# CAIRO GCAP

Green City Action Plan for Cairo Governorate

2025

محافظة القاهرة
Cairo Governorate

European Bank
for Reconstruction and Development

AtkinsRéalis

Taiwan Business
EBRD Technical Cooperation Fund

Ministry of Foreign Affairs of the Netherlands

Ministry of Local Development

وزارة التخطيط والتنمية الاقتصادية والتعاون الدولي
Ministry of Planning, Economic Development & International Cooperation

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# Glossary of terms

AFD - Groupe Agence Française de Développement

BIM – Building Information Modelling

BOD – Biochemical Oxygen Demand

BRT – Bus Rapid Transit

CAPEX - Capital Expenditures

CAPMAS - Central Agency for Public Mobilisation and Statistics

CAPW - Construction Authority for Potable Water and Wastewater

CCBA – Cairo Cleanliness and Beautification Authority

C&D – Construction & Demolition

CDW – Construction and Demolition Waste

CPZ – Controlled Parking Zones

CREATS – Cairo Regional Area Transport Study

CTA – Cairo Transport Authority

DMA – District Metered Areas

DMZ – Discharge Mixing Zone

EBRD - European Bank for Reconstruction and Development

ECM – Egyptian Company for Metro Operations

EE – Energy Efficiency

EEAA - Egyptian Environmental Affairs Agency

EEHC – Egyptian Electricity Holding Company

EETC – Egyptian Electricity Transmission Company

EfW - Energy from Waste

Egypt ERA – Egyptian Electric Utility and Consumer Protection Agency

EMS – Energy Management Systems

ESCO – Energy Service Companies

EV - Electric Vehicles

DISCO – Distribution Company

DWTP – Drinking Water Treatment Plant

GARBLT – General Authority for Roads and Bridges

GCAP – Green City Action Plan

GCR – Greater Cairo Region

GEFF – Green Economy Financing Facility

GESI – Gender Equality and Social Inclusion

GHGs – Greenhouse Gases

GIS – Geographic Information System

HCWW – Holding Company of Water and Wastewater

HIPCA – High-Impact Partnership Climate Action

HQ - Headquarters

HVAC – Heating, Ventilation, and Air Conditioning

IDA – Industrial Development Authority

IDP – Internally Displaced People

IFI – International Financing Institution

IPP – Independent Power Producer

ITS – Intelligent Transport Systems

KPI - Key Performance Indicators

LRT – Light Rail Transit

LRTA – Land Transport Regulatory Authority

MaaS – Mobility as a Service

MBT – Mechanical Biological Treatment

MENA – Middle East and North Africa

MoHUUC - Ministry of Housing, Utilities and Urban Communities

MiNTS – Misr National Transport Study

MoE – Ministry of Environment

MoERE – Ministry of Electricity and Renewable Energy

MoP – Ministry of Petroleum

MoTI – Ministry of Trade and Industry

MRV – Monitoring Reporting and Verification

MSW – Municipal Solid Waste

NAT – National Authority of Tunnels

NbS – Nature-based Solutions

NFC – Near-field Communication

NMT – Non-motorised Transport

NRW – Non-Revenue Water

NUCA – New Urban Communities Authority

O&M – Operations & Maintenance

OPEX - Operational Expenditures

PPA – Power Purchase Agreement

PPP - Public-Private Partnerships

PV - Photovoltaics

PwD – Persons with Disabilities

RAG – Red Amber Green

RE – Renewable Energy

SCADA – Supervisory Control and Data Acquisition

SUDS – Sustainable Urban Drainage System

SUMP – Sustainable Urban Mobility Plan

SWM – Solid Waste Management

TOD – Transit-Oriented Development

TSE – Treated Sewage Effluent

UHI – Urban Heat Island

UNDP – United Nations Development Programme

UNIDO – United Nations Industrial Development Organisation

VFD - Variable Frequency Drives

WHO – World Health Organisation

WMRA – Waste Management Regulatory Authority

WtE – Waste to Energy

WW - Wastewater

WWTP – Wastewater Treatment Plant

# Foreword by H.E. Dr. Ibrahim Saber, Governor of Cairo

Cairo Governorate is the beating heart of Egypt, where history meets innovation. Cairo stands as the most influential urban centre in the Middle East and the African continent. Over the years, the city has witnessed significant population growth, with more than 11 million residents, leading to a noticeable shortage of housing, environmental degradation, and increased exposure to the impacts of climate change—particularly in Cairo's informal settlements.

Despite the environmental challenges and the tremendous pressure on its infrastructure, we remain committed to preserving our rich heritage while pursuing continuous development. Cairo Governorate embraces a clear vision: to be a sustainable, clean city that harmoniously blends the old with the new.

Over the past ten years, Cairo has undergone a remarkable transformation in various sectors, particularly in roads and transportation systems, as well as sustainable mobility. These improvements have significantly enhanced the ease and comfort of movement within the city. There has also been a notable expansion in green spaces and the development of safe and liveable residential communities that promote a dignified life and a better future for citizens.

In line with our strong commitment to sustainability and pressing environmental issues—top priorities for the Governorate—Cairo signed an agreement to implement the Green City Action Plan (GCAP) in collaboration with the European Bank for Reconstruction and Development (EBRD). The work on developing this plan officially began in July 2023.

The project's objective has been to provide advisory solutions to Cairo Governorate to help identify and prioritize responses to its most urgent environmental challenges and climate change risks. The plan aims to address these challenges by proposing a set of short- and long-term projects across various infrastructure sectors, along with actionable pathways for implementation through targeted investments and supportive recommendations. Furthermore, this project serves as a mechanism to attract the necessary financing for implementing proposed projects across different sectors, all in pursuit of sustainable urban development.

Cairo Governorate has laid out an ambitious action plan to transform the capital into a model for sustainable urban living—through advancing the energy sector, expanding green spaces, and enhancing smart infrastructure. This plan is built on strong cooperation with relevant ministries, namely the Ministry of Local Development (MoLD) and the Ministry of Planning, Economic Development and International Cooperation (MoPEDIC), in coordination and partnership with the EBRD. It falls within the Green Cities Program, which seeks to address challenges that reduce carbon emissions and improve the quality of life for citizens.

The study concluded with a set of thirteen integrated projects spanning various sectors—including transport and traffic, green spaces, energy, buildings, water and wastewater infrastructure, and solid waste collection and treatment.

Cairo Governorate firmly believes that the transformation into a green city is not a choice but a necessity—imposed by the environmental, economic, and social challenges we face. It is a path that requires the collective effort of all partners—from government and private sectors to civil society—in order to achieve inclusive and sustainable development. I call upon everyone to actively participate in the implementation of this ambitious plan, so that together we can build a brighter future for our capital city, Cairo, and leave behind a civilizational legacy worthy of its great history and the aspirations of its people.

Dr. Ibrahim Saber

Governor of Cairo.

# Executive summary

## Overview of Cairo Governorate

Cairo Governorate is the beating heart of the Greater Cairo Region, the most influential urban area in the Middle East and the African continent. With a population of over 13 million, our city has experienced substantial population growth, contributing to a lack of sufficient accommodation, environmental degradation and vulnerability to climate change, especially in Cairo's informal settlements.

In February 2023, Cairo Governorate began the development of its Green City Action Plan (GCAP). Following the European Bank for Reconstruction and Development (EBRD) methodology, with support from the High-Impact Partnership on Climate Action (HIPCA) and TaiwanBusiness, the aim of the project is to systematically address environmental issues and deliver societal benefits needed to realise our Vision of a Green City for Cairo.

## Development of GCAP and stakeholder engagement

The GCAP process was led by a series of stakeholder consultation and public participation events running throughout the programme. Engagement events included workshops, bilateral consultations, focus groups and online surveys to obtain input and confirmation on key steps in the programme.

Gender Equality and Social Inclusion (GESI) was a key component of these consultations and included-specific focus groups with members of underserved groups in Cairo

From a very early stage in GCAP development, stakeholder validation has been essential for ensuring a successful participatory process. Throughout the Cairo GCAP, stakeholders have confirmed the challenges and proposed options to address them.

## Green City challenges

### Environmental challenges

A GCAP follows a systematic process of establishing a Green City Baseline by identifying the priority environmental challenges that need to be addressed.

The baseline phase of the GCAP involved collecting relevant data to understand the environmental challenges within the governorate area. Data was supplemented and enhanced through expert knowledge and stakeholder engagement to inform prioritisation of environmental challenges.

### Spatial impact of environmental challenges

Figure 0-1: Spatial impact of environmental challenges

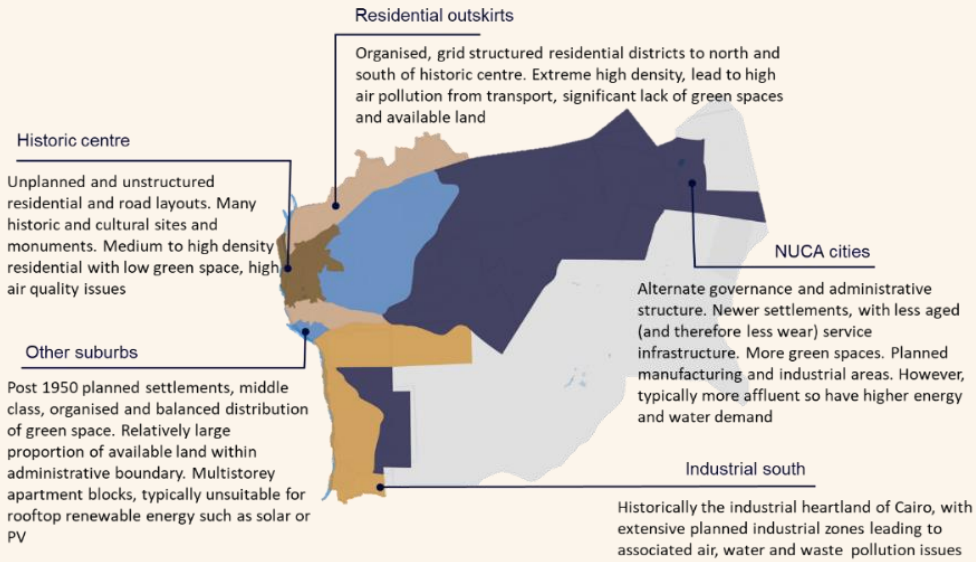
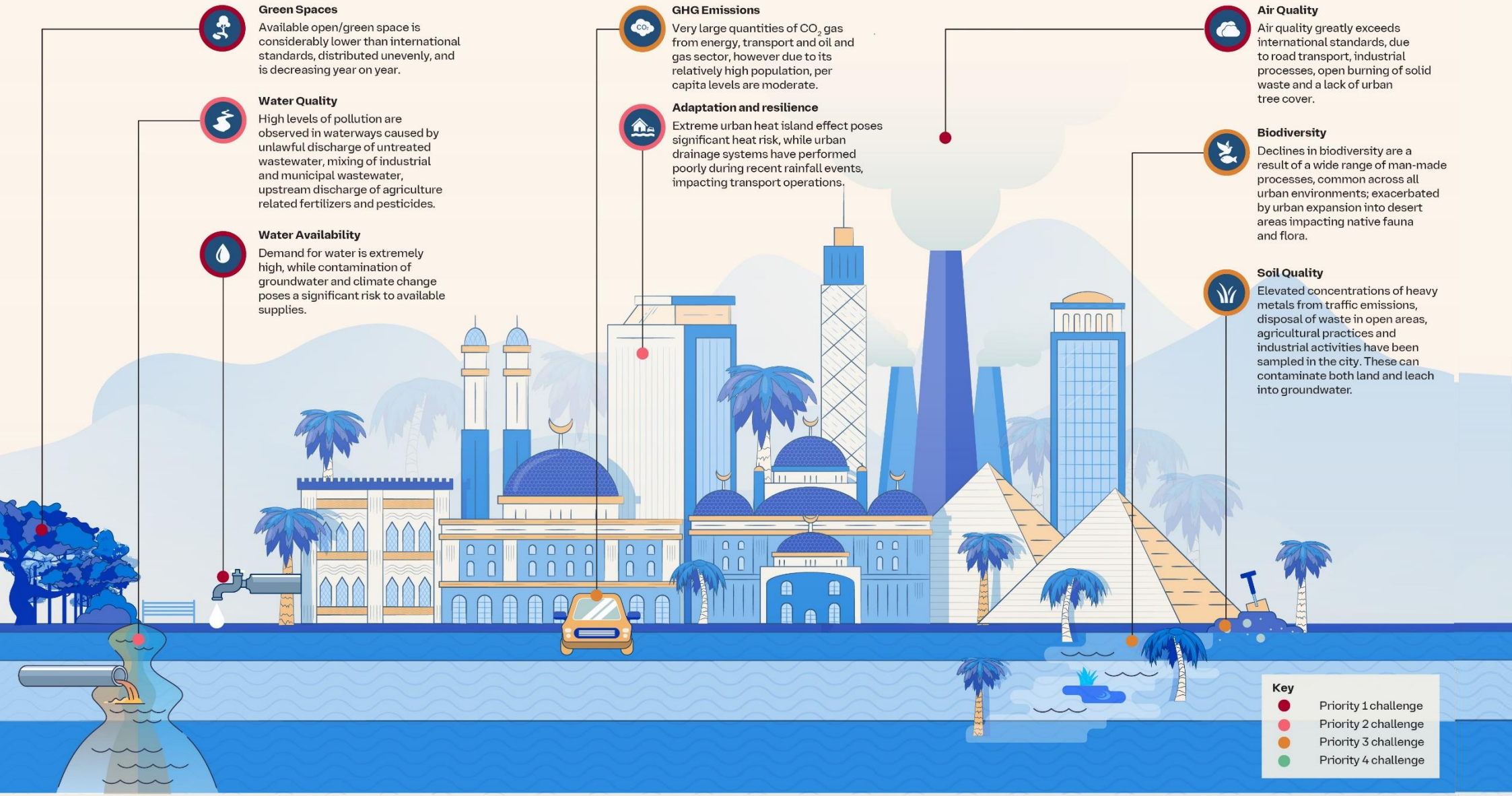


Figure 0-2: Priority challenges for Cairo



The governorate of Cairo is made up of a complex network of areas and districts. Using the bespoke Cairo Insights Engine visualisation tool prepared for this GCAP, environmental performance for each district was mapped and supplemented by further information against a range of socio-economic and land use parameters.

Through this, five distinct urban clusters were identified which prioritise commonalities in environmental, socio-economic and land use conditions (see figure 0-1). These clusters were used to assess sectoral challenges and develop the subsequent actions of the GCAP.

### Sectoral challenges

By identifying and benchmarking sectoral performance in Transport, Energy, Buildings, Industry, Water, Solid Waste, and Land Use, the GCAP identifies which aspects of economic sectors are responsible for creating the observed environmental challenges.

By considering environmental issues alongside sector performance, particular issues become apparent. These are considered as the Green City Challenges. Directly addressing these Green City Challenges will contribute to improving the overall environmental performance.

As part of this process, a Gender Equality and Social Inclusion assessment provided insight into demographics that may be more adversely affected by environmental and sectoral issues than others. These demographics were identified by virtue of characteristics such as their social status, gender, ethnicity, age, disability, and literacy. Underserved groups are disproportionately impacted by environmental challenges given how environmental degradation has been observed in informal settlements characterised by inadequate housing, lack of access to basic services, limited economic opportunities, and poor health.

These key pressures were then amalgamated by overarching themes and mapped against the challenges. This allowed for the clear identification of common themes of pressures which act across and between Green City Challenges, rather than affecting each challenge in isolation.

**Table 0-1: Green City challenges**

| Pressure area | Key pressures | Environmental impacts |
|---|---|---|
| **Transport provision** | High age of private vehicle fleet<br>Limited national emissions standards for public and private fleet<br>Low adoption of electric vehicles and alternative fuels<br>Lack of prioritised public transport and cycling infrastructure | |
| **Urban development and resilience** | High population density in some districts leading to UHI<br>Imbalanced provision of urban open/green areas<br>Extreme urban scale created large commuting distances<br>Localised flooding during heavy rainfall disrupts transport network<br>No requirements for buildings standards or energy performance assessments | |
| **Energy supply and efficiency** | High energy consumption in industrial processes<br>High fossil fuel use in industrial processes<br>High level of electricity uses especially in new cities<br>High electricity losses in the distribution network<br>Limited use of distributed renewable energy | |
| **Water management** | High water consumption<br>Limited reuse of grey water<br>Need for additional wastewater treatment capacity<br>High rate of non-revenue water | |
| **Solid waste management** | High level of unregulated waste disposal and landfilling<br>Limited waste treatment processes<br>Absence of formal waste collection in areas of city<br>Landfilling capacity and quality constraints<br>Low recycling of industrial and construction waste<br>Low separation at source, recycling and composting rates | |

## Action Plan development

Following the creation of a comprehensive picture of where the city is today and which areas need attention, the Action Plan was developed. This began with agreeing a single, overarching vision for its Green City development. To support the achievement of the Vision, a range of Strategic Goals, Targets and Actions have been developed.

### Cairo GCAP vision statement

*"Cairo, the vibrant heart and capital of Egypt, stands as the pinnacle of regional excellence, envisioning a future where economic vitality, cultural preservation and environmental sustainability seamlessly intertwine.*

*The city aspires to be an investment hub utilising local talents and resources and fostering a circular economy as the main driver for growth.*

*With a commitment to smart and green initiatives, Cairo exemplifies leadership, ensuring an enhanced quality of life towards a sustainable and prosperous future."*

### Sector goals and targets

**Table 0-2: Strategic goals and target areas**

| Sector theme | Strategic Goal | Mid-term targets |
|---|---|---|
| Transport provision | Reduce prevalence of fossil fuels within the transport sector which create poor air quality and GHG emissions. | Reduce reliance on private cars, enhance public transport provision, adopt alternative fuels, and promote sustainable modes of transport. |
| Urban development and resilience | Provide citizens a liveable city with planned, safe, well designed, and harmonious communities. | Promote 15 minute neighbourhoods, create TOD rehabilitation and regeneration of real estate, open/green space generation, protect and enhance culture and heritage. |
| Energy supply and efficiency | Reduce GHG emissions and cost of public and private energy supply. | Improve provision of renewables, improve efficiency of building stock and industrial processes, promote low carbon/low-demand alternatives for cooling and lighting. |
| Water management | Enhance availability/reduce demand of water for all purposes. | Improve wastewater treatment, increase grey water harvesting and recycling, reduce network losses, restrict high demand uses. |
| Solid waste management | Implement a sustainable MSW management system to reduce improper and harmful disposal practices. | Align the waste hierarchy, enhance coverage of formal collection, improve sorting, recycling, processing, and treatment, increase and improve landfill capacity. |

### Action generation

A comprehensive list of over 200 potential actions was identified through close collaboration with key city departments, municipal companies, and service providers. Following extensive consultation and engagement with multiple public stakeholder groups, a shortlist of priority actions was selected and further developed.

## Green City Actions

The GCAP includes 32 actions, encompassing a mix of policy, pre-investment, investment, and other initiatives. These actions were chosen for their potential to address the highest priority challenges in the governorate effectively.

The focus is on tackling significant environmental issues while also delivering a range of socio-economic co-benefits. Building on the Gender Equality and Social Inclusion assessment, the plan ensures the provision of safe, accessible, and affordable services, with improved facilities designed and implemented through participatory decision-making and ongoing workforce engagement. This will be supported by information access and awareness-raising activities to enhance inclusivity and promote sustainable green practices.

## Integrated Actions

To maximise benefits and cost efficiencies, the actions should be implemented in a targeted manner that directly addresses the observed challenges within the governorate. Where natural commonalities and overlaps between actions across sectors and locations were identified, they were combined and applied to specific clusters and spatial locations within Cairo Governorate, increasing the likelihood of a significant impact.

In total, the GCAP presents 13 Integrated Actions, requiring a total funding of €858 million over 10 years (2025 – 2035). These actions include a mix of policy, pre-investment, investment, and other initiatives.

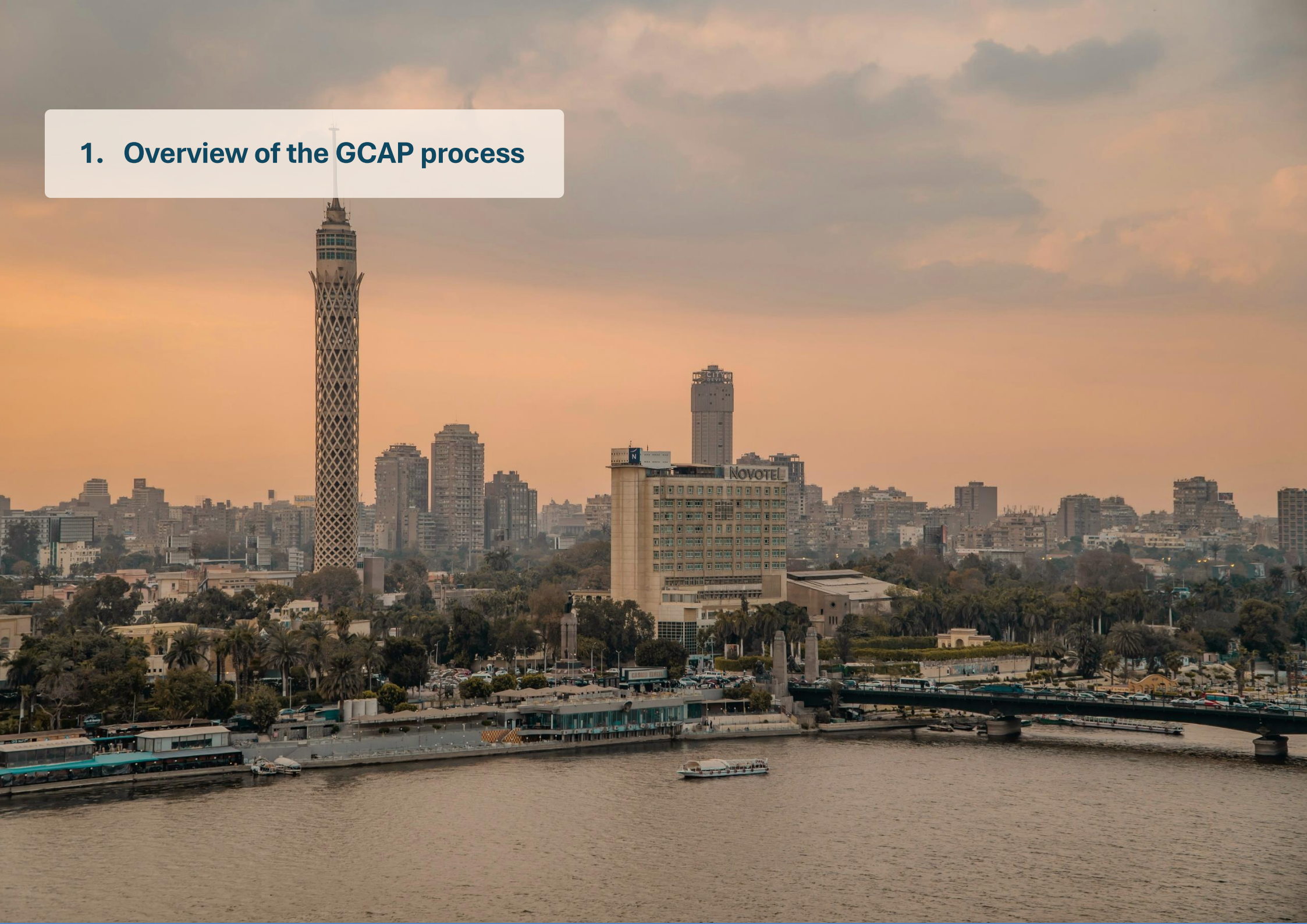
Table 0-3: Cairo GCAP investment plan

| # | Integrated Action | Location / Cluster | Capex (€m) | Opex (€m) | Capex (EGPm) | Opex (EGPm) | Timeframe | Environmental challenges addressed | Actions |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Badr electric bus system** | NUCA (Cluster A) | 130 | 6.51 | 6,773 | 337 | | | TR2: Sustainable transport measures<br>TR3: Electrify public transport |
| 2 | **Electric bus rapid transit (BRT)** | Governorate wide (Cluster C, D, E) | 230 | 11.56 | 12,025 | 559 | | | TR3: Electrify public transport |
| 3 | **Downtown traffic management** | Historic centre (Cluster C) | 43.3 | 2.17 | 2,252 | 112 | | | TR1: Demand management of private car usage<br>TR2: Sustainable transport neighbourhoods<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design |
| 4 | **Transit oriented development in New Cairo** | NUCA (Cluster A) | 150 | 7.51 | 7,813 | 389 | | | TR1: Demand management of private car usage<br>TR2: Sustainable transport neighbourhoods<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design<br>UD4: TOD of new mass transit stations<br>EN1: Efficient street lighting |
| 5 | **Liveable neighbourhoods Helwan** | Helwan (Cluster B) | 88.5 | 4.43 | 4,602 | 229 | | | TR2: Sustainable transport neighbourhoods<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design<br>UD3: Green building and retrofit scheme<br>EN1: Efficient street lighting |
| 6 | **Industrial efficiency** | Multiple districts (Cluster B) | 25.3 | 1.26 | 1,313 | 65.4 | | | EN3: Industrial efficiency |
| 7 | **Municipal energy efficiency** | Governorate wide (Cluster C, D, E) | 36.1 | 1.81 | 1,877 | 93.5 | | | UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design ;;<br>EN2: Municipal building efficiency |
| 8 | **Municipal water efficiency** | El Salam City and Fostat (Clusters C & D) | 112 | 5.61 | 5,837 | 291 | | | EN4: Energy from waste and sludge<br>WA2: Digital monitoring programme |
| 9 | **Wastewater network upgrades** | Governorate wide (Clusters D & E) | 53.2 | 2.67 | 2,768 | 138 | | | WA1: Sewage network rehabilitation<br>WA2: Digital monitoring programme<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design |
| 10 | **Solid waste management network expansion** | Governorate wide (Cluster C, D, E) | 13.5 | 0.675 | 702 | 35 | | | SW1: Organic waste recycling expansion<br>SW5: New waste transfer stations |
| 11 | **Medical waste disposal** | Governorate wide (All clusters) | 11 | 0.55 | 572 | 28.5 | | | SW3: Recycling plants<br>SW4: Medical waste disposal |
| 12 | **15th May landfill rehabilitation** | 15th of May, NUCA (Cluster B) | 169 | 8.46 | 8,801 | 438 | | | EN4: Energy from waste and sludge<br>SW2: Landfill rehabilitation<br>SW3: Recycling plants<br>SW4: New waste transfer stations |
| 13 | **Construction & demolition recycling** | New Cairo and Helwan (Clusters A & B) | 20.3 | 1.01 | 1,053 | 52.5 | | | SW3: Recycling plants |
| | **Total investment costs *** | | **1,084** | **52.2** | **56,388** | **2,819** | | | |

Timeframe: 2025 2026 2027 2028 2029 2030 2031 2032 2033 2034

* GCAP investment cost estimates were generated considering existing commitments, previous investments, expert judgement and international comparison - all costs are indicative at this stage and the GCAP methodology outlines the need for the city to refine these through detailed feasibility studies and cost estimations ahead of the implementation of specific actions.

# 1. Overview of the GCAP process



## 1.1. Purpose of the GCAP

Cities are particularly vulnerable to climate change and natural disasters and are significant drivers of pollution and pressure on natural resources. There is an increasing need for a systematic approach to address the broad range of environmental challenges cities face, linking these to economic and social objectives to provide comprehensive solutions that can translate into investable projects. Furthermore, the urban environmental agenda is gaining importance, emphasizing the need for decentralised, green, and sustainable city actions.

The Cairo Green City Action Plan (GCAP) offers the opportunity to align long-term development goals with an aspirational green growth agenda. This alignment will provide long-term investment benefits across multiple sectors, demonstrating our commitment to the global green agenda.

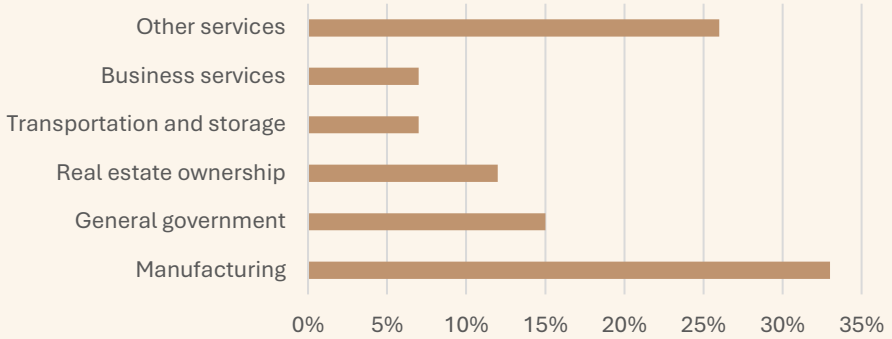
## 1.2. Economy

Cairo is the economic hub of Egypt, home to a diverse range of industries, including manufacturing, tourism, and trade, with the manufacturing sector being the largest contributor to the governorate's gross domestic product (GDP). The modern productive sector expanded dramatically in the second half of the 20th century. By the 1990s, with improving infrastructure and a growing tourist industry, Cairo began promoting itself as a premier conference and convention centre, hosting numerous international events.

Cairo's industries include cotton textiles, chemicals, plastics, and other goods. The relative distribution of the most important governorates' contributions to the value of production and revenues for public sector establishments, public businesses, and the private sector in Egypt indicates that 39% of revenues come from Cairo governorate. The GDP for Cairo governorate approached 1.87 trillion EGP in the financial year 2020/2021, with a growth rate of 27% compared to the financial year 2019/2020.

Figure 1-1 presents the distribution of Cairo's GDP into basic sectors. Cairo is also the primary centre for economic production and financial control in Egypt, containing many of the country's important banks, hotels, restaurants, and entertainment venues.

**Figure 1-1: Distribution of Cairo GDP by sectors**




## 1.3. GCAP process

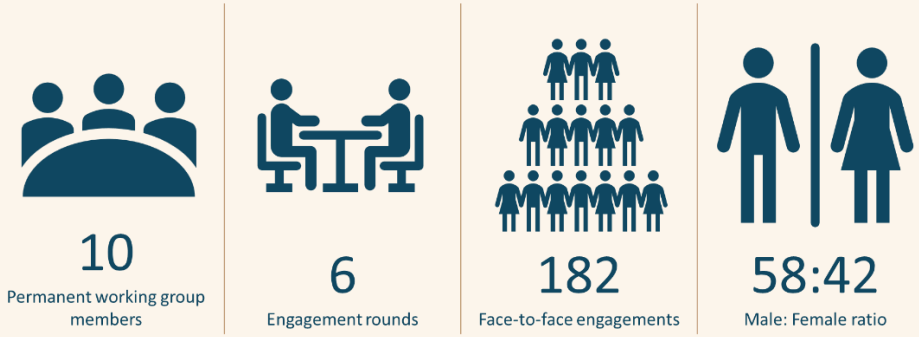
The development of the GCAP was spearheaded by an integrated project team comprising representatives from Cairo Governorate, the European Bank for Reconstruction and Development (EBRD), and technical consultants from AtkinsRéalis, Chemonics Egypt and ENOVA. This collaborative effort involved a wide array of stakeholders from the public, private, and civil society sectors in Cairo. Figure 1-2 provides a summary of the GCAP development process.

**Figure 1-2: GCAP process**

## 1.4. Stakeholder engagement

The GCAP process was driven by extensive stakeholder consultations throughout the program. Green City stakeholders were involved in the process of GCAP development, starting from the data collection and prioritisation of environmental challenges, visioning of Green City and identification of the most important actions up to the final approval of GCAP by decision-makers and its implementation.

The engagement included various methods of consultations, both individual and group activities: workshop sessions, presentations, working group meetings, online surveys, expert discussions and correspondence. Engagement at key milestones during GCAP development included:

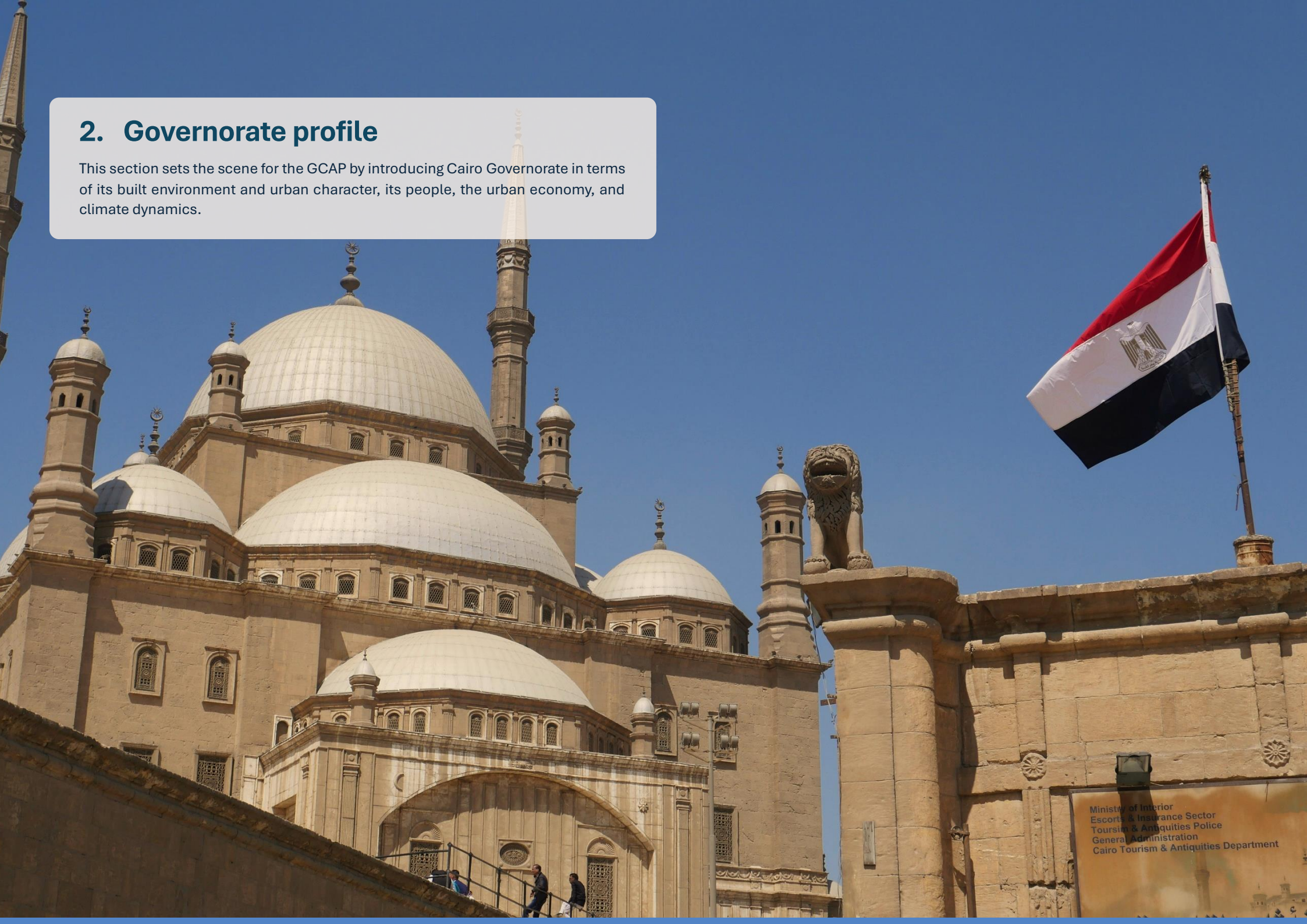



Gender Equality and Social Inclusion (GESI) was a key component of these consultations. In addition to the main stakeholder engagement workshops, GESI-specific focus group discussions were held with members of underserved groups in Cairo. These groups included the elderly, youth, women, Internally Displaced People (IDPs), refugees, Persons with Disabilities (PwD), low-income families (including single mothers and female-headed households), and individuals with no digital literacy or access to digital tools.

For example, while public spaces and main streets are well lit at night, side streets may have insufficient lighting, particularly in less developed areas of the city, and elderly people living alone face challenges in accessing public transportation. These are just a few ways in which these demographics are more vulnerable to the risks of climate change and social exclusion. Their specific needs were integral to informing the GCAP process, ensuring that our actions and policies are inclusive and equitable.

# 2. Governorate profile

This section sets the scene for the GCAP by introducing Cairo Governorate in terms of its built environment and urban character, its people, the urban economy, and climate dynamics.



## 2.1. Cairo Governorate

### Greater Cairo Region

The Greater Cairo Region (GCR) stands as the largest and most influential urban area in both the Middle East and the African continent. With a rich history rooted in cultural and commercial exchanges with countries across the region and the world, GCR serves as a historical bridge connecting the East and the West.

Home to approximately 26 million residents, the GCR encompasses the governorates of Cairo, Giza, and Qalyubia, representing 25% of Egypt's total population. This region significantly contributes to the national economy, housing the headquarters of government ministries, institutions, media, and numerous international and regional organisations.

### The governorate of Cairo

Cairo Governorate includes the national capital, Cairo, and five satellite cities: the New Administrative Capital, New Cairo, Shorouk, Badr, and 15th of May. Bordered by Qalyubia to the north, Giza to the south and west, and Suez to the east, Cairo Governorate is a central hub of activity and governance.

Cairo Governorate is divided into four areas: eastern, western, northern, and southern. Each area is overseen by a deputy governor, except for the new cities, which fall under the New Urban Communities Authority (NUCA) and are managed by the heads of their respective city authorities. These areas are further subdivided into districts, as detailed in Table 1-1. Figures 2-1 and 2-2 illustrate the geographical structure and maps of these districts.

With a population exceeding 13 million, Cairo Governorate spans an estimated total area of 3,160 $km^2$. The largest districts include Nasr City (East & West), Misr Al-Gadidah, Al-Nozha (the largest, covering 855 $km^2$), Al-Salam (1 & 2), Tora, and Basatin, each exceeding 200 $km^2$. Additionally, New Cairo covers an area of 246 $km^2$.

Several neighbourhoods in Cairo, including Al-Moqattam, Al-Sayeda Zeinab, Al-Matariya, and Bab al-Sha'aria, are currently facing extreme population densities, resulting in significant overcrowding. This situation places immense pressure on our physical and social infrastructure, particularly our transportation and education systems.

Figure 2-1: Map of the GCR and Cairo Governorate

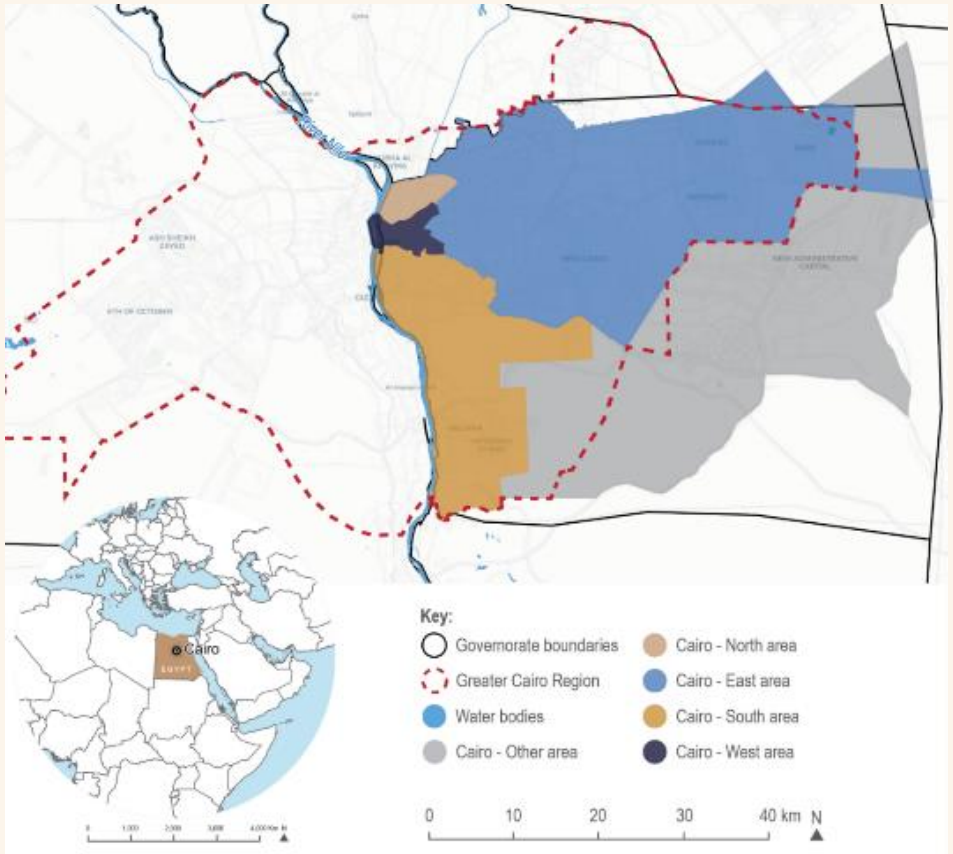
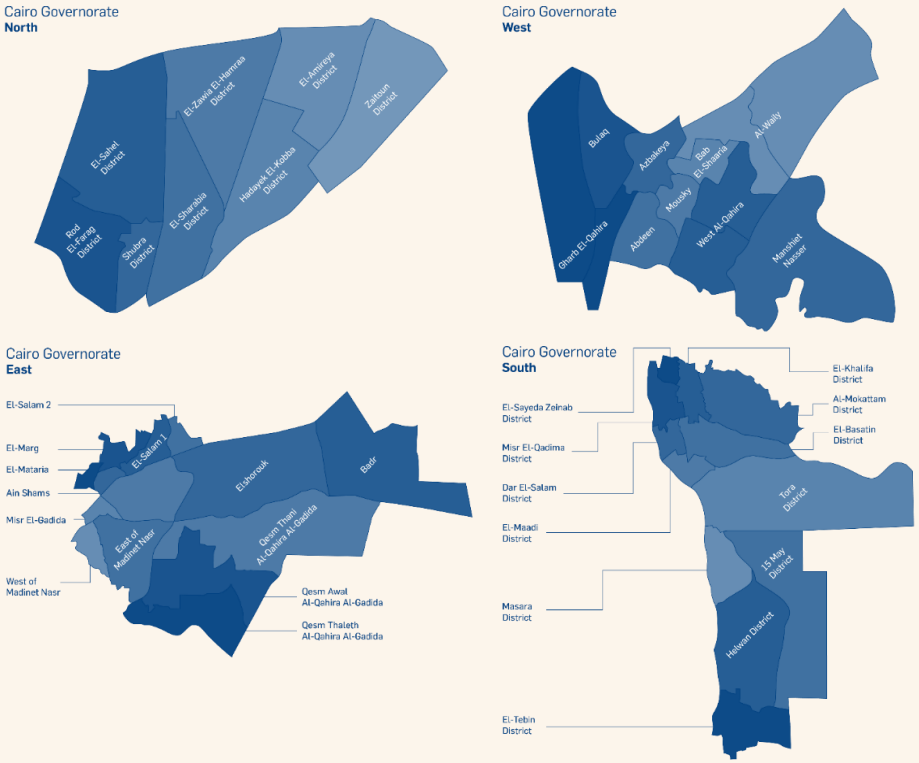


Figure 2-2: Cairo Governorate map




The rapid population growth in our city has led to a shortage of adequate housing and environmental degradation, especially in informal settlements. These areas often suffer from substandard housing, limited access to basic services, and restricted economic opportunities.

Residents in these densely populated neighbourhoods are particularly vulnerable to the impacts of climate change, which exacerbates existing challenges.

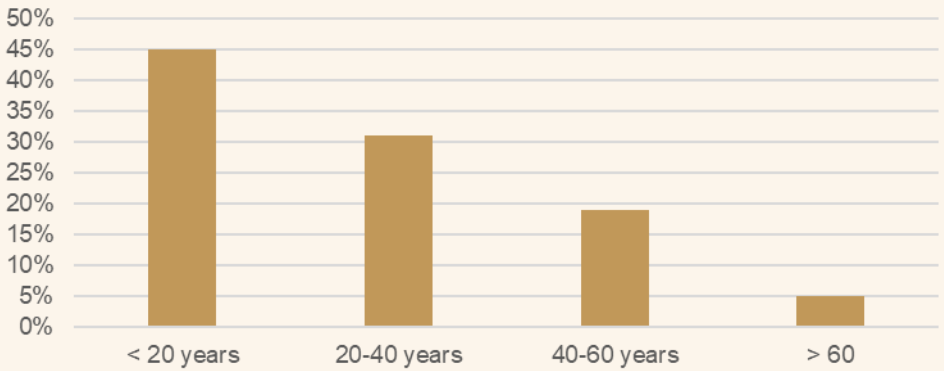
Table 2-1: Administrative districts of Cairo Governorate

| Area | District |
|---|---|
| **Northern area** | *Shubra; Al-Zawiya al-Hamra; Hadayek al-Qubba; Rod al-Farg; Al-Sharabia; Al-Sahel; Al-Zeitoun; Al-Amiriyya* |
| **Eastern area** | *Misr al-Gadidah and Al-Nozha (Heliopolis); Nasr City East and Nasr City West; Al-Salam 1 (Awwal) and al-Salam 2 (Thany); Ain Shams; Al-Matariya; Al-Marg; Shorouk; Badr; Al-Qahira al-Gadida (New Cairo)* |
| **Western area** | *Manshaaat Nasser; Al-Wayli; Wasat al-Qahira; Bulaq; Gharb al-Qahira; Abdeen; Al-Azbakiya; Al-Muski; Bab al-Sha'aria* |
| **Southern area** | *Masr El-Qadima; Al-Khalifa; Al-Moqattam; Al-Basatin; Dar al-Salam; Al-Sayeda Zeinab; Al-Tebin; Helwan; Al-Ma'sara; Al-Maadi; Tora; 15th of May* |

## 2.2. People

Cairo's population is notably young, with nearly half of our residents under the age of 20. As the national capital, Cairo attracts many young individuals from rural areas seeking employment and better opportunities. This youthful demographic represents a significant opportunity for innovation, economic growth, and social development, positioning them as key agents for the city's green transition. However, this also presents challenges, such as high unemployment rates among college-educated youth.

