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Foreword

As Adel El-Naggar, the Head of 6th of October City Authority, it is with great pride and a sense of urgent responsibility that I present the Green City Action Plan (GCAP) Report. This document is more than a blueprint for sustainable urban development; it is a declaration of our collective resolve to confront climate change head-on and to forge a future where economic growth and environmental stewardship go hand in hand for the good of the future generations.

Our city is poised at a critical juncture, facing the dual challenges of rapid urbanisation and the escalating impacts of a changing climate. The GCAP is our strategic response, crafted with the insight and expertise of local and international partners, including AtkinsRéalis, Chemonics Egypt, Enova, and the European Bank for Reconstruction and Development (EBRD). It embodies a series of targeted, green investments designed to fortify our City's resilience and transform our transport, energy, water, and waste systems to be green.

The projects and policies detailed within this report are the culmination of a comprehensive engagement process with our community and stakeholders. They reflect a shared vision for a 6th of October City that is not only green and climate-resilient but also vibrant and equitable. Our focus has been on prioritising actions that address our most pressing environmental challenges while also closing infrastructure gaps.

I extend my deepest gratitude to our partners for their unwavering support and valuable contributions. Their expertise has been instrumental in shaping a GCAP that is both ambitious and actionable. As we embark on this journey, I am confident that the initiatives we undertake will pave the way for a greener, more sustainable 6th of October City. This report is not just a plan, but a promise to our citizens and to future generations—a commitment to a City that thrives in harmony with its environment.

Together, we will turn these plans into reality, ensuring that 6th of October City stands as a beacon of sustainable urban development, not just in Egypt, but across the globe.

Eng. Adel Saeid El Naggar

Head of 6th of October City Authority 24 January 2024



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Abbreviations

Abbreviation	Description
AAA	Al- Amrikiyya Area
AC	Air Condition
AfD	French Development Agency
ASB	Advisory for Small and Medium Business
ATCS	Adaptive Traffic Control System
BAU	Business as Usual
BID	Business Improvement District
BOD	Biochemical Oxygen Demand
BOT	Board of Trustees
BRT	Bus Rapid Transit
CNG	Compact Natural Gas
CRVA	A Climate Risk and Vulnerability Assessment
DC	Direct Current
EBI	Energy, Building, Industry
EBRD	European Bank of Reconstruction and Development
EE	Energy Efficiency
EEHC	Egyptian Electricity Holding Company
EETC	Egyptian Electricity Transmission Company
EIA	Environmental Impact Assessments
ESCO	Energy Service Company
EU	European Union
EWRA	Egyptian Water Regulatory Agency
GCAP	Green Cities Action Plan
GCF	Green Climate Fund
GCR	Greater Cairo Region
GDP	Gross Domestic Product
GEFF	Green Economy Finance Facility
GESI	Gender, Economic and Social Inclusion
GHG	Greenhouse Gas
GIS	Geographic Information Systems

GoE	Government of Egypt
GOPP	General Organisation for Physical Planning
GPS	Global Positioning System
GPSC	Global Platform for Sustainable Cities
GTFS	General Transit Feed Specification
GVA	Gross Value Added
HBRC	Housing and Building National Research Centre (HBRC
HSR	High-speed rail
HCWW	Holding Company of Water and Wastewater
ICT	Information and Communications Technology
IDB	Indicators Database
IGES	Institute for Global Environmental Strategies
IMP	Impact Monitoring Plan
ITDP	Institute for Transportation and Development Policy
ITS	Intelligent Transport Systems
IWMCF	Integrated Waste Management Central Facilities
JICA	Japan International Cooperation Agency
KPI	Key Performance Indicator
LCOE	Levelized Cost of Electricity
LU&T	Land Use and Transport
MBT	Mechanical Biological Treatment
MCIT	Ministry of Communications and Information Technology
MDB	Multilateral Development Bank
MEPS	Minimum Efficiency Performance Standards
MHUUC	Ministry of Housing and New Urban Communities
MoEA	Ministry of Environmental Affairs
MoERE	Ministry of Electricity and Renewable Energy
MoF	Ministry of Finance
MoHP	Ministry of Health and Population
MoP	Ministry of Petroleum and Mineral Resources
МоТ	Ministry of Transport
MoTI	Ministry of Trade and Industry
MSW	Municipal Solid Waste

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SRF	Solid recovered fuels
SUMP	Sustainable Urban Mobility Plan
SWM	Solid Waste Management
TAR	Technical Assessment Report
TfC	Transport for Cairo
TOD	Transit Oriented Development
TRU	NUCA Transport Regulatory Unit
UDP	Urban Design Process
UNDP	United Nations Development Program
UNHCR	United Nations High Commissioner for Refugees
UPP	Urban Planning Process
USAID	United States Agency for International Development
WEEE	Waste Electrical and Electronic Equipment
WWT	Wastewater Treatment



Report Structure

- The first section presents the Executive Summary of the action plan;
- The second section provides an overview of the main features of the City including the area under study, the local, regional, demographic and socio-economic context, and institutional arrangements in the City;
- The third section presents the Baseline Study assessing the current status of the City including climate, environmental and sectoral assessments, and provides the priority green city challenges;
- The fourth section outlines 6th of October Green City Action Plan framework, covering the vision, sectoral roadmaps and strategic objectives, the spatial framework for development, and an overview of co-benefits under the GCAP;
- Sections five to eight cover the sectoral roadmaps relating to Land Use & Transport, Energy, Buildings, & Industry, Water and Wastewater, and Solid Waste;
- The ninth section outlines the GCAP implementation plan, including monitoring, evaluation and reporting requirements, and costs and funding sources;
- The final section outlines the next steps for the Green City Action Plan (GCAP);
- And lastly, the Appendices contain the detailed project proformas for sector Anchor Projects.







