the sustainability of the SWM system in place. • Support the establishment and operation of the newly established Executive SWM Unit at the MoLD through equipment, information systems, a vehicle, training, part-time and full-time expertise (more details on the scope of this support are provided in Annex 3); • Support the establishment of the Regional SWM units to be created in the three governorates • Training and capacity-building programs for the central and regional staff of SWM unit, officials of the governorates, and all other stakeholders; • Other TA activities (to be reviewed in light of the above listed enabling activities of WMRA), including a review of the institutional mandates, roles and responsibilities at the governorate level to improve service delivery. This will consider, inter-alia, the restructuring of the Cleanliness and Beautification Agencies and the enhancement of the role of the SWM Units in the Governorates.	
			Sub-total Component 2 126.00
Component 3: Vehicle emission reduction	Subcomponent 3.1 Electric Bus Fleet and Related Infrastructure	• Study for electric bus routes (detailed design) • Procurement of 100 electric buses • Retrofitting of existing bus depot • Procurement of charging infrastructure, operation and maintenance equipment for e-buses	36.00
	Subcomponent 3.2: Enabling activities	• Establishing of Air Quality Monitoring Systems • New technologies awareness and capacity building for operators and broader audience • Development of an implementation scaling up e-bus plan (based on the results of the demonstration project)	4.00
			Sub-total Component 3 40.00
Component 4: Enhanced Capacity, Behavioral Change and Communication	Subcomponent 4.1: Enhanced capacity and behavioral change	• Solid Waste Educational Center at the 10th of Ramadan Integrated Solid Waste Management Facility established and operational • South-to-south knowledge exchange and knowledge management skills • Behavior change - community based social marketing interventions (CBSM); Implementation of priority AQM awareness campaigns • Partnerships with civil society and NGOs/CBOs (performance monitoring of private solid waste companies, plan and deliver awareness campaigns to the general public, etc.) • Strategy for promotion of green Jobs and circular economy, and development of the skills of SMEs	5.00

Component	Subcomponent	Deliverables	Cost (US$, million)
		prepared and initiated	
	Subcomponent 4.2: Communication and outreach	• Development and implementation of communication plans in support of project components • Communication for behavioral changes on preparedness to high air pollution days	1.20
		Sub-total Component 4	**6.20**
Component 5: Project Management and Monitoring & Evaluation	Subcomponent 5.1: Monitoring and Evaluation, communication and capacity building	• Steering committee meetings • Launching event • Coordination meetings and working groups meetings • Monitoring and evaluation system established and operational • Mid-term and end of project evaluation and reports • Project communication material and publications • Training events and workshops on project planning, management and supervision to participating agencies	2.50
	Subcomponent 5.2: Stakeholders Engagement	• Political economy analysis • Implementation of Stakeholders Engagement Plan (ESF requirement) • Citizen participation (beneficiary feedback, participation in M&E, etc.)	1.80
	Subcomponent 5.3: Establishment of the Project Coordination Unit	• Hiring specialists, consultants and support staff • Office and IT Equipment for PCU • Periodic progress and implementation reports • Financial and audit reports • Operational cost	5.50
		Sub-total Component 5	**9.80**
		Loan Front-end Fee	**0.50**
		TOTAL	**200.00**

Note: * Including the TA component for the environmental upgrade of Al-Akrashah, Qalyubia.
** To be complemented by private sector investments of approximately US$40 million in financing.

ANNEX 3: Economic and Financial Analysis[33]

1. This annex summarizes the methods used for economic and financial analysis and the results. A stand-alone document of the detailed Economic and Financial Analysis is available in the project files.

Methods

2. **Component 1: AQM.** For the economic analysis, the literature shows that the benefits from resilience (avoiding exposure) are tantamount to the benefits accruing from reductions in pollution (abating pollution levels). The effects of air pollution on a person's health can range from breathing to severe cardiovascular diseases, cancer and more recently, diabetes. Connecting exposure to adverse health effects has been carried out and refined over the years to derive a dose-response function establishing the diseases associated with various levels of air pollution from PM. A conservative reduction of 1 $\mu g/m^3$ of $PM_{2.5}$ levels compared to 2017 (76 $\mu g/m^3$) annual average level in GC was considered as potential forgone mortality benefits associated with the introduction of AQM over the period. The Value of Statistical Life was applied to the number of avoided premature deaths and the total amount was annualized over the project lifetime.