Figure 2-3: Population by age group




Cairo boasts one of the highest proportions of female-headed households in the country, at approximately 19.2%, compared to the national average of 16%. The education gap between men and women is narrower in Cairo than the national average, and women actively participate in the labour market, particularly in sectors like education, health, tourism, and administration. However, many women in Cairo's informal workforce, including domestic workers, street vendors, and home-based workers, face significant challenges in accessing social protection and labour rights.

In Cairo, 18.6% of the population is under 5 years old, while 1.1% are over 90. Younger women in families often care for both children and the elderly. According to the 2017 Central Agency for Public Mobilisation and Statistics (CAPMAS) population census, 10.7% of Egypt's population has disabilities, with 53.9% being male and 46.1% female. A 2015 CAPMAS study found that 32.8% of the national GDP is contributed through female unpaid work, with 79% of women in Egypt involved in unpaid work. However, only 23% of women were part of the formal workforce in 2014. Women with disabled children often struggle to access adequate medical and social insurance from the government.

Elderly individuals living alone also face challenges in accessing public transportation and various services, such as hospitals, medical clinics, banks, post offices, and shopping centres. Although the exact numbers of migrants and refugees in Cairo are uncertain, the United Nations High Commissioner for Refugees (UNHCR) reports that 97,198 refugees and asylum seekers reside in the city.

Public spaces in Cairo often exclude certain groups based on gender and class, limiting access to communal areas. Women can face a lack of safe public spaces and transportation options, restricting their movement and access to employment opportunities, which contributes to economic disparities and limited career prospects.

Refugees and host community members face increased vulnerability in access services and opportunities. With many refugees lacking a stable source of income and soaring inflation rates, even basic needs have become difficult to cover. Other notable challenges include limited livelihood opportunities and the language barrier faced by many non-Arabic speaking refugees. Additionally, some refugees lack access to sustainable formal education, which is critical for their development and integration. Many refugees and asylum-seekers rely heavily on humanitarian assistance to meet basic needs and to access medical and psychosocial support.

The Governorate of Cairo is committed to actively supporting social and economic inclusion, as well as gender equality. Our Strategic Plan for 2030 includes goals for creating economic opportunities for young people and protecting underserved groups, including women.

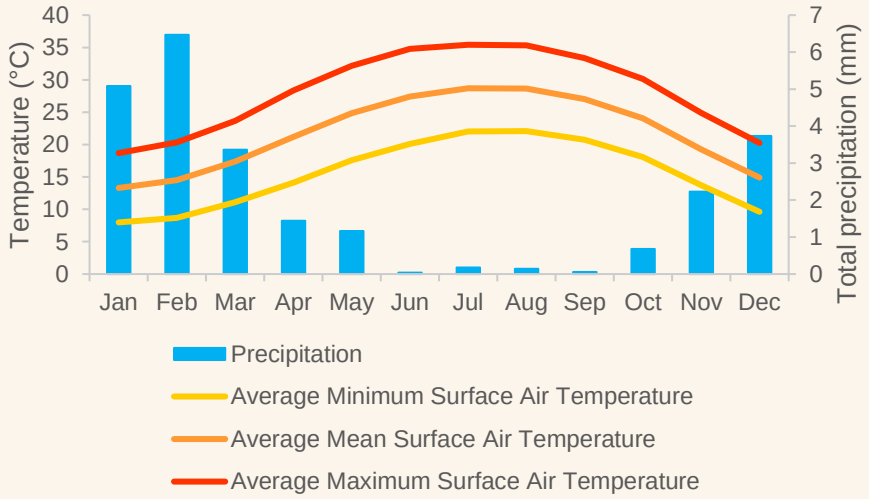
## 2.3. Climate

Cairo experiences a hot desert climate, with maximum temperatures regularly exceeding 35°C and extremely low annual rainfall, particularly during the summer months. The Urban Heat Island (UHI) effect and air pollution exacerbate the negative aspects of these conditions. On average, Cairo receives only 25mm of annual precipitation, primarily between November and March.

Cairo has faced extreme weather events, including storms and heavy rainfall. Notably, the March 2020 'dragon storm' brought heavy rain and thunderstorms across Egypt, with 42mm of rainfall recorded. This event led to the flooding of

Cairo's streets, low-lying buildings, Ramses railway station, and school closures. The city is not well-equipped to handle heavy rainfall events. Excessive urbanisation, especially near major roads, has reduced infiltration and increased flood peak discharges. Combined with inadequate stormwater drainage systems, this results in flooding even with low levels of rainfall (50mm/day).

**Figure 2-4: Cairo's monthly climatology 1991-2020**

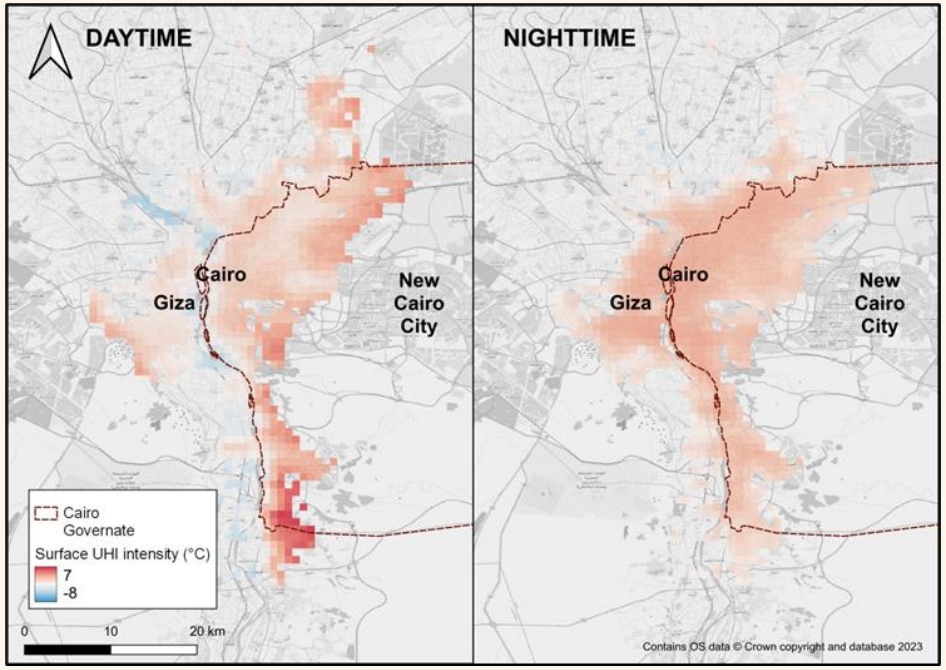



*Source: World Bank Climate Change Knowledge Portal*

Cairo's climate is projected to become hotter, with water availability likely to decline:

- Higher global emissions are expected to increase temperatures by 1.6°C-2.1°C by the 2050s under medium and high emissions scenarios, respectively.
- Nights with minimum temperatures exceeding 20°C could reach 28 days in June and every night in July, August, and September.
- Water availability is expected to decrease due to reduced flow in the River Nile, increased variability in rainfall and runoff, and rising water demand, potentially leading to increased water scarcity.

**Figure 2-5: UHI effect in Cairo and Giza**




Source: Earth Engine

Projected climate changes in Cairo are expected to result in heat stress, flash flooding, and water scarcity:

- UHI Effect: This effect causes higher air temperatures in urban areas compared to surrounding regions due to buildings, streets, and sealed surfaces. It can lead to heat stress, indoor overheating, and thermal discomfort, particularly

affecting the elderly, pregnant women, residents of poorly adapted buildings, and outdoor workers. Extreme heat can also cause desertification, increasing dust storms and air pollution across Greater Cairo.

- Flash Flooding: Extreme rainfall is likely to impact areas with large impermeable surfaces, causing surface water overflow and overwhelmed drainage systems. This can disrupt local transportation, damage buildings, and cause electricity outages.
- Water Scarcity: Water scarcity affects health and wellbeing, leading to malnutrition due to reduced food availability, mental health issues due to stress, lower sanitation levels, and increased risk of infectious diseases such as cholera. Health services may also be disrupted due to lack of water supplies.

## 2.4. Institutional arrangement

Cairo Governorate is led by the Governor, with each of the four areas (North, South, East, and West) governed by a Deputy Governor. Each district within these areas is managed by a director responsible for neighbourhood administration.

The governorate office oversees various directorates, authorities, and companies that provide essential services to our citizens. Table 2-2 outlines the relevant companies, directors, and authorities associated with the sectoral focus areas of the GCAP.

In addition to the governorate's efforts, national government and private sector entities play a crucial role in delivering key public services and setting standards. Chapter 5 of the action planning section provides a detailed description of the Governorate's decision-making powers in each sector and its influence on investment. This section also identifies influential external entities that significantly impact investment in each sector, helping to assign appropriate responsibilities for implementing proposed actions.

Within Cairo Governorate, NUCA governs the districts of New Cairo, Shorouk, Badr, and 15th of May. Established in 1979, NUCA is a state-owned enterprise affiliated with the Ministry of Housing. NUCA's mission is to support the redistribution of population away from heavily congested urban centres within the Nile Valley by developing lower-density new urban communities.

Table 2-2: Powers of governorate sectors

| Sector/ sub-sector | Relevant companies, directorates and authorities |
|---|---|
| **Transport** | Transport Directorate<br>Public Transport Authority |
| **Buildings** | Housing Directorate |
| **Industry** | Labour Directorate<br>Supply and Trade Directorate |
| **Energy** | South and North Cairo Electricity distribution companies<br>Cairo Electricity Production Company |
| **Water** | Greater Cairo Drinking Water Company and Greater Cairo Sanitation company |
| **Solid Waste** | Cairo Cleaning and Beautification Authority |
| **Land use** | Culture Directorate. Real Estate Taxes Directorate |
| **Environmental monitoring and protection** | Cairo Cleaning and Beautification Authority |

# 3. Green city baseline

The governorate of Cairo is committed to promoting sustainable green practices through our Green City Action Plan (GCAP). This plan follows a systematic process to establish a Green City Baseline by identifying the priority environmental and sectoral challenges that need to be addressed.

This chapter outlines the process for evaluating Cairo's current environmental conditions using traffic light screening performance benchmarks, which are referenced to both local and international standards and consider historical trends where feasible. By identifying and benchmarking sectoral performance in transport, energy, buildings, industry, water, solid waste, and land use, the GCAP pinpoints the economic sectors responsible for the observed environmental challenges.

Throughout this process, we have supplemented and enhanced the preliminary results of our indicators database with expert knowledge and stakeholder engagement. This collaborative approach has helped us arrive at an agreed challenge level that accurately reflects Cairo's true environmental challenges.

## 3.1. State of the environment

The following section provides a brief overview of the state of the environment in Cairo, examining results and the main factors influencing each “State Indicator” environmental challenge benchmark, based on data from the indicators database, presented in Figure 3-1.

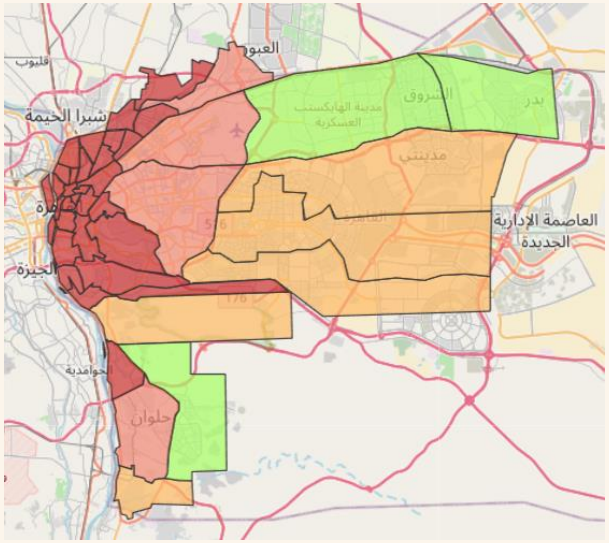
Figure 3-1: Environmental state indicators


For each environmental indicator, we assess the severity of impact using a red, amber, green (RAG) system and map these spatially to demonstrate how environmental challenges are experienced differently across the governorate.

We have also identified key sectors contributing to each environmental challenge, with reference icons for ease of identification. This helps us understand which aspects of economic sectors are responsible for the observed environmental challenges. Further detailed analysis of sector performance is presented in section 3.2.

## 3.1.1. Air quality

**Figure 3-2: Spatial distribution of air quality RAG assessment**




Air quality indicators in Cairo greatly exceed international thresholds. The main sources of pollution are road transport, industrial processes, open burning of solid waste, and a lack of urban tree cover.

Poor air quality is particularly prevalent in older parts of Cairo compared to newer areas, posing significant health risks to our citizens.

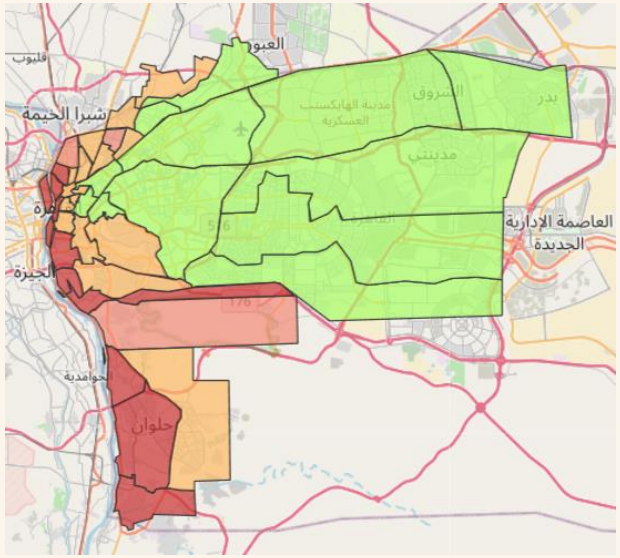

Addressing air quality is the highest priority challenge for the GCAP.

**Policy context – Existing, but requires improvement:** National air quality policy is set through Egypt's environmental law, which mainly reflects standards set by the World Health Organisation (WHO).

The Ministry of Environment (MoE) maintains a network of air quality monitoring stations and collaborates with various sectors (e.g., industrial, transport) to implement broader air pollution control measures.

## 3.1.2. Water quality

**Figure 3-3: Spatial distribution of water quality RAG assessment**




While drinking water in Cairo shows good performance, high levels of pollution are observed in waterways, as indicated by elevated levels of Biochemical Oxygen Demand (BOD) in sampled water courses.

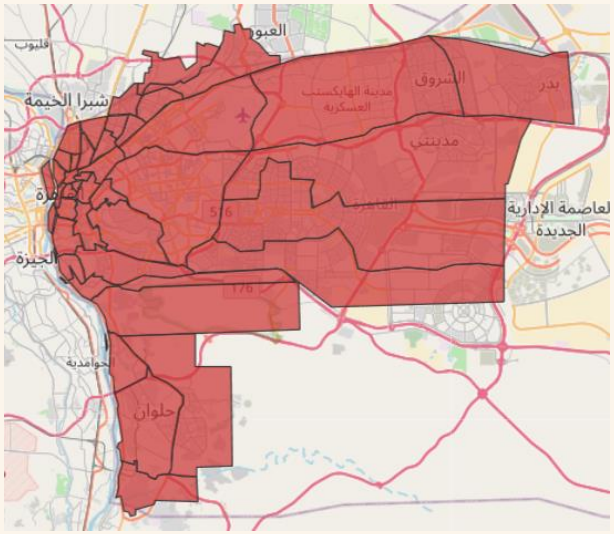
This pollution is most prevalent in areas bordering the Nile and its tributaries, caused by the mixing of industrial and municipal wastewater, which reduces treatment efficiency, and agricultural runoff polluted with fertilisers and pesticides. Illegal discharge of untreated wastewater into drains and surface water sources, such as the Nile, has also been reported.


Improving water quality is a high-priority area for investment. The first step is to ensure there is no deterioration in current performance, followed by enhancements.

**Policy context - Existing, but requires improvement:** The quality of water bodies is protected through a range of laws regulating the proper management and disposal of wastewater from industrial, commercial, residential, and agricultural sectors.

## 3.1.3. Water availability

Figure 3-4: Spatial distribution of water availability RAG assessment




We recognise the immense demand for water driven by our large population, industrial activities, and extensive irrigation throughout Egypt.

With ongoing population growth, residential water demand is expected to rise significantly.

Water availability is a critical issue across the entire Cairo governorate, though usage patterns vary by district. For example, per capita water use is higher in new cities where many households have lawns or swimming pools.

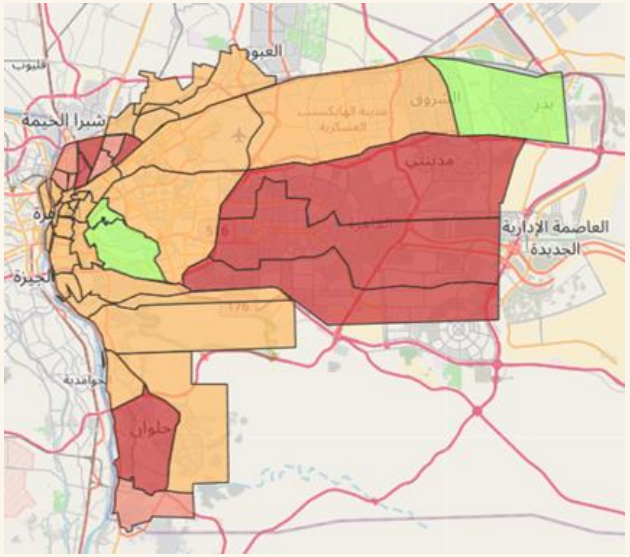
Additionally, groundwater contamination poses a risk to the existing water supply, and climate change threatens long-term water availability in Cairo. Addressing water availability is one of utmost priorities within the Green City Action Plan (GCAP).

Contributing sectors: Water, Industry, Land use, Buildings

**Policy context - Existing, but requires improvement:** Relevant water management strategies are outlined in the National Water Resources Plan 2037 and supported by specific laws and decrees covering groundwater use, water theft, and water reuse.

## 3.1.4. Soil quality

Figure 3-5: Spatial distribution of soil quality RAG assessment




Elevated concentrations of heavy metals, including cobalt, chromium, copper, nickel, lead, and vanadium, have been detected across Cairo, particularly in industrial areas.

These pollutants result from traffic emissions, waste disposal in open areas, agricultural practices, and industrial activities, contaminating land and potentially leaching into groundwater.

Contributing sectors: Transport, Solid waste, Land use, Buildings

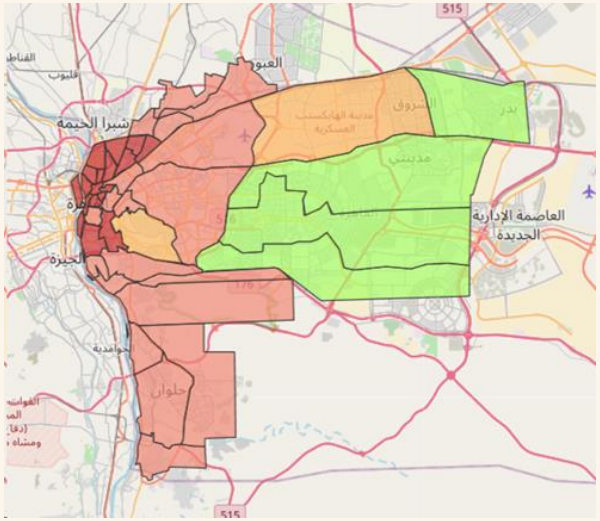
The highest concentrations are found in Greater Cairo, outside the governorate boundaries, making this a medium-priority issue.

**Policy context – Not existing:** Current environmental laws address potential soil pollution from various types of waste, particularly hazardous waste, but do not directly focus on soil quality.

There is no specific policy for soil assessment beyond the baseline requirements in environmental and social impact assessment studies.

## 3.1.5. Open / Green spaces

Figure 3-6: Spatial distribution of green spaces RAG assessment




The availability of green space in Cairo is considerably lower than international standards and is decreasing annually.

The distribution of green spaces is uneven, with downtown and historic districts having particularly low levels, while new cities have higher per capita green space, closer to international standards.

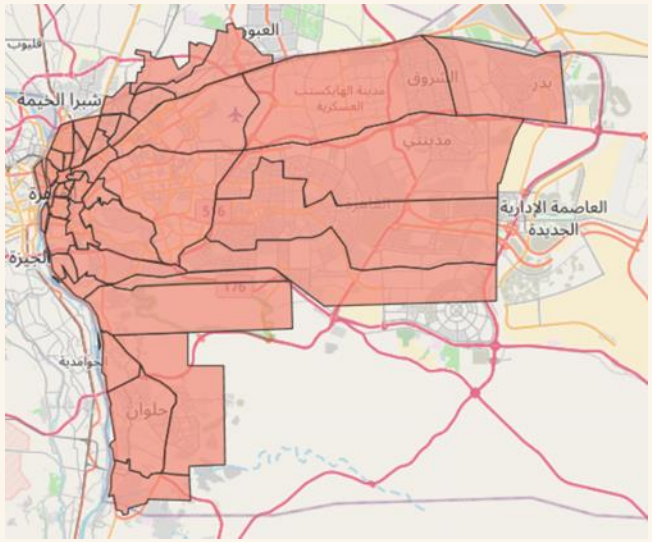
Green spaces are vital for improving air quality, enhancing water retention (which supports availability and reduces urban flooding), mitigating the UHI effect, and promoting social well-being. Therefore, addressing the lack of green and open spaces is a high priority for the GCAP.

**Policy context - Existing, but requires improvement:** Existing laws protect green spaces and set minimum standards for green space in each governorate and city. However, implementation has been more focused on new cities and affluent areas.

These laws stipulate that public parks should provide at least 10m$^2$ of space per person and be evenly distributed throughout the city, with residential open spaces concentrated in high-density areas.

## 3.1.6. Biodiversity

Figure 3-7: Spatial distribution of biodiversity RAG assessment




Quantitative data on biodiversity within the governorate is limited.

However, qualitative assessments indicate that declines in biodiversity are largely due to various man-made processes common in urban environments, exacerbated by continuous urban expansion into desert areas, impacting native fauna and flora.

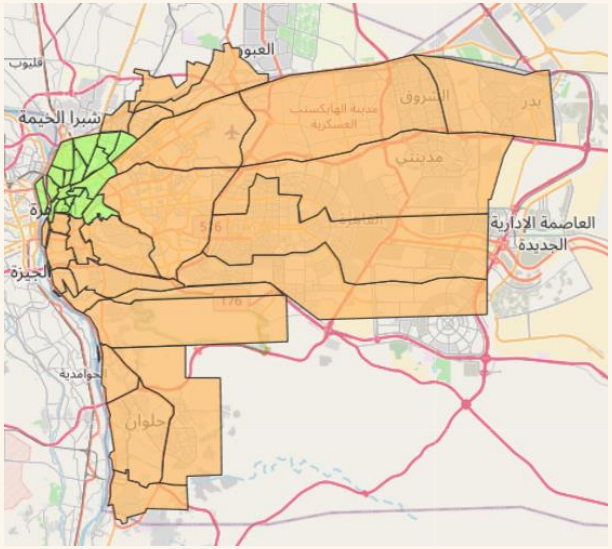
While this is an important challenge across Cairo, its urgency is considered lower relative to other challenges.

Therefore, we will integrate biodiversity considerations into broader improvements, treating it as a medium-priority challenge.

**Policy context - Existing, but requires improvement:** Currently, there is no dedicated biodiversity law in Egypt. However, a highly relevant law aimed at protecting nature and biodiversity is under discussion in parliament. Additionally, other existing laws promote aspects of biodiversity.

## 3.1.7. GHG emissions

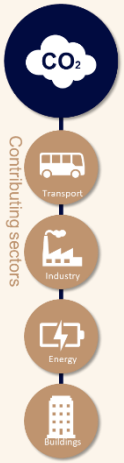
**Figure 3-8: Spatial distribution of GHG emissions RAG assessment**




Cairo is a significant emitter of greenhouse gases (GHGs) from its primary sectors: energy, transport, and oil and gas.

Despite this, the high population results in relatively low per capita emissions, earning a "green" flag on this indicator.

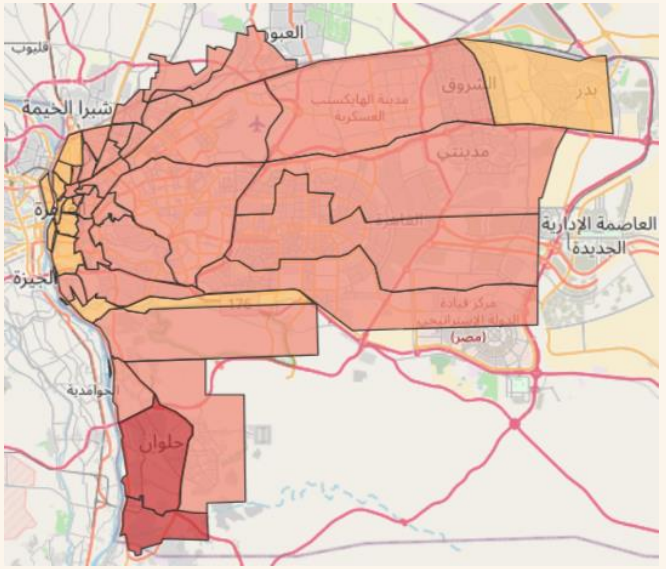
According to the World Bank, Egypt's $CO_2$ emissions per capita were 2.5 tons in 2019. Although emissions per unit of GDP are currently low, this is expected to increase as country continues to experience economic development.




**Policy context - Existing, but requires improvement:** Egypt's National Climate Change Strategy 2050 consolidates all aspects of climate change into a single document, serving as a fundamental reference to ensure the integration of climate change considerations into the general planning of all sectors. Additionally, various sector-specific strategic documents contribute to GHG mitigation.

## 3.1.8. Climate adaptation

**Figure 3-9: Spatial distribution of climate adaptation RAG assessment**




Climate change is projected to result in higher average temperatures, increased heat stress, more extreme rainfall events, and decreased water availability for Cairo.

These changes will exacerbate the UHI effect (particularly prevalent in the southern districts), pose health risks to citizens, and increase flooding, impacting the built environment and transport infrastructure. These effects will accelerate asset wear, reduce economic output, and cause component failures, leading to diminished service provision and quality.

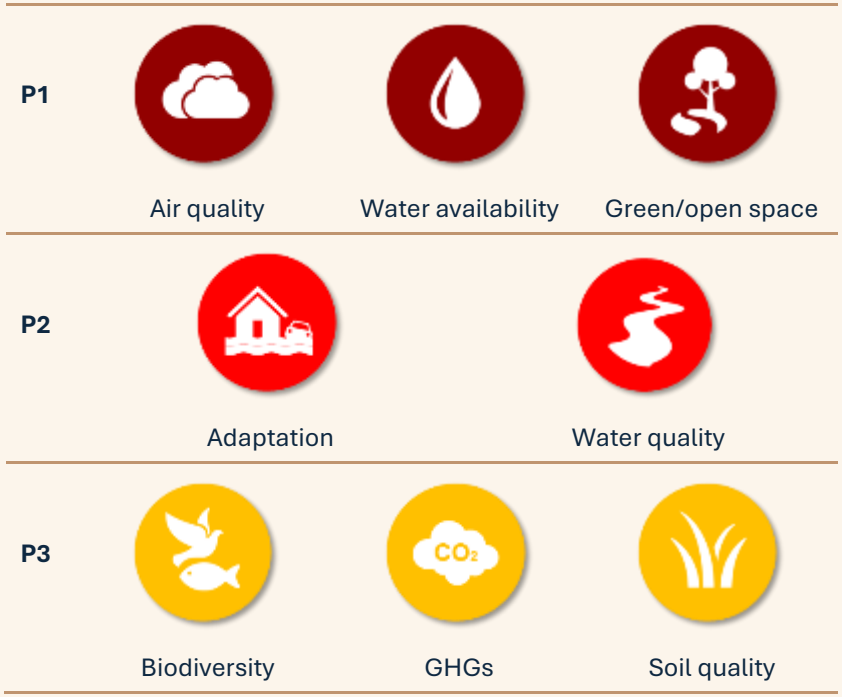

Addressing this multi-sector threat is a high priority for our GCAP.

**Policy context - Existing, but requires improvement:** National and international strategies and reporting guide Egypt's resilience policies to climate change. We have proposed a range of measures to address vulnerabilities to water scarcity and heat stress across various sectors, including transport, buildings, and urban development.

## 3.2. Priority environmental challenges

Based on the environmental assessment, the Governorate and relevant stakeholders developed a set of challenges for our GCAP based on baseline information, including socio-economic dynamics, the state of the environment, and sector performance. In summary the main environmental challenge areas are identified as follows:

Figure 3-10: Priority challenges for Cairo




There are no P4 challenges identified, which is not surprising given the extensive and intense urban interactions in our mega-city. The selection of three P1 challenges does not imply that no challenges exist in other environmental areas. Instead, it highlights that, compared to major issues, these areas pose lower urgency for our city.

While interventions may not be directly targeted at lower-priority areas, commonalities with the highest priority areas allow for co-benefits through carefully designed options. For example, integrating resilience measures within the urban environment can address multiple challenges simultaneously. These measures include:

- Planting Trees for Green Corridors: Enhances air quality and provides shade.
- Developing Sustainable Urban Drainage: Reduces flood risk and improves water quality.
- Installing Green Roofs: Mitigates the UHI effect and promotes energy efficiency.

These resilience measures will directly improve our high-priority environmental challenges.

Implementing Nature-based Solutions (NbS) will also yield clear benefits for our lower-priority areas. These include:

- Development of Biodiversity Corridors: Connects fragmented habitats and promotes wildlife movement.
- Improved Water Courses: Enhances water quality and availability.
- Additionally, these initiatives have proven health benefits for urban residents, promoting active and healthier lifestyles.

It is important to recognise that while certain environmental challenges will take prominence in the following stages of GCAP development, all environmental and social aspects can be improved through well-considered actions and investments. A holistic approach ensures that we address both high and low-priority challenges, creating a sustainable and resilient future for Cairo.

## 3.3. Sectoral assessment

In this section, we delve deeper into the assessment of Cairo's current environmental conditions to identify which aspects of economic sectors, referred to as "Pressures" in the GCAP Methodology, are responsible for the observed environmental challenges.

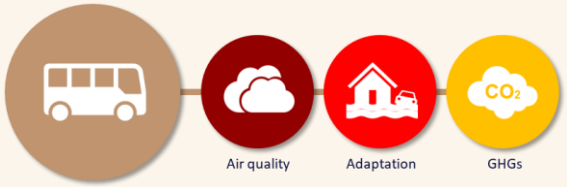
To complement the baseline data, we conducted a thorough review of available information, engaged in interviews with stakeholders, and observed both historic and current operations and infrastructure conditions. This comprehensive approach allows us to gain a deeper understanding of the environmental impacts of each sector and address any data gaps that limit benchmarking through our indicators database.

### 3.3.1. Key pressure indicators

The sectors reviewed as part of the baseline process are presented in Figure 3-11.

Figure 3-11: Sectoral pressure indicators

### 3.3.2. Transport




**Increasing car ownership and use in Cairo:** The Cairo authorities recognise the need to address car ownership and usage to transform our transport sector. Although the number of cars per capita is relatively low at 0.13-0.17 [CAPMAS, 2023], the number of cars per kilometre of road is already very high [World Bank, 2019]. This situation is unsustainable, contributing to severe traffic congestion and low average travel speeds. Congestion not only causes inefficiency but also impacts other modes of transport. Public transport vehicles are delayed along with private vehicles, and the dominance of private cars reduces the safety and attractiveness of non-motorised transport options. Additionally, traffic noise and pollution diminish the quality of urban environments, making areas less appealing to visit and spend time in.

**Unequal car ownership across the city:** City-level data often masks the diverse characteristics of different parts of Cairo. Travel options, types of travel movements, and socio-economic characteristics vary significantly across neighbourhoods, influencing travel behaviours and local considerations. For instance, car ownership in the wealthiest neighbourhoods is 2.2 per household, compared to an average of 0.5 cars per household in the poorest neighbourhoods.

**High age of the city's vehicle fleet:** The negative impacts of high car ownership and usage are compounded by the relatively high age of Cairo's vehicle fleet, which averages 16 years [CAPMAS, 2020/2021]. This contributes to increased emissions and reduced efficiency.

**Limited use of alternative fuels:** In 2020, less than 1% of the private vehicle fleet ran on alternative energy sources, and 69% of the city's buses operated on diesel [CAPMAS, 2021]. This is linked to the high average age of the vehicle fleet, which limits the adoption of cleaner technologies.

**Limited provision for non-motorised transport:** In 2022, only 0.78 kilometres of the road network per 100,000 inhabitants was dedicated to public transport use [CAPMAS, 2023]. This highlights the significant potential to rebalance transport provision and promote different modes of travel.

**The need for a comprehensive foundation for sustainable mobility:** Cairo boasts a diverse public transport system, with most services provided by paratransit vehicles (largely shared taxis). While public transport patronage is high, the services are not sufficiently planned or integrated. Instead Cairo Governorate aspires to a more coherent, comprehensive, and integrated public transport system that ultimately runs on alternative fuels. This will require a comprehensive charging infrastructure network to support the transition from fossil fuels for both public and private vehicle fleets.

An integrated network of dedicated active travel infrastructure is also essential, along with urban realm improvements to enhance the viability and attractiveness of non-car modes. Given the scarcity of available space in the city and the embedded carbon implications of constructing new infrastructure, we must focus on making better use of existing infrastructure. Reallocating space away from private cars to benefit public, shared, and active modes of travel is key to this transformation.

**Extreme weather and climate change:** Transportation in Cairo such as the metro, trains, buses and motor vehicles and associated infrastructure such as roads and tracks can be adversely impacted by climate-related hazards. Higher temperatures can lead to thermal expansion of tracks, causing major travel disruption and costly repairs. Flash flooding has also impacted a number of transport modes across Cairo, including flooding of Cairo International Airport in 2019 and flooding of Ramses railway station in 2020.

**GESI:** Social identity profoundly impacts travel choices and experiences. Therefore, sustainable transport interventions must consider the following:

- Accessibility patterns: Accessibility varies significantly across Cairo. Low-income areas and slum dwellers face high congestion and low-quality transportation, often characterised by long wait times and inadequate boarding conditions. Transport options also vary widely in price.
- Transport modal choice: The choice of transport mode in Cairo depends on the availability and accessibility of services and infrastructure, as well as the perceived decency of each mode. Higher-income households tend to use private cars, taxis, or ride-hailing services like Uber, while middle-income and lower-income individuals are more likely to use informal transportation due to its affordability.
- Safety standards: Safety standards differ across public transport modes. While formal transportation, such as the Cairo Metro, offers women-only carriages, women and girls often face harassment on informal transport.
- Protecting women and girls: The National Council for Women has developed guidelines (Decree No. 237/2021) for protecting women and girls in public transport. Cairo has the potential to implement these guidelines through various GCAP actions.
- Accessibility for the elderly: Although elderly people receive discounts on metro transportation, the infrastructure and services are not always accessible.

**Policy:** Current transport policies include the Master Plan for Nationwide Transport System (MiNTS) and the Cairo Regional Area Transport Study (CREATS). MiNTS provides a strategic plan for national transportation and helps regulate national development projects. At the regional level, CREATS (2002) supports the prioritisation of projects within the GCR and aims to upgrade transportation authorities.

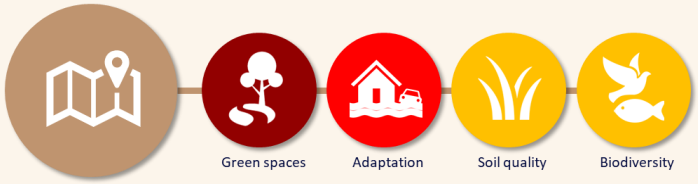
**Smart integration:** The Governorate has implemented several smart integration measures in the transport sector, such as e-tickets, contactless payment, and web-based service information for some public transport services. Traffic monitoring through Intelligent Transport Systems (ITS) is used on highways to detect accidents. There is considerable potential to expand the use of smart technologies to improve the transport network's efficiency and sustainability.

Existing applications, like ITS, can be extended, and new digital technologies introduced. For example, information about car parking spaces could be made available virtually, and the ability to reserve parking spaces in advance could help reduce bottlenecks caused by inadequate parking provision. Additionally, the introduction and use of a Mobility as a Service (MaaS) platform could optimise travel mode and route choices by providing integrated travel information and booking services.

**Jurisdiction:**

- Ministry of Local Development oversees the Cairo Transport Authority (CTA), who operates public buses in Greater Cairo
- Ministry of Interior is the policy setting authority and regulator for land transport (vehicle licensing and Inspection);
- The Egyptian Company for Metro Operations (ECM) is responsible for maintaining, managing and operating Greater Cairo metro lines;
- The General Authority for Roads and Bridges (GARBLT) is responsible for road maintenance;
- The National Authority of Tunnels (NAT) is responsible for public transport (mega project) implementation;
- The Ministry of Housing, Utilities and Urban Communities (MoHUUC) is also involved with both policy setting and planning in conjunction with NUCA linking mass transit plans between new urban cities and main neighbouring cities; and
- Land Transport Regulatory Authority (LRTA) is responsible for land transport regulations.

### 3.3.3. Urban development and resilience




Cairo is one of the largest cities in the world by population. Managing urban development and providing high-quality services across such a vast area is a significant challenge for Cairo Governorate. The city features a complex urban landscape with diverse neighbourhoods that vary in living standards, housing, urban services, and environmental challenges. The most pressing urban development challenges in Cairo are summarised below:

- **Unplanned growth:** Rapid growth has led to unplanned development, both within existing areas, straining urban services and infrastructure, and towards the east and west, encroaching on agricultural land where urban services are lacking.
- **High densities:** Many neighbourhoods, particularly in the historic centre and residential outskirts along the northeastern boundary, are densely populated and overbuilt.
- **Lack of green spaces:** Historical and recent growth patterns have resulted in a shortage of open and green spaces for public use.
- **Unregulated buildings with poor safety and energy efficiency standards:** Unplanned settlements often lack proper infrastructure and do not adhere to construction codes, posing safety, sustainability, and energy efficiency challenges. New settlements under NUCA also face low building efficiency due to high mechanical cooling and lawn irrigation demands.
- **Climate risks:** Cairo's hot desert climate, with temperatures regularly exceeding 35°C and minimal annual rainfall, is exacerbated by the urban heat island effect and air pollution. Urban heat is most severe in the historic centre, residential outskirts, and industrial south. Extreme weather events, such as storms and heavy rainfall, increasingly cause flooding in downtown Cairo. The city is not well-equipped to handle heavy rainfall, with widespread urbanisation reducing infiltration and a lack of green spaces. Water scarcity and supply disruptions pose major health risks, including malnutrition, poor hygiene, and increased infectious diseases.

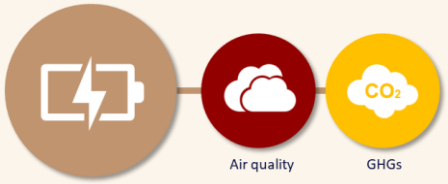
**Policy:** The National Strategic Plan for Urban Development 2052, developed in 2008, provides a framework for urbanisation in Egypt, aiming to accommodate population growth and improve quality of life in existing cities like Cairo, as well as establishing new urban areas in East Cairo. The Energy Supreme Council oversees energy efficiency deployment in Egypt, but there is no independent national agency for energy efficiency. Despite having nearly 40 building codes, enforcement is weak due to unclear penalties and lack of familiarity with guidelines.

**Smart integration:** The use of data and smart technologies in Cairo's urban development sector is currently limited. There is significant potential to enhance Geographic Information Systems (GIS) within the Governorate to support evidence-based planning. At present, land use data is captured manually and stored locally, with no dedicated GIS unit or team responsible for data management. In the building sector, the use of smart applications is minimal, although some smart meters are employed in the new cities developed by NUCA.

**GESI:** Gender equality and social inclusion are closely linked to urban space and its characteristics. Women and girls face limited access to public spaces and non-motorised transport due to safety concerns, such as harassment and physical violence, particularly in the evening and at night. The scarcity of public open and green spaces further restricts women's ability to meet outside their homes, reinforcing social exclusion dynamics.

**Jurisdiction:** The Governorate's primary role in urban development involves setting building codes. Cairo Governorate is responsible for proposing, planning, and implementing plans, programmes, and policies for urban areas within Markaz, cities, districts, and villages, including establishing land use rules. NUCA oversees the development of new urban communities, including setting land use regulations. Key actors in Cairo's urban development sector include the Housing, Culture and Real Estate Taxes Directorates.

### 3.3.4. Energy supply and efficiency




In recent years, the Government of Egypt has successfully extended the electricity network to over 97% of households nationwide. However, maintaining this extensive network while incorporating renewable energy presents challenges both nationally and within Cairo. Key challenges in Cairo include:

- **High consumption of electricity**: A significant portion of electricity consumption occurs in residential buildings, accounting for 40% of Egypt's total electricity use. The primary contributors to this high consumption are heating, ventilation, and air conditioning (HVAC) systems. As cooling demand increases, particularly in new residential compounds attracting more affluent citizens, electricity use is expected to rise further, exacerbated by climate change. This excessive demand has led to the necessity for "load shedding," where scheduled power outages are implemented across the city.
- **High electrical losses in the distribution network:** High electrical losses in the distribution network are a major issue in both Cairo Governorate and Egypt as a whole. In Cairo, electrical losses are estimated at 31% for South Cairo and 21% for North Cairo distribution companies (DISCOs). These losses include both physical and commercial losses, with the latter mainly due to theft and illegal access. Certain DISCO administrations, particularly Al-Marg and Helwan, report even higher losses of 37% and 40%, respectively.
- **Renewable energy integration**: Nationally, 12% of Egypt's electricity is generated from renewable energy sources (hydro, wind, and solar photovoltaics). In Cairo, small-scale distributed solar photovoltaic (PV) systems contribute to this effort, with a total capacity of 13.6 MWp connected to the North Cairo distribution network and 13.9 MWp to the South Cairo distribution network. However, most of these installations are likely in Giza Governorate, particularly in new cities. Issues such as suboptimal design (e.g., unoptimised tilt angles) and poor maintenance affect the performance of solar PV systems. Additionally, there is a lack of suitable space for solar PV or solar hot water installations on residential buildings, except in new cities like New Cairo, which have sufficient unshaded roof space. In contrast, the densely populated areas of Cairo have limited clear roof space. The industrial sector offers significant opportunities for solar PV roof installations, though many existing metal structures may require reinforcement to handle the weight and wind loads of the solar systems.
- **Low efficiency/high energy use**: Energy efficiency in Cairo's industrial sector is lagging, as indicated by below-average electricity and fossil fuel consumption per GDP. This inefficiency is due to the importation of second-hand, inefficient production lines and a lack of awareness and expertise in energy efficiency. The development of a mature Energy Service Company (ESCO) market is still in progress, with necessary regulations and contractual frameworks being established to manage relationships between end-users and ESCOs.
- **Limited renewable energy application**: Despite the availability of large, unobstructed roof spaces, the application of solar energy in Cairo remains limited. This is primarily due to the high costs of mostly imported equipment, which were significantly exacerbated by the 2022 devaluation of the local currency. Additionally, heavily subsidised electricity tariffs, which were frozen for the past five years until the end of 2023, have further hindered the adoption of solar energy. In many cases, additional costs are incurred to reinforce roof structures to withstand the weight and wind loading of solar panels.

**Policy**: The energy sector in Egypt is overseen by the Ministry of Electricity and Renewable Energy (MoERE) and the Ministry of Petroleum (MoP), with coordination by the Supreme Energy Council and the cabinet minister. At the governorate level, the Greater Cairo Urban Development Strategy promotes energy efficiency in factories and buildings and the use of clean energy, including green hydrogen. However, specific approaches, targets, and timelines are not detailed.

The Ministry of Trade and Industry's (MoTI) energy efficiency strategic plan, established in 2015, has yet to be endorsed or launched, and enforcement to hold industrial facilities accountable for pollution remains insufficient.