Executive Summary

In October 2022, 6th of October City launched its Green City Action Plan (GCAP), as a commitment to address its environmental concerns and infrastructure challenges and to support the transition to a green, low-carbon and resilient future. The City is the first to launch the action plan as part of the EBRD Green Cities programme in Egypt and provides a tangible example and replicable approach to achieve the country's commitment to COP27 targets.

Following the EBRD methodology, the City Authority and New Urban Communities Authority (NUCA) have engaged in extensive stakeholder engagement to develop a clear understanding and agreement on the priority challenges facing the City. This engagement process included two large workshops with approximately 100 city stakeholders at each, as well as a series of internal city workshops. These internal sessions involved sector experts and senior officials from NUCA and the City Authority. Together, these workshops have helped articulate a clear vision and a politically and economically feasible plan of investments and policies to support its delivery. The final vision for the City is shown below.

6th October City aspires to be a leading Egyptian city, championing sustainability, green investment, digitalisation, and inclusive growth. As a thriving educational and industrial hub, the city is committed to enhancing the living standards of its residents and attracting a diverse population of students, entrepreneurs, and industries. Emphasising eco-industrial development and resource efficiency, 6th October City envisions itself as a beacon of economic prosperity, embracing digitalisation, and solidifying its status as a regional educational powerhouse.

Summary of the Baseline

Critical to the development of the GCAP was the technical assessment of existing and future challenges in the City and their prioritisation with local stakeholders to identify the most pressing issues. Addressing them will deliver maximum benefits for the residents as well as opportunities for investment.

6th of October City is strategically positioned within the Giza Governorate and forms an integral part of the Greater Cairo Region (GCR). As a first-generation New City, it was envisioned to accommodate half a million residents. Today, it has a population of 1.5 million¹ and, aligned with the Strategic Urban Plan, is predicted to grow to 6 million over the coming years.

The City's strategic location, high connectivity to neighbouring urban communities, and proximity to key tourism attractions like the 'Pyramids of Giza', make it a significant hub for population movement, inward investments, and development activities.

The City's urban landscape is a combination of residential, industrial, service, and agricultural zones, each contributing uniquely to its socio-economic fabric. The industrial zone, one of Egypt's largest, as well as a number of educational facilities, serve as the City's economic base, offering significant employment opportunities to its residents.

Supporting the City achieving its full potential, the technical assessment identified a number of key challenges and opportunities:

Urban development and transport: The City is characterised by low-density, segregated land uses, leading to a reliance on private transportation and long commutes within the City or to Cairo. While there are significant large-scale transport projects currently under construction, such as the monorail and Bus Rapid Transit (BRT), these will not fully address the internal mobility challenges within the City.

A Transit-Oriented Development (TOD) approach around planned transport infrastructure, as well as a focus on last-mile connections, could intensify economic activities, diversify land use, and lead to more sustainable mobility options in the City.

Environmental Performance: There is a significant lack of open / green spaces, a decline in biodiversity, and particular hotspots of fluctuating air quality

¹ <u>NUCA and City Authority Official Websites – accessed on Dec 23rd ,2022 which refer to</u> 2017 census data which may include the population of the neighbouring cities of October Garden, Sheikh Zayed and New October. In all cases, the 4 cities still share main utilities such as water treatment and solid waste management. Access here



emanating from industrial activity, construction, and open burning of waste which occurs intermittently.

Climate Risks: Rising temperatures, decreasing precipitation, and the looming threat of water scarcity pose significant challenges. The City's desert location makes it susceptible to heatwaves, sandstorms, and water shortages, all exacerbated by climate change.

Municipal Infrastructure:

- Water and Wastewater: Per capita water consumption is relatively low, but network losses are high due to old infrastructure. Wastewater treatment is insufficient but improving, with the potential for grey water reuse in the future. With water availability becoming a pressing concern, efficient water management and wastewater treatment emerge as top priorities;
- Solid Waste Management: Waste management focuses on collection and disposal, neglecting recycling and treatment. There are opportunities to expand the coverage of solid waste services in the City, provide improved waste disposal facilities, and explore waste-to-energy potential; and
- **Energy consumption:** The City is reliant on a national grid and renewable energy capacity is limited to small-scale solar PV systems with an 8.4 MWp output. There is untapped potential, especially in residential and industrial rooftops suitable for solar installations. There is a need for strategic interventions to improve efficiency and expand renewable energy use.
- **Industrial Zone:** Contributing 25% to the City's GDP, the industrial sector faces challenges like high electricity use and low waste recycling. The industrial zone presents a major opportunity in improving the environmental performance of the 6th of October City particularly in terms of water, energy, waste management, air quality and GHG reduction.

Winning Youth Engagement competition logo



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Through rigorous benchmarking, technical assessments, and stakeholder engagement, key environmental challenges have been identified and prioritised. These priority challenges, detailed in the table below, form the baseline for developing targeted actions within 6th of October City's GCAP.