3. **Component 2: SWM.** For the financial analysis, a dynamic fee analysis (linking financial flows to volume generation over 20 years with discount rates: varying from 2 to 18 percent) was carried out to determine the fee and needed fiscal transfers per capita to cover CAPEX and/or OMEX in GC. Three layers of benefits were considered for the economic analysis: opportunity cost of compostable and recyclable fractions due to the new facility; hedonic pricing for the rehabilitation and closure of the Abou Zaabal dump; and the net GHG averted from collection, treatment and disposal in GC.

4. **Component 3: E-mobility.** A dynamic fee analysis (linking cost flows to the number of riders over a 20 year period with discount rates varying from 2 percent to 18 percent) was carried out as part of financial analysis to determine the fare and fiscal transfers per rider to cover CAPEX and/or OMEX and compare it to the current bus fare in GC. Three layers of benefits were considered for the economic analysis: a benefit transfer of the European Union EcoSense model was considered to value the reduction of all the criteria pollutants that will be averted with the introduction of 97 e-buses in GC; the forgone OMEX with the introduction of e-buses when compared to diesel buses; a benefit transfer of the willingness-to-pay of passengers to increased bus fare associated with both an increase in frequency as well as safety, comfort and cleanliness, provision of wi-fi and air conditioning; and the net GHG averted from the replacement of 97 diesel buses with 97 e-buses in GC.

Results

5. **The results of the financial analyses** are illustrated in Table 3.1. For SWM, the Governorate and other affiliated authorities should look at possible financing to cover OMEX (US$3.6 to US$3.7 per capita) which varies according to different discount rates bearing in mind that the current market interest rate in Egyptian pounds is 17 percent. For e-buses, CTA should look at possible financing to cover OMEX (US$0.2 per passenger) which is less than the current fare rate of US$0.28 per ride. If the total CAPEX and OMEX

[33] This annex is a synthesis of the economic and financial analysis as well as the solid waste and e-mobility GHG accounting results.

need to be recouped, the GC bus fare needs to be increase starting at a 2 percent discount rate and needs to be quasi trebled at 18 percent.

Table 3.1. Solid Waste and e-mobility Cost per Capita

Rate of Return per Capita to Break Even	Discounted At				
	2%	6%	10%	14%	18%
Dynamic Waste OMEX (US$/capita)	3.6	3.6	3.7	3.7	3.7
Dynamic Waste CAPEX (US$/capita)	0.8	1.0	1.2	1.5	1.7
Dynamic Waste Costs (US$/capita)	4.4	4.6	4.9	5.2	5.5
Rate of return per Rider to break even					
Dynamic Transport OMEX (US$/rider)	0.2	0.2	0.2	0.2	0.2
Dynamic Transport CAPEX (US$/rider)	0.2	0.3	0.4	0.5	0.6
Dynamic Transport Costs (US$/rider)	0.4	0.6	0.7	0.8	0.9

Note: Totals do not add up due to rounding.

6. Most social, environmental, economic, and financial benefits are acknowledged but only a few were quantified and valued. Benefit flows are illustrated in Table 3.2; although GHG benefits were also calculated over a longer timeframe, these were not used for the benefit-cost analysis.

Table 3.2. Local and Global Benefits by Component

Benefits	Unit	2021	2022	2023	2024	2025	2026
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6
Component 1: AQM							
Premature death avoided	US$, million		4.44	4.44	4.44	4.44	4.44
Component 2: SWM							
Composting and Recycling	US$		162,639	165,269	167,871	170,450	173,010
Rehabilitation of Abou Zaabal	US$			169,734			
Reduction of GHG emissions	US$, million		27.2	29.9	19.9	30.5	33.4
Component 3: E-mobility							
Reduction in local emissions	US$	7,269	70,513	70,513	70,513	70,513	70,513
Reduction in OMEX	US$	867,000	8,409,901	8,409,901	8,409,901	8,409,901	8,409,901
Improved Service	US$	26,772	267,718	267,718	267,718	267,718	267,718
Reduction of GHG emissions	US$		49,470	50,574	51,704	52,858	54,039

7. **The benefit-cost analysis** shows that the overall project over six years and discounted at four percent has a net present value (NPV) of US$2.6 million, an ERR of 5.4 percent and a Present Value of Benefit over Cost ratio greater than 1. Should the benefit flows be extended over 10 and 20 years, the viability of the project will be significantly improved.

Table 3.3. Cost/Benefit Analysis Summary over Six Years

Project Component	Key Economic Indicators	Project Scenario Analysis		
		6 years discounted at		
	Scenario	*2% Optimistic*	4% Base Case	*6% Pessimistic*
Overall project	NPV (US$, million)	*7.0*	**2.6**	*-1.1*
	ERR (%)	*5.4*	**5.4**	*5.4*
	PV benefit/cost ratio	*1.04*	**1.01**	*0.99*

ANNEX 4: Project Maps