**Smart:** Several smart initiatives are ongoing and planned for the energy sector, focusing on consumer and network management:

- Smart electricity meters: Limited but growing applications of smart electricity meters at both network and household levels in Cairo Governorate.
- Mobile applications: Development of mobile applications allowing customers to charge their pre-paid meters using NFC technology, with 82,000 subscribers as of mid-2021.
- Unified platform for smart electricity services: Launch of an online platform serving as a one-stop shop for energy consumers, handling payments, requests, and fee changes.
- Control centres: Implementation of control centres to monitor the distribution network, reduce operational costs and losses, and improve supply reliability and quality. Four control centres have been established for the distribution companies in South and North Cairo.
- Unified electricity subscriber database: Efforts to unify the electricity subscriber database across Egypt.

As part of the New Administrative Capital's construction, a National Energy Control Centre is being developed to unify the national grid. This centre will supply and install monitoring and operating systems for the electrical network Supervisory Control and Data Acquisition (SCADA) and energy management systems (EMS). Additionally, a Digital Transformation Unit has been established to digitise all documents and files related to all sectors of the Egyptian Electricity Holding Company (EEHC), with the first and second phases completed.

In the industrial sector, information on smart maturity is limited, with implementations occurring on an ad-hoc basis. Some factories are well-equipped with SCADA and other remote monitoring and control systems to manage production processes and energy use.

**GESI:** Key gender equality and social inclusion considerations in the energy sector include:

- Streetlighting: While public spaces and main streets are well-lit at night, side streets, particularly in less affluent areas, often suffer from inadequate lighting. This increases the risk of violence and crime, contributing to a heightened perception of fear, especially among youths and women. The Cairo Governorate's strategic plan emphasises expanding street lighting using environmentally friendly energy sources as part of a broader strategy to enhance urban safety and sustainability.
- Female-headed households: Cairo has an above-average number of female-headed households, with many women working from home due to caregiving responsibilities. These households often face high energy costs. There is an opportunity to support these households by implementing energy efficiency measures and raising awareness about energy conservation.
- Gender representation in EETC: The Egyptian Electricity Transmission Company (EETC) is a public entity with over 70% female participation and is led by a female chairperson. This significant female representation sets a positive example of gender diversity in the energy sector.

**Jurisdiction:** The Governorate's involvement in the energy sector is primarily limited to approving cable laying and the construction of aerial power lines. Instead, key entities in the energy sector include the South and North Cairo Electricity Distribution Companies and the Cairo Electricity Production Company.

Governorates in Egypt along with the Industrial Development Authority (IDA) and MoTI are responsible for the management and operation of the industrial sector and industrial zones unless managed by private developers. The MoTI and IDA are responsible for the enforcement of industrial, operational and environmental permits for all Industrial zones.

### 3.3.5. Water supply and management


Cairo is currently served by 11 water treatment plants affiliated with the Holding Company for Water and Wastewater (HCWW), with an overall capacity of 6 million cubic meters per day, though the actual capacity is 4.6 million $m^3$/day according to CAPMAS 2021/22 data. Additionally, NUCA operates a water treatment plant in New Cairo with a capacity of 500,000 $m^3$/day. Some areas, such as Badr City, receive treated water from outside Cairo Governorate, specifically from the 10th of Ramadan City water treatment plant. The governorate also operates four raw water treatment plants with a combined capacity of approximately 31,000 $m^3$/day, primarily used for landscaping irrigation.

Challenges in the water sector include:

- **High non-revenue water (NRW):** A significant challenge in Cairo's water sector is the high level of non-revenue water, which reached 31% in 2021 according to HCWW data. This issue is prevalent across Egypt and is particularly severe in areas with older infrastructure.
- **High per capita water use**: The per capita water use in Cairo is relatively high at 305 litres per day, compared to the national average of 230 litres per day. This figure is expected to be even higher in new cities, where many households have lawns and swimming pools.
- **Wastewater infrastructure:** Despite significant investments in wastewater infrastructure, with less than 5% of households lacking access to wastewater services, the governorate's wastewater treatment plants (WWTPs) are nearly operating at full capacity. One plant, Arab Abou Saed, is even exceeding its capacity.
- **High water consumption is observed in new cities:** High water consumption is particularly noticeable in new cities, where residential compounds often include lawns that require frequent irrigation, leading to water wastage. Although wasting water for lawn irrigation or car washing is prohibited by law, enforcement is unclear. Additionally, the reuse of grey water is limited across buildings, industrial, and water sectors, with less than 1% of non-industrial buildings equipped for grey water reuse. Some treated sewage effluent (TSE) is reused for irrigating green landscapes around the green belt.

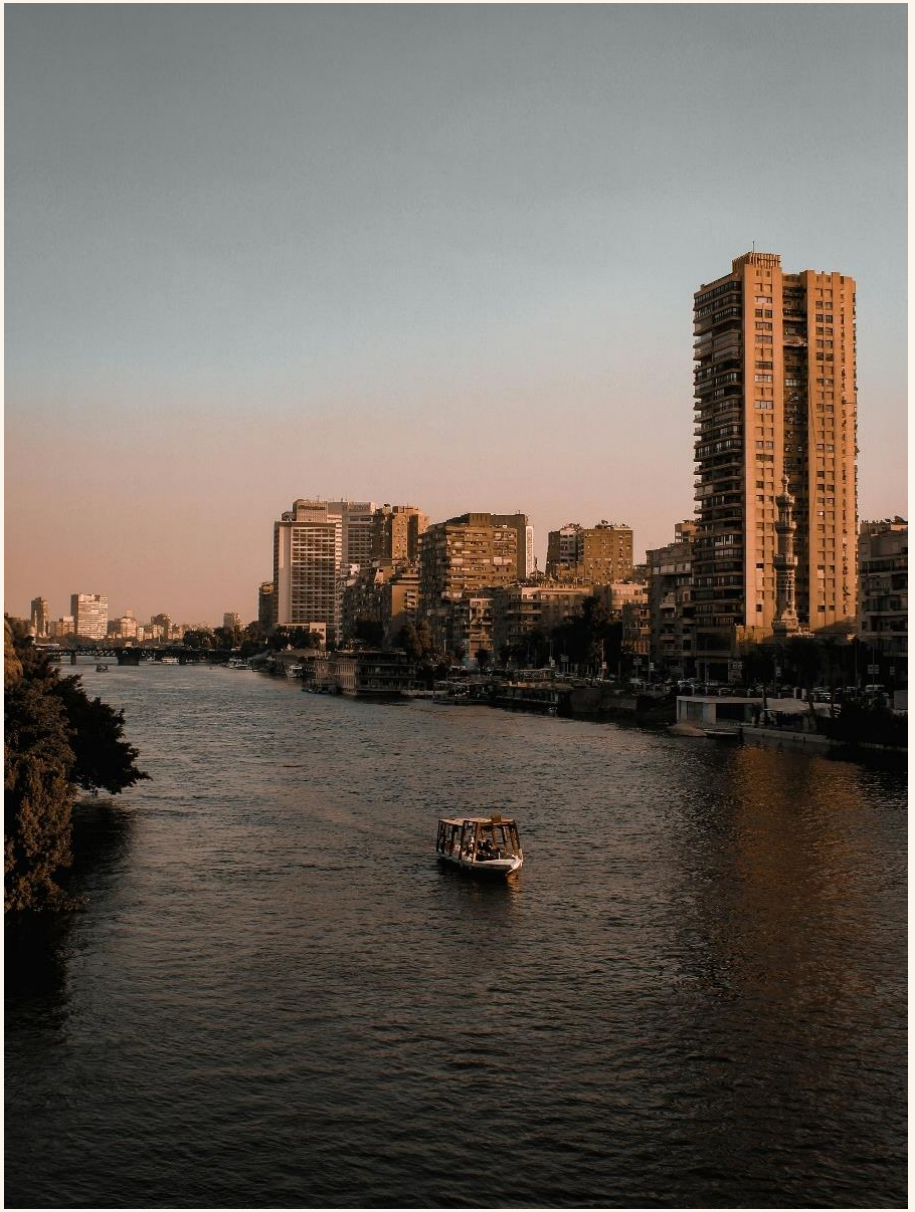
**Policy**: The water and wastewater infrastructure in Egypt is owned by the national HCWW. Locally, Cairo is divided into two management sections: one affiliated with old Cairo and the other with new cities under NUCA's jurisdiction. While existing policies are in place, there is room for improvement to enhance water management and efficiency.

**Smart:** The Governorate has implemented several smart integration measures to improve water management:

- SCADA systems: Implemented in water treatment plants (e.g., Rod El Farag Drinking Water Treatment Plant) for monitoring and controlling different purification stages. SCADA systems are also used in District Metered Areas (DMAs) to monitor pressures and flows, with data transferred wirelessly to the head office.
- GIS and hydraulic modelling: The Cairo Water Company has established GIS and hydraulic modelling departments to enhance water management.
- Artificial intelligence: AI applications have been completed in four stations of the Cairo Drinking Water Company, significantly improving water management by dealing with varying Nile levels. A pilot project is being studied for nine additional water stations.

**GESI:** According to the CAPMAS Housing Conditions Census of 2017, 98.8% of households in Cairo Governorate have access to the public sewage network, 0.75% use a civil network, 0.19% rely on septic tanks, and 0.006% do not have access to any system. The condition of the wastewater system is often poor, particularly in informal areas where infrastructure is typically neglected. Currently, there are no concessions or discounts for water costs for disadvantaged groups, such as female-headed households or low-income families.

**Jurisdiction:** The key entities involved in water and sanitation in Cairo include the Greater Cairo Drinking Water Company and the Greater Cairo Sanitation Company. The Governorate has very limited involvement in the operation and policy-setting for water and sanitation plants, except for those in new cities, which are implemented, owned, and operated by NUCA and relevant city authorities. These entities follow the Ministry of Housing, Utilities, and Urban Communities (MOHUUC) for general vision and policies but also have their local strategies and policies.



### 3.3.6. Solid waste management


Cairo, due to its vast size, generates a significant amount of solid waste daily. Effective management and processing of this waste face several challenges:

- **Lack of integration and coordination**: Municipal solid waste (MSW) management in Cairo still relies on traditional methods, involving various collection and transportation systems to transfer stations, treatment and recycling facilities, and final disposal sites. Despite these practices, the system lacks integration and sustainability.
- **Relatively low collection efficiency**: Cairo produces approximately 15,000 tons of solid waste daily, but only 7,450 tons are formally collected. The primary challenge lies in the disparity between the amount of waste generated and the amount managed formally or informally.
- **Informal waste picking**: Waste collection in Cairo is conducted by both formal and informal sectors. Several private companies support the public sector through the Cairo Cleanliness and Beautification Authority (CCBA), while traditional garbage collectors (waste pickers) operate in the informal sector.
- **Lack of proper landfills**: According to the Egyptian Environmental Affairs Agency (EEAA), only 7% of MSW was disposed of in sanitary landfills in 2016, while approximately 81% ended up in open dumpsites. This is due to the lack of integrated Solid Waste Management (SWM) planning and application, affecting the efficiency of existing facilities.
- **Sub-optimal recycling rates**: A lack of awareness about SWM and waste management laws reduces source separation and leads to inefficient recycling. Compost produced in Mechanical Biological Treatment (MBT) facilities is often of low quality.

**Policy**: While the new waste management Law 202 of 2020 provides extensive guidance, there is room for improvement. Various sector-specific strategies exist, covering MSW management, construction and demolition waste, agricultural waste management, industrial hazardous waste, and packaging waste.

**Smart:** There is potential to develop smart integration measures in the solid waste management system, such as implementing SCADA systems.

**GESI:** Women, who are often responsible for unpaid household tasks, play a significant role in solid waste management at the household level. However, the lack of a formal system for separating and recycling solid waste at home contributes to waste management challenges and environmental sustainability issues. Addressing these challenges requires improvements in waste infrastructure and recycling, with a focus on involving and supporting women.

**Jurisdiction:** The Cairo Cleaning and Beautification Authority is the key entity involved in solid waste management. Decisions regarding SWM are made at the governorate level for main districts and by NUCA and its affiliated city authorities for new cities, in coordination with the Ministry of Environment (MoE) and the Waste Management Regulatory Authority (WMRA). In new cities, city authorities manage waste collection and tariffs, with future revenues directed to the solid waste authority.

### 3.3.7. Key pressure areas

By linking state and pressure indicators, we can clearly understand which sectors contribute to the environmental challenges identified earlier. The key pressures have been consolidated into overarching themes and mapped against these challenges. This approach allows us to identify common themes of pressures that act across and between challenge areas, rather than affecting each challenge in isolation. Consequently, this will help us address these challenges by developing objectives that lead to improvements in multiple problem areas. The sectoral action areas and related pressures are presented in Table 3-1.

**Table 3-1: Pressure areas for the Cairo GCAP**

| Pressure area | Key pressures | Environmental impacts |
|---|---|---|
| **Transport provision** | High age of private vehicle fleet<br>Limited national emissions standards for public and private fleet<br>Low adoption of electric vehicles and alternative fuels<br>Lack of prioritised public transport and cycling infrastructure |  |
| **Urban development and resilience** | High population density in some districts leading to UHI<br>Imbalanced provision of urban open/green areas<br>Extreme urban scale created large commuting distances<br>Localised flooding during heavy rainfall disrupts transport network<br>No requirements for buildings standards or energy performance assessments |  |
| **Energy supply and efficiency** | High energy consumption in industrial processes<br>High fossil fuel use in industrial processes<br>High level of electricity uses especially in new cities<br>High electricity losses in the distribution network<br>Limited use of distributed renewable energy |  |
| **Water management** | High water consumption<br>Limited reuse of grey water<br>Need for additional wastewater treatment capacity<br>High rate of non-revenue water |  |
| **Solid waste management** | High level of unregulated waste disposal and landfilling<br>Limited waste treatment processes<br>Absence of formal waste collection in areas of city<br>Landfilling capacity and quality constraints<br>Low recycling of industrial and construction waste<br>Low separation at source, recycling and composting rates |  |

## 3.4. Clustering

The Governorate of Cairo comprises a complex network of areas and districts that have evolved over millennia into the rich urban fabric we see today. While administratively divided into North, South, East, and West, these groupings do not necessarily reflect the unique and varied nature of each of Cairo's 38 districts.

To better understand the environmental performance of each district, we mapped their conditions to quickly and clearly present commonalities in priority environmental issues across the city. This mapping was supplemented with additional information on a range of socio-economic and land use parameters, including:

- Environmental performance against priority challenges;
- Extent and condition of infrastructure and service provision;
- Population density;
- Age of the settlement; and
- Prevailing economic sectors and land use (e.g., industry, residential, commercial).

Through this analysis, the GCAP team identified five distinct urban clusters that share common environmental, socio-economic, and land use conditions. These clusters more accurately represent the diverse urban characteristics across the city and the citizens who live and work within them. The urban clusters are illustrated in Figure 3-12 and described in Table 3-2. These clusters will guide the development of subsequent actions and integrated initiatives within the GCAP.

Figure 3-12: Priority environmental conditions by cluster

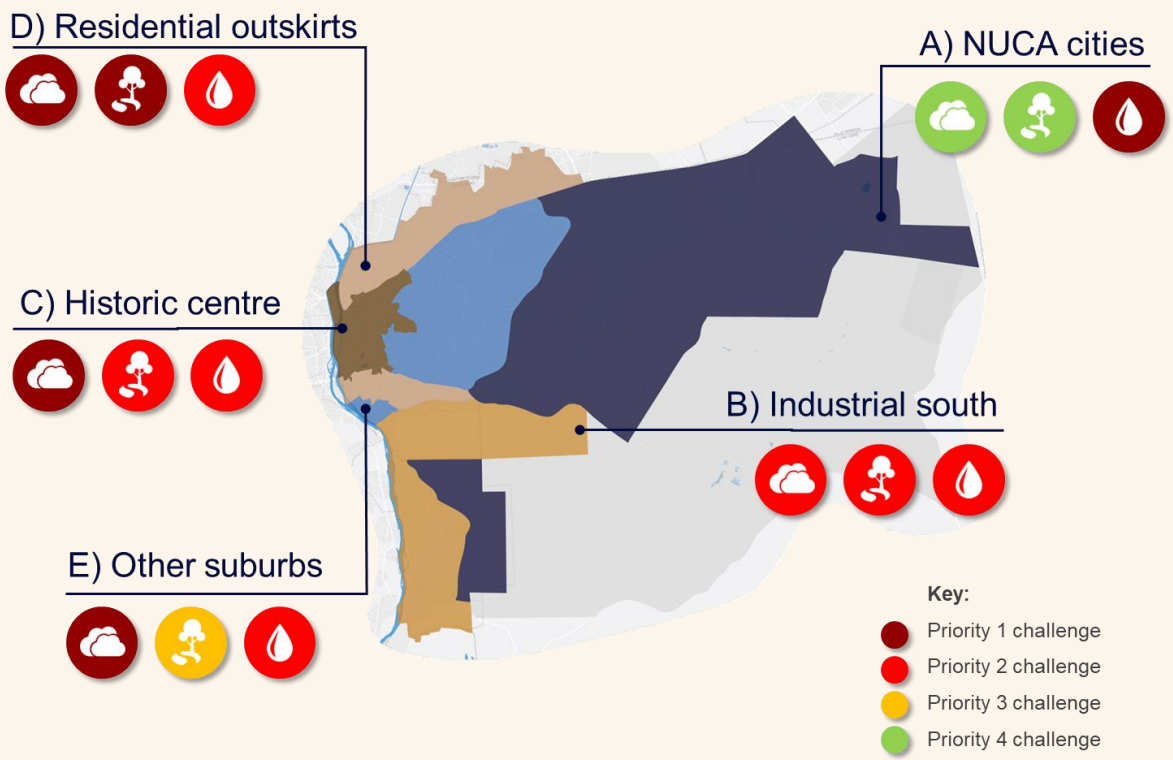
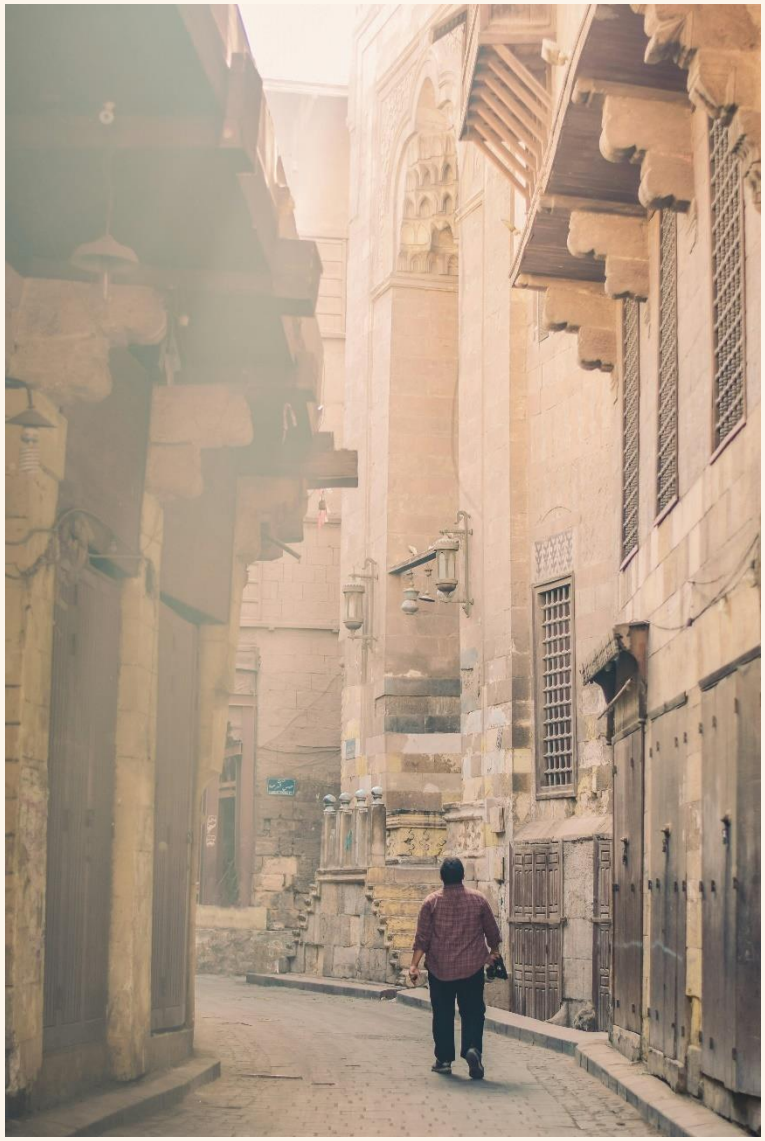


Table 3-2: Cluster descriptions

| Cluster | Theme | Characteristics |
|---|---|---|
| A | **NUCA cities** | Alternate governance and administrative structure. Newer settlements, with less aged (and therefore less worn) service infrastructure. More green spaces. Planned manufacturing and industrial areas. However, typically more affluent so have higher energy and water demand. |
| B | **Industrial south** | Southern corridor of districts adjoining the Nile. Historically the industrial heartland of Cairo. Many planned industrial zones. |
| C | **Historic centre** | Unplanned and unstructured residential and road layouts. Many historic and cultural sites and monuments. Medium to high density. |
| D | **Residential outskirts** | Organised, grid structured residential districts to north and south of historic centre. Extreme high density, significant lack of green spaces and available land. |
| E | **Outer suburbs** | Post 1950 planned settlements housing mainly middle class with organised and balanced distribution of green space. Relatively large proportion of available land within administrative boundary. Multistorey apartment blocks, typically unsuitable for rooftop renewable energy such as solar or PV. |



# 4. Vision and goals

The GCAP process can be divided into two phases. The first establishes the Green City baseline, described in the previous chapters, which provides a comprehensive picture of where Cairo is today and which areas need attention. The second phase, planning Green City actions, lays out a plan to improve our cities environmental performance through targeted actions.

## 4.1. Formulating Green City actions

The steps to formulating Green City actions are through the development of the following:

- **Vision** - One Vision to guide the GCAP over the 15-year lifetime period.
- **Strategic goals** - One objective providing a strategic goal for each green city challenge area.
- **Actions** - Policy, intervention and other action options to address the strategic goals.
- **Integrated actions** - Packaged actions, combined and applied spatially across the city.

Figure 4-1: Steps to formulating Green City actions

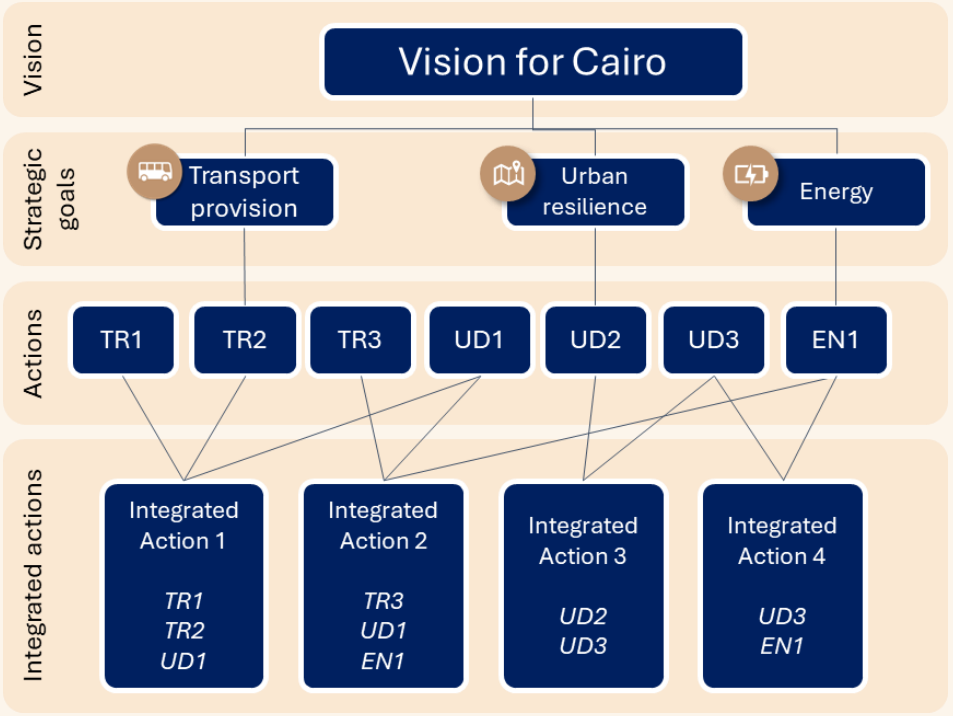



Figure 4-1 provides an example of the steps between these steps guiding development of the GCAP. Illustrating the interaction between some of the steps, it demonstrates a clear framework for developing measures that will significantly enhance Cairo's environmental performance.

## 4.2. Green City Vision for Cairo

The Vision aims to guide the city's development and provide a framework for the Green City Action Plan. It addresses the priority challenges and thematic areas identified in Chapter 2. The Vision is articulated as a Green City strategy statement, offering an aspiration for the city and a general principle that directs development actions and the implementation of the GCAP.

This Vision was developed collaboratively with stakeholders during an interactive working session, using an interactive word cloud to identify key words for inclusion.

***"Cairo, the vibrant heart and capital of Egypt, stands as the pinnacle of regional excellence, envisioning a future where economic vitality, cultural preservation and environmental sustainability seamlessly intertwine.***

***The city aspires to be an investment hub utilising local talents and resources and fostering a circular economy as the main driver for growth.***

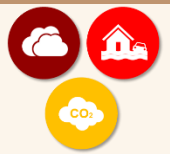
***With a commitment to smart and green initiatives, Cairo exemplifies leadership, ensuring an enhanced quality of life towards a sustainable and prosperous future."***

## 4.3. Strategic goals

To achieve the Vision, a range of strategic goals, targets, and actions have been developed. These provide a clear framework for creating measures that will significantly improve the city's environmental performance.

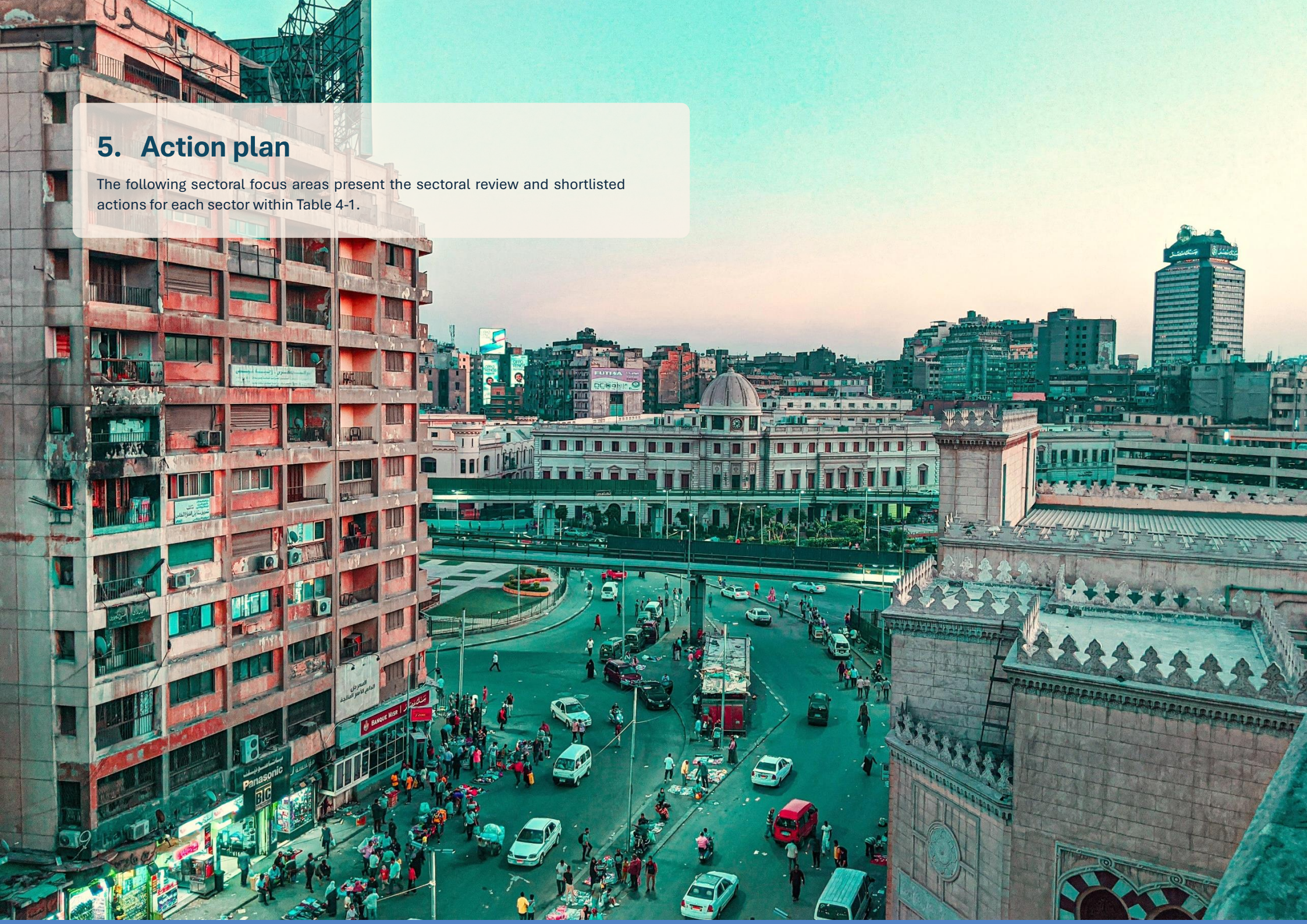
Table 4-1 provides an overview of the strategy goals and targets within each Green City sector area.

**Table 4-1: Strategic goals and target areas**

| Sector theme | Environmental impacts | Strategic Goal | Mid-term targets |
|---|---|---|---|
| Transport provision |  | Reduce prevalence of fossil fuels within the transport sector which create poor air quality and GHG emissions. | Reduce reliance on private cars, enhance public transport provision, adopt alternative fuels, and promote sustainable modes of transport. |
| Urban development and resilience |  | Provide citizens a liveable city with planned, safe, well designed, and harmonious communities. | Promote 15 minute neighbourhoods, create TOD rehabilitation and regeneration of real estate, open/green space generation, protect and enhance culture and heritage. |
| Energy supply and efficiency |  | Reduce GHG emissions and cost of public and private energy supply. | Improve provision of renewables, improve efficiency of building stock and industrial processes, promote low carbon/low-demand alternatives for cooling and lighting. |
| Water management |  | Enhance availability/reduce demand of water for all purposes. | Improve wastewater treatment, increase grey water harvesting and recycling, reduce network losses, restrict high demand uses. |
| Solid waste management |  | Implement a sustainable MSW management system to reduce improper and harmful disposal practices. | Align the waste hierarchy, enhance coverage of formal collection, improve sorting, recycling, processing, and treatment, increase and improve landfill capacity. |

# 5. Action plan

The following sectoral focus areas present the sectoral review and shortlisted actions for each sector within Table 4-1.



## 5.1. General overview

Through collaboration of key city departments, municipal companies, and service providers, over 200 potential actions were identified. Through extensive consultation and engagement with various public stakeholder groups, we shortlisted priority actions for further development.

Actions were selected based on criteria emphasising the greatest positive impact on the governorate's highest priority challenges.

The GCAP includes 32 actions, comprising a mix of policy, pre-investment, investment, and other initiatives:

- **Investments actions:** Capital expenditures aimed at improving the environmental performance of local infrastructure, including design, procurement of services, equipment, works, construction, and other implementation activities.
- **Policy:** Legislative, regulatory, or standard-setting measures, including the approval and implementation of strategic documents, institutional capacity building, and enhanced governance processes related to green city areas.
- **Pre-Investments initiatives:** Prefeasibility studies, environmental and social assessments for projects financed by international financial institutions (IFIs), strategy development, outreach campaigns, partnerships with financial and private partners, awareness raising, and capacity building.

## 5.2. Sectoral action plans

This chapter provides an overview of the recommended action plans for each sector, summarising issues, action types, and supporting policies and initiatives. The actions presented address principles that are applicable for adoption across Cairo, to guide improvements in all economic sectors, and respond directly to identified GCAP priority challenges.

Action plans are presented in the Green City Challenge areas covering sectors and cross cutting components of:

- Transport provision;
- Urban development and resilience;
- Energy supply and efficiency ;
- Water management ; and
- Solid waste management.

**Note on supporting policy options:** The majority of the actions all comprise measures and associated policies and awareness campaigns. These policies and awareness campaigns have been proposed in recognition that some physical measures will not have an impact unless they are supported by appropriate policy, regulatory, fiscal and information measures. The information measures relate to the need to raise citizen and local business awareness about the actions, recognising that travel behaviour is the result of a wide range of influences – perceptions and preferences as well as direct logical comparisons.

## 5.3. Green City Actions

The sectoral roadmaps provide guiding principles for adoption across Cairo, aimed at improving all economic sectors. These investments have been strategically combined, defined, costed, and applied in clusters and specific locations within Cairo Governorate to maximise their benefits.

The resulting actions focus on investments in areas where they can be most effective, addressing direct needs. This involves identifying specific target locations for investments to address key infrastructure gaps, as well as broader locations (e.g., district, area, or cluster level) to facilitate more holistic change. Additionally, these integrated actions can serve as pilot projects. If successful, they can be expanded across relevant areas of Cairo, taking into account the unique identity of each neighbourhood.

The actions are detailed in the following sections and summarised in Table 5-1.

## 5.4. Integrated Actions approach

To maximise benefits, cost efficiencies, and implementation synergies, actions should be implemented in a targeted manner that directly responds to the governorate's observed challenges. Actions must also be considered in combination.

The recommended actions naturally lend themselves to this approach, as commonalities and overlaps between actions across sectors and locations were observed. For example:

- Actions from different sectors addressing the same challenge or objective.
- Sectoral commonalities, such as land use planning and transport measures.
- Grouping actions to achieve more positive outcomes than if implemented individually.

Each sectoral action plan details the packaging of actions into 'Integrated Actions,' which combine measures that can be defined, costed, and applied in clusters and spatial locations within Cairo Governorate for maximum impact. These actions can then be scaled up or replicated elsewhere in the governorate, recognising the need for a phased approach to action preparation and implementation.

Each action includes a detailed proforma, providing as much detail as possible on the required stages of development, including:

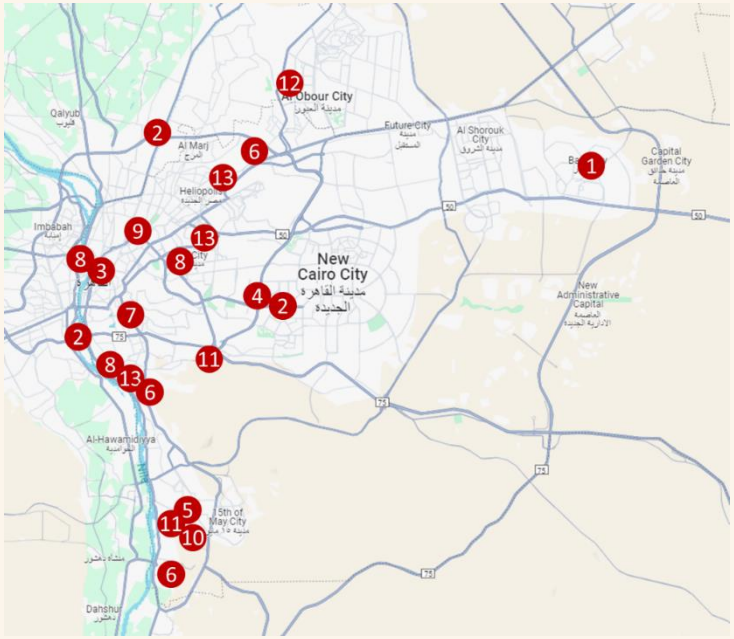
- project description;
- potential benefits offered;
- smart technology opportunities;
- social considerations;
- estimation of carbon savings;
- estimation of funding required (in Euro and Egyptian pounds); and
- Implementation timescales.

For all feasibility studies conducted for the integrated actions, gender analysis will be conducted as part of the project's feasibility study to understand how women and underserved groups benefit from the action and explore ways to address potential negative impacts.

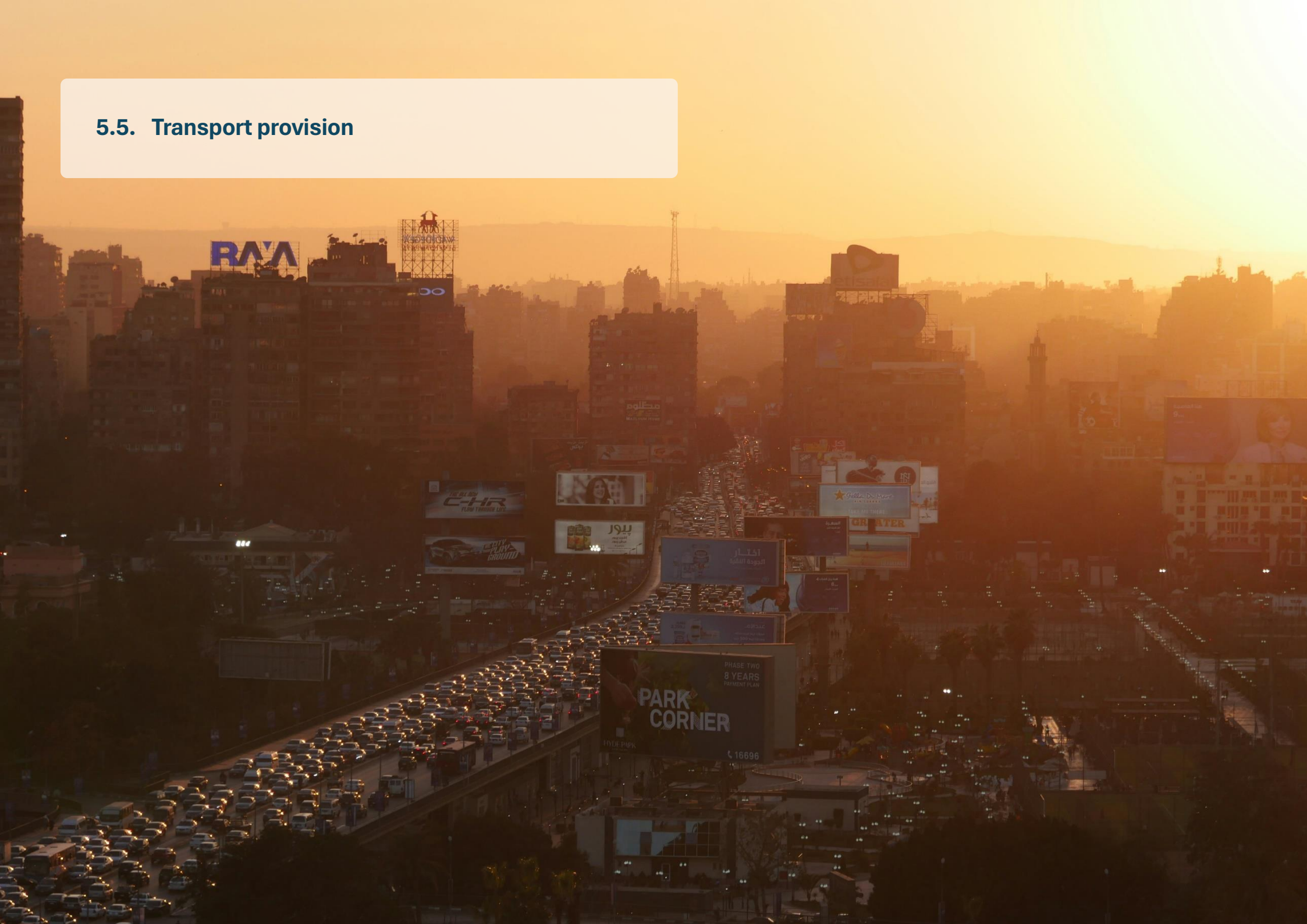
Table 5-1: Integrated action summary table

| # | Integrated Action | Cluster | Location | Sector actions |
|---|---|---|---|---|
| IA1 | Badr electric bus | NUCA (A) | Badr and NAC | TR2; TR3 |
| IA2 | BRT e-bus | Governorate wide (C, D, E) | Across BRT network | TR3 |
| IA3 | Downtown traffic management | Historic centre (C) | Historic Cairo | TR1; TR2; UD1; UD2 |
| IA4 | TOD New Cairo | New Cairo (A) | Monorail stations and BRT/ring road | TR1; TR2; UD1; UD2; UD4; EN1 |
| IA5 | Liveable neighbourhood | Industrial south (B) | Helwan | TR2; UD1; UD2; UD3; EN1 |
| IA6 | Industrial efficiency | Industrial south (B) | TBC | EN3 |
| IA7 | Municipal energy efficiency | Gov wide | Administrative HQs | UD1; UD2; EN2 |
| IA8 | Municipal water efficiency | Governorate wide | All WWTP | EN4; WA2 |
| IA9 | Wastewater network upgrades | Governorate wide (C, D, E) | Nasr City, Al Maadi, Al Marg | WA1; WA2; UD1; UD2 |
| IA10 | Solid waste management system | Governorate wide (C, D, E) | Zamalek, Al Maadi, Nozha | SW1; SW5 |
| IA11 | Medical waste disposal | Gov wide | TBC | SW3; SW4 |
| IA12 | 15th May landfill rehabilitation | NUCA cities (A & B) | 15th May Landfill | EN4; SW2; SW3; SW4 |
| IA13 | C&D recycling | New Cairo (A) and Industrial South (B) | Handasa landfill Helwan | SW3 |

Figure 5-1: Integrated Action locations within Cairo



## 5.5. Transport provision



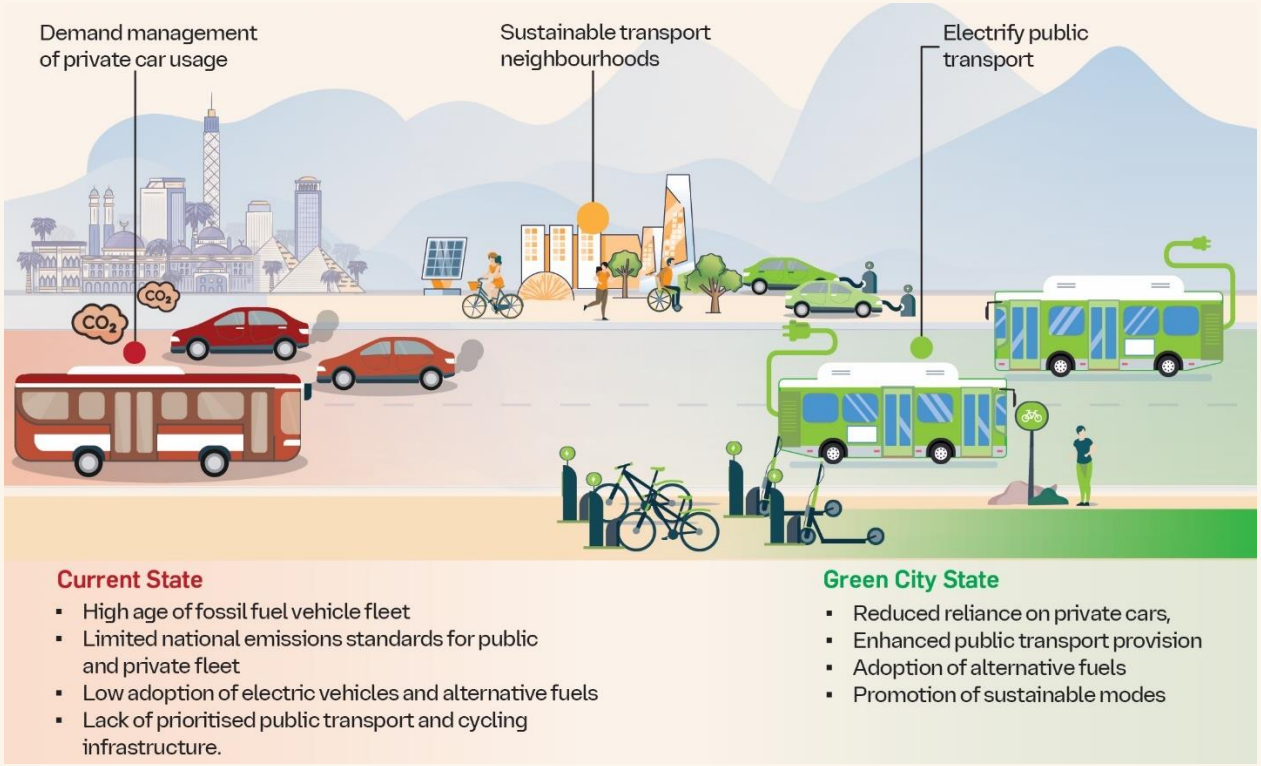
### 5.5.1. Sector summary

Urban transport significantly contributes to air pollution due to the prevalent use of old cars and buses, low fuel quality, and limited use of alternative fuels.