Priority environmental challenges

Environmental indicator	Priority	Sectoral linkages
Open / green spaces	High priority	 Land use – Lack of protection and infringement of open/green spaces from development. Water – Water scarcity is a challenge for the maintenance of open/green spaces. Treated wastewater would be required for the maintenance of green spaces. Solid waste – Open spaces used for disposal of waste.
Air quality	High priority	 Land use – Lack of open and green areas which impacts air quality; dispersed development in the City which increases private transport usage; and the location of industrial activities close to residential areas impacts upon air quality for residents. Transport – Traffic emissions from old highly polluting vehicles and significant traffic congestion. Industry – Increased activities located within the City. Solid waste – Lack of a sanitary landfill² and open burning of waste in the City which occurs intermittently
Water quality and availability	High priority	Industry – Pollutants from industrial wastewater. Water – Inefficient use adding pressure to already constrained water resources. Solid waste – Lack of a sanitary landfill which may pollute underground water resources.
GHG emissions	Medium priority	Transport – GHG emissions from motorized transport modes, particularly carbon dioxide. Buildings and energy – Inefficient residential and commercial buildings, and highly energy-intensive industry. Land use – Dispersed development in the City leading to reliance on private transportation.
Adaption and Resilience	Medium priority	Water – Inefficient systems and water scarcity challenges require additional consideration of future resilience. All sectors – Risks to utilities and local infrastructure associated with climate change.

² A new sanitary landfill is to be constructed in New October city serving the 4 cities of New October, Hadaek October, Sheikh Zayed and the 6th of October



6th of October City Green City Action Plan

The Green Cities programme in Egypt has been supported since the start by the Ministry of International Cooperation (MOIC). The GCAP's formulation is a demonstration of strong collaboration between key stakeholders such as the Ministry of Housing, Utilities and Urban Communities (MHUUC), NUCA, the City Authority, and the private sector. This spirit of cooperation will be sustained during the GCAP's implementation, offering a robust platform for International Financial Institutions (IFIs) to back financially sustainable projects. A prime example of this is the EBRD's 25 million Euros loan for Egypt's inaugural dry port in the City, marking a significant milestone in this collaborative journey, and acting as a trigger project for the City's GCAP.

6th of October City GCAP serves as a strategic roadmap designed to realise the City's Vision through the implementation of pivotal 'Anchor Projects'. These projects, detailed in the Summary Table (below), have been prioritised based on their technical feasibility, short-term readiness for implementation, and their alignment with the City's overarching Strategic Goals. To supplement these Anchor Projects, Priority Policies have been developed. These policies are instrumental in facilitating the successful rollout of both immediate and future projects. Additionally, Wider Supporting Policies have been developed to provide a holistic framework that guides the City's transformation into a green urban centre over the next decade and beyond.

The GCAP identifies 14 Anchor Projects spread across key sectors. These projects are buttressed by 17 longer-term initiatives and 23 policy directives. Each Anchor Project is not just a standalone initiative, but a catalyst designed to spur further development in each sector. They serve as essential building blocks for subsequent projects outlined in the Roadmap.

Moreover, this plan is tailored to address the unique geographical, political, and environmental challenges facing 6th of October City. It is a strategy, born out of extensive stakeholder engagement, ensuring a comprehensive and actionable roadmap for the City.

It is worth noting that some of these challenges are also shared by other Egyptian cities, and certain solutions can be scaled up to different cities facing the same issues. The potential for green bonds as a financing mechanism could offer a viable way to address these environmental challenges across multiple cities.

In the Land Use and Transport sector, the strategic objective is to improve the City's liveability while minimising dependence on private vehicles. Anchor Projects in this sector focus on the delivery of more urban green space,

densifying development around key urban nodes and transit lines, and providing more low-carbon and sustainable mobility options. Initial projects open up opportunities for the expansion and use of electric mobility across the City and the provision for more non-motorised transport (NMT) options.

For the Energy, Buildings, and Industry sector, the roadmap is focused on expanding the use of renewable energy and shrinking the City's carbon footprint. Initial efforts are concentrated on high energy consumption in residential compounds and public buildings. Subsequent projects aim to enhance resource efficiency in the Industrial Zone, offering substantial opportunities for carbon reduction.

The Water and Wastewater sector roadmap is developed to improve water supply efficiency and enhance water conservation as well as making better use of sludge. Anchor Projects in this sector act as catalysts, enabling the rollout of future projects such as the expansion of the October Water Treatment Plant and the Grey Water Treatment and Reuse project. Priority policies, such as the Water Conservation and Wastewater Reuse policies, offer immediate solutions to the pressing issue of water scarcity.

In the Solid Waste sector, the roadmap is geared towards overhauling the City's waste management practices and addressing the significant challenges of illegal dumping and open burning of waste, which occurs intermittently. The sequencing of projects adheres to the waste hierarchy³, with Anchor Projects prioritising foundational infrastructure within the sector that paves the way for the adoption of more advanced technologies and methods.

By aligning with international standards and frameworks, 6th of October City is not only setting a benchmark for urban sustainability in Egypt but is also positioning itself as a regional exemplar. This comprehensive Green City Action Plan serves as a strategic roadmap for realising these ambitious objectives.

6th of October GCAP identifies 325.4 to 362.8 million Euros (10.9 to 12.2 billion EGP) for short-term investment in priority initiatives (Anchor Projects). These

³ "The waste management hierarchy is a conceptual framework designed to guide and rank waste management decisions at both the individual and organisational level. It gives top priority to waste prevention, followed by re-use, recycling, recovery and finally disposal." Axil Integrated Services, WHAT IS A WASTE MANAGEMENT HIERARCHY, 2022, Access <u>here</u>

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projects are not just a financial investment but a commitment to future growth, with the potential to unlock additional investment in the City and generate employment opportunities. Moreover, these initiatives are projected to make a substantial environmental impact, targeting a reduction of approximately 38,426 tonnes of CO_2 emissions.

Funding options for these projects have been identified and range from public budgets to green bonds and multilateral development banks (MDBs) for larger projects. The EBRD's Green Economy Financing Facility (GEFF Egypt II) offers 150 million Euros for green initiatives, providing another potential avenue for financing these critical projects. In addition, there is potential for private sector companies to support the City achieve its objectives by implementing green municipal projects or foster partnerships with the public sector for delivery. As SMEs can be important stakeholders and action owners that support the implementation of some of the actions and objectives within the GCAP, EBRD's Advisory for Small and Medium Business (ASB) program can support these entities and can foster possible collaborations. The ASB program is designed to support private companies which fit under the EU definition of SMEs in Eqypt. This is done through assessing business growth needs per company and addressing challenges through linking them with the technical experts in all business-related functions within a consultants database, on a grant support basis. Strategically, ASB supports the themes of green transition, innovation, digitalization and inclusion.





Summary of Anchor Projects

	Public sector-led actions (with potential private sector participation)			CAPEX		
Sector	Action	Description	Benefits	Euros	EGP	Description
	Urban Greening Programme	This action will introduce more green spaces and biodiversity in the City. It can be integrated into other infrastructure projects led by NUCA to introduce solutions which will help with flooding and reducing urban heat while improving public spaces and streets. Components of this action can also be led by the private sector if supported by the City / NUCA through the development of different business models for green space delivery, operations and maintenance.	Improved air quality and reduced urban heat island effect.	15.3 million	504 million	The CAPEX for urban greening is based on an average cost of 20 Euros per square meter, which includes landscaping, irrigation and the planting of small trees. The total CAPEX has been calculated for the lower south-west area of the residential industrial separation zone, which covers approximately 364 feddans in total (1,528,800 m ²). It is assumed that 50 to 75% of this area will be leased to the private sector. The CAPEX relates to the remaining area which would be funded by the public sector.
Land Use and Transport	Transit- Orientated Development Plan and Pilot Project	This action will support TOD in the City, starting with a pilot project in the central commercial area. The action consists of two components, the first is a Regeneration Strategy and Action Plan, which sets out the vision and outline design for the Pilot TOD Project, along with design packages to guide public & private sector involvement. The second component focuses on the implementation of the Pilot TOD Project in the commercial centre and the delivery of specific work packages.	Promote brownfield infill development and increase the density of existing urban areas.	500,000 to 800,000 (for pre-action study) in addition to CAPEX for TOD pilot	16 to 22 million	The CAPEX for delivery of the Pilot TOD Project would be dependent on the type and quantum of development. A cost is provided for the Regeneration Strategy and Action Plan, which would provide detailed costings of the TOD Pilot.
	Implement BRT scheme, potentially with the full or partial integration of E-bus fleet	This action supports the implementation of the BRT project that has already been scoped by the government which aims to reduce the City's reliance on private cars. Implementation of this intervention will enhance air quality by minimising the use of polluting vehicles and transitioning shift to lower carbon mass transportation modes. It further aims to improve city connectivity, incorporate innovative technologies, and ensure gender-inclusive	Reduce GHG emissions and reduce pollution.	48 to 67 million	1.6 to 2.2 billion	This includes the purchase cost of 119 BRT EVs regular 12m buses, and associated charging infrastructure and charging strategy.





Public sector-led actions (with potential private sector participation			on)			CAPEX
Sector	Action	Description	Benefits	Euros	EGP	Description
		access to the network. Additionally, it has the potential to develop a skilled workforce and presents opportunities for green investment by adopting eco-friendly practices and infrastructure, including potential integration of an e-bus fleet or its future integration.				
	Multi-modal Integrated Transport Network	The focus of this action is to establish an integrated transport network in the City based on detailed analyses of current use and demand for different modes in the City and taking into account new and ongoing studies and initiatives to identify key areas for investment in new or upgraded infrastructure. The action, accordingly, will also include revising and updating 6th of October Sustainable Urban Mobility Plan (SUMP). Following the revision of the SUMP, the action would move into the implementation of identified work packages.	Improved access to sustainable mobility, which will support environmental improvements in the City.	1 to 1.5 million (for pre-action study) in addition to CAPEX for infrastructure construction	33 million to 49 million	The CAPEX for delivery of the Multi- modal Integrated Transport Network would be dependent on the quantity of NMT and last-mile connectivity infrastructure delivered. The cost of the revision of the 6 th of October Sustainable Urban Mobility Plan, with detailed costings for these components, has been provided. This cost is also based on the development of a transport model for the City as part of the updated SUMP.
Energy, Buildings and Industry	Installing Photovoltaic Systems in Buildings	This action will support the installation of decentralised PV systems (below 25 MWp to qualify for either the net-metering or self- consumption schemes) on rooftops of residential, industrial, commercial, and public buildings. The systems will be below 1MWp each. The action will also support the installation of solar water heating systems, with units of 100 to 300 litres. The first phase of this action aims to expand the delivery of rooftop PV on 259 buildings as part of the UNDP-funded Jannah October Project: in addition to the installation of 100 kWp PV systems on the roofs of 10 factories. This project will signal the transition to RE to the private sector which then may proceed to integrate PV on commercial buildings.	Cost savings and reduced emissions.	2 million	66 million	The CAPEX is based on an average of 4 kWp unit installed per building across 259 buildings; in addition to installing 100 kWp PV systems on the roofs of 10 factories.
	Solar-Powered Street and Public Spaces	The action involves the installation and maintenance of approximately 3000 solar- powered lighting units along the City's main	Cost savings and reduced energy	4.8 million	158 million	The CAPEX is based on an average cost of 1,600 Euros per unit for 3000 units.