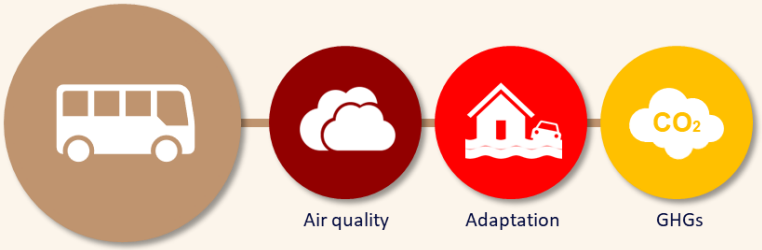
Private car usage is particularly high in Cairo's new cities. The absence of a comprehensive, integrated, and high-quality public transport network, along with a lack of dedicated lanes for public transport and bicycles exacerbates the reliance on private cars.

Figure 5-2: Transport provision roadmap

**Sector goal: Reduce prevalence of fossil fuels, which create poor air quality and GHG emissions, within the transport sector**




Key challenges



## 5.5.2. Investment options

### TR1 - Demand management of private car usage

**Description**: Despite the relatively low modal share of private vehicles in Cairo, the number of cars in the governorate is exceptionally high compared to the available infrastructure, particularly parking spaces. This imbalance results in parking issues, including unplanned parking areas, on-street parking, and illegal parking, which cause traffic bottlenecks.

This action proposes comprehensive traffic management and parking regulation, including a coherent on- and off-street car parking policy. Regulated and Controlled Parking Zones (CPZs) will be introduced in high-traffic areas, and some on-street parking will be relocated to new off-street facilities in areas such as downtown and New Cairo.

**Detail**: Parking policies will be implemented to make on-street parking less attractive. This will involve reallocating on-street road space and constructing new off-street carparks to support the relocation of parking spaces.

CPZs will designate parking bays for specific types of vehicles and users at certain times of the day. On-street parking spaces in specified locations will prioritise residents, local business customers, and people with disabilities. These users will have access to on-street parking for a specified period, as indicated by adjacent signage. There will be no reduction in available on-street parking spaces, only restrictions on their use.

Additionally, off-street car parking facilities will be provided in strategic locations, particularly in commercial areas, potentially by the private sector.

Parking charges across the zone will be reviewed and formalised to balance the cost of private car use relative to other modes. Revenues from the CPZ will contribute to enforcement costs. Car parking bay allocations may be reviewed to consider equity implications, such as privileges for electric vehicles (EVs).

Figure 5-3: On street parking in New Cairo

Source: GoogleMaps, accessed 26th July 2024

**Benefits**: Regulating on-street parking can enhance the safety and attractiveness of areas for active and public transport modes while having a limited impact on the city budget. Increased availability of off-street parking spaces can reduce congestion and contribute to travel demand management. Parking policies can also promote the use of electric or low-emission cars, supported by appropriate information systems.

**GESI**: The needs of persons with reduced mobility will be addressed by introducing accessible parking bays and spaces for people with disabled permits and ensuring off-street car park facilities are connected with accessible infrastructure. . Opportunities for women in traffic management roles can be promoted through training and employment

**Smart applications**: Smart technologies will be integrated, including automated lighting and ventilation systems, real-time occupancy tracking, security surveillance, and payment and reservation apps. Some of these technologies are already in use in off-street carparks in the city, such as Roxy, Tahrir, and Azhar.

**Supporting policies**:

- Enforce fines for illegal parking.
- Regulate unplanned public transport stops and terminals.
- Provide parking privileges for low-carbon vehicles.

**Action implementation**: This investment is featured in Integrated Action 3 – Downtown traffic management and Integrated Action 4 – Transit oriented development in New Cairo.

## TR2 - Sustainable transport measures

**Description**: We propose to introduce coordinated new bus services and related infrastructure, along with reallocating road space to prioritise public and active modes of transport. This initiative aims to enhance the provision, speed, and reliability of bus services, and improve infrastructure for walking and cycling, thereby reducing the reliance on private cars. The goal is to design neighbourhoods that maximise the movement of people rather than vehicles, aligning with the principles of Liveable Neighbourhoods.

**Detail**: This investment includes five complementary measures, tailored to the characteristics of different areas:

1. **Introduction of new bus services**: New bus services will be introduced on high-demand corridors, operating on dedicated bus lanes (part-time), supported by new bus stops and designated waiting environments. Routes will follow hub-and-spoke principles to contribute to a coherent city-wide public transport network.
2. **Sidewalk rehabilitation and improvement**: Sidewalks will be maintained and enhanced, with improvements such as seating, lighting, and urban greenery. This measure also promotes the increase in number, quality, and diversity of commercial activities serving sidewalk users.
3. **Expansion of pedestrian crossing facilities**: More signalised and non-signalised pedestrian crossings will be introduced to prioritise pedestrians, focusing initially on key routes and desire lines.
4. **Implementation of segregated cycling routes**: Existing road space will be reallocated to create dedicated cycling routes, making cycling more attractive for current cyclists and encouraging an increase in modal share.
5. **Development of mobility hubs**: Mass transit stations will be developed into interchange hubs to facilitate sustainable last/first mile travel. These hubs will include facilities such as cycle storage, bike hire (e.g., Cairo Bike), Kiss and Ride, and links with Park and Ride services. They will be recognizable, visible, accessible, and safe, providing sheltered waiting environments and high-quality public transport information.

**Benefits**: These measures will enhance accessibility and the sense of place. Reallocating space from private cars to multi-modal integration will increase the viability and attractiveness of sustainable modes, optimising operational efficiency and the overall network. This reallocation will also improve the public realm and local environment. Additional benefits include improved equity, air quality, noise levels, health, fitness, and safety of travellers, and overall wellbeing. The local economy will benefit as people tend to spend more time and money in areas they reach by public or active transport. Investment in sidewalks will also create new commercial opportunities.

**GESI**: The integration and improvement of alternatives to private car use will positively impact equity by providing cost-effective travel choices. Enhancing the actual and perceived safety through increased segregation of road users and improved amenities, such as street lighting and seating, will disproportionately benefit women and older people. Inclusive and gender-sensitive design principles will improve the journey experience for all users, particularly those with health conditions or impairments, and women, who generally have less positive perceptions of walkability in Cairo compared to men. Encouraging active travel can normalise cycling and reduce harassment, challenging cultural norms. Including women in awareness campaigns on green transport modes will enable them to share knowledge with family members and promote sustainable practices.

**Smart applications**: Smart traffic signalling systems can reduce journey times and improve traffic flow for all modes of transport. Advanced surveillance systems will enhance neighbourhood security. Public transport services will benefit from real-time information, supported by smart mobility platforms that provide access to multi-modal traffic and travel information.

**Supporting policies**: City-wide network planning is essential to develop a coherent and integrated

network for public and active travel. The quality and provision of walking and cycling networks and infrastructure must be considered in relation to these hubs. Awareness-raising activities that communicate the need for sustainable travel behaviours and equip individuals with the necessary information will also be crucial.

**Action implementation**: This action is featured in Integrated Action 1 – Badr electric bus , Integrated Action 2 – Electric bus rapid transit (BRT) , Integrated Action 3 – Downtown traffic management, Integrated Action 4 – Transit oriented development in New Cairo, and Integrated Action 5 – Liveable neighbourhood Helwan.

## TR3 - Electrify public transport

**Description**: We are implementing a comprehensive program to support the phased electrification of both public and private transport fleets in Cairo. This initiative includes the application of smart technology to enhance bus service information for passengers and facilitate the introduction of e-ticketing.

**Detail**: This action has three components:

1. Procurement of 300 e-buses: We will procure 300 e-buses, with 100 designated for the CTA plans in Badr City and 200 for the Bus Rapid Transit (BRT) on the Greater Cairo Region Ring Road, which will become operational later this year with an initial 100 buses. The BRT project aims to secure a soft loan to cover the cost of these additional vehicles and the necessary EV charging infrastructure.

2. Construction of an e-bus garage: A 10-feddan e-bus garage will be constructed in Badr City to accommodate and provide charging infrastructure for the e-bus fleet serving routes between Badr City and the New Administrative Capital.

3. Introduction of smart technologies: We will introduce smart technologies on e-buses and implement multi-operator e-ticketing. This will enable electronic transport payment and e-ticketing, along with the installation of GPS units to track bus movements and provide real-time information at bus stops and via mobile apps.

**Benefits**: This initiative will enhance the energy efficiency of public transport across the city, positively impacting the environment and reducing operating costs. The phased replacement of the public transport fleet with e-buses will support a modal shift, while the introduction of e-ticketing and payment will offer operators more pricing flexibility and reduce ticket purchase times. Network planning and user experience will be further improved with real-time information.

**GESI**: Enhancing the quality and accessibility of public transport will positively impact equity by making cost-effective alternatives to private cars more attractive. Bus travel could become cheaper, with e-ticketing enabling one ticket for multiple journeys across different operators and modes. Inclusive and gender-sensitive design principles will improve access for all, particularly benefiting the elderly and those with mobility challenges. Youth are also more likely to prioritise public transport, leading to positive environmental outcomes.

**Smart applications**: We will integrate smart applications such as e-ticketing, e-payment, smart mobility platforms, GPS tracking, real-time information, and energy management systems.

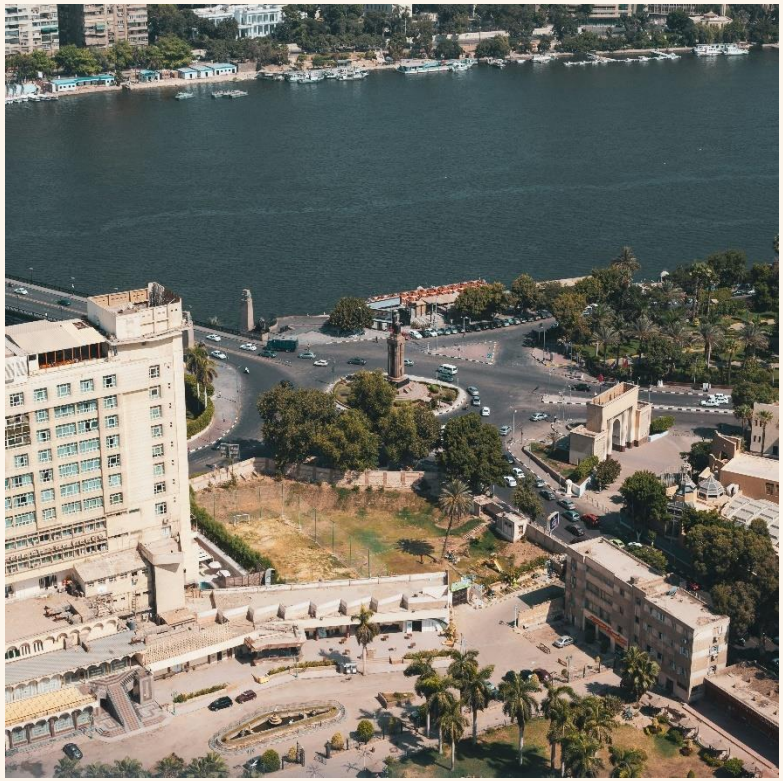
**Supporting policies**: We will review the provision of charging infrastructure for commercial EVs and consider policies, incentives, or standards to promote increased development density, mixed-use zoning, public transport use, and the conversion or procurement of EVs.

**Action implementation**: This action is featured in Integrated Action 1 – Badr electric bus and Integrated Action 2 – Electric bus rapid transit (BRT) .

## 5.5.3. Supporting policy options

The effectiveness of our transport initiatives relies on the development of a comprehensive, integrated strategy aimed at improving accessibility and influencing travel patterns and behaviours across the city. To achieve this, we are introducing the following supporting policy measures:

### TR4 - Strategies and masterplans



Development of a Sustainable Urban Mobility Plan (SUMP): SUMPs are strategic plans that incorporate measures based on observed traffic flows across entire functional urban areas, including the city and its commuting zones. Recognizing the diverse travel characteristics across urban areas, these plans feature tailored interventions for different regions. The SUMP will also include the development of a city traffic model to understand traffic patterns and simulate the impact of future transport projects.

Non-motorised transport strategy: This evidence-based strategic plan aims to enhance pedestrian and cycling networks throughout the city. By utilising data on socio-demographic characteristics and travel movements, the strategy will recommend measures to improve active travel options and support a shift towards non-motorised modes of transport.

### TR5 - Awareness raising for active travel

Campaign to encourage active mobility: We will launch a campaign to raise awareness about the benefits and viability of walking and wheeling. This campaign will address specific barriers to increased uptake and support the ongoing shift towards active travel modes.

### TR6 - Parking regulation

Parking privileges for low carbon vehicles: We will introduce parking space allocation and charging policies that reflect the environmental impact of vehicle use, encouraging the adoption of smaller, lower-emission vehicles.

Appropriate enforcement regime: To ensure compliance with all traffic regulations, we will implement an enforcement regime aimed at minimising unauthorised activities related to car parking management and public transport service delivery.

### Key benefits

The introduction of these supporting policies will:

- Reinforce our transport actions by providing a robust framework for implementation and enforcement.
- Encourage the adoption of desired travel behaviours through targeted communication campaigns.
- Ensure consistent policy application across the city, particularly in parking management.
- Form part of a coherent, evidence-based approach to transport and land-use planning, as outlined in the SUMP and supported by planning principles such as Superblocks.

## 5.5.4. Integrated Action 1 – Badr electric bus system

| IA1 – Badr electric bus system | Capex: €130m (EGP 6,773m) | Opex: €6.5m (337m) |
|---|---|---|

**Location:**

NUCA (Cluster A)

**Timeframe for implementation:**

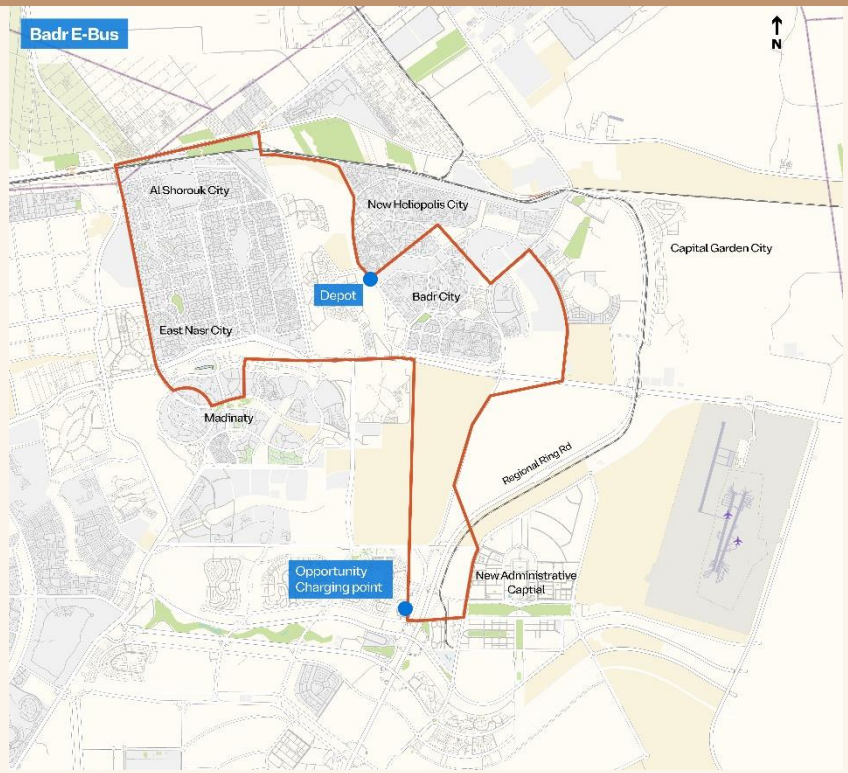
2025 – 2029

**Challenges addressed:**


**Actions:**

TR2: Sustainable transport measures

TR3: Electrify public transport




**Description:**

This initiative proposes the development of a comprehensive e-bus system serving Badr City, the New Administrative Capital, and surrounding districts of eastern Cairo governorate. This includes procuring e-bus fleet vehicles, integrating smart/digital ticketing, tracking, and GPS, and constructing dedicated depots and charging facilities at key locations along the route.

**Impacts:**

Reduce local air pollution, noise pollution and GHG emissions, enhance customer experience, improve the public realm, increase operational efficiency, reduce operating and vehicle maintenance costs. Increase accessibility, social inclusion, and equity.

**Detail:**

**Component 1 – Procure 100 modernised e-buses for operation in CTA public transport vehicle fleets and invest in infrastructure and systems to facilitate their use**

We will procure 100 modern e-buses for the CTA public transport vehicle fleets and invest in the necessary infrastructure and systems to facilitate their use. These e-buses will be equipped with e-ticketing and GPS tracking capabilities. Public funds will be used to ensure an equitable deployment approach.

To support the e-buses, we will invest in:

| IA1 – Badr electric bus system | Capex: €130m (EGP 6,773m) | Opex: €6.5m (337m) |
|---|---|---|

- E-bus charging infrastructure: Establishing charging stations at strategic locations.
- Real-time service information networks: Implementing systems to track and relay real-time service information from bus GPS units, including mobile apps and enhanced information displays at bus stops.
- E-ticketing and e-payment systems: Developing systems capable of integrating with tickets issued for other modes of transport

These investments will facilitate the broader modernisation and electrification of public transport vehicles in Badr City and the NUCA. The e-buses will also be future-proofed with technology to improve surveillance, such as cameras.

Pilot Project and Wider Strategy: This action will serve as a pilot project, recognising that the full electrification of the public transport vehicle fleet will require significant investment. It will be most effective as part of a broader electrification strategy for the city. The minimum required activities to develop this action include:

- Reviewing frameworks: Assess domestic, legal, regional, and international political frameworks to determine relevant obligations (e.g., battery management, energy use, and safety), ensure compliance, and identify financial assistance programs.
- Optimal deployment approach: Conduct network planning and travel demand analysis to determine the best approach for deploying the e-buses. Initial efforts will focus on a small number of routes for testing, particularly in industrial zones, and then extend to replacing tuk-tuks with microbuses in Badr City and 15th of May. Stakeholder engagement is crucial in this early step.
- Identifying e-bus technologies and charging requirements: Select appropriate e-bus technologies (battery, hybrid, or fuel cell) and develop a charging strategy based on the chosen technology. Considerations include the amount of vehicle charging that will occur en-route (opportunity charging) or overnight at a depot. This will impact the location of charging facilities, necessary charging speed, and space requirements. The average age of the current vehicle fleet suggests that phased replacement of vehicles is more appropriate than converting the existing fleet, but this will need to be confirmed.
- Identifying e-payment and ticketing, GPS tracking, and surveillance camera technology: Consider these technologies in conjunction with related system requirements. The devices should be scalable, upgradeable, and capable of connecting to various networks. Integration with equivalent technologies deployed on the BRT system will also be a key consideration

***Cost estimate: 100 buses (included battery replacement or extended warranty) = 50m EUR. E-ticketing system and supporting ITS = 5m EUR.***

**Component 2 – Construct an e-bus depot in Badr city**

We will construct an e-bus depot on the 10 feddans of land already allocated for this purpose. This project, planned by the Governorate, includes future-proofing for the phased transition to EVs, catalysed by Component 1 and the World Bank's investment in 100 e-buses. Priority actions include:

- Determine bus depot requirements: build on preliminary planning to gain a detailed understanding of requirements. Consider variables such as the number of vehicles to be charged overnight, expected daily mileage per vehicle, bus routes served, and availability of electrical infrastructure. This will inform depot design and infrastructure charging strategy.

| IA1 – Badr electric bus system | Capex: €130m (EGP 6,773m) | Opex: €6.5m (337m) |
|---|---|---|

- Develop a charging strategy: optimise energy use in e-bus charging to manage energy costs and grid demands. For example, charge e-buses during off-peak hours or stagger charging to reduce grid load. The strategy should consider future and imminent energy demand, potentially requiring local grid infrastructure upgrades.
- Assess feasibility of rooftop solar PV and water heating panels: support renewable energy generation on-site for depot energy requirements and potential e-fleet charging.
- Prepare a business case and investment plan.
- Tender the procurement: conduct an international tendering process for the construction of the EV bus depot and supply of necessary charging infrastructure to enhance value for money.
- Conduct a training needs assessment and develop a training and capacity building program: recognise that operating, managing, and maintaining e-buses differs significantly from conventional public transport vehicles. These programs will also strive to increase the representation of women in the transport sector through inclusive hiring practices.

***Cost estimate: bus depot design and build including EV wiring = 20m EUR. Opportunity charging points = 5m EUR. Bus priority measures across 50km = 3.75m***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| TR4 - Strategies and masterplans | NUCA, Cairo Governorate, Badr City Authority, CTA, CTA private transport operators, Ministry of Electricity, Ministry of Environment | State budget, IFI/ donor organisations, Private sector |

**Potential GHG reduction**

GHG emission reductions will be quantified during preliminary feasibility studies. Factors such as the capacity of vehicles to be replaced and introduced, expected patronage, average distance travelled by each e-bus, and vehicle specifications will be considered. Additionally, the source of the mode shift (e.g., from minibuses, private cars, or active modes) and the charging strategy and power source for the electricity will be determined.

Early-stage calculations estimate 4,380 $tCO_2e$ reduction per year.

**GESI considerations and benefits**

Enhancing the attractiveness and viability of cost-effective alternatives to private cars improves equity. Lowering the cost of public transport through e-ticketing, which allows one ticket to be used for multiple journeys across different operators and modes, further supports this goal. Implementing inclusive and gender-sensitive design principles in the procurement of e-buses and related infrastructure, such as well-lit bus stops, surveillance, and better accessibility for prams and wheelchairs, will enhance equality of access. This gender-responsive design will also benefit female bus drivers, creating a safe and conducive work environment. Additionally, this action offers alignment with the BRT (IA2) agency commitments increase the representation of women in its workforce, hiring them for roles in maintenance, management, and technical support for e-buses.

| IA1 – Badr electric bus system | Capex: €130m (EGP 6,773m) | Opex: €6.5m (337m) |
|---|---|---|

### Climate resilience considerations

Climate resilience must be integrated into e-bus features, such as air conditioning, and the introduction of e-bus charging infrastructure and depots. Measures can range from low-cost solutions, like elevating chargers and power cables to improve flood resilience, to investing in chargers that can operate under adverse conditions.

### Smart City considerations

The e-bus charging infrastructure should include smart meters and energy management systems to provide real-time information about energy consumption. Smart technology is essential for facilitating e-payment, e-ticketing, and integrated ticketing, as well as GPS tracking. This information can be relayed to operators and customers through smart mobility platforms and real-time information displays at bus stops and depots.

## 5.5.5. Integrated Action 2 – Electric bus rapid transit (BRT)

| IA2 – Electric bus rapid transit (BRT) | Capex: €231m (EGP 12,025m) | Opex: €11.6m (EGP 599m) |
|---|---|---|

**Location:**

Governorate wide (Cluster C, D, E)

**Timeframe for implementation:**

2025 – 2028

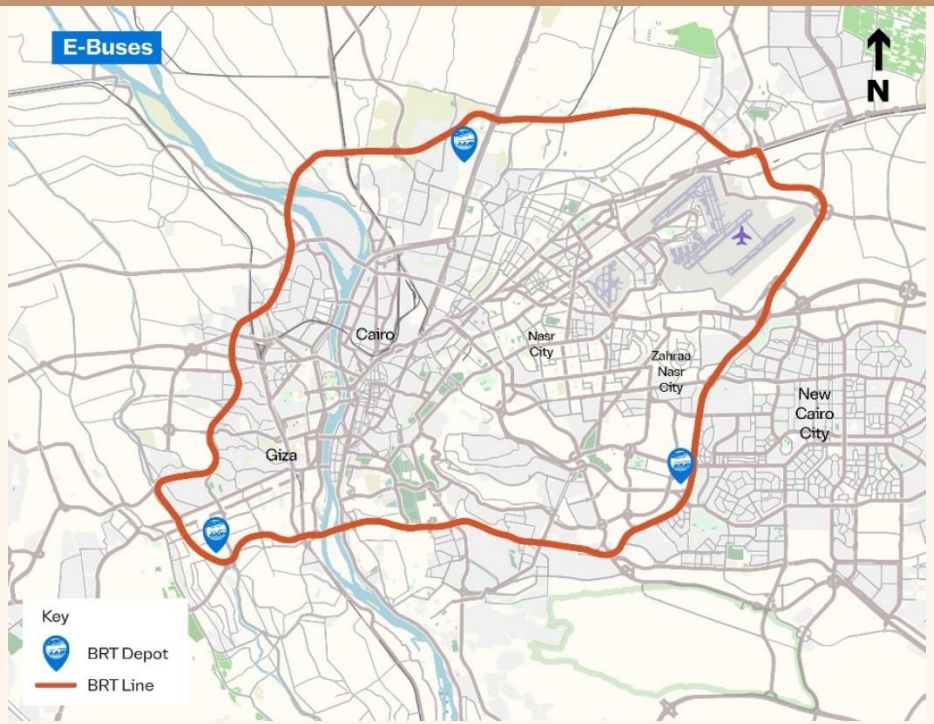
**Challenges addressed:**


**Actions:**

TR3: Electrify public transport

**Description:**

This action proposes the procurement of 200 electric buses (e-buses) to enhance the BRT system along the Greater Cairo Region Ring Road. This initiative includes significant investment in the necessary charging infrastructure to support these e-buses. These new buses will be integrated into the existing BRT network, complementing the 100 e-buses already secured for Phase 1, which is set to become operational later this year. This phase will significantly improve connectivity between the new community of 6th of October City and central Giza and Cairo. Ultimately, this integrated action will ensure the operation of all 300 BRT vehicles required for the network.




**Impacts:**

Reduce local air pollution, noise pollution and GHG emissions, enhance customer experience, improve the public realm, optimise operational efficiency and operating costs. Increase accessibility, social inclusion, and equity.

**Detail:**

**Component 1 – Procurement of 200 E-Buses:**

- **Feasibility study:** Conduct a comprehensive feasibility study to identify suitable vehicle technologies and charging infrastructure requirements. While these 200 e-buses may be similar to those in Phase 1, due diligence is essential before procurement.

| IA2 – Electric bus rapid transit (BRT) | Capex: €231m (EGP 12,025m) | Opex: €11.6m (EGP 599m) |
|---|---|---|

- **Review charging strategy:** Reassess the existing charging strategy to validate assumptions and calculations from Phase 1. Key considerations include the balance between en-route (opportunity) charging and overnight depot charging, which will influence the location, speed, and space requirements for charging facilities.
- **Modernisation:** Utilise this opportunity to modernise the public transport system, ensuring compatibility with e-ticketing technology, GPS tracking, and security surveillance systems being introduced by CTA public transport operators.
- **Business case and investment plan:** Develop a comprehensive business case and investment plan to support the procurement and deployment of e-buses and the necessary charging infrastructure.
- **Procurement process:** Initiate the tender process for the procurement of e-buses, ensuring they include modern features such as GPS units, surveillance cameras, and e-ticketing facilities. Additionally, procure the required charging infrastructure to support these e-buses.

***Cost estimate: 200 buses (included battery replacement or extended warranty) = 100m EUR; E-ticketing system and supporting ITS = 5m EUR.***

**Component 2 – Depot construction:**

- **Strategic locations:** Develop depots at strategic locations along the Ring Road (over 100 km in distance). A primary depot is being developed near the Sharkawia BRT station, with additional locations under consideration, including Ismailia Road, the Airport, Nasr City, and the intersection of the Ring Road and Suez Road.
- **Review plans:** Review and advance existing plans to ensure they accommodate the number of vehicles and expected daily mileage. Consider the availability of electrical infrastructure to determine charging requirements.
- **Charging strategy:** Develop an optimised charging strategy to manage energy use and grid demands. This may include off-peak charging or staggered charging to reduce grid load. The strategy should also consider future energy demands to avoid the need for immediate grid upgrades.
- **Energy supply assessment:** Assess current energy supply and future needs to ensure the wider bus electrification is future-proofed. This includes reviewing power requirements, grid performance, and electricity supply sources, identifying any necessary parallel investments.

***Cost estimate: 3x bus depot design and build including EV wiring = 60m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| TR4 - Strategies and masterplans | Ministry of Transport, NUCA, Cairo Governorate, BRT Agency, CTA, Ministry of Electricity, Ministry of Environment | State budget, IFI/ donor organisations, Private sector |

| IA2 – Electric bus rapid transit (BRT) | Capex: €231m (EGP 12,025m) | Opex: €11.6m (EGP 599m) |
|---|---|---|

### Potential GHG reduction

The project aims to quantify direct GHG emission reductions through a preliminary feasibility study. This study will assess the capacity of the vehicles, expected patronage, average travel distances, and vehicle specifications. It will also determine the sources of mode shift, whether from minibuses, private cars, or active modes of transport. The power source for the electricity used by the e-buses will be evaluated to provide accurate GHG reduction calculations.

Early-stage calculations estimate 8,760 tCO2e reduction per year.

### GESI considerations and benefits

The BRT project has been designed with gender-sensitive and inclusive principles to ensure that the system accommodates the needs of all users. Features such as voice messaging and surveillance cameras, announced by the Ministry of Transport, will be implemented to support underserved groups, including women and PwD. The BRT agency is committed to launching communication campaigns to address harassment of women and enforce related standards, fostering a safe environment for both passengers and female workers. Additionally, the agency aims to increase the representation of women in its workforce, hiring them for roles in maintenance, management, and technical support for e-buses. This initiative will also enhance equity by providing cost-effective alternatives to private cars, potentially lowering public transport costs through improved operational efficiency and integrated e-ticketing systems.

### Climate resilience considerations

Climate resilience is a key factor in the design of e-bus features and the development of charging infrastructure and depots. Measures to enhance resilience range from low-cost solutions, such as elevating chargers and power cables to prevent flood damage, to investing in chargers capable of operating under adverse conditions.

### Smart City considerations

The 200 new BRT vehicles will be equipped with advanced smart technologies, similar to those introduced in TR1. These include e-payment, e-ticketing, integrated ticketing, GPS tracking, and real-time information displays at bus stops and depots. The e-bus charging infrastructure will feature smart meters and energy management systems to provide real-time data on energy consumption, supporting efficient and sustainable operations.

## 5.5.6. Integrated Action 3 – Downtown traffic management

| IA3 – Downtown traffic management | Capex: €43m (EGP 2,252m) | Opex: €2.2m (EGP 112m) |
|---|---|---|

**Location:**

Historic centre (Cluster C)

**Timeframe for implementation:**

2026 – 2029

**Challenges addressed:**


**Actions:**

TR1: Demand management of private car usage

TR2: Sustainable transport neighbourhoods

UD1: Urban Green Space Development

UD2: Resilient Street Scape Design


**Description:**

In our commitment to enhancing transport and urban spaces holistically, we are implementing five interconnected components under this Integrated Action. These components are designed and executed together to achieve a transformational impact across the network area.

To prioritise public and non-motorised transport, we must review the broader design and character of urban areas. The three key hubs—Ramses Square, El-Tahrir Square, and El Khalafawy Square—generate significant travel demand, leading to high traffic congestion. This action aims to provide attractive alternatives to private vehicle travel, supported by comprehensive urban fabric improvements, benefiting all road users. The implementation will proceed through the following five components.

| IA3 – Downtown traffic management | Capex: €43m (EGP 2,252m) | Opex: €2.2m (EGP 112m) |
|---|---|---|

**Impacts:**

Reduce local air pollution, noise pollution and GHG emissions, enhance public realm and sense of place, increase reliability of journey times, optimise operational efficiency of the transport network, as well as public transport operating costs. Social inclusion and equity will increase along with accessibility, local economic benefits will result, and climate resilience will increase.

**Detail:**

**Component 1 – Demand management of private car usage**

We will introduce CPZs on streets prioritised for walking and cycling infrastructure, as indicated in the location maps. These zones will feature time-restricted designated parking bays for PwDs, residents, and local business customers. The kerbside will also be managed to facilitate the loading and unloading of goods vehicles at specified times. Active enforcement of the new parking regime will be essential.

Other components of this Integrated Action will focus on reducing private car travel demand by enhancing the viability and attractiveness of sustainable transport modes. Residual demand will be accommodated in a multi-storey car park, a cost-effective solution for maximising limited space. This off-street car park will be developed on land designated by the Governorate, ideally on brownfield land near a public transport hub and well-served by active transport infrastructure. The car park's size will be reviewed, but it should not exceed 10,000 square meters, accommodating approximately 500 vehicles, or more with an automated vehicle stacking system.

The car park will incorporate advanced technology and mechanical engineering techniques to maximise capacity and ease of use, including automated payment systems, energy-efficient lighting and ventilation, surveillance, and real-time occupancy tracking. It will also provide EV charging infrastructure to support the transition to EVs.

The next steps needed to progress this action include:

- Unified approach to car parking provision and management: Develop and adopt a unified approach to car parking provision and management, including enforcement, across the area. Consult to prepare clear guidance on the availability, allocation, location, and cost of car parking, with potential for city-wide adoption. This approach will differentiate between various road categories and off-street facilities. Revising existing legislation to enable active and passive enforcement will be considered to ensure compliance.
- Design and consultation: Design and consult on on-street and off-street car parking interventions. Propose potential sites for the multi-storey car park based on recommendations from the Governorate. Engage with the private sector, including local businesses, regarding the construction and operation of the off-street parking facility. Review existing enforcement processes, equipment, and resources, and consider adopting best practices locally.
- Approval and implementation planning: Secure approval for the proposals, including the location and specifications of the new off-street car park. Take steps to lease the land and move forward with implementation planning.

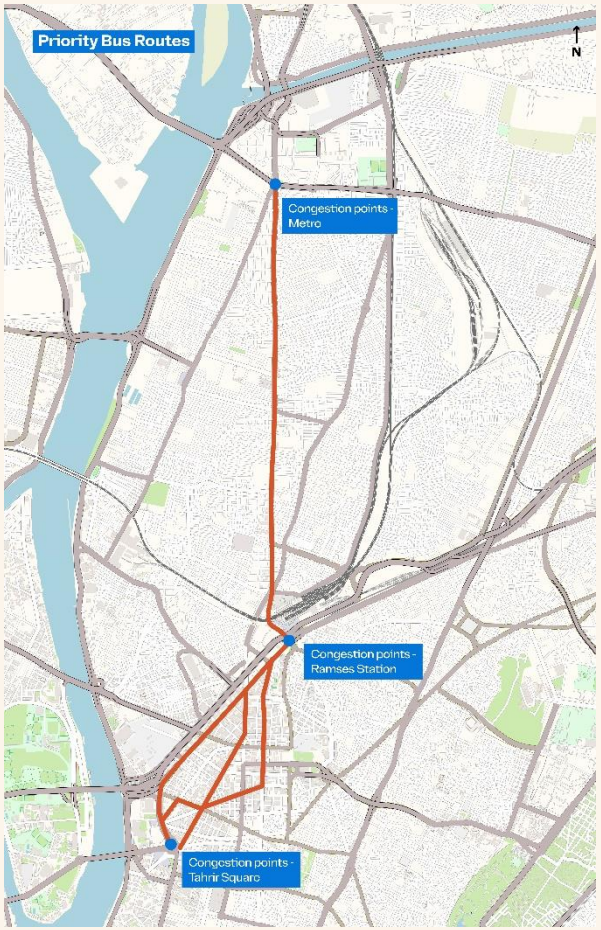
***Cost estimate - Parking regulation across 7km of main corridors = 2.8m EUR; Off-street multi-story car park x 2 = 20m EUR***

**IA3 – Downtown traffic management** **Capex: €43m (EGP 2,252m)** **Opex: €2.2m (EGP 112m)**

**Component 2 – Introduce new bus services with priority**

Improved parking regulation will facilitate the introduction of new bus services with priority lanes, as part of our ongoing efforts to enhance urban mobility. The location maps highlight three routes where bus priority lanes with traffic signal controls will be implemented, along with new bus services and improved supporting infrastructure, such as bus stops, travel information, and designated waiting areas. These routes span a total of 13.5 kilometres.

The proposed routes serve three major hubs: Ramses Square, El-Tahrir Square, and El Khalafawy Square. These areas have been selected due to their high levels of traffic congestion and travel demand, making them strategic corridors with significant potential for urban growth and development. By allocating bus priority on these routes, we aim to achieve high patronage on bus services with reduced journey times compared to other modes of transport. The bus priority at signals will further enhance journey time reliability. All road users will benefit from improved traffic flows, resulting in decreased journey times for all modes of transport




The proposed corridors are currently one-way streets with three to four lanes of traffic. The restrictions on on-street parking (as outlined in Component 1) will effectively increase road space. Bus priority will also reduce the need for on-street parking by providing a direct and reliable connection to a wider range of areas.

The priority steps that need to be taken to progress this action are:

- Transport study: Conduct a comprehensive transport study to validate the proposed network area and bus priority corridors. This study will assess average daily traffic volumes, the number of vehicle lanes, current bus service provision, and existing on-street parking. The findings will confirm the potential routes.
- Feasibility study: Prepare a feasibility study for the selected routes, exploring all available options for bus priority, including different types of bus lanes and signal prioritisation. The study will also consider the integration of cycling priority, as per Component 3. The options will be assessed based on the transport study findings, operational benefits (notably time savings), customer benefits, and wider impacts, including road safety, environmental impacts, urban realm, and local economy. The study will also explore enforcement approaches, combining passive (e.g., road surface differentiation) and active (e.g., fixed or mobile cameras) techniques. The feasibility of starting with a pilot scheme will also be considered.
- Consultation with decision-makers: Engage with decision-makers to finalise the scheme selection, recognising that it is ultimately a political decision.

**IA3 – Downtown traffic management** **Capex: €43m (EGP 2,252m)** **Opex: €2.2m (EGP 112m)**

- Business case and investment plan: Prepare a business case and investment plan and obtain the necessary permissions.
- Project design: Design the project, including bus lane specifications, junction design, traffic signal programming, and enforcement equipment. Provide training and employment opportunities for women in traffic management roles.
- Procurement: Tender the procurement of the necessary works, infrastructure, equipment, and bus services.
- Marketing and communications campaign: We will prepare a comprehensive marketing and communications campaign to publicise the service improvements and address any potential misconceptions about negative impacts on non-public transport users.

***Cost estimate – priority bus lanes across 7km of main corridors – 5.25m EUR***

**Component 3 – Improve walking and cycling infrastructure**

This component focuses on enhancing provisions for non-motorised modes of transport within the network area bounded by the new priority bus routes (Component 1), covering approximately 3km$^2$. This provision will include the:

- Pavement improvements: Rehabilitation and development of pavements.
- Streetside commercial services: Review and targeted promotion.
- Pedestrian crossing facilities: Improvement and expansion.
- Dedicated cycle routes: Implementation of segregated cycle routes along the proposed bus priority corridors.
- Vehicle speed limits: Review and adjustment.

These improvements will complement Component 1, recognising that public transport journeys are only part of the overall travel experience. To transform the area's sustainable transport offerings, the new bus priority routes and services must consider the entire passenger journey, from origin to destination. Integrating cyclist priority within bus priority projects is a cost-effective approach to enhancing corridor provisions. Reviewing vehicle speed limits will contribute to creating more pedestrian-friendly streets, making walking and cycling more attractive and competitive compared to private car travel.

- Review walking and cycling environment: Conduct a comprehensive review of the walking and cycling environment across the network area. This involves categorising the entire area into specific links, routes, crossings, interchange spaces, and public transport waiting areas, and assessing each. Factors to consider include average daily footfall and cycling flows, footway widths and obstructions, accessibility for all users (including women, children, the elderly, and persons with disabilities), and real and perceived safety. Use the findings to propose improvements at both area and corridor levels.
- Develop an integrated package of measures: Based on the environment review and Component 1 studies, develop an integrated package of measures and seek government approval. These measures should be coherent with wider network and city-wide initiatives. Actions will range from mainstreaming inclusive design principles to increasing effective pavement width by removing obstructions and consulting on vehicle speed limits. This may involve reviewing current and optimal commercial activities and introducing regulations to support Dedicated Vending Zones. Economic measures, such as low-

interest loans for streetscape improvements by small enterprises and commercial property owners, will also be considered. The package will extend to other pedestrian realm improvements, such as increasing green space (Component 4) and upgrading street lighting (Component 5).

- Feasibility study and project design: Conduct a feasibility study for the proposed improvements and collaborate on project design. Ensure women are involved in the decision-making process to address their concerns directly.
- Business case preparation and implementation planning: Prepare a business case and implementation plan, prioritising and phasing the improvements (suggested priority routes are marked in the sample maps). Procure services, works, infrastructure, and equipment.

***Pedestrianisation and dedicated cycling infrastructure along 6km = 9m EUR***

**Component 4 – Urban greening and resilience enhancements**

This component focuses on retrofitting existing streets to enhance greening and promote resilience against environmental, social, and infrastructure challenges. By updating and modifying street infrastructure, we aim to better withstand extreme weather events, increase safety, and improve comfort for non-motorised transport (NMT) users.

The study area faces high population density and a lack of green spaces, contributing to the UHII effect and pollution. This action identifies key streets as opportunities to integrate advanced materials and green infrastructure, creating more durable streets that foster a healthier and safer environment for residents.

Integrating this action provides a no-regret, time- and cost-efficient method of establishing resilient streets across Cairo. The proposed actions include:

- Mapping underground utilities: Conduct surveys to map the location of existing underground utilities, ensuring the feasibility of planting street trees or other natural interventions. This will prevent damage to utilities, avoid service interruptions, and maintain utility access while ensuring trees are planted in optimal locations.
- Introducing reflective and high-albedo materials: Use materials that reflect sunlight and increase urban greenery to lower temperatures and mitigate the Urban Heat Island effect.
- -Implementing permeable paving: Install permeable paving, primarily in areas currently used for on-street parking, to improve stormwater management.
- Preparing a business case and investment plan: Develop a comprehensive business case and investment plan for the proposed enhancements.
- Developing maintenance plans: Create and implement maintenance plans to ensure the effectiveness of sustainable urban drainage and energy-efficient measures. Provide training for relevant personnel on maintaining the new systems.

***Cost for resilience landscaping, greening, paving and surfacing along 6km = 6m EUR***

| IA3 – Downtown traffic management | Capex: €43m (EGP 2,252m) | Opex: €2.2m (EGP 112m) |
|---|---|---|

**Component 5 - Efficient street lighting**

We will implement solar-powered, LED street lighting to provide renewable, off-grid, low-demand lighting throughout this action. This includes both on-street enhancements to promote road safety for all users and residents, and within green space developments to improve accessibility, inclusivity, and promote all-day economic and commercial activities. Off-grid systems will reduce reliance on the grid, eliminating blackouts due to load shedding.

***Cost estimate for 500 LED light poles across the area = 1m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| TR4: Strategies and masterplans NMT/SUMP<br>TR5: Awareness raising for active travel<br>TR6: Parking enforcement - signs and active enforcement | Cairo Governorate, CTA, NAT, private sector | State budget; IFI/ donor organisations; Private sector; Revenue generated (from increased public transport farebox revenues and off-street car parking charges) |

**Potential GHG reduction**

Our initiatives are expected to generate significant GHG emission savings. These reductions will be achieved through a modal shift from private vehicles to public and active modes of transport. Additionally, the energy efficiency of both public and private transport modes will improve due to reduced congestion and associated idling. By reviewing commercial activities in the area, we aim to meet more needs locally, thereby reducing the total distance travelled. Changes in car parking provisions will also contribute to this reduction. Furthermore, the enhancement of urban green spaces and resilience improvements will boost carbon sequestration.

Early-stage calculations estimate 37,887 $tCO_2e$ reduction per year.

**GESI considerations and benefits**

The City of Cairo is committed to implementing inclusive and gender-sensitive design practices for all road users. This approach is central to effective place-making. Our initiatives will include the provision of on-street parking for people with disabilities and the explicit consideration of barriers that all potential road users might face when accessing and navigating the project area. The primary goal is to encourage a shift from private car use to shared and active modes of transport. This shift will positively impact equity, enhancing opportunities for social and economic participation. Improvements in public and active transport provisions will particularly benefit women, people with disabilities, and older adults.

**Climate resilience considerations**

Climate-resilient streetscape design is a key component of our action plan. The proposed investments will be climate-proofed to reduce vulnerability to current and future climate shocks, offering a cost-effective solution compared to addressing these issues separately. We plan to implement a range of infrastructure modifications and upgrades, leveraging advances in materials and green infrastructure to enhance the construction of new facilities and the retrofitting of existing ones.

**IA3 – Downtown traffic management** **Capex: €43m (EGP 2,252m)** **Opex: €2.2m (EGP 112m)**

### Smart City considerations

Components 1 and 2 will see the introduction of smart traffic signalling systems. These systems, powered by sensors and artificial intelligence, aim to reduce journey times, prioritise buses, cyclists, and pedestrians, and improve overall traffic flow for all modes of transport.

We will also review and enhance surveillance systems throughout the area. This will facilitate the enforcement of new restrictions, as outlined in Component 3, and help track and influence broader behaviours.

Additionally, the construction of an off-street car park under Component 3 will incorporate smart technologies. These will include real-time occupancy tracking, as well as advanced payment and reservation facilities.

Our commitment to Smart City innovations underscores our dedication to creating a more efficient, safe, and sustainable Cairo for all residents.

## 5.6. Urban development and resilience

### 5.6.1. Sector summary

Cairo has experienced rapid urban growth over the past decades, both in population and spatial expansion, leading to the densification of existing urban areas.