Public sector-led actions (with potential private sector participation)						CAPEX
Sector	Action	Description	Benefits	Euros	EGP	Description
	Lighting	roads. Each unit is equipped with a 75-100 Wp solar panel and a 12-hour storage battery (0.9-1.2 kWh).	consumption.			
	Development of Smart Data Systems	This action will reduce non-revenue water (NRW) through investment in digital meters and data loggers. The action will include investment in permanent flow meters, chambers, pressure loggers, smart meters, quality monitoring systems, SCADA, and specialised software. The action will initially focus on a combined area of 10 km ² , including residential districts 7 and 8, as well as the Almotameyz district. In 2021, NRW was estimated to be 22% (though the actual value could be higher). An initial target was set to reduce NRW by 50%, this is inline, but more conservative, with Egypt 2030 vision which aims to reduce NRW (technical losses) in Egypt to 1/3 of its 2015 value.	Improved water supply efficiency and reduced waste.	3.5 million	115 million	The CAPEX is based on an area of 10 km ² .
Water and Wastewater	Energy Efficiency Improvement in Water and Wastewater Treatment Plants	This action includes investment in energy- efficient technologies, such as variable speed drives (VSDs), high-efficiency motors, pump system optimisation, power factor improvement, improved coupling, control systems for aerators, and efficient lighting.	Reduced energy consumption and reduced carbon footprint.	300,000	10 million	The CAPEX is based on targeting two plants - the old Water Treatment Plant and Phase I Wastewater Treatment Plant.
	Expansion of Western Wastewater Treatment Plant for the Fourth Phase	The action includes the construction of the 4th phase of the western wastewater treatment plant with 150,000 m ³ /day capacity bringing the overall plant capacity to 600,000 m ³ /day after the completion of the 3rd phase). The action includes investment in six primary sedimentation tanks (25,000 m ³ /day), six aeration tanks (25,000 m ³ /day), twelve final sedimentation tanks (12,500 m ³ /day), twelve filters (12,500 m ³ /day), a contact tank (4,000 m ³)	Increased plant capacity, improved environmental health and resilience.	150 million	4.95 billion	The CAPEX is based on expenses related to the construction of the wastewater treatment plant, such as procurement of materials, labour costs, and installation of equipment.





	Public sector-led actions (with potential private sector participation)			CAPEX		
Sector	Action	Description	Benefits	Euros	EGP	Description
	Sludge to energy	The action aims to convert the sludge generated from the existing western wastewater treatment plant into electricity. This is achieved through anaerobic treatment, which generates biogas. The action is a sustainable solution to manage the increasing volume of sludge, turning a waste product into a valuable energy resource. It is worth noting that while this action has specific prerequisites and challenges to materialize mainly in terms of bankability, it has been chosen to be an Anchor Project as an ambition to trial this technology in Egypt to align with current MHUCC direction.	Improved valorisation of sludge and a sustainable energy source.	90 million	3 billion	The estimated CAPEX for this action includes costs for construction, equipment, and other upfront expenses necessary to start the project. Further costs may be incurred if elements of the plant need to be upgraded to handle future capacity.
Solid	The Door-to- Door Waste Collection initiative	The action involves investment in, and distribution of, three types of bins for waste segregation at the household level. The action also requires the development and implementation of a public education campaign, which could involve various media and community engagement activities.	Increase collection efficiency and recycling rates.	-	-	The CAPEX for the door-to-door waste collection system will depend on several factors, including collection equipment, Streets GIS, trained staff, collection schedule, waste segregation and packaging, communication and education, and monitoring and evaluation.
Waste	Remediation of Existing Dumpsite and Construction of New Sanitary Landfill combined with a recycling plant	The action includes investment in a sanitary landfill combined with an MBT facility for recycling organic waste into compost and light plastics into RDF or SRF, with a capacity of 1200 tonnes/day, which would enhance the city's waste management capacity. The action would also include closing and remediating the existing dumpsite.	Reduce soil and air pollution and improve environmental health.	19-22 million	630 to 730 million	21 million Euros for the recycling plant. 1.2 to 1.6 million Euros for the landfill.





Public sector-led actions (with potential private sector participation)						CAPEX
Sector	Action	Description	Benefits	Euros	EGP	Description
	Development of a Transfer Station	The action involves investment in the construction of a transfer station, with a capacity of 500 tonnes of waste per day. An area of land has been allocated by NUCA for the transfer station which is 10 feddans (42,000 m ²).	Improved efficiency of waste management and improve environmental conditions.	1.6 to 2 million	53 to 66 million	The CAPEX is based on an area of 42,000 m ² .