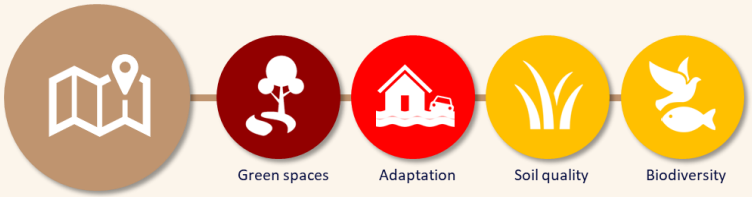
Unplanned settlements, often developed with limited consideration for energy efficiency, suffer from a lack of public services, utilities, and access to public green or open spaces.

This, combined with the effects of climate change, exacerbates the UHI effect in many districts across the governorate.

Figure 5-4: Urban development and resilience roadmap

**Sector goal: Provide citizens a liveable city with planned, safe, well designed and harmonious communities**


Key challenges



## 5.6.2. Investment options

### UD1 - Urban green space development

**Description**: This initiative aims to increase green space and tree cover throughout the governorate. By planting trees and integrating green open spaces into the urban fabric, we seek to mitigate the UHI effect, improve air quality, and enhance biodiversity. Additionally, this action aims to create attractive, comfortable environments that promote social interaction and community cohesion. Urban greening can be integrated with other investments to improve resilience to climate change, such as passive building retrofits and non-motorised transport.

**Detail**: The action includes three components:

- Tree planting program: Focused on areas with high population densities and limited open or green spaces, such as the historic urban centre, residential outskirts, and the industrial south. Trees will be planted on traffic islands, along roads, and in courtyards to maximise the use of limited space.
- Building new parks: Also focused on densely populated areas with a lack of open or green spaces, such as the historic urban centre, residential outskirts, and the industrial south.
- Rehabilitation of existing parks: Multiple parks across the governorate could be rehabilitated and enhanced, increasing the sustainability and accessibility to residents. Such examples include the Japanese Gardens in Helwan, Al-Dawlya park in Nasr city, and Al-Horeya Park in Zamalek.

Both components will integrate the key principle of biodiversity enhancement by introducing native plant and tree species and creating habitats to attract a diverse range of flora and fauna. This includes cultivating high-value, low-water consumption plants such as jojoba and cactus.

**Benefits**: Urban greening and tree planting help mitigate the UHI effect, reducing the energy demand for cooling buildings. Trees in green areas will sequester carbon dioxide, reducing greenhouse gas emissions and improving air quality. The amount of sequestered carbon will depend on tree coverage and type.

Additionally, urban green spaces provide climate adaptation benefits, such as addressing extreme heat and facilitating stormwater management and flood control. Trees and grass reduce air temperature, lower cooling energy demand, and improve thermal comfort. Deep gardens can infiltrate and drain rainwater during extreme rainfall events.

Other benefits include:

- Improving the visual appeal and liveability of neighbourhoods.
- Reducing noise pollution.

- Providing shaded areas for public gatherings and exercise.
- Increasing the share of recreational and green open spaces per capita.
- Enhancing tourism incentives in the city.
- Encouraging walkability and cycling.

**GESI**: Cairo has limited public spaces where women and girls can safely meet, relax, or exercise outdoors, especially in low-income areas. There is a lack of affordable and accessible public spaces catering to a demographic beyond middle and upper-middle-class residents.

This action aims to improve access to open and green spaces in low-income, densely populated neighbourhoods. Adequate lighting systems will be installed to increase safety, particularly for women, children, and the elderly. This initiative can also promote women's participation in public life by encouraging them to venture outside their homes. The action will implement best practices in disability inclusion, incorporating features such as ramps and tactile paving for easy navigation, benches designed for the elderly and people with reduced mobility, and firm, non-slippery materials for footways. Signage will be designed to cater to people with hearing and visual impairments or learning disabilities.

**Smart applications**: To enhance efficiency, sustainability, and community engagement, several smart technologies can be integrated into green space management:

- Smart Irrigation: Utilising the Internet of Things (IoT) sensors to automate watering, these systems collect real-time data on soil moisture and temperature, ensuring optimal water usage.
- GIS Mapping: Accurate GIS maps of open green areas assist in future planning and development.
- Adaptive Management: This approach uses data-driven adjustments to maintain the ongoing effectiveness of green space management.
- Weather Monitoring: Stations that track air quality and weather conditions help in managing the environmental impact and health benefits of green spaces.

Al-Azhar Park is a successful large-scale urban greening project spanning 80 acres. Developed on an old landfill site, the park includes gardens, walking paths, restaurants, and cafeterias designed in the Islamic style, as well as waterways and an artificial lake. Greenery covers two-thirds of the park area, featuring a mix of Egyptian and non-Egyptian plants.

**Supporting policies:** Develop Green Space Safeguarding Regulations: Guidelines as a requirement for any proposed new development in green areas. These guidelines will prioritise the preservation and creation of green spaces and promote eco-friendly practices.

**Action implementation**: This action is featured in Integrated Action 3 – Downtown traffic management, Integrated Action 4 – Transit oriented development in New Cairo, Integrated Action 5 – Liveable neighbourhood Helwan, Integrated Action 7 – Municipal building energy efficiency and Integrated Action 9 – Wastewater network upgrade.

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## UD2 - Resilient streetscape design

Description: Conventional paving materials, such as asphalt, typically cover around 40% of a city's surfaces. These surfaces can reach peak temperatures of up to 65°C, heating the air above them. Cairo's narrow-paved roads, often congested with traffic and encroached by parked vehicles, contribute to the Urban Heat Island (UHI) effect through:

- Lack of vegetation and trees, which could provide shading and cooling.
- Impervious surfaces (asphalt and concrete) that absorb and retain heat.
- Traffic congestion, which generates additional heat from vehicle engines and increases air pollution, compounding the heat effect.
- Narrow buildings that trap heat and limit natural ventilation.

These roads are also perceived as unsafe for walking and cycling and lack spaces for sitting and resting. The resilient streetscape design action aims to transform selected street spaces in the city's heat hotspot areas to reduce the UHI effect while developing high-quality pedestrian environments suitable for walking and cycling.

**Detail**: The action includes the following components:

- Identification of streets: Identify streets where design contributes to the UHI effect, focusing on areas with underserved groups (e.g., low-income areas, near schools).
- Design measures: Develop specific design measures, such as:
  - Cool surfaces using reflective paint to reflect heat back into the atmosphere.
  - Permeable paving to allow for evapotranspiration.
  - Additional greenery, including trees and Sustainable Urban Drainage Systems (SUDS).
  - Shading structures, such as canopies and trellises for climbing plants.
  - Access to water, such as drinking fountains, to aid hydration.
  - Cool, safe, and accessible resting spaces for public use (benches and seating areas).
- Redesign and Construction: Redesign and construct street spaces based on the selected measures.
- Maintenance: Ensure the maintenance of streetscape design measures, such as watering trees, ensuring shading structures are safe, and maintaining water fountains.

**Benefits**: This action will reduce the UHI effect in heat hotspot areas, increase resilience during heat waves, and make streets more suitable for walking and cycling.

**GESI**: The action focuses on low-income areas or areas where groups most exposed to extreme heat are present, such as around schools or markets. Low-income households often have small, poorly equipped domestic spaces that are vulnerable to extreme heat. Providing cool public spaces ensures that people have areas in their neighbourhoods where they can socialise and feel comfortable. Additionally, increasing foot traffic in streets, combined with appropriate lighting, can enhance safety for women and girls.

**Smart applications**: Consider including Smart Irrigation systems that use IoT sensors to automate watering, collecting real-time soil moisture and temperature data (as detailed in the Urban Green Space Development action).

**Supporting policies**: Identification of Streets prone to UHI due to design as part of the Heat Preparedness Plan. Identification and monitoring of suitable streets using GIS setup as part of the "Institutional Development on Geographic Information Management" supporting Policy.

**Action implementation**: This action is featured in a number of Integrated Actions, and it is proposed to integrate this into as many projects as possible, to provide a no-regret, time and cost-efficient way of establishing resilient streets across Cairo. Specific actions include Integrated Action 3 – Downtown traffic management, Integrated Action 4 – Transit oriented development in New Cairo, Integrated Action 5 – Liveable neighbourhood Helwan, Integrated Action 7 – Municipal building energy efficiency and Integrated Action 9 – Wastewater network upgrade

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## UD3 - Green building and retrofit scheme

**Description**: Unplanned settlements, often lacking proper infrastructure and constructed without adherence to building codes and standards, pose significant challenges to safety, sustainability, and energy efficiency.

There is a risk of energy poverty in Cairo, despite subsidies on electricity tariffs for low-consuming households. Lower-income households in old Cairo typically have fewer air conditioning units, leading to extreme UHI effects within homes and apartment blocks during hot summer months. Additionally, many residential buildings across the governorate, particularly in densely populated areas, are not suitable for renewable energy solutions.

This action promotes the development of green buildings (social housing) to include energy efficiency measures in the residential building stock. This includes roof insulation, double-glazed windows, and reflective paint. Additionally, green roof programs, supported by awareness campaigns and capacity-building initiatives, will aid passive cooling and address challenges such as biodiversity, water availability, and green space availability.

**Detail**: Aligned with the Cairo 2030 Strategic Plan, this action supports high-performance green

technologies, materials, and solutions for privately owned residential dwellings and buildings in areas experiencing extreme UHI.

Investments in energy-saving equipment, such as insulation, windows, heat pumps, and solar panels, will reduce greenhouse gas emissions, lower energy costs, and improve residents' quality of life. This action can be implemented via a dedicated green finance fund through a local banking institution.

**Benefits**:

- Reduced energy demand: lower requirements for air conditioning and reduced urban heat in districts, resulting in improved indoor thermal comfort and less heat pollution in the streets.
- Increased resilience: enhanced resilience during heat waves.
- Cost savings: lower energy bills for lower-income households, reducing the risk of energy poverty and the need for government subsidies.

**GESI**: Reducing energy requirements for cooling will lower energy bills for lower-income households, reducing the risk of energy poverty and the need for government subsidies. Women, who often handle unpaid household work requiring energy (e.g., childcare, cooking, laundry, cleaning), will benefit from reduced energy costs. This initiative will also decrease their energy footprint.

**Smart applications**: Installation of smart systems for accounting for energy consumption and for automatic regulation of heating systems in weather conditions.

**Supporting policies**:

- Energy auditing: Conduct energy audits of potential districts and residential buildings to identify citizens and households facing energy poverty and support suitable energy efficiency measures.
- Awareness campaigns: Promote energy efficiency technologies for residential buildings and green rooftops through awareness campaigns and capacity-building initiatives.
- Energy efficiency practices: Raise awareness of energy efficiency practices and consumption standards by printing guidelines on paper bills.

**Action implementation**: This action is featured in Integrated Action 4 – Transit oriented development in New Cairo and Integrated Action 5 – Liveable neighbourhood Helwan.

## UD 4 - TOD around new mass transit stations

**Description**: We are promoting sustainable urban development through the creation of a Transit-Oriented Development (TOD) framework. This framework supports an integrated approach to urban development and transport planning by encouraging investment around mass transit stations. The goal is to maximise the amount of residential, business, and recreational space within walking distance of public transport. A key element of the TOD model is multi-modal integration, supporting the use of efficient and sustainable transport for the 'last mile' (or first mile) of journeys to or from mass transit stations.

**Detail**: This action will support the development and application of a TOD framework to integrate public transport and urban development. The initial focus will be on a pilot area, such as the Administrative Capital monorail route (56.5 km long with 22 stations).

**Benefits**:

- Increased accessibility: Enhancing the number, quality, and diversity of services around high-accessibility areas will increase the number of trips fulfilled by public transport and short journeys, promoting environmental sustainability and economic development, including urban renewal.
- Integrated transport hubs: Developing integrated transport hubs will support sustainable first/last mile transport, making alternatives to car travel more viable and attractive. The provision of Park and Ride facilities will expand the catchment area for mass transit services.

**GESI**: Improved public transport accessibility and multi-modal connectivity will provide cost-effective travel choices. Inclusive and gender-sensitive design principles in mobility and interchange hub development will enhance equality of access. TOD will particularly benefit women's participation in economic development by improving accessibility to various amenities, allowing them to achieve a better work-life balance. Special consideration for housing near high-employment areas will further facilitate social and economic inclusion for women.

**Smart applications**: Implementation of real time information, smart mobility platforms enabling access to multi-modal traffic and travel information, and use of car parking technologies (Cairo is supportive of underground parking facilities and vertical garages, for example).

**Supporting policies**:

- Incentives and standards: Implementing incentives and standards to increase development density within the city, including mixed-use zoning and housing projects.
- Integrated transport planning: Developing a city-wide strategy for public transport services, including BRT, monorail, metro, buses, taxis, and tuk-tuks, focusing on a core

network, connecting services, and interchange and mobility hubs.

- Walking and cycling infrastructure: Ensuring the provision and quality of networks and infrastructure for walking and cycling in relation to these hubs.
- Associated services and facilities: Guiding the provision and rollout of associated services, such as bike hire, and facilities like Kiss and Ride and Park and Ride.
- Awareness campaigns: Conducting campaigns to raise awareness about sustainable alternatives to private cars and the travel options available for door-to-door transport by alternative modes.

**Unit costs**: €5 million to €10 million to develop the TOD framework, €10 million to €20 million to support provision of integrated transport for first/ last mile travel, and €5 million to €10 million to introduce Park and Ride facilities.

**Implementing agents**: Cairo Governorate, CTA, NUCA, NAT, ENR.

**Action implementation**: This action is featured in Integrated Action 4 – Transit oriented development in New Cairo.

### 5.6.3. Supporting policy options

The roadmap is supported by three key policy measures aimed at enhancing the governorate's institutional capacity to implement the proposed actions in the urban development sector.

**UD5 - Institutional Development on Geographic Information Management**

Cairo Governorate has established the Central Department of Information System and Digital Transformation, tasked with various aspects of digital transformation and smart integration, from data management to capacity and policy development. This is a crucial step in translating the national Digital Egypt meta strategy to the urban level in Cairo. However, the department currently does not fully meet its mandate in terms of data collection and management. By building institutional capacities in Geographic Information Management, Cairo Governorate can lay the foundation for evidence-based urban planning. The policy includes the following components:

- Updating the GIS for urban planning: Enhancing the existing GIS software to better support urban planning needs.
- Building technical capacity: Systematically developing the technical skills of Governorate staff in the Central Department of Information System and Digital Transformation to enable them to effectively capture, transfer, interpret, utilise, and share data. This includes resourcing, staffing, and training.
- Cross-sectoral coordination: Enhancing the capabilities of sector departments to mainstream digital transformation and smart integration across the government. This includes training on Building Information Modelling (BIM), GIS, and Civil 3D.

These measures will ensure that the Governorate can effectively implement and manage urban development initiatives, leading to more sustainable and resilient urban growth.

**UD6 - Heat Preparedness Plan**

Extreme heat is emerging as one of the deadliest climate risks globally. Cairo, with its hot desert climate and temperatures exceeding 35°C, is particularly vulnerable. Projections indicate that the city's climate will become even hotter, with increases of 1.6°C to 2.1°C expected by the 2050s. The UHI effect, caused by buildings, streets, and sealed surfaces, exacerbates temperature differences between urban and surrounding areas.

Urban heat severely impacts the health of Cairo's population, particularly affecting babies, the elderly, and those living or working outside or in buildings prone to overheating, such as informal settlements. Extreme heat also contributes to desertification, dust storms, and increased air pollution in the Greater Cairo region. Additionally, water availability in Cairo is expected to decrease due to reduced flow in the River Nile, variable rainfall, and rising demand, further increasing the risks associated with extreme heat.

To address these challenges, Cairo needs a comprehensive strategy to manage heat risk, including acute heat waves and chronic heat, to build long-term resilience and limit impacts on people, the economy, and infrastructure.

Components of the heat preparedness plan include:

- Heat risk assessment for Cairo Governorate: This involves assessing local capacities for heat management, including policy frameworks, institutional arrangements, and stakeholder landscapes. It also includes evaluating heat risk in the city, considering heat hazard characteristics, current and future exposure, and vulnerability. The UHI mapping conducted as part of this GCAP will serve as a starting point, supported by the Geographic Information Management measure.
- Heat Action Plan for Cairo Governorate: This plan will develop standard operating procedures to follow before, during, and after a heat wave. It will include setting thresholds, establishing interagency coordination mechanisms, communicating with affected populations, implementing social protection measures, and conducting response activities such as setting up cooling centres and water stations. Post-heatwave assessments will also be conducted.
- Heat Resilience Strategy: This strategy will develop actions to adapt public services, city planning standards, and building regulations

to build long-term heat resilience. Several GCAP actions already contribute to heat resilience in Cairo, including urban green space development, resilient streetscape design, and green building and retrofit schemes.

- Capacity building: This involves enhancing the skills and knowledge of local government and key stakeholders on urban heat management.
- Outreach and advocacy: This component aims to build awareness of heat risks and share information on appropriate behaviours during heat waves.

## 5.6.4. Integrated Action 4 – Transit oriented development in New Cairo

**IA4 – Transit oriented development in New Cairo** **Capex: €150m (EGP 7,813m)** **Opex: €7.5m (EGP 389m)**

**Location:**

NUCA (Cluster A)

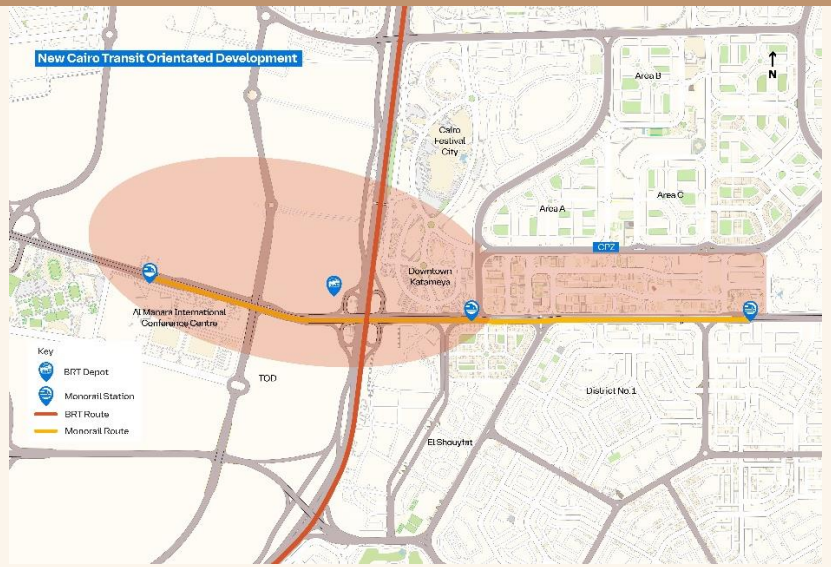
**Timeframe for implementation:**

2027 – 2031

**Challenges addressed:**

**Actions:**

- TR1: Demand management of private car usage
- TR2: Sustainable transport neighbourhoods
- UD1: Urban Green Space Development
- UD2: Resilient Street Scape Design
- UD4: TOD of new mass transit stations
- EN1: Efficient street lighting




**Description:**

The City of Cairo is committed to encouraging TOD, building on the successful approach taken at the Adly Mansour Mobility Hub. Our focus will be on leveraging the city's significant planned transport infrastructure, including the BRT, LRT, and Metro stations. Urban development along these transit lines will connect high-density residential areas to commercial and industrial zones, with Moshier Tantawy and One Ninety monorail stations serving as prime examples of such mobility hubs.

Moshier Tantawy and One Ninety stations are located on the east monorail in New Cairo, connecting Cairo with the New Administrative Capital, and intersects with the ring-road and its proposed BRT system. The stations are surrounded by major arterial roads (ring-road, Monshier Mohammed Ali Fahmy road). Nearby commercial and cultural assets and facilities include Al Manara International Conference Centre; International Fairgrounds; Moshier Tantawi Mosque; Air Defence System; and Ramage Hotel containing general entertainment facilities.

The surrounding areas contain significant vacant or undeveloped land within the catchment of these stations. The TOD area will include undeveloped areas to the west of the ring road and existing developments in New Cairo to the east.

| IA4 – Transit oriented development in New Cairo | Capex: €150m (EGP 7,813m) | Opex: €7.5m (EGP 389m) |
|---|---|---|

**Impacts:**

Reduce local air pollution, noise pollution and GHG emissions, enhance public realm and sense of place, increase reliability of journey times, optimise operational efficiency of the transport network, as well as public transport operating costs. Increase social inclusion and equity, and improvements to the local economy, including the promotion of economic development, such as urban renewal, and increased footfall. Climate resilience will increase.

**Detail:**

**Component 1: TOD feasibility and design**

We will conduct feasibility studies to assess the suitability of potential sites and define the TOD boundary and connected areas. The proposed area includes various types and levels of development, from existing developments to new projects under implementation and undeveloped land. This area involves numerous owners, stakeholders, development consents, and financiers. Understanding the local context is critical, as existing communities and commercial operators may have conflicting visions for the area. To align with TOD principles, the following actions are necessary:

- Conduct parking surveys to assess current parking provision and demand.
- Align current developments with proposed TOD plans, including mass transit routes, key feeder routes, and pedestrian facilities.
- Enforce parking restrictions on mass transit routes and regulate parking provision for minor roads.
- Develop off-street parking facilities.

It is essential to consider the necessary legal and policy frameworks to support TOD. We will prepare a comprehensive community and stakeholder engagement plan to create supportive policies, regulations, and incentives. This engagement will involve local government, developers, and the community, considering the varying needs and ambitions of stakeholders to ensure necessary buy-in and support for development.

This component will include the development of a comprehensive plan featuring:

- a land use plan to integrate mixed-use developments with transit facilities;
- density and zoning regulations to encourage development;
- provision of child-friendly public spaces to enhance community interaction and walkability;
- affordable housing close to employment hubs, particularly for women, female-headed households, low-income families, and people with disabilities; and
- an infrastructure investment plan.

***Cost estimate = 1m EUR***

**IA4 – Transit oriented development in New Cairo** **Capex: €150m (EGP 7,813m)** **Opex: €7.5m (EGP 389m)**

**Component 2: Multi-modal interchange**

We aim to enhance urban renewal prospects and expand the catchment areas of mass transit services by improving the transport hubs around which the TOD area is designed. These enhancements will reinforce their role as mobility hubs. The required public transport improvements will be determined and progressed through the following steps:

- Identify opportunities: Conduct a network review of public transport service provision and interchange spaces across the TOD area and beyond. This review will explore the potential benefits of introducing or enhancing services for taxis, other bus services, or tuk-tuks (walking and cycling are covered separately under Component 3). Managing car parking demand is considered in Component 3 but reviewing the need for Kiss and Ride and Park and Ride facilities could also promote increased modal shift. Additionally, transit stations will be reviewed against good practice principles for interchange hubs, potentially leading to proposed improvements in mode interchange, shelter provision, and information dissemination.
- Feasibility study and consultation: Conduct a feasibility study, consult on a long list of improvement options, and secure necessary approvals.
- Implementation planning: Prepare a business case, plan the implementation, prioritise and phase the improvements, and procure the required services, works, infrastructure, and equipment.

**Component 3: Improve walking and cycling infrastructure**

Our focus will be on enhancing walking and cycling infrastructure, including priority and segregation where appropriate, around the transport hubs defining the project boundary, notably the current and planned BRT, LRT, and Metro stations. These hubs must be well integrated into wider walking and cycling networks to increase intermodal connectivity and facilitate first and last mile travel. Initial efforts will focus on key routes and desire lines across the TOD area, radiating from the mass transit hubs and improving connections to the New Cairo centre.

The improvements will be comprehensive and may include surface rehabilitation, accessible design applications, crossing point enhancements, wayfinding infrastructure, surveillance, and cycle storage. The exact scope will be defined and progressed through the following steps:

- Review environment: Assess the walking and cycling environment around mass transit hubs by categorising specific waiting areas, links, routes, and crossings. This assessment will consider factors such as average daily footfall and cycling flows, footway widths and obstructions, accessibility for all users, and real and perceived safety. The findings will inform an integrated package of improvements.
- Develop measures: Based on the environment review, develop a suite of measures and gain government approval. These measures could include creating Dedicated Vending Zones and implementing economic measures to facilitate streetscape improvements by small enterprises and commercial property owners.
- Feasibility study and design collaboration: Conduct a feasibility study for the proposed improvements and collaborate on project design.
- Implementation planning: Prepare a business case, plan the implementation, prioritise and phase the improvements, and procure the required services, works, infrastructure, and equipment.

| IA4 – Transit oriented development in New Cairo | Capex: €150m (EGP 7,813m) | Opex: €7.5m (EGP 389m) |
|---|---|---|

***Cost estimate for 10km of NMT routes = 15m EUR***

**Component 4: Parking demand management**

The City of Cairo is committed to implementing effective parking demand management strategies to support our TOD initiatives. CPZs will be introduced in areas prioritised for walking and cycling infrastructure investment, as identified in Component 2. These zones will include time-restricted designated parking bays for people with disabilities, residents, and local business customers. Additionally, kerbside management will facilitate the loading and unloading of goods vehicles at specified times of the day. Active enforcement of the new parking regime will be essential. This measure would be designed and advanced by:

**Assessment of current parking provision and demand:**

- Conduct city-wide parking surveys to analyse current provision, requirements, and usage trends. This includes on-street surveys to assess demand volume, duration of stay, and temporal nature of demand.
- Develop an action plan for regulated parking policy management, covering rules for parking in New Cairo and the proposed TOD area, linkage with public transport, impact of proposed urban developments, jurisdiction and management responsibilities, and payment and enforcement processes.
- Undertake an economic impact assessment to ensure the action supports local commerce by improving access for customers, deliveries, and service vehicles.

**Enhancement of enforcement on the road network:**

- Create a tiered radial zonal parking structure extending from New Cairo centre.
- Implement limitations on on-street parking including prohibiting parking on pedestrian pavements. Clearly demarcate no stopping and parking areas throughout the road network for easy understanding by all road users.
- Improve and increase signage in areas with high parking violations.
- Invest in staffing and smart solutions for enforcement such as establishing a physical inspection unit to detect and remove violations. Develop a CCTV network to support enforcement through video surveillance and digital tools to automatically detect parking rule violations and access to public transport lanes.

**Regulated parking provision for minor roads and off-street facilities:**

- Develop a network of intermediate parking lots linked to public transport, cycling, and pedestrian routes in the focus area. Integrate information boards and launch a public awareness program about the new system of information boards in parking lots.
- Better enforcement of restrictions on the road network

***Cost estimate - Parking regulation across10km of main corridors = 4m EUR; Off-street multi-story car park x4 =20m EUR***

| IA4 – Transit oriented development in New Cairo | Capex: €150m (EGP 7,813m) | Opex: €7.5m (EGP 389m) |
|---|---|---|

**Component 5 – Urban greening and resilience enhancements**

We will be dedicated to retrofitting existing streets to enhance greening and promote resilience against environmental, social, and infrastructure challenges. This involves updating and modifying street infrastructure to better withstand extreme weather events, increase safety, and improve comfort for NMT users. Actions include:

- Mapping utilities: conduct surveys to map the location of existing underground utilities, ensuring the feasibility of planting street trees or other natural interventions without damaging utilities or interrupting services.
- Reflective materials and urban greenery: introduce reflective and high-albedo materials and increase urban greenery to lower temperatures and mitigate the UHI.
- Permeable paving: implement permeable paving, primarily in areas currently allocated to on-street parking, to improve stormwater management.
- Business case and investment plan: prepare a comprehensive business case and investment plan.
- Maintenance plans: develop and implement maintenance plans to ensure the effectiveness of sustainable urban drainage and energy-efficient measures. provide training for relevant personnel on the new systems.

***Cost estimate for resilience landscaping, greening, paving and surfacing along 10km = 10m EUR***

**Component 6 – Efficient street lighting**

We will implement solar-powered LED street lighting to provide renewable, off-grid, low-demand lighting. This includes both on-street enhancements to promote road safety for all users and residents, and within green space developments to improve accessibility, inclusivity, and promote all-day economic and commercial activities. Off-grid systems will reduce reliance on the grid, eliminating blackouts due to load shedding.

***Cost estimate for 500 LED light poles across the area = 1m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| TR4 - Strategies and masterplans<br>TR6: Parking enforcement - signs and active enforcement | Governorate, NAT, ENR, CTA, NUCA, private sector | State budget; IFI/ donor organisations; Private sector; Revenue generated (from increased public transport farebox revenues and car parking charges) |

**Potential GHG reduction**

Total vehicle kilometres will reduce as TOD enables people to make fewer and shorter journeys. It also increases the viability of active and public modes of transport. The extent of emission reduction will be calculated once data on existing travel patterns and flows has been collated and analysed at the project development stage.

Early-stage calculations estimate 39,323 $tCO_2e$ reduction per year.

| IA4 – Transit oriented development in New Cairo | Capex: €150m (EGP 7,813m) | Opex: €7.5m (EGP 389m) |
|---|---|---|

### GESI considerations and benefits

Improved public transport accessibility and multi-modal connectivity will increase cost-effective travel choices for travellers. The application of inclusive and gender-sensitive design principles in mobility and interchange hub development will further improve equality of access, as will the increased physical proximity of different commercial outlets and services.

### Climate resilience considerations

New infrastructure will be designed to withstand extreme weather events, increase safety, and improve overall functionality. Existing infrastructure will be upgraded and retrofitted to meet these same standards.

### Smart City considerations

We will integrate real-time information and smart mobility platforms to enable access to multi-modal traffic and travel information. This includes car parking technologies, such as underground parking facilities and vertical garages, and integration into vehicle charging systems using both grid connections and potential PV installations.

## 5.6.5. Integrated Action 5 – Liveable neighbourhood Helwan

| IA5 – Liveable neighbourhood Helwan | Capex: €88.5m (EGP 4,602m) | Opex: €4.4m (EGP 229m) |
|---|---|---|

**Location:**

Helwan (Cluster B)

**Timeframe for implementation:**

2027 – 2034

**Challenges addressed:**

**Actions:**

TR2: Sustainable transport neighbourhoods

UD1: Urban Green Space Development

UD2: Resilient Street Scape Design

UD3: Green building and retrofit scheme

EN1: Efficient street lighting


**Description:**

This action promotes a comprehensive initiative aimed at revitalising the historic Salt Oasis Resort and its surrounding public spaces in Helwan. Originally built by Khedevi Abbas in 1899, this culturally significant site will serve as a cornerstone for urban development, greening, and sustainable transport within the district.

This initiative aligns with the priority challenges outlined in the GCAP and aims to deliver numerous complementary benefits, including:

- Restoration of the salt oasis resort: enhancing water quality and resort facilities.
- Expansion of recreational and green spaces: increasing the per capita share of green open spaces.

| IA5 – Liveable neighbourhood Helwan | Capex: €88.5m (EGP 4,602m) | Opex: €4.4m (EGP 229m) |
|---|---|---|

- Promotion of walkability and cycling: encouraging sustainable modes of transport.
- Reduction of congestion: improving accessibility and road safety.
- Implementation of nature-based solutions: incorporating passive cooling to mitigate urban heat exposure.

**Impacts:**

Reduce local air pollution, noise pollution and GHG emissions; enhance public realm and sense of place, increase reliability of journey times, optimise operational efficiency of the transport network including public transport operating costs, providing local economic benefits and increase climate resilience.

**Detail:**

The area surrounding the Salt Oasis Resort, encompassing 40 hectares of parks, green spaces, and vacant land, presents a unique opportunity to create a vibrant recreational cluster for both the community and tourists. The proposed actions include:

- Transformation of vacant land: developing a cohesive recreational cluster integrated with existing parks to create a larger, interconnected green area for public use.
- Street retrofitting: establishing green connections that link surrounding neighbourhoods to the new recreational cluster.
- Economic impact assessment: ensuring the initiative supports local commerce by improving access for customers, deliveries, and service vehicles.
- Utility mapping: conducting surveys to locate existing underground utilities, ensuring the feasibility of street tree provision without damaging utilities or causing service interruptions.
- Business case and investment plan: preparing detailed plans to secure funding and ensure the project's success.

***Proposed green space rehabilitation will cover 40 hectares, at an estimated cost of 20m EUR***

**Component 2 – Sustainable transport measures**

This action focuses on enhancing sustainable transport within the Helwan district. This initiative focuses on key corridors and access roads, forming a strategic network that connects major assets such as the Salt Oasis, Helwan metro station, Japanese Garden, and various pocket parks.

By adopting superblock principles, dedicated NMT routes, and nature-based solutions, we aim to promote sustainable transport, improve accessibility, enhance road safety, reduce congestion and pollution, and create a Liveable Neighbourhood for Helwan.

**Demand management of private car usage**

To ensure accessibility, safety, and reduced congestion while promoting public transport, we will implement demand management measures for private car usage. This includes:

| IA5 – Liveable neighbourhood Helwan | Capex: €88.5m (EGP 4,602m) | Opex: €4.4m (EGP 229m) |
|---|---|---|

- On-street parking restrictions: enforcing metered, fully restricted, or time-based parking (e.g., 07:00 – 19:00) to manage demand.
- Phase 1 implementation: restricting private car parking on the north-south corridor (3 km) and reallocating space to NMT.
- Targeted locations: including areas within blocks that link to main corridors.

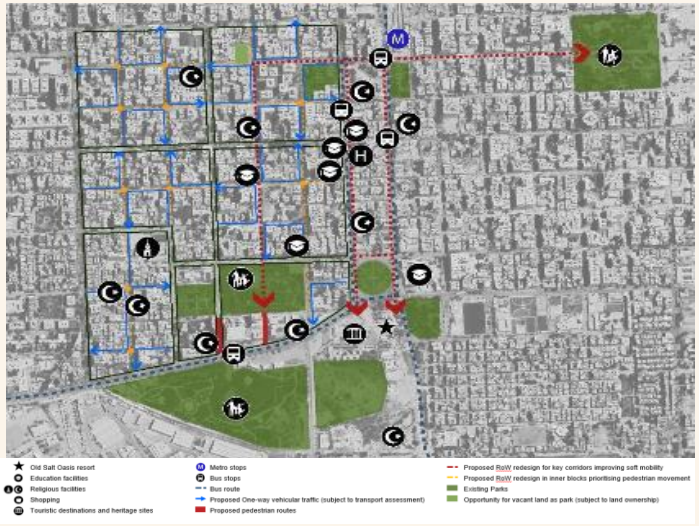
**Improve walking and cycling infrastructure**

To prioritise sustainable transport, we will enhance walking and cycling infrastructure by:

- Increasing open space and greening: identifying opportunities within right of ways to expand open spaces and integrate greenery into the urban fabric.
- Traffic diversion: redirecting traffic to perimeter roads to reduce congestion within inner block areas, thereby increasing public realm and tree canopies for pedestrians.
- North-south corridor development: implementing a 3 km cycle lane at a cost of €2.25 million.
- Comprehensive sustainable transport measures: covering 20 km within the grid structure residential area at a cost of €5 million.

***North-south corridor is 3km. Cost for cycle lane is €2.25m. Sustainable transport measures should be implemented along the corridor as well as within the grid structure residential area, covering 20km. Cost 5m EUR***

Figure 5-5: Helwan liveable neighbourhood concept




**Component 3 – Urban greening and resilience enhancements**

This action is committed to enhancing the resilience and greening of our urban streets to address environmental, social, and infrastructure challenges. This initiative involves retrofitting existing streets to better withstand extreme weather events, increase safety, and improve the comfort of NMT users. Given that Helwan and the southern districts of Cairo experience the most extreme UHI effects, it is crucial to integrate advanced materials and green infrastructure alongside larger infrastructure investments.

- Mapping utilities: conduct surveys to map the location of existing underground utilities, ensuring the feasibility of planting street trees or other natural interventions without damaging utilities or interrupting services.
- Reflective materials and urban greenery: introduce reflective and high-albedo materials and increase urban greenery to lower temperatures and mitigate the urban heat island effect.
- Permeable paving: implement permeable paving, primarily in areas currently allocated to on-street parking, to improve stormwater management.

| IA5 – Liveable neighbourhood Helwan | Capex: €88.5m (EGP 4,602m) | Opex: €4.4m (EGP 229m) |
|---|---|---|

- Business case and investment plan: prepare a comprehensive business case and investment plan.
- Maintenance plans: develop and implement maintenance plans to ensure the effectiveness of sustainable urban drainage and energy-efficient measures. Provide training for relevant personnel on the new systems.

***Resilient urban roads should be closely aligned to the sustainable transport measures, totalling 20km – cost estimate = 20m EUR***

**Component 4 – Efficient street lighting**

To enhance road safety and promote sustainable energy use, the City of Cairo will implement solar-powered, LED street lighting throughout this initiative. This includes:

- On-street enhancements: providing renewable, off-grid, low-demand lighting to improve road safety for all users and residents.
- Green space development: enhancing accessibility and inclusivity and promoting economic and commercial activities throughout the day by improving lighting in green spaces.

***Estimated cost – 500 light poles will require 1m EUR***

**Component 5 – Green building and retrofit scheme**

The City of Cairo is committed to addressing the extreme UHI effects experienced in Helwan and the southern districts. This initiative focuses on enhancing energy efficiency in key locations, aligning with the strategic corridors and areas identified in previous components.

***The scheme may be implemented as a revolving fund of 20m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| UD5: Institutional Development on Geographic Information Management<br>UD6: Heat Preparedness Plan<br>TR4 - Strategies and masterplans<br>TR5: Awareness raising for active travel<br>TR6: Parking enforcement - signs and active enforcement | Ministry of Housing, Utilities and New Communities, Private sector, Cairo Governorate | Development banks, Commercial Banks, private sector concessionaires |

**Potential GHG reduction**

Urban greening and the increase of tree canopies plays a crucial role in reducing GHG. The increase of soft landscape and tree provision supports carbon sequestration. The increase of green canopies providing shade and reducing the urban heat island effect, leads to lowering temperatures and decreased energy demand for air conditioning in buildings, reducing GHG emissions as a result.

| IA5 – Liveable neighbourhood Helwan | Capex: €88.5m (EGP 4,602m) | Opex: €4.4m (EGP 229m) |
|---|---|---|

Direct GHG emission reductions are not quantifiable at this stage, however studies around the globe are currently quantifying the reduction of CO2 emissions due to tree planting (e.g. Million Trees NYC initiative) with positive results.

Early-stage calculations estimate 39,323 $tCO_2e$ reduction per year.

### GESI considerations and benefits

Enhancing the streetscape and increasing open space provision will create safer, more accessible, and welcoming environments. Key actions include:

- Improved street lighting: enhancing lighting to reduce crime risk and the perception of fear, particularly for women and underserved groups.
- Universal accessibility: redesigning streetscapes with universal accessibility principles to improve equality and access to public spaces.
- Promotion of soft mobility: creating environments that support walking and cycling, benefiting those without access to private vehicles and integrating e-ticketing technology in public transport.

### Climate resilience considerations

Climate resilience will be integrated into streetscape design through:

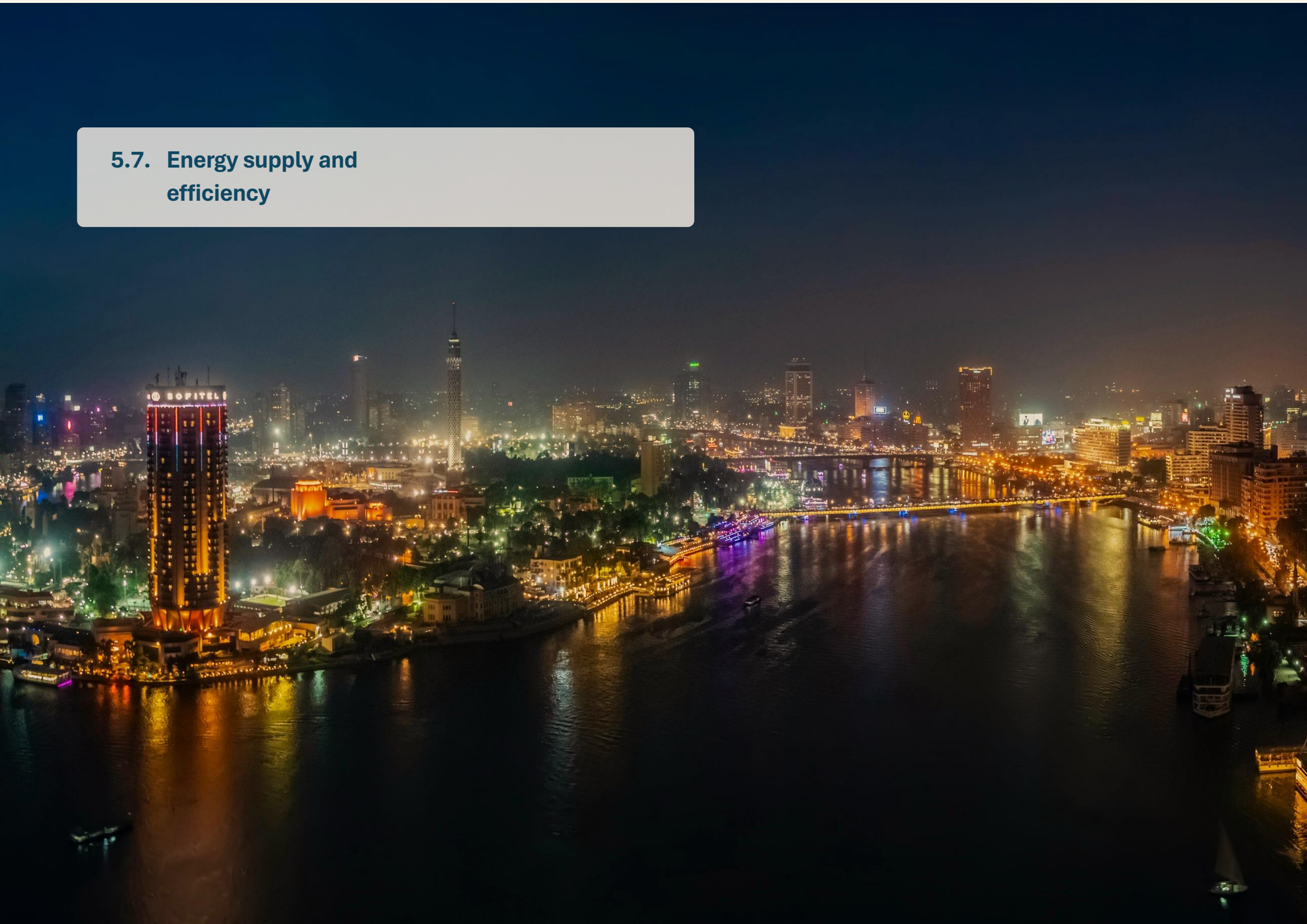
- Sustainable Urban Drainage Systems: Implementing SUDS to manage stormwater effectively.
- High-albedo materials: Using reflective materials to reduce heat absorption and mitigate UHI effects.

### Smart City considerations

To ensure the effectiveness of resilience enhancements, we will:

- Monitor environmental conditions: use sensors to track air and water quality, noise levels, and traffic flows.
- Energy-efficient streetlights: install streetlights with sensors to adjust lighting levels based on real-time conditions.
- Local metering: implement local metering of municipal supplies, such as street lighting, to monitor energy consumption.

## 5.7. Energy supply and efficiency



### 5.7.1. Sector summary

The distribution network in Cairo experiences significant electrical losses, both physical and commercial.

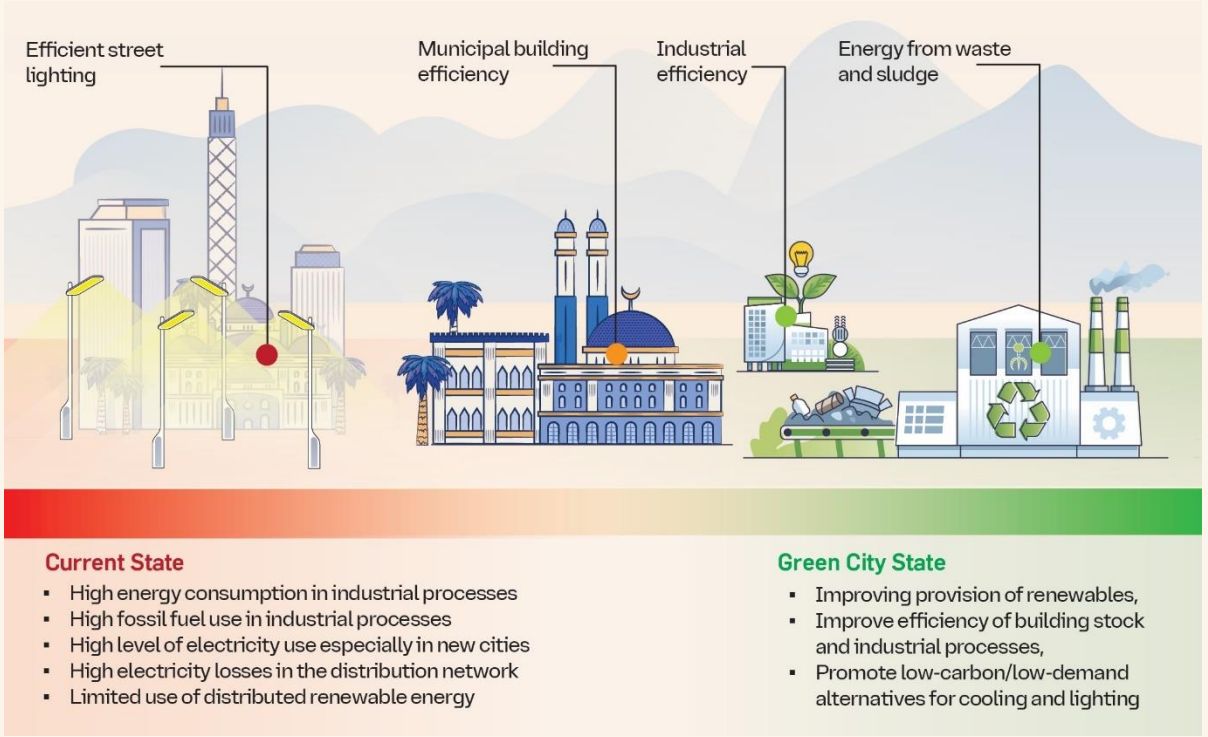
Some industrial zones are located within residential areas, where inefficient and high-energy-use industrial processes pose potential health risks to nearby residents due to pollution.

The application of solar energy for heat and power in the industrial sector remains limited, primarily due to the high costs of purchasing and installing equipment.

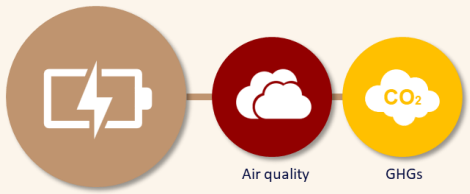
Additionally, there is limited suitable space for micro-renewables in the existing building stock, and issues related to the design and maintenance of solar PV systems affect their overall performance.

Figure 5-6: Energy supply and efficiency roadmap

**Sector goal: Reduce GHG emissions and cost of public and private energy supply.**




Key challenges



## 5.7.2. Investment actions

### EN1 - Efficient streetlighting

**Description**: During periods of high demand, load shedding and power outages can occur across Cairo, leading to prolonged streetlight outages. These blackouts negatively impact all road users and reduce accessibility, inclusivity, and safety, particularly for women and underserved groups. Currently, most streetlights use traditional incandescent bulbs, which place a significant demand on the electricity grid. However, LED lamps consume only 25-30% of the power used by traditional lamps.

We propose replacing traditional streetlamps with LED lamps, and expanding streetlighting to more streets and public places throughout the governorate. Additionally, using solar power will further reduce reliance on the grid while offering benefits in implementation, operation, and maintenance.

**Detail**: This initiative can be applied to main roads and streets and integrated with urban development projects for green parks. It is also promising for compounds and new developments, where real estate developers can implement centralised systems for easier maintenance and cleaning. The action can be implemented governorate-wide in large-scale connected schemes, with major roads and highways determined by the Cairo Cleaning and Beautification Authority. Estimates suggest up to 3,000 units will cover main roads around the city.

Specific plans include:

- Shaheed Road, Nasr City - 400 units
- Al-Mokhaiam Al-Daem St., Nasr City - 284 units
- Al-Hegaz St., Misr El-Gedida - 500 units
- Ismailia Road (from El-Herafien bridge till Adly Mansour station) - 240 units
- 6th October bridge - 200 units

A centralised PV system can power street lighting and be integrated with urban development projects, such as green parks, by powering lights and fence lighting with PV.

Key stakeholders for successful implementation include the Electricity Distribution Company, Electricity Regulator and Operations & Maintenance (O&M) service providers. Essential steps to the optimal implementation:

- Proper maintenance schemes to reduce dust and sand buildup, which limits optimal energy generation of solar cells.
- Careful monitoring and implementation of effective operational strategies.
- Automation and control for optimum operation and restricted load shedding where necessary.

**Benefits**: Green and renewable source of energy for street lighting, reducing the electricity consumption from grid. Reduce

energy consumption by 75% of street and public parks lighting. As such, this is financially sustainable initiative, where financial savings quickly outweigh the initial outlay on new lighting systems.

**GESI**: Reduced frequency and severity of blackouts will improve safety and security for women at night. Street lighting will enable women to venture into public spaces, enhancing their safety and inclusivity. Off-grid micro-solar systems will ensure lighting throughout parks and new developments, improving accessibility and inclusivity.

**Smart applications**:
- Expanding the use of street lighting and public places powered by photovoltaic solar energy, provided proper maintenance is done. Ensuring all heads are LED and have optimised control systems. Developing potential solar PV streetlamps with 12-hour storage batteries (0.9-1.2 kWh) for efficient O&M and security

**Supporting policies**:

- Mapping and prioritisation of locations and sufficient space.
- Market assessment of technology for this initiative.
- Capacity building targeting public sector workers on solar energy systems in terms of design, operation and maintenance.
- Simplify existing distributed generation regulations & fully allow Independent Power Producer (IPP) models including virtual Power Purchase Agreement (PPA) with reasonable wheeling/grid connection fees.
- Implementation of the Electricity Law, which encourages electricity utilities to develop demand-side management programs including energy efficiency programs to main users.

**Action implementation**: This action is featured in Integrated Action 2 – Electric bus rapid transit (BRT) , Integrated Action 4 – Transit oriented development in New Cairo and Integrated Action 5 – Liveable neighbourhood Helwan.

## EN2 - Municipal building efficiency

**Description**: Cairo's built environment is significantly impacted by extreme heat due to the high density of buildings, contributing to the urban heat island effect. This issue is expected to worsen with rising temperatures. The use of mechanical ventilation systems, such as HVAC, is already high and will increase during extreme heat events. Failures of these systems can lead to overheating buildings and adverse health impacts on residents

We propose implementing passive energy efficiency measures and building modernisation programs for older buildings, along with the potential integration of renewable energy technologies like solar PV systems in municipal buildings. This initiative aims to reduce energy demand and mitigate the urban heat island effect across the city's building stock.

**Detail**: Currently, 12 out of 38 district administrative authority headquarters have solar PV systems, presenting an opportunity for 26 additional installations across governorate administration buildings.

The initiative includes financing energy efficiency and modernisation programs for old buildings, including the Ministry Quarter. This involves retrofitting old public buildings, such as ministry and governorate-owned buildings, to enhance energy efficiency through insulation, green roofs, shading, proper ventilation, LED lamps, and energy-efficient cooling devices.

The program could also include incremental public building retrofits in heat hotspot areas, focusing on schools, hospitals, and municipal housing.

This would involve installing rooftop grid-connected PV systems on public buildings owned by the Governorate and its authorities to reduce grid energy consumption. Although each system may be small (20-25 kW), the cumulative capacity could exceed 0.5 MW.

The initiative will also raise awareness and knowledge among consumers about adopting energy and water-saving measures in buildings, highlighting how improving energy and water demand in city buildings can decrease GHG emissions and improve air and water quality.

**Benefits**: Green and renewable energy source for public buildings, reducing grid electricity

consumption. Reduction of GHG emissions and energy consumption, leading to savings in electricity and heating. Wider resource savings, such as water through green roofs, allowing increased greening and greywater use for irrigation.

**GESI**: Improving the energy efficiency of residential and municipal buildings will enhance indoor comfort, reduce health issues among residents and workers, extend the lifespan of buildings, and lower cooling costs. The initiative will include provisions for low-income citizens, targeting those most in need to ensure cost savings and support poverty reduction efforts. It will also address the higher energy costs faced by female-headed households, which can adversely impact lower-income households.

**Smart applications**: Smart metering to monitor savings and encourage further efficiency. Smart lighting, air conditioning, and appliances to manage energy use remotely and reduce demand.

**Supporting policies**: Conducting a fuel poverty assessment will identify where intervention would derive the most savings for residents.

**Action implementation**: This action is featured in Integrated Action 7 – Municipal building energy efficiency.

## EN3 - Industrial efficiency

**Description:** Cairo, known as the manufacturing capital of Egypt, hosts numerous manufacturing companies. However, the combination of aged building stock and sub-optimal machinery and processes results in poor energy efficiency in the industrial sector, leading to increased energy requirements, costs, and associated pollution. Some industrial zones, such as El Marg district and Nozha, overlap with residential areas, posing potential health risks to nearby residents due to pollution.

We propose targeting industrial zones in Cairo to improve energy efficiency and promote renewable energy in industrial and manufacturing processes.

**Detail**: Actions to enhance industrial efficiency in Cairo should focus on:

- Funding or incentivising high-efficiency equipment: Support the use of high-efficiency equipment, including motors and boilers, building on existing donor programs such as UNIDO motors. This can also expand to cover resource efficiency, including water and raw materials.
- Constructing grid-connected photovoltaic (solar power) plants: Install PV arrays on rooftops, parking structures, or open land adjacent to manufacturing facilities. Enhanced benefits can be achieved if the virtual PPA model is fully enacted by the regulator.

Enhancing efficiency and expanding renewable energy provision in industrial, manufacturing, and commercial processes will reduce grid demand, improve provision for other sectors, and limit the need for load shedding and planned blackouts.

For enterprises, reduced grid demand lowers electricity costs, integrates renewable energy into the grid, and may qualify for tax incentives and rebates. Egyptian Electric Utility and Consumer Protection Agency (Egypt ERA) recently approved the private-to-private (wheeling system) agreement between companies, where one generates and another consumes, with the grid taking wheeling charges against distribution.

**Benefits**: Reduce raw materials and energy consumption of industrial facilities, reducing operating costs and hence increase their profitability whilst reducing CO2 emissions.

Increase the renewable energy contribution and reduce the carbon footprint of industrial facilities, supporting factories in purchasing carbon credits and enhancing export capabilities.

**GESI**: Improving industrial energy efficiency will reduce air pollution in surrounding residential districts, raise awareness of energy resource use, improve working conditions for employees in factories, and provide housing for women near industrial zones with high employment opportunities, promoting social and economic inclusion.

**Smart applications**: Comprehensive use of smart and digital applications, such as EMS and smart metering, to monitor and control energy use of existing and new equipment. This will also help identify faults and schedule maintenance.

**Supporting policies**: Technical due diligence reviews will be required to assess the impact of grid-connected PV on network stability (e.g. harmonics and voltage impact) and identify/address any issues. Regulatory review will be necessary to formalise relationships between stakeholders (developer, off-takers, regulatory entities such as Egypt ERA, DC, Transmission companies).

**Action implementation**: This action is featured in Integrated Action 6 – Industrial energy efficiency.

## EN4 - Energy from waste and sludge

**Description**: Recent studies indicate that Cairo produces approximately 15,000 tons of solid waste daily, with over 80% ending up in open dumpsites or landfills. Additionally, the city's sewage treatment plants have a capacity of over 5 million cubic meters of sewage water treatment daily.

This initiative proposes converting a portion of municipal solid waste and sewage sludge from the surrounding area into usable energy, producing electricity and heat.

**Detail**: Energy from Waste (EfW) schemes are essential components of modern waste management and energy strategies. Through combustion, heat recovery, and electricity generation, these schemes can convert municipal waste into valuable energy, reducing landfill use, lowering greenhouse gas emissions, and contributing to a more sustainable and resilient energy system. Anaerobic digestion of properly segregated organic waste can also produce biogas for further use.

- Al-Salam Landfill: The Al-Salam landfill has been closed for a long time, and ongoing infrastructure work ensures it is safe to collect and flare landfill gases. However, converting methane to electricity has been hindered by the low feed-in tariffs for electricity generated from waste.
- Wastewater Treatment Plants: Cairo has 10 WWTPs with a capacity of over 5 million cubic meters per day. Energy generation potential exists through processing WWTP sludge to produce alternative fuel and electricity, which can then be used to meet the electricity needs of the WWTPs. This aligns with the MoHUUC's current direction and can be implemented at all WWTPs, considering available space.

Successful implementation requires an effective contractual framework for off-take agreements, access to land, take-or-pay schemes, provision of spare parts, continuous training, and proper O&M.

**Benefits**: Waste to Energy (WtE) schemes have multiple, simultaneous benefits, across numerous sectors and challenges in Cairo.

- Reduction in landfill use: WtE plants reduce the need for landfills by converting waste into energy.
- Energy production: WtE plants produce electricity and heat, meeting the energy needs of communities and industrial areas, and reducing greenhouse gas emissions.
- Utilisation of sludge: This initiative makes use of sludge that would otherwise be dumped, producing alternative fuel and electricity.
- Waste valorisation: Reduces waste sent to landfills by converting it into usable energy.

**GESI**: Development of EfW facilities creates job opportunities during construction and operational phases, encouraging greater inclusion of women in the water sector workforce and supply chain, reducing gender disparity, and providing more career opportunities.

**Smart applications**: EfW systems will include smart sensors and advanced processing controls to optimise operational efficiency. Integration into the grid will require load management and scheduling to respond to demand.

**Supporting policies**: Detailed sludge assessment; Providing space inside WWTP and preparing Environmental and design studies, Tender documents.

**Action implementation**: This action is included in Integrated Action 9 – Wastewater network upgrade and Integrated Action 12 – 15th of May landfill rehabilitation

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### 5.7.3. Policy actions

- **EN5 - Regulatory change** - Implementing regulatory changes will promote the adoption of energy efficiency measures. This includes simplifying existing distributed generation regulations and fully allowing IPP models, including virtual PPAs with reasonable wheeling/grid connection fees. Additionally, the implementation of the Electricity Law will encourage electricity utilities to develop demand-side management programs, including energy efficiency initiatives for major users.
- **EN6 - Supporting financing initiatives** - To support financing and implementation, private sector finance and lending should be encouraged. This includes linking factories with technical and financial support programs for resource efficiency provided by development partners such as the Green Economy Financing Facility (GEFF) and Groupe Agence Française de Développement (AFD), as well as the Ministry of Commerce and Industry. Measures should also ensure that local bank branches are aware of and promote green finance facilities and opportunities, particularly those near industrial facilities.
- **EN7 - Green building incentivisation** - To promote energy and water efficiency, we will launch a local compensation scheme that offers monetary rewards for consumption savings. This scheme will incentivize the use of high-efficiency appliances, including reverse cycle air conditioning for heating. Local bank branches will be encouraged to promote green finance facilities and opportunities. Regulatory changes will embed good practices within the building sector. We will develop or review existing building codes to reduce energy and water use, supported by capacity-building initiatives targeting real estate developers to promote low-energy building design concepts.

## 5.7.4. Integrated Action 6 – Industrial energy efficiency

| IA6 – Industrial energy efficiency | Capex: €25.3m (EGP 1,313m) | Opex: €1.3m (EGP 65m) |
|---|---|---|

**Location:**

Multiple districts (Cluster B)

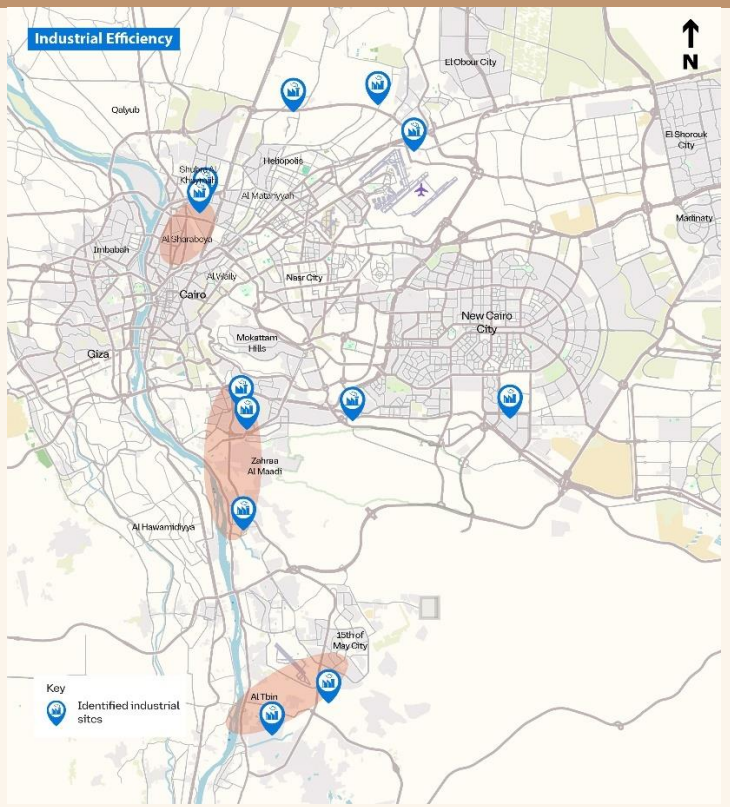
**Timeframe for implementation:**

2026 – 2034

**Challenges addressed:**

**Actions:**

EN3: Industrial efficiency




**Description:**

To promote energy efficiency within our industrial and manufacturing sectors, this initiative focuses on providing financial support for energy-efficient machinery through a revolving fund, which can be managed by a local financial institution (e.g., a commercial bank for on-lending) or through direct senior loans to privately-owned enterprises. Key industrial sectors targeted include the southern industrial clusters of Tora and Helwan/Tebin districts, as well as northern industrial sites within residential districts such as Shobra.

**Impacts:**

Adoption of efficient machinery, improved technological processes and onsite energy generation will reduce energy demand, offering cost savings, decreased GHG emissions, and improved air quality.

**Detail:**

**Component 1 - Feasibility assessment**

This component aims to simplify access for enterprises to specific measuring equipment (e.g., thermal imagers, gas analysers) and assist them in identifying non-productive uses of energy resources. Key actions include:

| IA6 – Industrial energy efficiency | Capex: €25.3m (EGP 1,313m) | Opex: €1.3m (EGP 65m) |
|---|---|---|

Thermal imaging surveys: Facilitating thermal imaging surveys to detect thermal energy leaks from steam/hot water pipelines, enclosing structures, and gas-using equipment. This information will help enterprises allocate funds to eliminate such leaks.

Renewable energy integration mapping: Developing a mapping of potential renewable energy integration options in the industrial sector, both on a park basis and factory basis. This includes identifying opportunities for shared utilities and considering a national roadmap for RE integration with specific KPIs.

**Component 2 - Rooftop PV systems**

Based on the feasibility assessment findings, this component will establish a revolving fund to facilitate the installation of grid-connected PV systems at factories in the governorate. Key actions include:

- Virtual power purchase agreement: Applying Virtual PPAs to enable factories to increase PV capacity if they have limited space. This may require legislative and policy support from the Governorate or ministry.
- Roof structure inspection and reinforcement: Combining the action with a program to inspect and, if necessary, reinforce roof structures to ensure they are suitable for PV system installation.
- Dedicated solar PV program: Developing a program to finance, incentivise, and support the installation of solar PV on public buildings. This includes determining the availability of suitable equipment and qualified installers, developing approved lists of equipment and suppliers, and providing training to ensure local content in new installations.

***Cost estimate – revolving fund of 20m EUR***

**Component 3 - Efficient machinery**

In addition to PV installations, this initiative will support investments in high-efficiency motors and variable frequency drives (VFDs) to optimise energy use in machinery. This includes applications such as pumps, fans, conveyors, energy-efficient motors, boilers, compressed air networks, other mechanical systems, and energy management programs. Where appropriate, it will also encompass water and material reuse and recycling to maximise benefits and improve the business case for investment. Investing in modern, energy-efficient equipment will:

- Reduce energy consumption: lower operational costs and extend equipment lifespan.
- Improve efficiency: enhance the performance of industrial processes.
- Support sustainability: contribute to environmental goals by reducing energy demand from fossil fuels.

This initiative will be financed through a revolving fund of €5 million, similar to successful programs like the GEFF by the EBRD and the UNIDO revolving fund for ESCOs.

***Cost estimate = revolving fund of 5 million EUR***

| IA6 – Industrial energy efficiency | Capex: €25.3m (EGP 1,313m) | Opex: €1.3m (EGP 65m) |
|---|---|---|

To ensure the success of this initiative, we will:

- Raise awareness: Promote energy-saving measures and the benefits of energy-efficient equipment among local enterprises.
- Build capacity: Provide training on energy saving, energy efficiency, and energy management

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| EN5 - Regulatory change<br>EN7 - Green building incentivisation<br>WA6: Revise current water tariff structure | Industrial zones and developers, Regulatory entities: Egypt ERA, Transmission companies, North and South Cairo Electricity Distribution Companies, Development partners (UNIDO, IFC) | Development bank, Revolving fund administered by local commercial bank, green investment programs such as GEFF and AFD |

**Potential GHG reduction**

Enhanced efficiency and renewable energy generation will significantly reduce GHG emissions.

Early-stage calculations estimate 12,750 $tCO_2e$ reduction per year.

**GESI considerations and benefits**

Reduced air pollution: improved efficiency and on-site renewables will lower energy demand from fossil fuels, reducing air pollution in surrounding residential districts. Enhanced energy resource use: training and capacity building will foster a culture of efficient energy use.

**Climate resilience considerations**

Improved working conditions: more efficient machinery will reduce latent heat, improving factory working conditions.

Nature-based solutions: consider greening roofs and implementing wider nature-based solutions on-site.

**Smart City considerations**

Resource monitoring: use heat and imaging sensors to identify and reduce resource demand within facilities.

Energy management: implement local metering to monitor energy consumption and optimise usage.

## 5.7.5. Integrated Action 7 – Municipal building energy efficiency

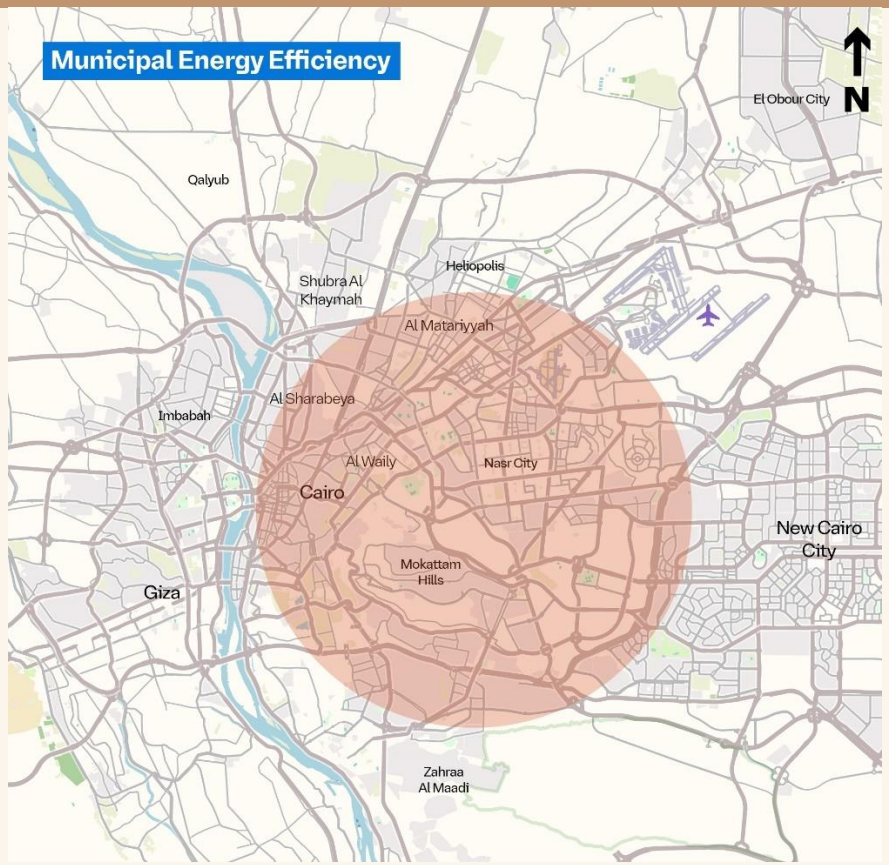
| IA7 – Municipal building energy efficiency | Capex: €36.1m (EGP 1,877m) | Opex: €1.8m (EGP 36m) |
|---|---|---|

**Location:**

Governorate wide (Cluster C, D, E). Exact locations to be confirmed – governorate wide across 26 district headquarters (HQs)

**Timeframe for implementation:**

2025 – 2034




**Challenges addressed:**


**Actions:**

UD1: Urban Green Space Development

UD2: Resilient Street Scape Design ;;

EN2: Municipal building efficiency

**Description:**

This initiative focuses on implementing passive energy efficiency measures and renewable energy technologies, such as solar PV systems, in municipal buildings. Currently, 12 of the 38 district administrative authority HQs have solar PV systems, presenting an opportunity for 26 additional installations across the governorate.

**Impacts:**

Increased resource efficiency including energy savings. Improved energy resilience. GHG emissions reduction. Improved resilience to climate change including reduction in exposure to extreme heat, particularly in the context of regular climate-related power cuts.

| IA7 – Municipal building energy efficiency | Capex: €36.1m (EGP 1,877m) | Opex: €1.8m (EGP 36m) |
|---|---|---|

**Detail:**

**Component 1 – Energy Performance**

We will develop an energy performance program using public funds to finance and support retrofit improvements in existing public buildings, including government offices, schools, and hospitals. This program will focus on:

- Thermal efficiency: improving thermal efficiency using low-carbon and locally available materials.
- Efficient lighting and equipment: retrofitting buildings with energy-efficient lighting and equipment.
- Climate resilience: integrating measures to address overheating and surface water flooding.

Key actions include:

- Energy audits: conducting energy audits for 26 municipal HQ buildings to identify the worst-performing buildings and understand the primary reasons for their poor performance.
- Technical and commercial studies: undertaking studies to determine the most effective interventions and assess the availability of suitable equipment and labour skills.
- Priority list: completing energy audits on all public buildings and developing a priority list to address the worst-performing buildings.

**Component 2 – Retrofitting of energy efficiency and climate resilience measures**

We will retrofit governorate district buildings to reduce energy consumption and improve climate resilience through various interventions, such as:

- Energy management plans: developing energy management plans for each public building under the city's responsibility.
- Passive ventilation: implementing passive ventilation systems.
- Energy-efficient systems: installing energy-efficient air conditioning systems, secondary glazing, insulation/shading, and led lighting.
- Enhanced energy management: increasing the energy management system in buildings to improve thermal comfort during extreme heat events and climate change.

***Cost estimate – revolving fund of 15m EUR***

**Component 3 – Renewable Energy system installation**

We will develop a program to finance, incentivise, and support the installation of solar PV systems on public buildings. This program will include:

- Training and assistance: providing training and assistance to manufacturers to ensure local content in new installations.
- Roof-mounted PV systems: developing roof-mounted PV systems, assessing costs per intervention, and identifying benefits such as annual cost savings and emissions reduction.
- Rooftop assessments: conducting assessments to identify suitable rooftops for solar PV installation, potentially using satellite imagery.
- Equipment and installer lists: developing approved lists of equipment and suppliers and determining their availability.

| IA7 – Municipal building energy efficiency | Capex: €36.1m (EGP 1,877m) | Opex: €1.8m (EGP 36m) |
|---|---|---|

- Implementation plan: setting upper boundaries for the number of interventions, determining total costs, and engaging with suitable funders. We aim to implement solar PV systems across 10 administrative district HQ buildings per year, with an average capacity of 10-15 kWp per building (total of 150 kW annually).

***Cost estimate for 20 micro PV systems of 600k EUR***

**Component 4 – Urban greening and resilience enhancements**

This action builds on a commitment to enhancing the resilience and greening of our urban streets to address environmental, social, and infrastructure challenges. This initiative involves retrofitting existing streets to better withstand extreme weather events, increase safety, and improve overall functionality. Key streets near municipal buildings will be identified for integrating advanced materials and green infrastructure, creating more durable streets that contribute to a healthier and safer environment. Cooler ambient temperatures in these areas will also maximise building efficiency measures.

Integrating this action offers a no-regret, time and cost-efficient way of establishing resilient streets across Cairo, where the opportunity presents itself. Actions include:

- Mapping utilities: conduct surveys to map the location of existing underground utilities, ensuring the feasibility of planting street trees or other natural interventions without damaging utilities or interrupting services.
- Reflective materials and urban greenery: introduce reflective and high-albedo materials and increase urban greenery to lower temperatures and mitigate the urban heat island effect.
- Permeable paving: implement permeable paving, primarily in areas currently allocated to on-street parking, to improve stormwater management.
- Business case and investment plan: prepare a comprehensive business case and investment plan.
- Maintenance plans: develop and implement maintenance plans to ensure the effectiveness of sustainable urban drainage and energy-efficient measures. provide training for relevant personnel on the new systems.

***Cost estimate for resilient landscaping and greening of up to 20km of roads surrounding action sites = 20m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| UD6: Heat Preparedness Plan<br>EN6: Awareness raising of Supporting financing initiatives<br>EN7: Green building incentivisation | NUCA, Cairo Governorate district municipalities | State budget<br>IFI/ donor organisations |

**Potential GHG reduction**

Public buildings are expected to have higher emissions than private properties, with more roof space available for PV arrays, leading to significant GHG reductions.

Early-stage calculations estimate 1,436 $tCO_2e$ reduction per year.

| IA7 – Municipal building energy efficiency | Capex: €36.1m (EGP 1,877m) | Opex: €1.8m (EGP 36m) |
|---|---|---|

### GESI considerations and benefits

Energy cost reduction: this program will reduce energy costs for all consumers, significantly benefiting underserved groups, including low-income households, single-headed female households, and the elderly.

Inclusive decision-making: ensure these groups are represented in the decision-making process to ensure their voices are heard.

Skill development and job opportunities: seek opportunities to offer skill development programs and job opportunities for women and disadvantaged groups.

### Climate resilience considerations

Cooling and insulation measures: identify opportunities to introduce cooling and insulation measures where possible.

Renewable energy sources: further explore the use of renewable energy sources, such as solar PV systems.

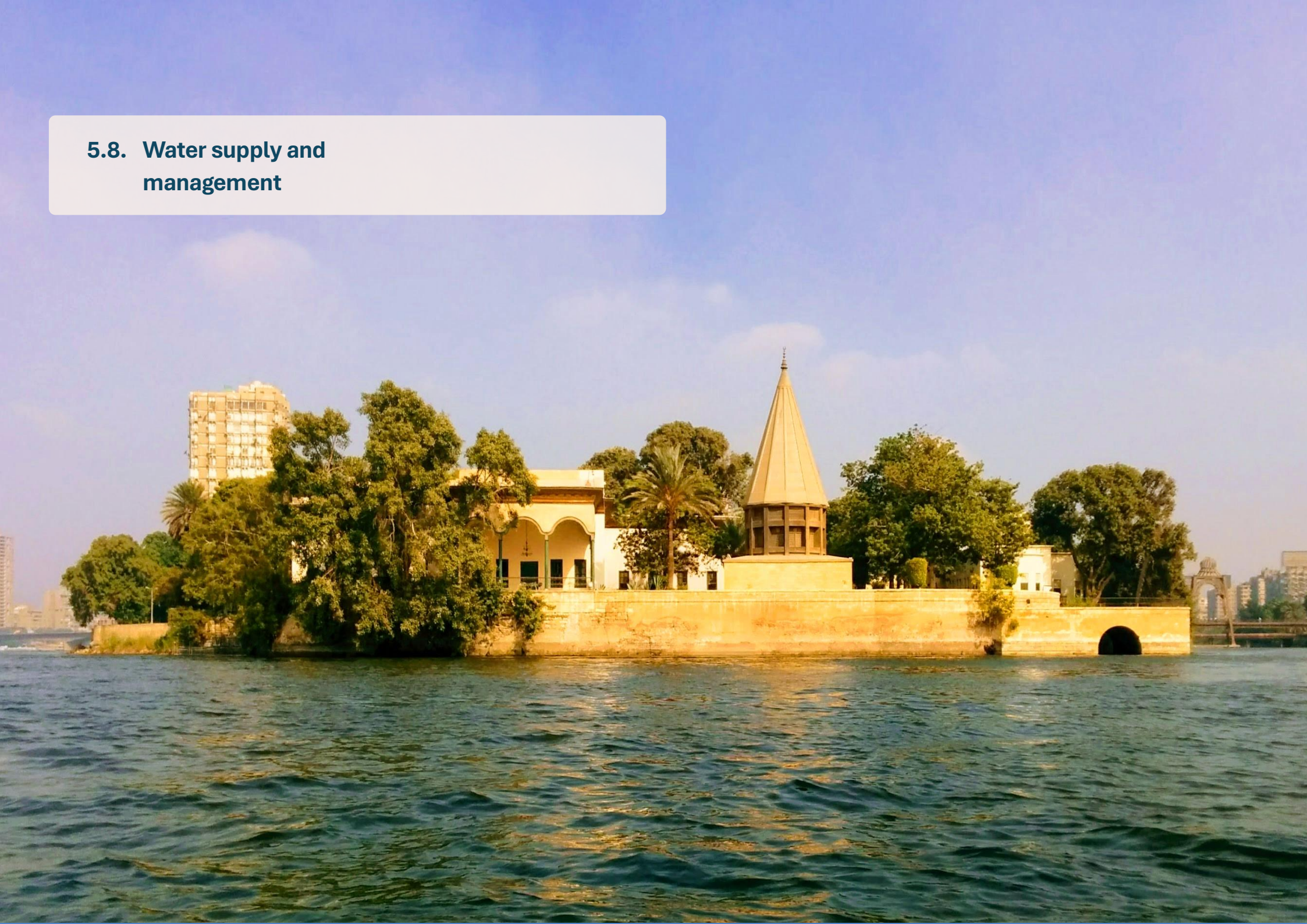
Water efficiency measures: implement measures to reduce water demand and increase city resilience to drought and dry spells.

### Smart City considerations

The action proposes a number of smart initiatives such as solar PV and solar water heaters.

The latest technology in lighting, pumps and equipment should be used when retrofitting buildings.

## 5.8. Water supply and management



### 5.8.1. Sector summary

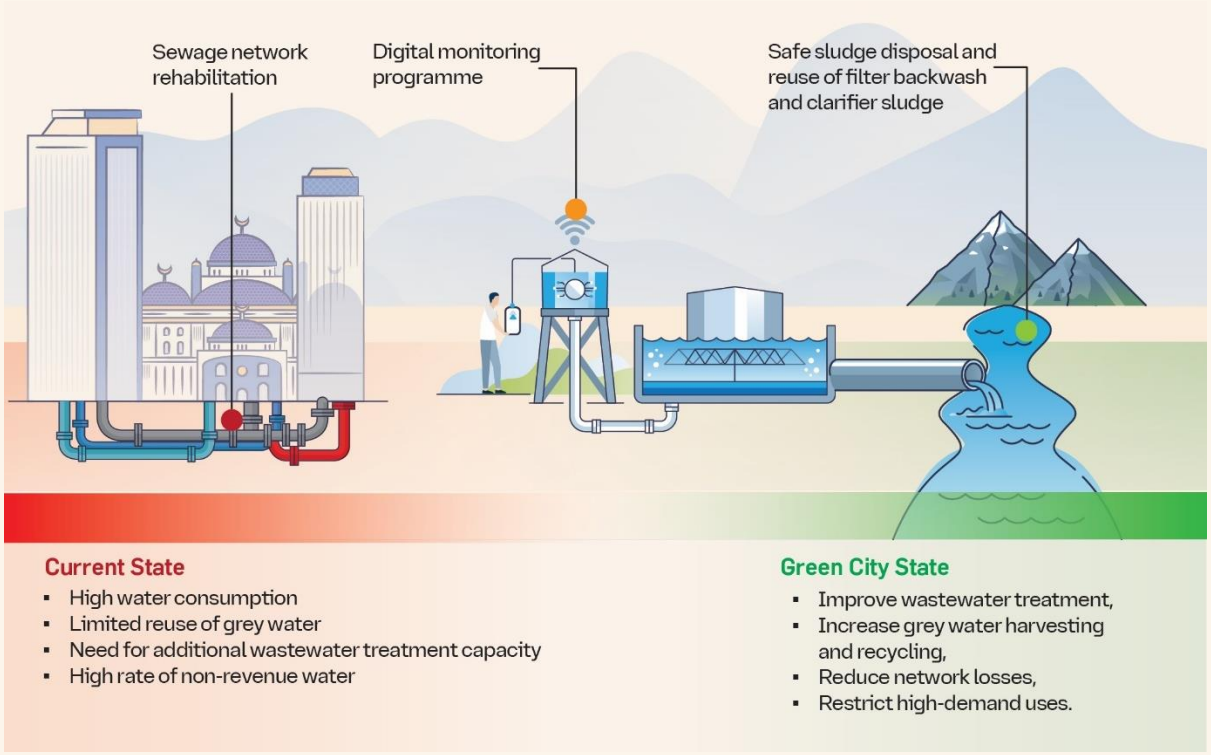
The water sector in Cairo faces significant challenges, primarily due to high non-revenue water and elevated per capita water usage. The governorate's water consumption stands at 305 litres per capita per day, significantly higher than the national average of 230 litres per capita per day.

Despite being served by 11 drinking water treatment plants with a combined capacity of 6 million cubic meters per day, the actual operational capacity is only 4.6 million cubic meters per day, according to CAPMAS 2021/22 data.

Additionally, the governorate's four wastewater treatment plants are operating at or above their capacity of 6,870,000 cubic meters per day.

Figure 5-7: Water supply and management roadmap

**Sector goal: Enhance availability/reduce water demand for all purposes.**




Key challenges

## 5.8.2. Investment actions

### WA1 - Sewage network rehabilitation

**Description**: Several districts within the governorate lack sufficient capacity to serve their populations. With anticipated population growth, urban development, and changing precipitation patterns due to climate change, it is essential to upgrade, expand, and redirect sections of the wastewater network. This initiative aims to rehabilitate and enhance the wastewater sewerage network in selected locations across the governorate.

**Detail**: Three specific areas have been identified for capacity enhancement and improved connections to existing wastewater treatment facilities. The proposed actions include network expansion and reorientation to divert wastewater to treatment plants with available capacity, or the implementation of gravity network pipelines instead of multiple pumping stations. The specific projects are:

- Nasr City: Upgrade and rehabilitate the wastewater sewerage network to adequately serve the population.
- Zahraa Al Maadi district: Divert and expand the sewage pipeline network to Al Amrya pumping station and then to Al Gabl Al Asfar WWTP, replacing the Arab Abo Msaed WWTP.
- El Marg district: Upgrade the wastewater networks using a gravity pipeline instead of seven existing pumping stations to reach Ain Shams pumping station, addressing improper planning and unexpected population increases.

These measures will enhance network efficiency and ensure adequate capacity for the districts, both now and in the future. Investment in these locations will provide reliable wastewater services and improve network planning.

Such measures will improve efficiency of the network, while ensuring suitable capacity for that district, both now and in the future.

Investment in all three locations will provide adequate wastewater service provisions to the population and more effective/efficient planning of the network in these districts.

**Benefits**: Gravity pipe networks offer a straightforward solution for storm and wastewater management. Compared to pumping stations, they require less maintenance, improving reliability, cost, and energy efficiency.

Reduced energy demand will sustain operations, allowing alternative uses of existing grid power and reducing GHG emissions from the wastewater treatment process.

**GESI**: Safe and reliable sewage water treatment is crucial for basic urban sanitation and reducing infections and waterborne diseases. Improved wastewater treatment will particularly benefit women and girls, who are more vulnerable to the risks associated with inadequate sanitation facilities.

**Smart applications**: Digital monitoring, including telemetry, pressure/flow sensors, and water quality sensors, can be integrated into any network rehabilitation scheme to monitor flows and detect faults, blockages, or leaks.

**Supporting policies**: A detailed investigation of proposed areas, including the presence of other services and utilities infrastructure, is necessary. Detailed mapping and integration into GIS, along with prioritisation of areas, will support effective implementation.

**Action implementation**: This action is featured in Integrated Action 9 – Wastewater network upgrade.

## WA2 - Digital monitoring programme

**Description**: Water losses within Cairo's network present a significant challenge. Given the high utilisation of available water, increasing demand, and supply vulnerabilities due to climate change, reducing non-revenue water is critically important.

Currently, smart data monitoring systems are used in certain locations and assets within the water treatment network. For example, SCADA is applied in drinking water treatment plants (DWTPs) like Rod El Farag DWTP for monitoring and controlling various purification stages. It is also used in DMAs to monitor pressures and flows at boundary points, with data transferred wirelessly to the head office.

This initiative proposes the incorporation of smart and digital solutions throughout the water supply and treatment network.

**Detail**: The implementation of the SCADA system in water treatment plants is essential to enhance digital monitoring of water volumes, pressures, and systems. This action will provide comprehensive digital monitoring for the water network, enabling early fault detection, data analysis, and reporting, thereby improving responsiveness, emergency responses, and safety.

The programme will include network digital monitoring and smart performance optimisation, developing the use of "smart" data systems for assessing water losses, leakage detection, DMA & Discharge Mixing Zone (DMZ), and pressure management programs, along with GIS mapping for selected areas.

This initiative will enhance the monitoring and evaluation processes of the water network, reduce water losses, and increase data analysis, reporting, and responsiveness. Previous efforts in this area faced challenges due to the high costs and difficulties of replacing networks in older districts. Therefore, this action may need to be confined to new cities despite its critical importance.

**Benefits**: Effective and dynamic operation of DWTPs and WWTPs will help reduce non-revenue water, prevent sewage network failures, and minimise pollution of subsurface and groundwater. It will also ensure a reliable supply of treated sewage effluent for agriculture or other purposes, thereby reducing pollution of natural waterways.

**GESI**: Reducing water waste will support water availability across the governorate. Increasing the inclusion of women in the water sector will lead to more career opportunities.

**Smart applications**: Some water and wastewater treatment plants already have smart monitoring systems, which need to be extended to the entire system. This should include an online dynamic system to facilitate decision-making processes.

**Supporting policies**: Before implementation, a non-revenue water reduction strategy should be prepared based on an accurate assessment of the

current status, with key performance indicators (KPIs) set. An assessment of existing facilities and instruments is necessary to determine the needs for SCADA implementation.

**Action implementation**: This action is implemented as part of Integrated Action 8 – Municipal water efficiency and Integrated Action 9 – Wastewater network upgrade.

### 5.8.3. Supporting policy actions

- **WA3 - Non-revenue water reduction strategy –** The NRW reduction strategy will address both apparent losses (such as theft or metering inaccuracies) and real losses (such as leaks). This involves assessing the current condition of assets to identify key hotspots and developing mitigation measures. These measures include improved inspection regimes for leak detection and repair, enhanced maintenance and asset management practices, manual and smart pressure management, improved metering and billing accuracy, creation of district metered areas, and better institutional capacity and stakeholder coordination.
- **WA4 - Public awareness campaigns -** Public awareness campaigns will aim to reduce water consumption, supporting the NRW strategy and the implementation of new measures in the city. These campaigns will educate the public and commercial enterprises on the importance of water conservation and the impact of NRW. They will encourage responsible water use, such as checking and reporting leaks, expanding the provision of water-saving plumbing accessories, and managing water supply pressure in areas where water is directly sourced without tanks. These efforts will also help consumers save money. Additionally, increasing awareness of water quality and conservation, especially among women, will empower them to make informed decisions about water use.
- **WA5 - Key performance indicators -** Developing KPIs for the water network, which are regularly monitored and improved, is essential. These indicators can be based on the Green Cities indicators database to ensure alignment with internationally approved benchmarks and support the monitoring and evaluation of the GCAP.
- **WA6 - Water tariff structure revision -** Revising the current water tariff structure to be more cost-reflective, especially for large consumers, is crucial. Many water service companies operate at a loss due to subsidised water tariffs, particularly in the residential sector, and the relatively high NRW. Investigating and revising tariffs, or implementing different subsidies based on the end consumer, should be considered to improve operating margins for water suppliers and provide financial incentives for end users to reduce consumption.