Private sector-led actions					CAPEX		
Sector	CAPEX investment	Description	Benefits	Euros	EGP	Description	
Land Use and Transport	Transitioning Commercial Fleets to EVs	The action involves investment in Electric Vehicle (EV) infrastructure, specifically focusing on both converting existing relevant fleets to EVs and/or the purchase of new EV fleets. This action would initially target the conversion of industrial and commercial fleets to EVs, eventually being rolled out across the City, including residential compounds. The public sector can support this through the development of a Transport Masterplan.	Zero tailpipe emission transport.	550,000 to 650,000 for converting fleets 700,000 to 3,000,000 for purchasing new EV fleets	18 to 22 million for converting fleets 23 to100 million for purchasing new EV fleets	The CAPEX is based on converting 100 vehicles to EVs. A CAPEX for purchasing 100 new EVs (11-14 seats) is also provided for comparison. This action can be scaled up to several private sector clients focussed on residential compound mobility.	
Energy, Buildings and Industry	Sustainable Energy Residential Compound Package	This action involves investing in a bundle of renewable energy and energy efficiency technologies, in addition to smart distribution networks targeting residential compounds. Technology options for this action include efficient lighting, automation and thermal efficiency, solar systems (5 to 7 kWp solar PV and 300L solar hot water systems), as well as energy management, distribution network upgrade, and smart metering in addition to district-centralised cooling. A compound with 100 buildings/roofs could serve as an exemplary case.	Energy- efficient buildings.	170,000 to 630,000	6 to 21 million	The CAPEX is based on the implementation of 7 kWp PV systems or 300-litre solar hot water units in 100 properties.	











1. Introduction

Cities are particularly vulnerable to climate change and natural disasters as well as drivers of pollution and pressure on natural resources. There is an increasing need for a systematic approach to cities covering the broad range of environmental challenges and linking these to economic and social objectives to provide a comprehensive set of solutions which can translate into investable projects. Furthermore, there is a growing importance given to the urban environmental agenda and the need for a decentralised character of green and sustainable city actions.

Over the past few years, environmental objectives have gained critical importance in the EBRD's strategies and operations. The Bank has adopted the Green Economy Transition approach, which aims to have 'green' projects represent 50% of the Banks' investment portfolio. There is a growing importance given to the urban environmental agenda and the increasingly decentralised character of green or sustainable city actions. Furthermore, there is an increasing need for a systematic approach to cities covering a broad range of environmental issues and linking these to economic and social objectives to provide a comprehensive set of solutions which can translate into investable projects.

The EBRD Green Cities programme supports cities across Europe, Central Asia and the MENA region to develop Green City Action Plans using a systematic approach to identify and prioritise environmental challenges and connecting them with infrastructure investments and policies.

1.1. Purpose of the GCAP

On October 2022, 6th of October City launched its Green City Action Plan (GCAP), as a commitment to address its environmental concerns and infrastructure challenges and to support the transition to a green, low-carbon and resilient future. Following the EBRD methodology, the aim of the project is to assist the City to systematically address its environmental issues.

6th of October GCAP offers the City the opportunity to align their long-term development goals with an aspirational green growth agenda. This will provide long-term investment benefits for the city across multiple

sectors, demonstrating commitment to the global green agenda. The GCAP methodology represents a systematic process of identifying, benchmarking, prioritising and guiding Green City Actions that involves four steps:

- 1. Establishing a Green City Baseline and priority setting, which includes measuring the current status of environmental challenges in the City based on circa 70 core indicators and identifying the priority environmental challenges that need to be addressed.
- 2. Developing a Green City Action Plan, which includes preparing a document that articulates the City's vision, strategic objectives and priority actions and investments to address priority environmental challenges and meet the objectives;
- 3. Implementation i.e., execution of the GCAP; and
- 4. Monitoring and Evaluation of the GCAP results and updating the GCAP as necessary.

1.2. Engagement Process

The City Authority and NUCA have engaged in extensive stakeholder involvement to develop a clear understanding and agreement on the priority challenges facing the City. This engagement process included two large workshops with approximately 100 city stakeholders at each, as well as a series of internal city workshops (approximately 400 stakeholders in total across all engagements). These internal sessions involved sector experts and senior officials from NUCA and the City Authority. In addition, stakeholders have also been engaged via online forms and questionnaires to gain broader feedback on the GCAP. Together, these workshops and online engagement have helped articulate a clear vision and a politically and economically feasible plan of investments and policies to support its delivery.







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Figure 1-1 – Stakeholder Engagement Workshop



Engagement activity was also undertaken specifically targeted at the youth in the City. A seminar was held on 17th July at the City Authority premises, aiming to inform and involve youth and university students in the GCAP. Approximately 70 students from 5 universities, with various academic specializations, attended the seminar. 75% of attending students were female (53 females), and 25% of attendees were male (18 male participants).

The seminar included a short presentation about the GCAP and sustainable development concepts, followed by discussions on potential solutions for the City's challenges, identified by the students. The students expressed interest in participating in ongoing awareness campaigns and proposed activities with the City Authority and developing a curriculum focused on sustainable green City concepts.

Figure 1-2 – Youth Engagement Seminar



In addition, a mural design and logo competition was announced, aiming to encourage youth to think creatively about the City's challenges. The winning mural design will be painted on the external wall of the City Authority offices and the winning logo design has been used by the City Authority in their wider communication activities in 6th of October City.





Figure 1-1 – Winning mural design implementation



Figure 1-2 – Winning Youth Engagement Competition logo



The Stakeholder Engagement Plan (Appendix B) provides further insight into the youth engagement activity and other consultations undertaken.

1.3. Structure of the Document

Following this introductory chapter, the rest of the document is structured as follows:

Section 2 presents the City Profile covering the GCAP study area, the local and regional, demographic and socio-economic context, as well the institution arrangement for the GCAP.

Section 3 presents the baseline review of the City covering the climate profile, environmental and sectoral review, and the priority Green City Challenges.

Section 4 outlines 6th of October City GCAP framework covering the GCAP Vision, Sectoral Roadmaps and Strategic Objectives, Spatial Framework for Development, and an overview of co-benefits.