## 5.8.4. Integrated Action 8 – Municipal water efficiency

| IA8 – Municipal water efficiency | Capex: €112m (EGP 5,837m) | Opex: €5.6m (EGP 112m) |
|---|---|---|

**Location:**

El Salam City and Fostat (Clusters C & D)

**Timeframe for implementation:**

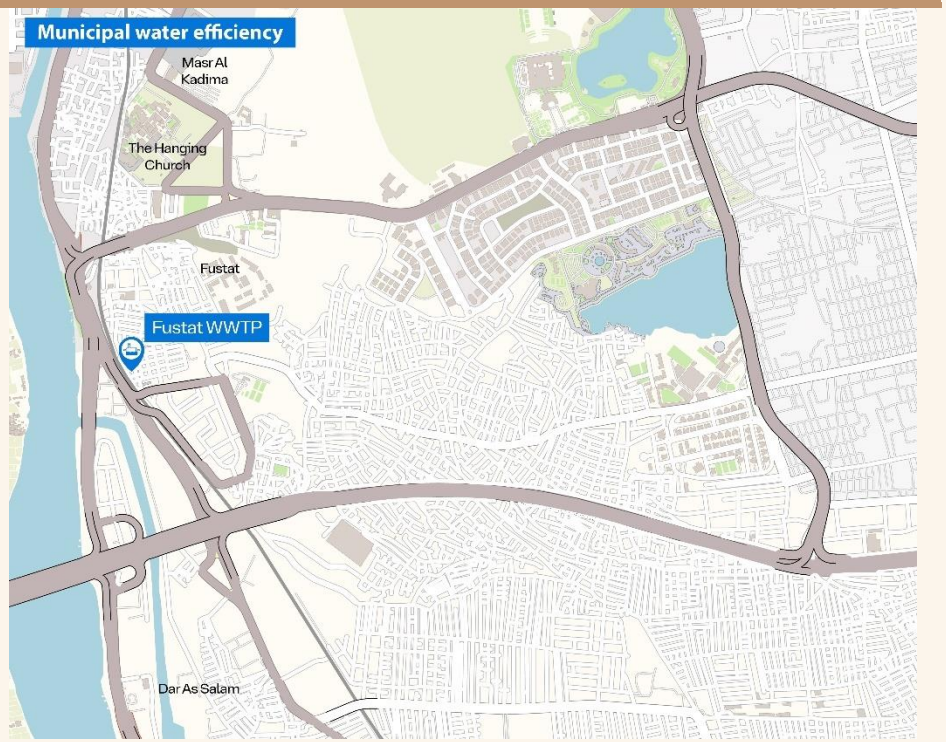
2028 – 2031

**Challenges addressed:**


**Actions:**

EN4: Energy from waste and sludge

WA2: Digital monitoring programme




**Description:**

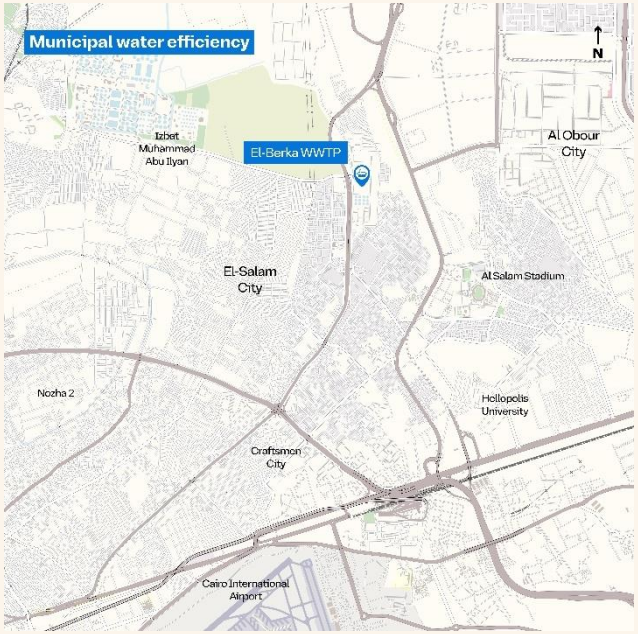
The City plans to process WWTP sludge to generate electricity and alternative fuel, meeting WWTP energy needs and contributing surplus to the grid. Sludge will be treated through digestion, with digestate managed for agricultural use or as low-carbon fuel. A digital monitoring programme will enhance facility efficiency with smart data systems, SCADA, and capacity building.

**Impacts:**

Reduce the wastages from WWTPs. Reduce the energy requirements to run the WWTPs. Reduce the soil and water pollution and the health issues related to pollution. Increase the water use efficiency. Social inclusion and equity will increase along with reduced health issues, economic benefits and improved water environment and increase climate resilience.

| IA8 – Municipal water efficiency | Capex: €112m (EGP 5,837m) | Opex: €5.6m (EGP 112m) |
|---|---|---|

**Detail:**




**Component 1 - Energy from waste and sludge**

The City proposes an innovative approach to processing WWTP sludge to generate alternative fuel and electricity. This initiative aims to meet the electricity needs of the WWTPs and contribute surplus energy to the grid.

- Sludge treatment and energy generation: all sludge from El-Berka and Balaks will be treated through digestion to produce electricity, sufficient to cover the energy consumption of the WWTPs at El-Berka and the new sludge treatment plant on the east bank. The generated electricity can be supplied to the grid under a feed-in-tariff arrangement or directly to Gabar Al Asfar or Balaks via dedicated power lines.
- Digestate management: the digestate will be dewatered to 28% and recycled for agricultural use or composted to 40% dry solids. Additionally, thermal solar drying, utilising waste heat from digestion and energy recovery processes, will be considered to dry the sludge to 80% dry solids (biosolids) for sale as a low-carbon fuel, such as in cement kilns.

***Cost estimation for energy from sludge facility = 110m EUR. Cost estimation for sludge treatment facility = 30m EUR***

**Component 2 - Digital monitoring programme**

To enhance the efficiency and maintenance of new and existing facilities, the city will implement a comprehensive digital monitoring programme.

- Smart data systems: installation of smart data systems will support fault detection, equipment maintenance, and asset management schedules. These systems will provide real-time data on equipment status, enabling rapid fault identification, accurate cause determination, and predictive maintenance scheduling.
- SCADA system: a SCADA system will monitor water volumes, pressures, and quality of incoming wastewater, including measurements of total dissolved solids, turbidity, and pH. This will help identify loads that may pose risks to the system or affect the quality of treated water.
- Capacity building: the programme will include the installation of monitoring and sensing equipment within the WWTPs and the necessary infrastructure within water companies to manage the system. This will require a comprehensive capacity-building package.

Some of the components to include are

- Data transmission enabled sensors and devices for real time monitoring.

| IA8 – Municipal water efficiency | Capex: €112m (EGP 5,837m) | Opex: €5.6m (EGP 112m) |
|---|---|---|

- Centralised data centres where the real time data is analysed and used to make informed decisions.
- Automated chemical dosing systems to optimise the use of chemicals such as coagulants and disinfectants based on the real time data analysed through AI algorithms.

***Cost estimation for digital monitoring and SCADA systems = 2m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| EN5: Regulatory change<br>WA5: Develop key performance indicators for the water network | Private sector developer, Electricity utility companies, HCWW, Governorate, WWTPs, Egypt ERA (to review FIT value, and the fair relation between the developer and utility) | Development banks, HCWW |

**Potential GHG reduction**

The following activities are expected to contribute to greenhouse gas (GHG) reduction:

- Energy generation from sludge: utilising sludge to produce energy will lower ghg emissions.
- Reduced water abstraction: reusing treated sewage effluent will decrease the need for water abstraction, further reducing ghg emissions.
- The creation of greenspaces around the infrastructure and resilience improvements will enhance carbon sequestration.

Early-stage calculations estimate 5,548 $tCO_2e$ reduction per year.

**G&EI Considerations and benefits**

The city is committed to implementing inclusive and gender-sensitive designs in our proposed infrastructure projects. This approach ensures that all staff benefit from the improvements. Additionally, by enhancing the quality of TSE, we aim to significantly reduce soil and water pollution, thereby decreasing health issues related to pollution. These health benefits will extend to the entire community, including all genders and economically disadvantaged groups.

**Climate resilience considerations**

Our proposed investments will be climate-proofed to enhance resilience against current and future environmental shocks. Efficiency improvements will reduce the need for water supply abstractions from the Nile, which is increasingly vulnerable to climate change impacts. By generating energy from sludge, we will decrease our reliance on fossil fuel-based electricity production. This initiative will also ensure that sludge is utilised efficiently, rather than being wasted through landfilling.

**Smart City considerations**

Improving the quality of TSE will benefit natural waterways and support agricultural reuse. The digitalisation of our water and wastewater systems (Component 3) will enhance water use efficiency and management. This will reduce system leakages, lower overall water treatment costs, and result in significant energy savings.

## 5.8.5. Integrated Action 9 – Wastewater network upgrade

| IA9 – Wastewater network upgrade | Capex: €53.2m (EGP 2,768m) | Opex: €2.7m (EGP 53m) |
|---|---|---|

**Location:**

Governorate wide (Clusters D & E)

**Timeframe for implementation:**

2025 – 2034

**Challenges addressed:**

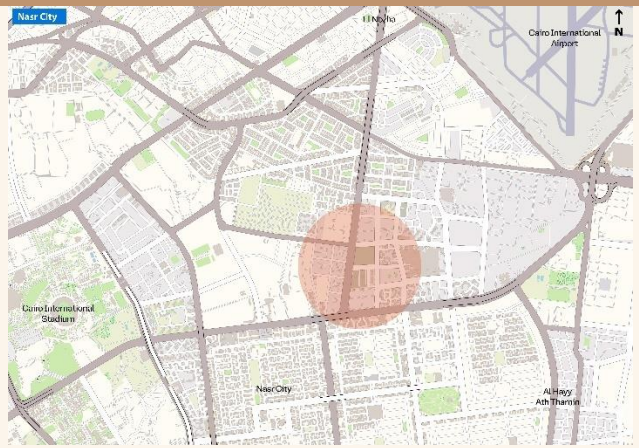
**Actions:**

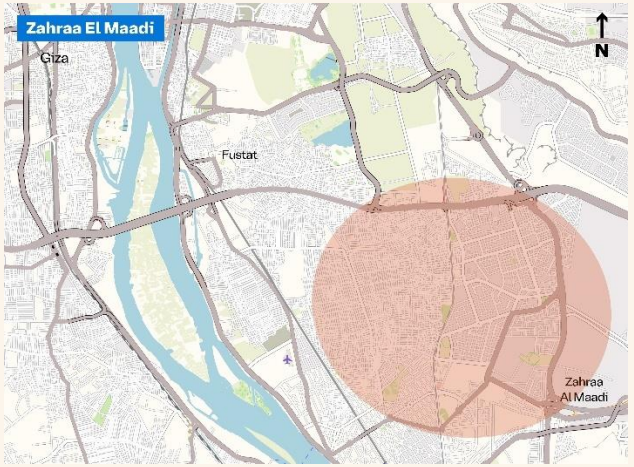
WA1: Sewage network rehabilitation

WA2: Digital monitoring programme

UD1: Urban Green Space Development

UD2: Resilient Street Scape Design




**Description:**

Across the governorate, several districts lack sufficient capacity to adequately serve their populations. To address this, we have identified three key areas for capacity enhancement and improved connections to existing wastewater treatment facilities. To maximise the impact of these investments, we propose integrating digital/smart monitoring systems and environmental improvements into a comprehensive investment package.

**Impacts:**

Ensuring access to all residents through expansion of the network. Reduction in improperly disposed wastewater. Improved efficiency of WWTPs.

## IA9 – Wastewater network upgrade

**Capex: €53.2m (EGP 2,768m)** **Opex: €2.7m (EGP 53m)**

**Detail:**

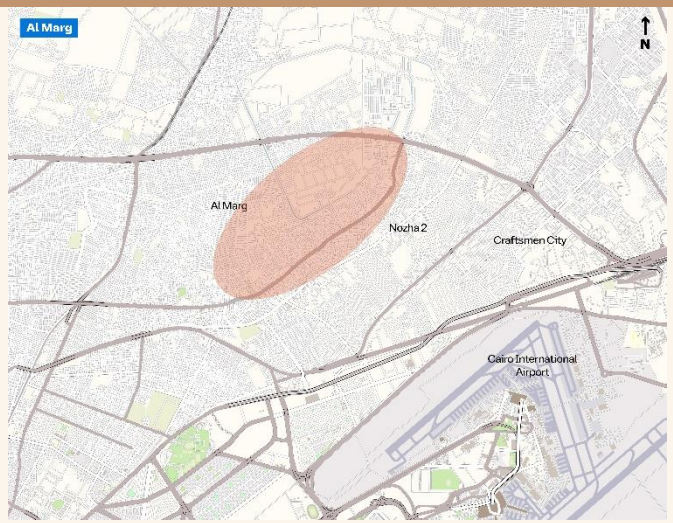
### Component 1 - Sewage network rehabilitation

Upgrade/rehabilitate WW network to Nasr City: This will include an increase in the diameter of the combined line from 900 mm to 1200 mm over a 5 km stretch. Cancel the Rabaa Al-Adawiya station and implement an alternative line using pipe jacking along the route (extension of Abbas El Akkad St., Abdel Azim Wazir St., El Nozha St.) To the disposal point at the intersection of El Nozha Street and Asmaa Fahmy Street, with a combined line diameter of 1500 mm over 1600 metres.

***Cost estimate – 4.1m EUR***

Divert the wastewater network in Zahraa Al Maadi to Al Gabl Al Asfar WWTP, which has the capacity to treat the area's wastewater, instead of the current Arab Abo Saed WWTP – Divert the network to the Amerya pumping station, with a pipe network diameter of 1200 mm over 5 km, including the implementation of manholes.

***Cost estimate – 11.5m EUR***




Upgrade the wastewater sewerage network to serve the population of El Marg adequately – Implement a pipe network with diameters ranging from 600 mm to 2500 mm over a total length of 7.3 km.

***Cost estimate – 18.9m EUR***

### Component 2 - Digital monitoring programme

This component will enhance the efficiency and responsiveness of the sewage network through real-time monitoring.

Install monitors within the sewage network to provide real-time data and record volume measurements. This will enable the detection of blockages, overtopping, and provide alerts to operators for swift action. Additionally, remote testing of sewage quality will monitor high pollutant levels, improving the quality of treated water.

| IA9 – Wastewater network upgrade | Capex: €53.2m (EGP 2,768m) | Opex: €2.7m (EGP 53m) |
|---|---|---|

Installation of monitoring and sensing equipment within the network and the necessary IT infrastructure within water companies to manage the system. This will include a comprehensive capacity-building package.

***Cost estimate – 2m EUR***


**Component 3 – Urban greening and resilience enhancements**

This component focuses on retrofitting existing streets to enhance greening and promote resilience against environmental, social, and infrastructure challenges. The goal is to update and modify street infrastructure to better withstand extreme weather events, increase safety, and improve overall functionality.

Given that sewage network rehabilitation requires significant groundworks, re-establishing the road network (as identified in Component 1) presents an opportunity to integrate advanced materials and green infrastructure. This aims to create more durable streets that contribute to a healthier and safer environment for residents. Actions include:

- Survey and mapping: conduct surveys to map the location of existing underground utilities. This ensures the feasibility of planting street trees or other natural interventions without damaging utilities, avoiding service interruptions, and retaining utility access.
- Reflective and albedo materials: introduce reflective and high-albedo materials and increase urban greenery to lower temperatures and mitigate the UHI effect.
- Permeable paving: implement permeable paving, particularly in areas currently used for on-street parking, to improve stormwater management.
- Business case and investment plan: prepare a comprehensive business case and investment plan.
- Maintenance plans: develop and implement maintenance plans to ensure the effectiveness of sustainable urban drainage and energy-efficient measures. Provide training for relevant personnel on the new systems.

***The above three schemes have a combined length of 12.3 km. Therefore, measures are proposed along the total length of these rehabilitated sections, with an estimated cost of 20m EUR***

| IA9 – Wastewater network upgrade | Capex: €53.2m (EGP 2,768m) | Opex: €2.7m (EGP 53m) |
|---|---|---|

**Supporting policy:**

WA3: Non-revenue water (NRW) reduction strategy
WA4: Public awareness campaigns to make consumers aware of the importance reducing water losses
WA5: Develop key performance indicators for the water network which are regularly monitored and improved
UD6: Heat Preparedness Plan

**Stakeholders:**

Private sector developer, Electricity utility companies, HCWW, Governorate, WWTPs

**Potential funding sources and revenue generation:**

Development banks, HCWW

**Potential GHG reduction**

Improved capacity/maintenance and optimally designed sewer networks can reduce emissions through preventing blockages and ensuring proper flow to minimise conditions that lead to methane production in sewage systems.

**GESI considerations and benefits**

Enhancing the water network distribution across three districts will expand essential services to a significant number of people:

- Nasr City: Approximately 750,000 residents.
- El Marg: Approximately 850,000 residents.
- Al Maadi: Approximately 95,000 residents.

This initiative is estimated to benefit around 75,000 citizens directly. Urban greening in these areas will reduce extreme heat, promote active travel, and improve conditions for street vendors.

**Climate resilience considerations**

Climate-resilient streetscape design is a key component of this action. The proposed investments will be climate-proofed to reduce vulnerability to current and future climate shocks, offering a cost-effective approach compared to addressing these issues separately. Infrastructure modifications and upgrades will capitalise on advances in materials and green infrastructure features.

**Smart City considerations**

This action includes a comprehensive package of smart integration:

- Real-time monitoring: installation of sensors and devices for real-time monitoring.
- Data analysis: centralised data centres for real-time data analysis and informed decision-making.
- Automated systems: implementation of automated systems to optimise operations based on real-time data.

## 5.9. Solid waste management

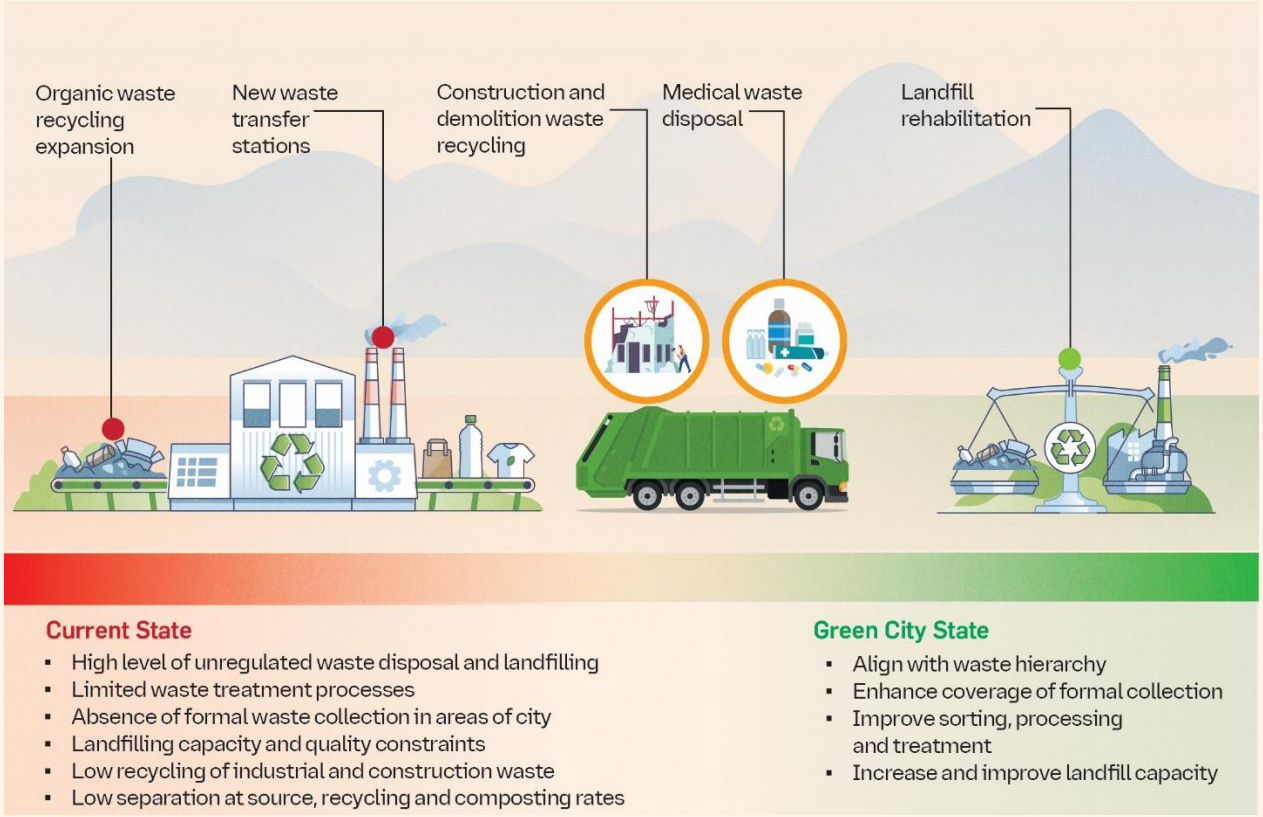
## 5.9.1. Sector summary

Cairo generates approximately 15,000 tons of solid waste daily, with only 7,450 tons formally collected. The primary challenge in SWM is the large volume of informally managed waste. Currently, eight transfer stations provide around 67% of the required capacity.

Only 7% of MSW is disposed of in sanitary landfills, while 81% ends up in open dumpsites. A lack of awareness about SWM and waste management laws hampers source separation and recycling efficiency. Additionally, compost produced in MBT facilities is often of low quality due to contamination with other waste components.

Figure 5-8: Solid waste management roadmap

**Sector goal: Implement a sustainable MSW management system to reduce improper and harmful disposal practices.**




### Key challenges

## 5.9.2. Investment options

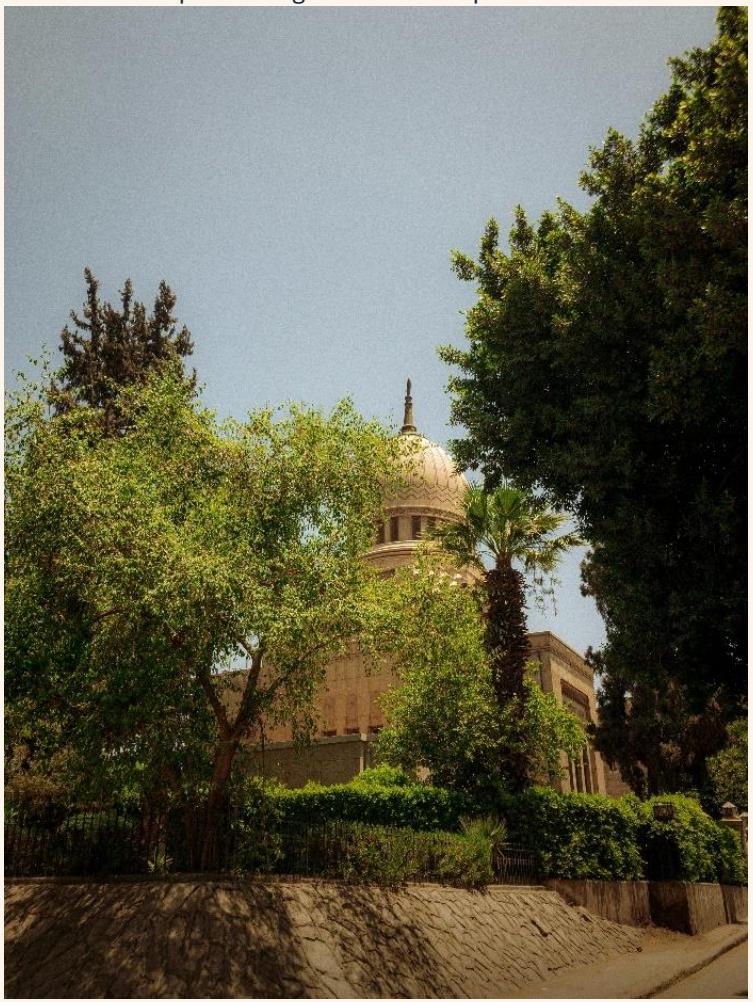
### SW1 - Organic waste recycling expansion

**Description**: One of the key factors affecting SWM efficiency is the collection of mixed MSW, where the organic fraction is the highest and mixed with other waste types. Field studies indicate that the organic fraction in Egypt's mixed MSW ranges from 40% to 70%. The low quality of compost from MBT facilities is due to contamination with materials like PVC, batteries, or broken glass.

This initiative proposes a coordinated scheme for household-level segregation, door-to-door collection, and consolidation of organic waste across the city.

**Detail**: This action consists of a range of initiatives and associated benefits:

- Pilot districts: Implement door-to-door municipal waste collection in several pilot districts to expand recycling activities and enhance waste segregation at the source.
- Co-processing: Combine the organic portion of MSW with tree pruning waste to produce compost and biogas (or ethanol).
- Alternative fuel production: Utilise the organic portion of MSW to produce compost for soil conditioning and alternative fuels like biogas and ethanol, promoting a bio-based and circular economy.
- Pilot segregation: Test source segregation in selected areas to evaluate the system, gain stakeholder acceptance, and scale up processing for broader implementation.



- Agri-waste management: Consolidate agri-waste from tree and park pruning, managed by the Cairo Beautification Department, to enhance viability and profitability.
- Private sector support: Engage private sector companies, such as Ertekaa and Enviro-Master, already working with the Cleaning Authority, to support the scheme.

**Benefits**: Proper segregation and collection of waste prevent informal recyclers or waste pickers from taking high-value waste, enhancing recycling activities, reducing waste separation costs, and increasing profits by keeping all waste portions intact.

**GESI**: Integrating and involving the public, private, and informal sectors in collection will enhance adoption, support local communities, and utilise the knowledge and expertise in Cairo's waste management sector. Women, who often handle unpaid household tasks like cleaning, cooking, and childcare, play a significant role in waste management. Expanding organic waste recycling with a focus on involving and supporting women will yield substantial sustainability benefits.

**Smart applications**: Develop comprehensive waste reporting and data management systems, including electronic waste carrier licenses and weighbridges at all waste facility gates.

**Action implementation**:

This action is proposed in Integrated Action 10 – Solid waste management network expansion.

## SW2 - Landfill rehabilitation

**Description**: Over 80% of collected MSW in Cairo is disposed of in unregulated dumpsites or landfills that do not meet international standards.

This initiative proposes the rehabilitation of landfills in the governorate to align with EU and international standards. Additionally, options to expand existing landfill capacity and establish on-site facilities for waste transfer and recycling will be explored.

**Detail**: Improper landfilling and waste management lead to numerous issues in Cairo, including environmental challenges identified in the GCAP. These issues include air pollution from burning waste, methane emissions contributing to climate change, and leachate contaminating local groundwater, soil, and biodiversity. These problems also create nuisances for local communities through pests, odours, and unsightly conditions.

Greater Cairo currently has only two formally recognised landfills: the 15th of May facility within Cairo governorate and the Aloubor landfill in Qalubia governorate, which serves both Cairo and Qalubia. The Al-Salam landfill has recently been closed, and infrastructure has been installed to generate methane gas. The NUCA is tendering the construction of a new landfill and recycling plant in the 10th of Ramadan city to serve five nearby cities, with a designed capacity of 3,000 tonnes per day.

Proper landfill design is crucial for efficient waste management and reducing environmental and social impacts. This proposal includes developing engineered landfills that meet EU Landfill Directive standards, with adequate capacity to handle the total waste generated in the medium term. Construction to these standards will ensure that contaminants are contained through proper lining and capping of cells, promoting efficient waste decomposition and resource recovery.

Properly designed and constructed landfills will significantly reduce the land required for waste disposal, either by reducing the overall surface area or by allowing for higher capacity within the site, thereby prolonging its usable life.

**Benefits**: Reducing leachate contamination will improve groundwater quality, while enhanced gas management will improve air quality and greenhouse gas benchmarks.

Job creation in landfill rehabilitation will support the local economy, and reducing open dumpsites will improve living conditions for local communities. Women, who often manage household waste, will particularly benefit from improved waste management practices.

**GESI**: Job creation opportunities will arise during both the construction and operational phases, supporting the local economy. Reducing open dumpsites will decrease the incidence of pests and local nuisances such as noise and odours.

**Smart applications**: Incorporating electronic management systems will streamline operations, track progress, and monitor KPIs. Modern equipment for automated waste sorting and processing will enhance efficiency and operational capacity.

**Action implementation**: This action is proposed Integrated Action 12 – 15th of May landfill rehabilitation.

## SW3 - Recycling expansion

**Description**: Official data from the governorate indicates that 40% of collected waste is recycled, with the remainder going to dumpsites. However, the Egyptian Environmental Affairs Agency (EEAA) estimates the actual recycling rate to be closer to 12%. Consequently, a significant portion of MSW in the governorate is not properly processed, leading to substantial environmental impacts and missed opportunities to valorise waste and generate economic value.

In 2023, Cairo governorate, excluding four new cities, generated approximately 4.5 million tons of construction and demolition (C&D) waste. The governorate plans to recycle this construction waste and has expressed the need for crushers and factories to reuse the material in road base layers, platform separators, and interlocked road pavements.

This initiative proposes the development of dedicated facilities for recycling both MSW and C&D waste.

**Detail**:

- **MSW recycling facilities** - Currently, there are two waste treatment plants with a total nominal capacity of 8,500 tons per day. The El-Salam facility is operating at full capacity and is being closed, while the 15th of May facility only manages to treat approximately 25% of the waste it receives and serves the southern districts of Cairo and 15th of May City. Both plants use outdated technologies with their treatment lines are nearing the end of their operational life. Enhancing these facilities to incorporate modern MBT will reduce the volume of waste sent to landfills, recover valuable materials, and produce renewable energy. Similar MBT systems and processes are already in use in other governorates within Egypt and can be easily adopted.
- **C&D waste recycling** - Currently, there is a 70-feddan open dumpsite in New Cairo where construction waste is mixed with municipal solid waste. Due to the difficulty of transporting construction waste, the NUCA is seeking private developers to recycle the construction waste on-site, which will also require the separation of municipal waste. A feasibility study is needed to establish a C&D waste treatment and recycling facility, as this approach has not been successfully applied before due to a lack of information and study on the matter.

**Benefits**:

- Resource conservation: Reducing the demand for primary resources.
- Hazardous waste management: Preventing hazardous waste from being part of MSW in landfills and ensuring proper treatment by licensed companies.
- Landfill reduction: Reducing the need for landfilling MSW and ensuring only treated MSW residues are landfilled.

**GESI**: Awareness-raising campaigns will promote the scheme and sensitise local residents, with a focus on involving and supporting women, who are more likely to be responsible for household-level waste management. Expanding recycling efforts with a focus on women will have significant sustainability benefits.

**Smart applications**: Smart and digital solutions can provide detailed monitoring of waste quantities and types, as well as online monitoring and coordination of waste movement within the hierarchy and associated facilities.

**Action implementation**:

This action is proposed in Integrated Action 12 – 15th of May landfill rehabilitation and Integrated Action 13 – Construction and demolition waste recycling.

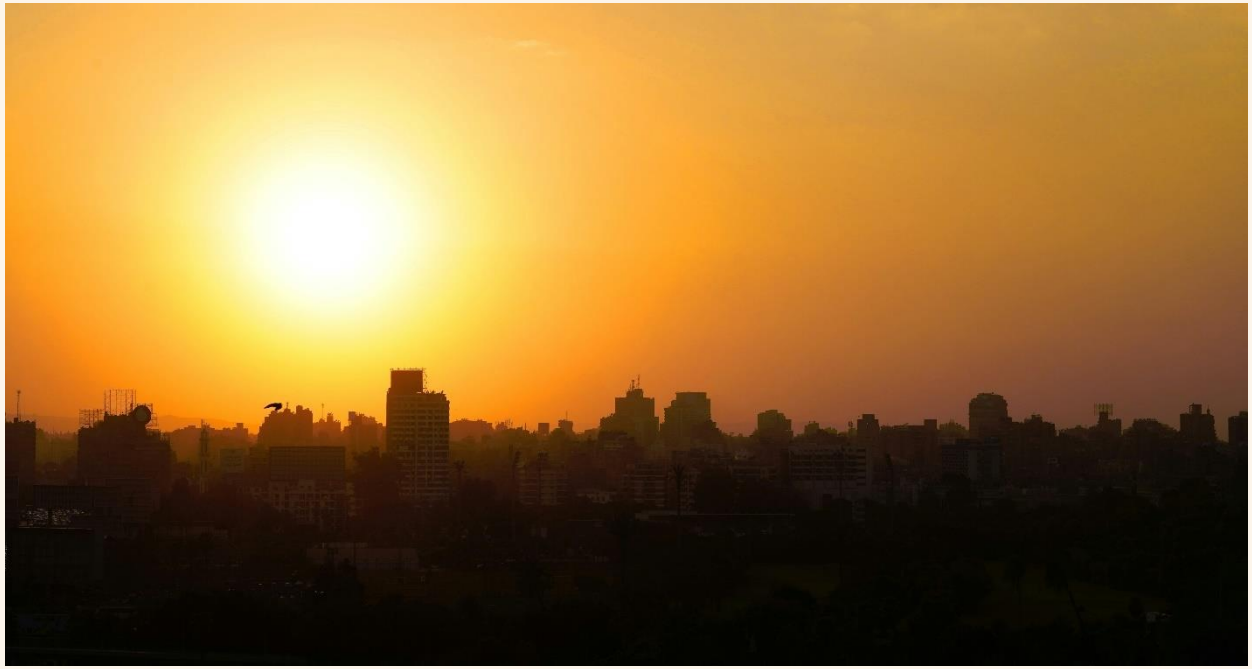
## SW4 - Medical waste disposal

**Description**: In Cairo governorate, only a limited amount of medical waste is properly treated. Out of the 293.7 tons of medical waste generated daily, only 85.2 tons (29%) are collected for treatment before safe disposal. The remaining 208.6 tons are collected for open burning in landfills or dumpsites.

This initiative proposes the establishment of dedicated medical and hazardous waste treatment and recycling facilities for hospitals.

**Detail**: Currently, over 70% of medical waste in Egypt is openly burnt in dumpsites, posing significant environmental and health risks. This action involves supplying autoclaves (shredders and sterilisers) to medical facilities for on-site treatment of hazardous healthcare waste. This model has proven successful in Egypt.

Additionally, the construction of a centralised facility to treat hazardous healthcare waste for Cairo Governorate is proposed. This facility would handle waste that cannot be sterilised, using incineration, and would include a designated area for the final disposal of incineration ashes. A 5-feddan site at the 15th of May facility is proposed for this purpose, which already has a steriliser and landfill on-site.



**Benefits**:

- On-site treatment: Medical waste is treated on-site, reducing storage time.
- Environmental protection: Reduces the likelihood of waste being dumped or openly burnt, mitigating the spread of diseases and contamination of soil and groundwater.
- Efficiency: Decreases the amount of waste requiring transport, treatment, and disposal.
- Safety: Ensures the safe treatment and final disposal of hazardous healthcare waste.

**GESI**: This initiative will protect informal sector workers, such as waste pickers and sorters, from exposure to hazardous waste.

**Smart applications**:

- Smart bins: Monitor waste levels and alert management personnel when full, preventing overflow and associated health risks.
- Smart tagging and tracking: Accurately track and categorise medical waste, ensuring precise record-keeping.

**Action implementation**: This action is proposed in Integrated Action 11 – Medical waste disposal.

## SW5 - New waste transfer stations

**Description**: Currently, the governorate operates eight waste transfer stations with a combined capacity of approximately 10,900 tonnes per day, and an additional 700-tonne-per-day station is under construction. However, these stations are insufficient to handle the generated waste, and it is estimated that one or two more transfer stations are needed.

Depending on land availability, we propose constructing additional waste transfer stations to receive waste and transfer it to landfills and other processing facilities.

**Detail**: Given Cairo's vast area and the significant distances between districts and available waste processing sites, suitable waste transfer stations are essential as intermediate collection points for all types of solid waste generated in the governorate. At these stations, waste collected from residential, commercial, and industrial sources is unloaded from smaller collection vehicles, consolidated, and reloaded onto larger, long-distance transport vehicles. This process optimises the efficiency and effectiveness of waste management by reducing the number of trips and vehicles required for waste transportation.

To meet current demand and maintain suitable geographical coverage across the governorate, it is estimated that two additional waste transfer stations are necessary. Existing transfer stations in New Cities, built by the NUCA in New Cairo and Obour, are sufficient to transport waste to the 10th of Ramadan landfill/recycling plant. There is no need for additional stations in Badr or Sherooq due to their proximity to the 10th of Ramadan.

The governorate authorities have identified the El Salam recycling factory as a potential location to serve as a transfer station for transporting waste to the 10th of Ramadan complex, serving northern districts in Cairo. To address gaps in the south, the 15th May landfill is considered an appropriate location for a transfer station.

**Benefits**: Consolidation and onsite processing will lead to:

- Improved sorting and recycling: Enhanced sorting and onward recycling of MSW.
- Valuable material extraction: Improved extraction of valuable organic materials.
- Reduced transportation: Decreased transportation of MSW, particularly to distant sites such as the 10th of Ramadan landfill.

**GESI**: Creating employment opportunities in waste management will contribute to the local economy and can include the incorporation of Cairo's large, established informal waste sector.

Transfer stations can mitigate the impact of large-scale disposal or processing facilities located near residential areas.

**Smart applications**:

- Advanced machinery: Automation of processing through advanced machinery.
- Digital management: Improved waste tracking and capacity management of transfer facilities, facilitating coordination with onward processes in the waste hierarchy.

**Action implementation**: This action is proposed in Integrated Action 10 – Solid waste management network expansion and Integrated Action 12 – 15th of May landfill rehabilitation.

### 5.9.3. Supporting policy actions

- **SW6 - Market assessments** - To ensure the economic viability of actions within the solid waste sector, it is crucial to understand the presence of onward markets that can generate revenue from processed waste products. This requires conducting waste composition surveys and studies to confirm the availability of sufficient input materials for processing.
- **SW7 - Waste management strategy** - Following the market assessments, we will prepare a comprehensive solid waste management and circular economy strategy for the governorate. This strategy will include a market study for circular economy products to evaluate revenue potential and justify investments. For the organic waste stream, a biogas market and infrastructure study will be conducted to identify opportunities for biogas production from waste infrastructure.
- **SW8 - Amendments to regulations** - New policies and regulations will be necessary to define the limits and capacity of landfills, with strict enforcement to ensure compliance. Additionally, reducing restrictions, such as taxes, on existing recycling facilities will encourage more investors to establish licensed recycling operations.
- **SW9 - Awareness raising and capacity building for new initiatives** – The successful adoption of new processes by public, private, and municipal stakeholders depends on engagement, buy-in, and capacity building. We will support programs to raise awareness of existing green finance options for startups and SMEs, fostering further private sector participation in the sector. Additionally, linking factories with technical support and donor programs for waste recycling, provided by development partners (e.g., GEFF, AFD), will promote access to concessional finance, aligning with sustainable waste management principles.

## 5.9.4. Integrated Action 10 – Solid waste management network expansion

| IA10 – Solid waste management network expansion | Capex: €13.5m (EGP 702m) | Opex: €0.7m (EGP 0.68m) |
|---|---|---|

**Location:**

Governorate wide (Cluster C, D, E)

**Timeframe for implementation:**

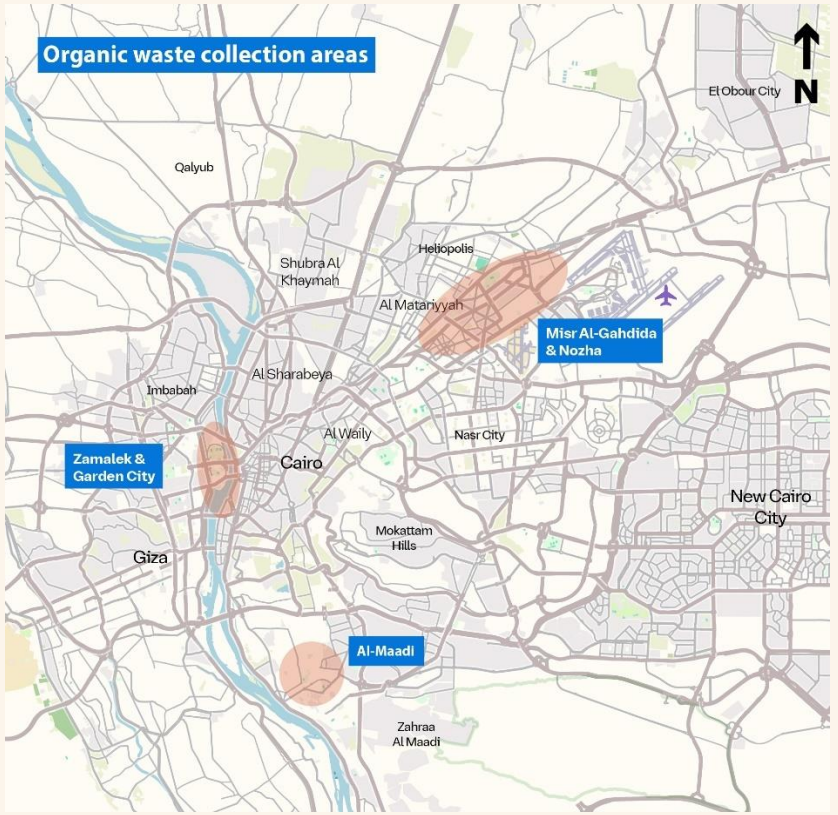
2026 – 2028

**Challenges addressed:**

**Actions:**

SW1: Organic waste recycling expansion

SW5: New waste transfer stations




**Description:**

This action will implement an effective system for the collection of organic municipal solid waste, as well as wider transportation, storage and treatment of MSW across the governorate.

**Impacts:**

Increased primary waste sorting and onward recycling of organic waste will reduce quantity of disposed waste, and the associated air pollution from burning. Promotion of circular economy and revenue generation through production of compost.

**Detail:**

**Component 1 – Organic waste recycling expansion**

An essential preliminary step is the development of a waste characterisation study to ensure the availability and critical mass of suitable organic material to justify investment. This study will determine the quality of input material and ensure there is a market for the output material.

## IA10 – Solid waste management network expansion

**Capex: €13.5m (EGP 702m)** **Opex: €0.7m (EGP 0.68m)**

Following validation by the waste market study, a feasibility assessment for the waste collection system is crucial. This will determine the suitable scope, extent, and technical due diligence of the scheme. Key actions include:

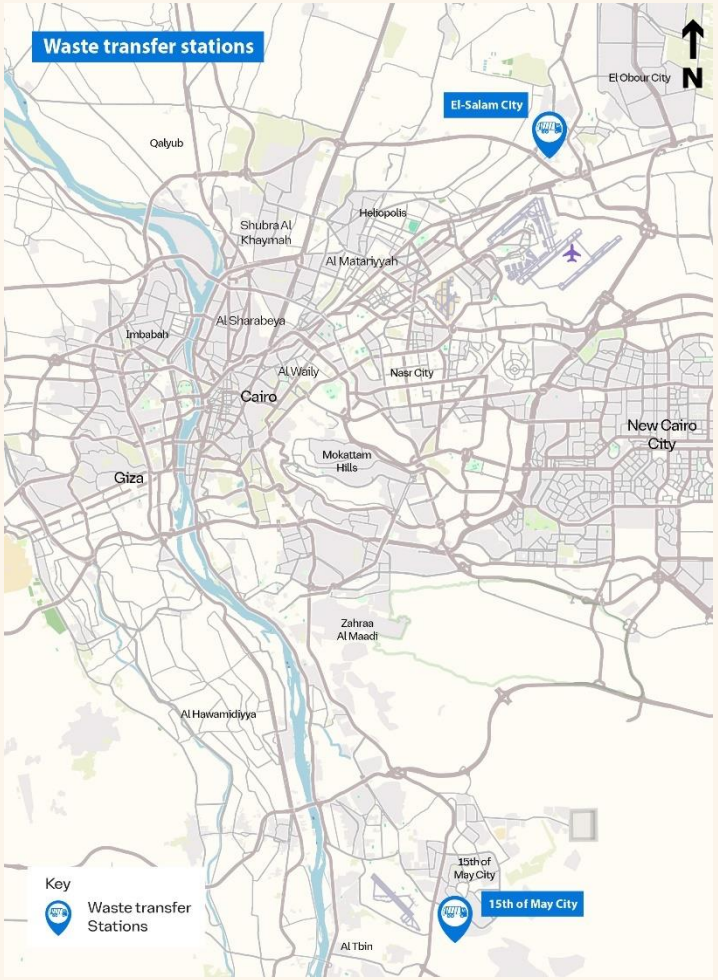
- Specifying Areas: Identifying appropriate areas for project commencement.
- Selecting Collection Companies: Specifying suitable collection companies and exploring opportunities to employ informal waste collectors.
- Regional Analysis: Assessing each region to determine the volume of material and supporting requirements, such as collection vehicle specifications, frequency, and management operations.
- Investment Plan: Developing an investment plan and seeking private sector partners to support the governorate in implementing the scheme.

The Cleaning Authority recommends starting the organic waste collection scheme in three locations from the following options: Zamalek, Garden City, parts of Maadi, Misr El Gdida, and Nozha. Some of these areas already have private sector collection, which can be leveraged to enhance rollout and maintain private sector participation. Potential private sector delivery partners include ENTAG Company, Enviromaster, Green Plant, Zero Carbon and Erteka.

Currently, households mix all waste together. To improve efficiency, the scheme will provide separate bags for organic waste. An awareness campaign will be conducted to educate residents on the importance of MSW management, source segregation, and the door-to-door collection system.

Separately collected organic waste will be processed at dedicated facilities, such as the 15th of May landfill. While the scheme may require additional upfront investment, revenue from compost production and improved efficiency in extracting other valuable waste resources will justify the investment.

***Cost estimate for door-to-door collection network (three areas covering 21km2) = EUR 10 million***



| IA10 – Solid waste management network expansion | Capex: €13.5m (EGP 702m) | Opex: €0.7m (EGP 0.68m) |
|---|---|---|

**Component 2 – New waste transfer stations**

Due to the extent of Cairo and the current utilisation of existing waste transfer stations, two new stations are required, and must be strategically located in the governorate. These stations will improve the management and processing of organic waste and provide additional capacity for MSW collected across the governorate.

Each should have:

- Capacity of receiving 500 tons/day
- Estimated area of 6000:8000 m2

El Salam: Governorate authorities have identified the El Salam factory for recycling as a potential location for a new transfer station. This station will serve the east and north of Cairo, handling 4,500 tons of MSW per day and transporting waste to the 10th of Ramadan complex. Currently, some waste is dumped in the El Obour landfill, which is nearing capacity. Key features including weighbridges, sorting and screening equipment and compactors.

The consolidation process will include compacting waste to maximise payload, minimise transportation time and costs, and reduce associated air pollution and greenhouse gas (GHG) emissions.

Supporting policies include:

- Regulations: Prepare strict regulations for proper management of transfer stations.
- Staff Training: Equip staff with the knowledge and awareness to manage transfer stations within allowable limits and capacities.
- Policies: Implement new policies to restrict the transfer station's acceptance of MSW from targeted regions.

15th of May: The second waste transfer station is proposed as part of the 15th Landfill rehabilitation project (see IA12)

***Cost estimate for waste transfer station = 3m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| SW6: Market assessments<br>SW7: Waste management strategy<br>SW8:Amendments to regulations<br>SW9: Awareness raising and capacity building for new initiatives | Cairo Cleaning and Beautification Authority, 15th May Authority, NUCA, Private operators and transporters | State budget, IFI/ donor organisations, Private sector |

**Potential GHG reduction**

Improved waste management practices will contribute to significant GHG reductions through reduced burning of waste.

| IA10 – Solid waste management network expansion | Capex: €13.5m (EGP 702m) | Opex: €0.7m (EGP 0.68m) |
|---|---|---|

Early-stage calculations estimate 237,250 $tCO_2e$ reduction per year.

**GESI considerations and benefits**

Reduced improper burning of organic waste will benefit underserved residents suffering from respiratory diseases.

**Climate resilience considerations**

Improved processing and landfilling will limit exposure of solid waste to extreme heat – reducing nuisance odour and pests.

**Smart City considerations**

Wide integration of automated weighing, tracking and processing of input waste and trucks at transfer stations will increase efficiency on site and maximise throughput.

## 5.9.5. Integrated Action 11 – Medical waste disposal

| IA11 – Medical waste disposal | Capex: €11m (EGP 572m) | Opex: €0.6m (EGP 28.5m) |
|---|---|---|

**Location:**

Governorate wide (All clusters)

**Timeframe for implementation:**

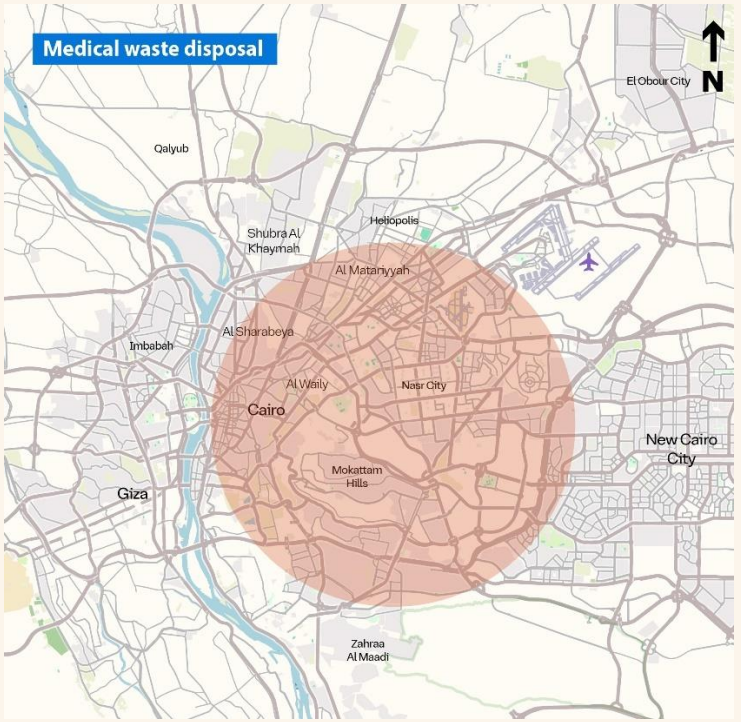
2025 – 2028

**Challenges addressed:**

**Actions:**

SW3: Recycling plants

SW4: Medical waste disposal




**Description:**

This action commits to improving the management of medical waste, which is currently estimated at 293.7 tons per day. Of this, only 85.2 tons per day (29%) are treated before safe disposal, while 208.6 tons per day are collected for open burning in landfills or dumpsites. With plans to close some existing incinerators, new modern facilities with sufficient capacity are essential to treat all medical waste generated within the governorate.

**Impacts:**

Reduction in hazard waste disposal and air pollution through burning. Reduction of waste sent to landfill and improved groundwater and soil quality.

**Detail:**

**Component 1 - Market assessment and feasibility**

- Waste quantification: calculate the amounts of medical waste generated in various regions and investigate current collection and disposal practices.
- Data collection methodologies: assign experts to establish accurate data collection methodologies for medical waste.

| IA11 – Medical waste disposal | Capex: €11m (EGP 572m) | Opex: €0.6m (EGP 28.5m) |
|---|---|---|

- Regulatory responsibility: clarify that medical hazardous waste management is the responsibility of the ministry of health and population, not NUCA or the governorate.
- On-premises treatment: allow hospitals the option to treat hazardous waste on-site.
- Policy implementation: apply new policies and regulations in all medical facilities.
- Awareness and capacity building: implement programs to ensure proper medical waste management practices are followed.

**Component 2 - Program to supply hospitals with on-site medical hazardous waste treatment such as sterilisers (autoclave) and shredders**
This measure is needed for large hospitals that have enough space for on-site waste treatment and to decrease the load on the steriliser at 15 May landfill.

Based on the results of the feasibility study the number of hospitals with sufficient space and need for on-site treatment will be identified. Funded by the private sector in case the hospitals are private hospitals, and funded by the governorate or NUCA in case the hospitals are public depending on their location.

Required specification include:

- Capacity from 150-250 kg/hr
- Minimum distance 3 km from the nearest residential area
- Duration of the cycle is 50 min

***Cost estimate for three on-site treatment autoclaves = 750k EUR***

**Component 3 - Constructing a medical treatment and recycling facility**

- Investment confirmation: Confirm investments based on the amount of medical waste generated to construct facilities with appropriate capacity.
- Site selection: Address challenges in site selection to ensure community acceptance.
- Private sector development: Explore the development of a treatment site by the private sector in Badr city.
- Feasibility study: Consider findings from the world bank's feasibility study on treating medical hazardous waste for GCR, which currently covers Qalubiya.
- Centralised vs. on-site treatment: Decide on centralised or on-site treatment based on feasibility study results.

***Price of construction of the building with three autoclaves, 2500 Lit per cycle = 10m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| SW6: Market assessments<br>SW8:Amendments to regulations | Hospitals and medical facilities, 15th May Authority, Private operators and transporters | |

| IA11 – Medical waste disposal | Capex: €11m (EGP 572m) | Opex: €0.6m (EGP 28.5m) |
|---|---|---|
| SW9: Awareness raising and capacity building for new initiatives | Private and public funding depending on location | |

**Potential GHG reduction**

Reduced improper burning and disposal will significantly reduce associated emissions.

Early-stage calculations estimate 98,696 $tCO_2e$ reduction per year.

**GESI considerations and benefits**

Protect informal sector workers (waste pickers and sorters) from exposure to hazardous waste.

**Climate resilience considerations**

Enhanced processing and landfilling will limit exposure of solid waste to extreme heat, reducing nuisance odours and pests.

**Smart City considerations**

Smart bins: implement smart bins to monitor waste levels and alert management personnel when full, preventing overflow and associated health risks. Smart tagging and tracking: use smart tagging and tracking to accurately categorise and record medical waste.

## 5.9.6. Integrated Action 12 – 15th of May landfill rehabilitation

| IA12 – 15th of May landfill rehabilitation | Capex: €169m (EGP 8,800m) | Opex: €8.5m (EGP 438m) |
|---|---|---|

**Location:**

15th May, NUCA (Cluster A)

**Timeframe for implementation:**

2025 – 2034

**Challenges addressed:**

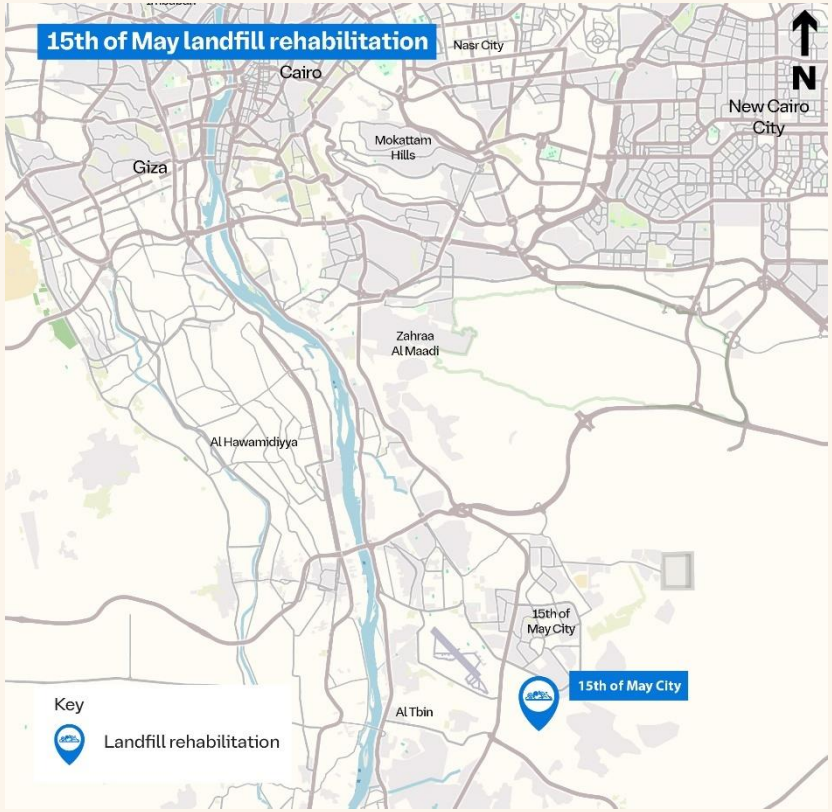
**Actions:**

EN4: Energy from waste and sludge

SW2: Landfill rehabilitation

SW3: Recycling plants

SW4: New waste transfer stations




**Description:**

The City of Cairo is committed to transforming the 15th of May landfill into an EU-compliant sanitary landfill, significantly enhancing waste management practices and environmental sustainability. This initiative will extend the landfill's lifespan, reduce the need for new landfills, and provide substantial sectoral and environmental benefits.

**Impacts:**

Alignment to EU standards will ensure decreased dumping and its negative aspects including reduced quantity of disposed waste and improved air quality. Combined with improved soil and groundwater quality and decreased impact to environment. Increased energy production (waste to energy system)..

| IA12 – 15th of May landfill rehabilitation | Capex: €169m (EGP 8,800m) | Opex: €8.5m (EGP 438m) |
|---|---|---|

**Detail:**

**Component 1 - Landfill rehabilitation**

The 15th of May landfill, covering 65 feddans (27 hectares) and operational since 2007, is nearing the end of its lifespan with approximately five years remaining. This component focuses on rehabilitating the landfill to meet EU standards. Key elements include:

- Waste characterisation study: assess waste types and quantities for processing and energy derivation.
- Feasibility study: define the catchment area, site concept design, and investment specifications.
- Rehabilitation requirements:
  - leachate collection system
  - gas collection system
  - landfill shape and operational factors

Improving the management of the facility will be essential for its efficient operation. This includes:

- Compaction equipment: to maximise space and efficiency.
- Weighbridges: at entry points to monitor and manage waste intake.
- Hazardous waste facility: for safe disposal of hazardous materials.

Supporting policies:

- Regulations: Implement new policies to define landfill limits and capacities.
- Capacity Building: Train staff for proper operation and management of the landfill.

Figure 5-9: Aerial image of existing site

***Cost estimation for landfill rehabilitation = €10m***

**Component 2 – Recycling facility expansion**

This component involves upgrading and expanding the existing recycling plant in the 15th of May city, provided that NUCA allocates land for the landfill's expansion. The current machinery is outdated and requires modernisation to improve efficiency and value extraction from waste streams. The Governorate has expressed interest in expanding this facility and has requested NUCA to confirm the availability of adjacent free space. Actions include

| IA12 – 15th of May landfill rehabilitation | Capex: €169m (EGP 8,800m) | Opex: €8.5m (EGP 438m) |
|---|---|---|

- Upgrade technology: modernise equipment to enhance recycling and composting capabilities.
- Expand capacity: increase the facility's capacity to 2,500 tons/day, requiring up to 20 feddans of land.
- Funding: seek private sector investment or government funding, depending on available incentives.

***Cost estimation for recycling facility= €6m***

**Component 3 - New waste transfer stations**

This component focuses on enhancing waste management by establishing new waste transfer stations at the 15th of May site. These stations will support the efficient processing and transportation of waste. Necessary components to be included are:

- Weighbridges: for accurate measurement of incoming waste.
- Sorting and screening equipment: to separate and process different types of waste.
- Compactors: to maximise payload, minimise transportation time and costs, and reduce air pollution and GHG emissions.

Supporting policies include:

- Regulations: implement strict regulations for the proper management of transfer stations.
- Staff training: equip staff with the knowledge and skills to manage transfer stations effectively.
- Waste acceptance policies: restrict the acceptance of MSW to targeted regions.
- Employment opportunities: explore ways to incorporate informal recyclers into the formal waste management system.

***Cost estimate for one TS 5000 tons/day, estimated area is 6000:8000 m2 area = 3m EUR***

**Component 4 - Energy from waste**

Constructing waste-to-energy plants is a crucial solution for Cairo's waste management program. These projects have a lifespan of 25 years and require less space compared to MBT technology. Improvements in land use at the 15th of May landfill will allow for the development of an onsite energy-from-waste facility.

Indicative technical specification includes:

- Daily waste= 2500 ton /day
- Plant capacity = 1200 ton/day
- Produced Electricity = 30 MW
- KW price = 8 cent (estimate)

| IA12 – 15th of May landfill rehabilitation | Capex: €169m (EGP 8,800m) | Opex: €8.5m (EGP 438m) |
|---|---|---|

- Area needed = 42000 m2
- Fly Ash % = 10% of the total capacity
- Bottom Ash % =90 % of the total capacity

***Capital cost for energy from waste plant = 130 million USD$***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| SW6: Market assessments<br>SW7: Waste management strategy<br>SW8:Amendments to regulations<br>SW9: Awareness raising and capacity building for new initiatives | Cairo Cleaning and Beautification Authority, 15th May Authority, NUCA, Private operators and transporters | Development Banks, Governorate, private sector operators |

**Potential GHG reduction**

Methane capture: proper capping of landfills will capture methane, a potent greenhouse gas. Process improvements: enhanced waste collection and management will reduce burning, air pollution, and GHG emissions, extending the landfill's lifespan.

Early-stage calculations estimate 711,750 $tCO_2e$ reduction per year.

**GESI considerations and benefits**

Pollution reduction: decrease harmful pollutants and nuisances from the site. Job creation: generate employment opportunities through improved landfill and energy-from-waste facilities. Inclusion of informal workers: integrate informal waste collectors into long-term employment opportunities.

**Climate resilience considerations**

Fire risk reduction: improved waste management will lower the risk of fires at dumpsites. Heat stress mitigation: design facilities to reduce heat stress for employees. Drainage improvements: ensure suitable drainage to prevent damage and operational limitations from heavy rain and flash floods.

**Smart City considerations**

Weighbridges and digital licenses for operators, to improve efficiency of access on site, as well as monitor wate quantities and types.

## 5.9.7. Integrated Action 13 – Construction and demolition waste recycling

| IA13 – Construction and demolition waste recycling | Capex: €20m (EGP 1,053m) | Opex: €1m (EGP 52.5m) |
|---|---|---|

**Location:**

New Cairo and Helwan (Clusters A & B)

**Timeframe for implementation:**

2026 – 2028

**Challenges addressed:**

**Actions:**

SW3: Recycling plants


**Description:**

This action presents investments to address the challenges of construction waste management and recycling. Currently, a 70-feddan open dumpsite in New Cairo mixes construction waste with municipal solid waste. To tackle this issue, NUCA is seeking private developers to recycle construction waste on-site, which will also require the separation of municipal waste.

**Impacts:**

Release of real estate for onward development. Alignment to circular economy. Revenue generation potential from reuse of waste into new revenue stream.

**Detail:**

**Component 1 – Feasibility assessment**

To establish a Construction and Demolition Waste (CDW) treatment and recycling facility, a comprehensive feasibility study is essential. Key actions include:

- Authority communication: engage with authorities to facilitate the establishment of the CDW treatment and recycling facility through public-private partnerships (PPP).
- Pre-demolition auditing: implement new policies and regulations to ensure continuous provision of CDW.
- On-site CDW characterisation: introduce policies for on-the-spot CDW characterisation during demolition to ensure data availability.

| IA13 – Construction and demolition waste recycling | Capex: €20m (EGP 1,053m) | Opex: €1m (EGP 52.5m) |
|---|---|---|

- Capacity building: provide training for all stakeholders involved in the construction and demolition sector.

**Component 2 – Establish C&D recycling**

Follow confirmation of requirements, a full recycling plant for CDW will be established in the Handasa Landfill, which is a dedicated location in Helwan. The plant can then send the output to construction and building materials factories located in Shek El Teban, thereby avoiding the need to transport waste to New Cairo for processing. This will help to decrease the load on the recycling plant in New Cairo and the 10th of Ramadan complex. Furthermore, the MoE can provide technical support to build this recycling plant at Handasa landfill.

This action involves setting up two recycling facilities for CDW. The first facility will be located at Handasa landfill and will handle all collected CDW from Cairo districts. The second facility will be situated in Salama landfill in New Cairo and will be responsible for processing the collected CDW from New Cairo City. This will directly address the on-site construction waste recycling for the 70 feddans open dumpsite in New Cairo & preceded by the separation of existing municipal waste.

Recycling collected CDW for road construction instead of dumping on roads or unallocated areas.

Governorate plan to recycle construction waste and have expressed their need for crushers and factories that re-use the material in road base layer, platform separator, and interlocked road pavement.

Initial capacity assessment is 1000 tons/day (Prototype project which is not cover the Cairo governorate)

Area needed = 2 feddans

***Cost estimation for C&D recycling facility = 20m EUR***

| Supporting policy: | Stakeholders: | Potential funding sources and revenue generation: |
|---|---|---|
| SW6: Market assessments<br>SW7: Waste management strategy<br>SW8:Amendments to regulations<br>SW9: Awareness raising and capacity building for new initiatives | Cairo Cleaning and Beautification Authority, Private sector developers, Transporters | Development Banks, Governorate, private sector operators |

**Potential GHG reduction**

Emissions savings potential from reuse and recycling of materials.

Early-stage calculations estimate 209,510 $tCO_2e$ reduction per year.

| IA13 – Construction and demolition waste recycling | Capex: €20m (EGP 1,053m) | Opex: €1m (EGP 52.5m) |
|---|---|---|

**GESI considerations and benefits**

Job creation for processing and circular economy producing onward construction material

**Climate resilience considerations**

n/a

**Smart City considerations**

Automation and smart monitoring will improve operational efficiency in recycling plans

# 6. Investment plan

## 6.1. Investment plan and funding sources

The GCAP outlines 13 integrated actions, requiring a total funding of €1.08[1] billion over 10 years (2025 – 2034). These actions encompass a mix of policy, pre-investment, investment, and other initiatives.

## 6.2. Generating cost estimates

GCAP investment cost estimates were developed based on existing commitments, previous investments, expert judgment, and international comparisons. However, these costs are indicative at this stage. The GCAP methodology emphasises the need for the City to refine these estimates through detailed feasibility studies before implementing specific actions.

While the GCAP typically plans for a five-year period, the complexity of the required projects suggests that five years may be insufficient to fully realise these actions. Therefore, we have included an additional five-year implementation period, extending the timeline to ten years. This approach provides clarity on the full investment required and supports the identification and sourcing of sustainable financing for the GCAP implementation and beyond.

The GCAP presents recommended potential investments across various sectors, implementing agencies, and scales. It should be viewed as a guidance document, outlining potential options to improve the city's environmental performance. Suitable actions can be chosen and implemented as appropriate. These recommendations are based on technical assessments, expert judgment, stakeholder input, and considerations of priority and urgency within an environmental context. However, there is no obligation for the city to implement the entire action plan, nor should the funding and implementation responsibility rest solely on the city.

Funding for these measures can be secured from a range of financing mechanisms, including donor finance, private sector investments, green and sustainable funds, grants, state support, and the municipal budget. Each action has identified possible funding mechanisms, with an overview provided in chapter 5 and an indicative summary below.

[1] Equivalent of EGP 55.9bn – using exchange rate of 51.8

Table 6-1: Cairo GCAP investment plan

| # | Integrated Action | Location / Cluster | Capex (€m) | Opex (€m) | Capex (EGPm) | Opex (EGPm) | Timeframe | Environmental challenges addressed | Actions |
|---|---|---|---|---|---|---|---|---|---|
| 1 | **Badr electric bus system** | NUCA (Cluster A) | 130 | 6.51 | 6,773 | 337 | 2025–2029 | | TR2: Sustainable transport measures<br>TR3: Electrify public transport |
| 2 | **Electric bus rapid transit (BRT)** | Governorate wide (Cluster C, D, E) | 230 | 11.56 | 12,025 | 559 | 2025–2027 | | TR3: Electrify public transport |
| 3 | **Downtown traffic management** | Historic centre (Cluster C) | 43.3 | 2.17 | 2,252 | 112 | 2026–2029 | | TR1: Demand management of private car usage<br>TR2: Sustainable transport neighbourhoods<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design |
| 4 | **Transit oriented development in New Cairo** | NUCA (Cluster A) | 150 | 7.51 | 7,813 | 389 | 2027–2031 | | TR1: Demand management of private car usage<br>TR2: Sustainable transport neighbourhoods<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design<br>UD4: TOD of new mass transit stations<br>EN1: Efficient street lighting |
| 5 | **Liveable neighbourhoods Helwan** | Helwan (Cluster B) | 88.5 | 4.43 | 4,602 | 229 | 2027–2034 | | TR2: Sustainable transport neighbourhoods<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design<br>UD3: Green building and retrofit scheme<br>EN1: Efficient street lighting |
| 6 | **Industrial efficiency** | Multiple districts (Cluster B) | 25.3 | 1.26 | 1,313 | 65.4 | 2026–2034 | | EN3: Industrial efficiency |
| 7 | **Municipal energy efficiency** | Governorate wide (Cluster C, D, E) | 36.1 | 1.81 | 1,877 | 93.5 | 2025–2034 | | UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design ;;<br>EN2: Municipal building efficiency |
| 8 | **Municipal water efficiency** | El Salam City and Fostat (Clusters C & D) | 112 | 5.61 | 5,837 | 291 | 2028–2031 | | EN4: Energy from waste and sludge<br>WA2: Digital monitoring programme |
| 9 | **Wastewater network upgrades** | Governorate wide (Clusters D & E) | 53.2 | 2.67 | 2,768 | 138 | 2025–2034 | | WA1: Sewage network rehabilitation<br>WA2: Digital monitoring programme<br>UD1: Urban Green Space Development<br>UD2: Resilient Street Scape Design |
| 10 | **Solid waste management network expansion** | Governorate wide (Cluster C, D, E) | 13.5 | 0.675 | 702 | 35 | 2026–2029 | | SW1: Organic waste recycling expansion<br>SW5: New waste transfer stations |
| 11 | **Medical waste disposal** | Governorate wide (All clusters) | 11 | 0.55 | 572 | 28.5 | 2025–2029 | | SW3: Recycling plants<br>SW4: Medical waste disposal |
| 12 | **15th May landfill rehabilitation** | 15th of May, NUCA (Cluster B) | 169 | 8.46 | 8,801 | 438 | 2025–2034 | | EN4: Energy from waste and sludge<br>SW2: Landfill rehabilitation<br>SW3: Recycling plants<br>SW4: New waste transfer stations |
| 13 | **Construction & demolition recycling** | New Cairo and Helwan (Clusters A & B) | 20.3 | 1.01 | 1,053 | 52.5 | 2026–2029 | | SW3: Recycling plants |
| | **Total investment costs *** | | **1,084** | **52.2** | **56,388** | **2,819** | | | |

* GCAP investment cost estimates were generated considering existing commitments, previous investments, expert judgement and international comparison - all costs are indicative at this stage and the GCAP methodology outlines the need for the city to refine these through detailed feasibility studies and cost estimations ahead of the implementation of specific actions.

## 6.3. GCAP cost profile

The GCAP cost profile indicates that 90% of the overall estimated costs are capital expenditures (CAPEX) and 10% are operational and maintenance expenditures (OPEX). Pre-investment and investment projects (CAPEX + OPEX) constitute about 99% of the suggested investments. OPEX is estimated at 5% of CAPEX, to be clarified upon feasibility.

Figure 6-1: GCAP investment cost profile

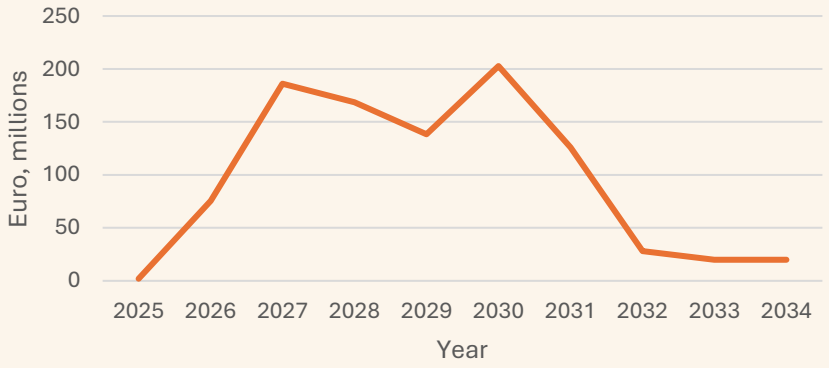



Figure 6-2: GCAP investment profile by sector

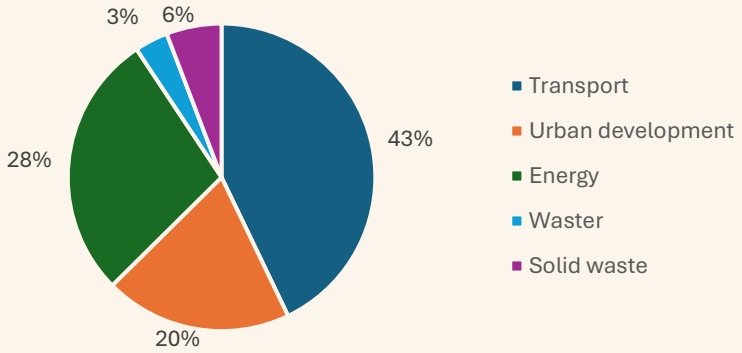



Table 6-2: Investment by actions

| Code | Action | Capex (million) EUR | EGP |
|---|---|---|---|
| **Transport provision** | | **463.3** | **24,004** |
| TR1 | Demand management of private car usage | 66.8 | 3,461 |
| TR2 | Sustainable transport neighbourhoods | 136.5 | 7,072 |
| TR3 | Electrify public transport | 260 | 13,471 |
| **Urban development and resilience** | | **213** | **11,036** |
| UD1 | Urban Green Space Development | 46.75 | 2,422 |
| UD2 | Resilient Street Scape Design | 46.25 | 2,396 |
| UD3 | Green building and retrofit scheme | 80 | 4,145 |
| UD4 | TOD of new mass transit stations | 40 | 2,072 |
| **Energy supply and efficiency** | | **304** | **15,730** |
| EN1 | Efficient street lighting | 3 | 155 |
| EN2 | Municipal building efficiency | 15.6 | 808 |
| EN3 | Industrial efficiency | 25 | 1,295 |
| EN4 | Energy from waste and sludge | 260 | 13,471 |
| **Water management** | | **38** | **1,968** |
| WA1 | Sewage network rehabilitation | 34 | 1,761 |
| WA2 | Digital monitoring programme | 4 | 207 |
| **Solid waste management** | | **62.8** | **3,251** |
| SW1 | Organic waste recycling expansion | 10 | 518 |
| SW2 | Landfill rehabilitation | 10 | 518 |
| SW3 | Recycling expansion | 26 | 1,347 |
| SW4 | Medical waste disposal | 10.75 | 557 |
| SW5 | New waste transfer stations | 6 | 311 |

Several actions and sub-projects are already in advanced stages of exploration or investment, such as energy-efficient street lighting, downtown area renovation (specifically the Ministerial Quarter), and the rehabilitation of the Salt Oasis in Helwan. The GCAP recommendations aim to reinforce and provide further support for the business case for these initiatives, rather than replace or supersede them.

## 6.4. Co-benefits offered

### 6.4.1. Climate resilience

The city is committed to addressing the challenges posed by climate change, ensuring climate-resilient growth for Cairo. The baseline assessment identified extreme heat, surface water flooding, and water scarcity as the most significant climate hazards.

For each hazard, pathways have been developed to address these challenges through the GCAP actions and supporting policies.

An example of the considerations for extreme heat is presented below, to demonstrate the process.

#### Challenges of extreme heat

- UHI effect;
- Heat stress, heat stroke, dehydration, thermal discomfort;
- Increased desertification and dust;
- Health inequalities affecting the elderly, children, and pregnant individuals; and
- Power outages.

#### Actions addressing extreme heat

- Development of a new park in Helwan;
- Large-scale urban greening projects;
- Retrofitting public buildings; and
- Promoting green building development.

#### Benefits of actions

- Green roofs reduce air temperatures, improve thermal comfort, and lower cooling energy demand.
- Shading measures such as pergolas, shutters, and awnings reduce solar heat gain and lower temperatures.
- Nature-based solutions enhance air and water quality regulation and provide urban cooling.
- Increased tree cover reduces air temperature, lowers cooling energy demand, and improves thermal comfort.
- Thermal insulation extends periods of thermal comfort without mechanical ventilation, reducing annual energy costs.
- Applying light-coloured paint increases albedo, reflecting more sunlight and reducing temperatures.

### 6.4.2. Integrating smart solutions into the GCAP

The GCAP supports a range of smart solutions that contribute to the city's green objectives. Each action considers the integration of smart technologies and assesses Cairo's smart maturity. This evaluation identifies opportunities to leverage smart technologies to optimise outcomes and support the city's green objectives. Actions are categorised as follows:

- Entirely smart: the action/project is entirely smart in nature.
- Smart component: the action/project can be enhanced through smart technology or key smart components.
- Not smart: no foreseeable smart application at this time.

### 6.4.3. Integrating social and gender recommendations into the GCAP

The GCAP integrates gender equality and economic inclusion throughout its development. Based on Gender and Social Assessments from the Baseline assessment, each action includes recommendations and considerations to address gender and inclusion in the governorate.

### 6.4.4. Carbon saving potential

For each action an estimation of potential carbon savings has been developed, where possible. The annual emissions reduction potential, based on implementation of all actions by 2034, is presented in Table 5-2. Based on the above the GCAP offers possible GHG reductions of 1.4Mt$CO_2$e per year based on current emissions profile – which is a 4.5% reduction on current levels (based on available data).

Figure 6-3 projects a summary of the potential contribution to GHG reduction from the GCAP, against a business-as-usual trajectory. While 1.4Mt$CO_2$e is considerable in absolute terms, this represents a 3% reduction against forecast business as usual emissions for Cairo overall, demonstrating the level of challenge required to achieve significant decarbonisation across the governorate.

**Figure 6-3: GHG emissions trajectories analysis**

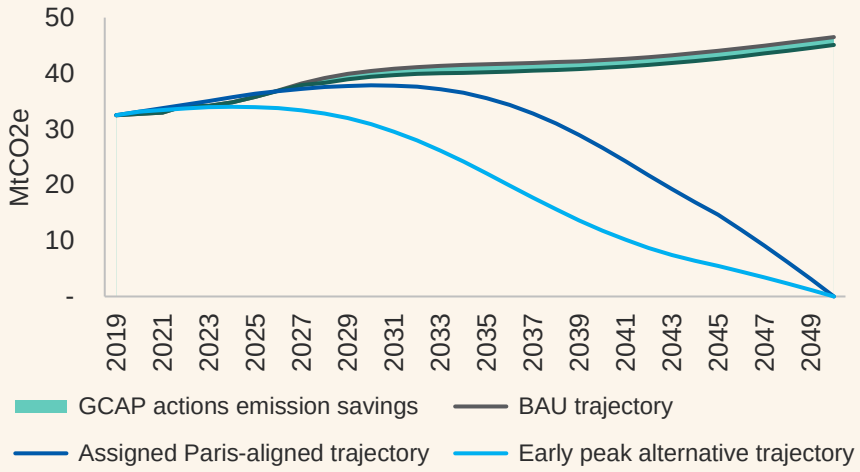
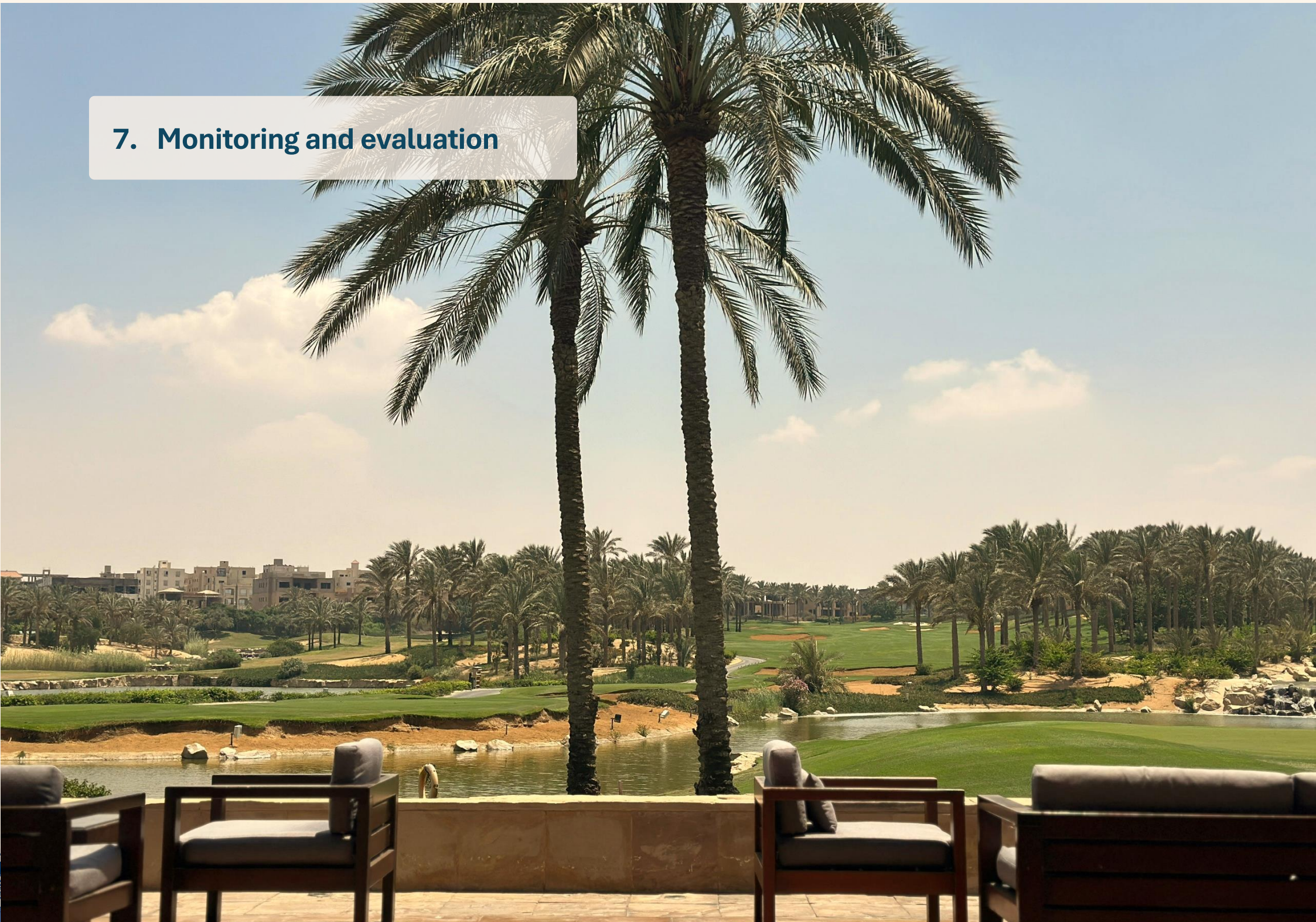



Table 6-3: GHG reduction potential

| Action # | Integrated Action | Details | Tonnes of $CO_2e$ saved per year | Assumptions |
|---|---|---|---|---|
| 1 | Badr electric bus system | 100 e-buses instead of diesel bus and private cars | 4,380 | 100 buses, 200km per day, per bus, operating throughout the year. Due to high fossil fuel use in electricity production, the grid emissions factor in Egypt results in an e-bus indirectly F26 emitting 600g co2e/km including loss in transmission |
| 2 | BRT e-bus | 200 e-buses instead of diesel bus and private cars | 8,760 | 200 buses, 200km per day, per bus, operating throughout the year. Due to high fossil fuel use in electricity production, the grid emissions factor in Egypt results in an e-bus indirectly F26 emitting 600g co2e/km including loss in transmission |
| 3 | Downtown traffic management | Restriction of car use, leading to mode shift to diesel bus and NMT. Urban greening | 37,887 | 20% car reduction of 30,000 cars per day which usually travel through the historic centre of Cairo, assuming mode shift to diesel buses with a capacity of 100 people per bus |
| 4 | TOD New Cairo | Promotion of PT (monorail and e-bus) instead of private car. Supporting local NMT | 39,323 | 300k population in the area, with a projection of 35% shift to PT, and 9% shift to NMT. This includes the provision of 160000m2 green space |
| 5 | Liveable neighbourhoods - Helwan | PT and NMT uptake. Building efficiency reducing electricity demand. Green space and tree provision sequestering carbon. | 39,323 | 200k m2 per floor, 4 stories on average = 800,000 m2 - energy reduction by 30% from baseline through installation of energy efficient building materials and urban greening. |
| 6 | Industrial efficiency | Industrial efficiency reducing electricity demand. | 12,750 | 85000m2 per site, 1MW solar to power heating, air con, and lighting etc. These each cost between €1-2m each, 10 buildings per year |
| 7 | Municipal energy efficiency | Building efficiency reducing electricity demand. | 1,436 | 1500m2 per building, 20 buildings total, 30% reduction in demand |
| 8 | Municipal water efficiency | Improved efficiency of water treatment renewable energy from sludge treatment - biogas 200 tonnes/day/plant) | 5,548 | 200t/day, 40m3/t CO2 eliminated from not burning NG |
| 9 | Wastewater network upgrades | Improved efficiency of water treatment | - | Negligible savings through small scale greening |

| Action # | Integrated Action | Details | Tonnes of $CO_2e$ saved per year | Assumptions |
|---|---|---|---|---|
| 10 | Solid waste management network expansion | Reduction in burning and improper disposal | 237,250 | 500t/day increase in collection and proper disposal of waste |
| 11 | Medical waste disposal | Reduction in burning and improper disposal | 98,696 | 500t/day increase in collection and proper disposal of waste |
| 12 | 15th May landfill rehabilitation | Reduction in burning and improper disposal, energy from waste of 2500t/day | 711,750 | 1500t/day increase in collection and proper disposal of waste pyrolysis of waste releases 0.3-0.6t co2e / tonne incinerated |
| 13 | C&D recycling | Recycling reduces primary material processing | 209,510 | 1000t/day; 90% concrete; 10% steel; 70% energy saved from recycling |
| **Total** | | | **1,406,613** | **tonnes of $CO_2e$ per annum** |

# 7. Monitoring and evaluation



## 7.1. Reporting format and frequency

Continuous monitoring of all actions and measures in the GCAP is essential for successful implementation. By regularly and systematically tracking all Green City actions and their environmental impacts, the Cairo Governorate can assess whether the GCAP is progressing as planned and achieving its established goals.

Successful monitoring requires two key components:

- Implementation Monitoring Plan: Tracks the status and progress of the GCAP actions being implemented.
- Impact Monitoring Plan: Measures the impact of the GCAP projects and policies on the city's environmental and resilience performance. This plan should include continuous observation of the risk and vulnerability landscape and the extent to which Green City actions contribute to resilience.

## 7.2. Progress Monitoring Plan

In addition to these two reports, the Indicators Database will continue to be used to collate and present data collected alongside global benchmark values. Any additional reporting requirements will be set by the GCAP Coordinator in Step 3 of the GCAP process ('Green City Implementation'). The City Administration will circulate these reports internally to inform decision-making and communicate them with other stakeholders as appropriate.

## 7.3. Impact Monitoring Plan

A Monitoring, Reporting, and Verification Coordinator will be appointed from within the administration team. This coordinator will delegate data collection, analysis, and reporting tasks to senior-level officials across the governorate administration.

The Monitoring, Reporting and Verification (MRV) Co-ordinator' role will involve the delivery of the activities presented and detailed further below.

Stepped MRV process:

1. Liaise with the GCAP Coordinator
2. Identify and assign an official 'MRV Sector Expert' within each of department
3. Identify and designate an official 'Data Collection Officer'
4. Establish formal communication channels
5. Communicate regularly with officials with designated MRV responsibilities
6. Set and enforce deadlines
7. Assimilate inputs from MRV Sector Experts to report on each GCAP action

### Detailed MRV process

1. Liaise with the GCAP Co-ordinator, to confirm the data collection requirements (including frequency and quality) for assessing the implementation and impact of GCAP actions, as well as associated timescales and budget, and ultimately of the GCAP as a whole. This should include a review of the targets and constituent indicators that each GCAP action will contribute towards achieving, as well as the objectives that each action and policy addresses, which are presented in Chapter 5. This step will also be used to support the identification of synergies with other city, and wider domestic, processes and protocols as well as of the specific stakeholders responsible for each.

2. Identify and assign an official 'MRV Sector Expert' within each of the departments responsible for the implementation of a GCAP action(s) to monitor and report on the action(s). It is likely that this would be a head of department and in most instances, if not all, be the same official responsible for the implementation of the relevant GCAP action ('GCAP Action Owner') from the relevant department within the administration. The selected officials will be responsible for monitoring, reporting and verifying data relating to a) the implementation progress of each action, b) the budget, scope and

implementation programme of each action, and c) the impact of each action in relation to the relevant targets.

3. Identify and designate an official 'Data Collection Officer' with responsibility for the collection and review of data to inform each GCAP indicator.

4. Establish formal communication channels between the MRV Sectoral Experts and the relevant Data Collection Officers.

**Table 7-1: Potential departments responsible for MRV**

| GCA sector | Department responsible for MRV |
|---|---|
| **Transport** | Transport Directorate<br>Public Transport Authority |
| **Land use** | Housing Directorate. Real Estate Taxes Directorate |
| **Energy** | South and North Cairo Electricity distribution companies<br>Cairo Electricity Production Company |
| **Water** | Greater Cairo Drinking Water Company and Greater Cairo Sanitation company |
| **Solid Waste** | Cairo Cleaning and Beautification Authority |

5. Communicate regularly with officials with designated MRV responsibilities to ensure that they are suitably informed, trained and otherwise supported to conduct their role effectively, efficiently and in a transparent and consistent manner. This will include the development and dissemination of guidance to facilitate appropriate and consistent MRV that meets the requirements of the GCAP methodology. This communication should also be conducted to ensure that the tasks of the MRV Sector Experts and Data Collection Officers are being executed to the specified quality, time and budget, as set by the MRV Co-ordinator.

6. Set and enforce deadlines for regular reports relating to each GCAP action and indicator.

7. Assimilate inputs from MRV Sector Experts to report on each GCAP action, as well as on the progress and impact of the GCAP as a whole, and cascade the findings to the GCAP Coordinator, who will in turn share findings with other stakeholders, notably internal and external actors who are responsible for making decisions based on the findings. The MRV Sector Experts, as appointed by the MRV Co-ordinator to take responsibility for the MRV of actions in specific GCAP sectors, will be required to:

a) Acquire an in-depth understanding of the targets and indicators relevant to their GCAP action(s) and about how the data to inform each is derived and validated. This will require consultation with the MRV Co-ordinator and relevant Data Collection Officers;

b) Communicate regularly with the official responsible for the implementation of each GCAP action ('GCAP Action Owner'), and if different, also the official responsible for reviewing, and if necessary, revise the budget, scope and planning of each action;

c) Familiarise themselves with the required method and frequency of data collection for each data item. In terms of the monitoring of the implementation of GCAP actions, data collection will, in all instances, be continuous throughout the implementation period. There will be more variation in the frequency of the data collection for each indicator;

d) Liaise with Data Collection Officers to ensure that any factors that might compromise the quality or availability of data to meet deadlines set by the MRV Co-ordinator are identified in time to identify an alternative approach;

e) Adopt responsibility for the validation of all data in relation to each GCAP action, reviewing data received to ensure that it is complete, consistent and otherwise robust;

f) Analyse and assimilate the inputs of Data Collection Officers and GCAP Action Owners to report on the progress and impact of each GCAP action, and report on the findings; and

g) Cascade the results to the MRV Coordinator.


EBRD GREEN CITIES
القاهرة
CAIRO
GCAP
ENOVA
CONSULTANTS AND ENGINEERS
INSPIRED BY THE FUTURE
Chemonics Egypt
Consultants
AtkinsRéalis
European Bank
for Reconstruction and Development
وزارة التخطيط والتنمية الاقتصادية والتعاون الدولي
Ministry of Planning, Economic Development & International Cooperation
Ministry of Local Development