Sections 5 - 8 expand on the Land Use, Energy, Buildings and Industry, Water and Wastewater, and Solid Waste roadmaps, key actors and stakeholders involved in the actions, and a summary of the supporting studies and policies.

Section 9 sets out the implementation plan for the GCAP including the Monitoring, Evaluation and reporting requirements, and Costs and funding sources.

Section 10 sets out the next steps of the GCAP.





2. City Profile

6th of October City is in the Giza Governorate of Egypt. It is part of the Greater Cairo Region (GCR) and lies in the desert approximately 35 km west of Central Cairo. The City is a first-generation new city developed as part of Egypt's New Town Policy in the 1970s.

The City was planned to be geographically and economically independent of major cities with an initial target population of 500,000⁴. However, in the early 1990s, the city began to undergo fundamental changes leading to an expansion of its boundaries and a deviation from the initial development model⁵. Today, the city covers an area of 57,500 feddans (approx. 240 km²) and is home to approx.1.5 million residents⁶.

The City's urban landscape is a combination of residential, industrial, service, and agricultural zones, each contributing uniquely to its socio-economic fabric. The industrial zone, one of Egypt's largest, as well a number of educational facilities, serve as the City's economic base, offering significant employment opportunities to its residents.

2.1. Study area

Error! Reference source not found. illustrates the study area for the GCAP (red boundary), which is identical to the urban boundary of 6th of October City as demarcated in the City's Spatial Plan.

The City is bordered by three other urban settlements that were part of the city area until 2019, namely October Gardens to the southwest, New October City to the west and Sheikh Zayed City to the northeast. While these cities lie outside the GCAP's study area, the interaction between them and 6th of October City were considered in the analysis for this GCAP

http://www.newcities.gov.eg/english/New_Communities/October/default.aspx

as they share many urban services, as well as key infrastructure. This is particularly the case for New October City, which is still in the early stage of its development.

2.2. Local and regional context

Figure 2-3 provides an overview of the regional context for the 6th of October City. The City is strategically positioned within the Giza Governorate and forms an integral part of the GCR⁷. Cairo is the biggest city in the MENA region (by population) and Egypt's economic powerhouse. A centre of tourism, commerce, finance, administration, and culture, it is responsible for 30% of Egypt's GDP.

The GCR is characterised by multipolar development with polycentric poles in the Nile Delta and the surrounding desert and undeveloped land in between. 6th of October City in the west of the GCR is an important growth pole and provides a balance with New Cairo in the east in terms of activities, population movement, and urban services across the region in a manner which achieves a developmental parity between the two sides of the GCR.

The City is easily accessible from central Cairo and well connected to other major Egyptian Cities, such as Alexandria and Bahariya Oasis City by road. The City has two entrances from the regional ring road, namely the Cairo - Alexandria and the Giza - Fayoum Desert Roads.

The City's strategic location, high connectivity to neighbouring urban communities, and proximity to key tourism attractions like the 'Pyramids of Giza', make it a significant hub for population movement, inward investments, and development activities.

⁷ The Greater Cairo Region consists of Cairo, Giza and Qalyubiya Governorate.



⁴ Ibrahim Rizk Hegazy, et al (2013) Toward revitalization of new towns in Egypt case study: Sixth of October.

⁵ Ibrahim Rizk Hegazy, et al (2013) Toward revitalization of new towns in Egypt case study: Sixth of October

⁶ NUCA and City Authority Official Websites – accessed on Dec 23rd ,2022 which refer to 2017 census data which may include the population of the neighbouring cities of October Garden, Sheikh Zayed and New October. In all cases, the 4 cities still share main utilities such as water treatment and solid waste management,



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2.3. Demographic and socio-economic context

The GCR is projected to see its population grow from 18 million to 40 million by 2050⁸. Within this, the Giza Governorate stands as the second most populous in Egypt with 8.6 million residents. As of 2021, the 6th of October City is home to 1.5 million people. Notably, the City is a magnet for daily commuters, with 2006 figures indicating around 238,000 individuals commuting to 6th of October and Sheikh Zayed Cities daily^{9,10}. The City's Strategic Plan anticipates a population growth to 6 million by 2030, which is the maximum development capacity of the City. Demographically, the City has a young population: 42% are under 20, 36% between 20-40 years, 17% between 40-60 years, and 3.8% over 60. This higher youth population is possibly driven by the City's economic prospects and the large number of universities located in the City.

6th of October City plays a pivotal role in Egypt's economic landscape. There is no accurate data on economic output (Gross Domestic Product), however, it is estimated the GDP of £75 million is attributed to the City, assuming it generates 30% of the Giza Governorate's output (£252 million in 2018). The City is a hub for various sectors, with manufacturing, construction, retail, and education being the predominant employment areas¹¹, although the Governorate of Giza grapples with a high unemployment rate of 10% and ranks as a top 10 governorate in terms of unemployment rate, being higher than the national average of 7.2% (as of 2022). This is potentially due to an unaccounted large informal sector and a deficiency in market-related education and training facilities¹². The highest rate of unemployment in urban governorates, which includes Giza, is amongst 20-24 age bracket consisting of 28.4%, though age brackets from 25 to 29 and 30 to 39 follow closely with approximately 25% each. In urban governorates, the male unemployment rate is higher than that of females i.e. 56.8% vs 43.2%. In Egypt, in general, most of the unemployed are in the building and construction sector followed closely by the wholesale and retail sector, and manufacturing. It is also worth noting that the highest employment rates in Egypt is for bachelor's

degree/higher education holders¹³. Industry is a key economic driver in the City, particularly in engineering and electronics, with a focus on technological, electronic, and agriculture-based industries. The City's industrial zone is the second largest in the country and houses approximately 1,690 factories, providing around 100,000 jobs, and is set to expand with 694 factories under construction¹⁴. Notably, it hosts multinational corporations like Pepsico, Unilever, and Nestle, which adhere to high environmental and climate change standards.

Moreover, the EBRD is financing the development of Egypt's first inland dry port (DP6) in the City, which will function as an extended gateway for the deep-sea ports located in the northern and eastern regions of Egypt¹⁵. Other important economic sectors include technical and financial services, commerce and trade, private education, and a modest tourism and leisure sector. The City also has a significant informal sector, although its contribution to the GDP remains undocumented. The co-benefits of focusing on sectors like industry, and commerce and trade is important as they present opportunities for green investment, job creation, and sustainable development, aligning with the City's economic and environmental aspirations.

2.3.1. Gender Equality and Social Inclusion (GESI)

Evidence gathered for the Gender Equality and Social Inclusion (GESI) assessment is based on stakeholder engagement with representatives from civil society groups engaged through the GCAP process. The GESI assessment has provided insights into the status of women and refugees communities within 6th of October City and their access and involvement in key sectors.

Despite a national commitment to enhancing gender equality and women's political participation, exemplified by the ratification of international gender equality standards and the establishment of the National Council for Women, tangible barriers persist. In 6th of October City, these barriers manifest as spatial

⁸ The 6th of October Strategic Plan

⁹ Access <u>here</u>

¹⁰ Greater Cairo Urban Development Strategy | UN-Habitat (unhabitat.org)

¹¹ The 6th of October Strategic Plan, CAPMAS Economic Census 2017/18

¹² CAPMAS, Economic Census 2018, Main economic indicators

¹³ CAPMAS, Annual Collective Bulletin Workforce Research: An Analytical Report, 2022, Access <u>here</u>

¹⁴ Cairo Future Vision: Greater Cairo Urban Development Strategy

¹⁵ <u>6th of October Dry Port (ebrd.com)</u>



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segregation by income and gender, and a deficiency of safe public spaces and transport systems for women and girls, with the risk of sexual harassment acting as a barrier to education and employment opportunities. While the City provides relatively more opportunities for women, girls, and youth compared to more conservative rural areas, this has not significantly impacted the labour market, where females constitute only 26%.

Regarding refugees and asylum seekers, Egypt hosts over 270,000 individuals from 65 countries, with a substantial concentration in urban areas like Greater Cairo. The economic downturn in Egypt has adversely impacted refugees, exacerbating issues related to education, housing, employment, and healthcare. While exact data on refugees is unavailable for 6th of October City, It was clear from the stakeholders engagement that the percentage of expatriates from different countries is significant and has an impact on the various services and activities of the city. It has been also found that the largest refugee group is from Syria, with varying levels of social integration. The refugee support network, driven by the Habibet El Kheir NGO and a coalition of local NGOs, associations, and the local UNHCR office, is often stretched by demand. Additionally, refugees, particularly non-Arabic-speaking African refugees, encounter challenges in community integration and securing stable income opportunities. The Ministry of Social Solidarity has implemented housing projects for natural disaster victims from various informal settlements in GCR, but rapid and unplanned informal developments in these areas have resulted in them becoming crime and illegal activity hotspots.

2.3.2. Smart Maturity Assessment

The Government of Egypt's approach to 'smart' is broadly between the 'initiating' and 'enabling' stages in terms of maturity, with strategies like the Egypt Digital Transformation Strategy and Egypt ICT Strategy 2030 in place, aiming to digitise administration and enhance ICT infrastructure. However, the implementation of these strategies is hindered by a lack of capacity and financial allocations, particularly at the City level. A notable gap in coordination exists between local and central administrations, with most sectors being managed by relevant ministries rather than the City Authority or NUCA. Additionally, a digital skills gap exists, necessitating a national capacity development plan to facilitate digital transformation. Stakeholder engagement is limited to the national level, and there is a lack of evidence of structures and programs supporting the digital agenda at the City level. In 6th of October City connectivity and internet services are fairly accessible with a high percentage of the population using the internet primarily via mobile devices. However, challenges persist. Data capture is done manually, there is an absence of dedicated data management units, and data is stored locally which underscores the need for improved data management practices and cross-sector integration.

Despite a general lack of infrastructure and resources to support smart city development in Egypt, there are projects and programs, especially in the digital payments, financial technology, and cybersecurity sectors, that the GCAP can leverage to advance smart maturity. There are also notable examples of smart integrations in infrastructure provision which include:

- Water sector Instalment of electronic meters, which have started to be distributed in 25 new cities affiliated with NUCA;
- **Energy sector** A digitisation strategy is being implemented. This focuses on the digitisation of the electricity and renewable energy sector, including the application of smart meters;
- **Transport sector** There are plans to introduce a mass transportation system in the City consisting of Monorail and BRT systems, As well as the extension of the metro line; and
- A key challenge in the City is the development of accurate GIS maps. These are necessary for urban development to support projects such as TOD and urban greening. GIS mapping is also needed for the existing water network infrastructure, for maintenance activities and to minimize damage to the infrastructure. Accurate GIS is also important for improving the efficiency and coverage of door-to-door solid waste collection and accurately tracking areas of service and optimising garbage collection routes.

2.4. Institutional arrangement

The GCAP has been developed and will be implemented by the three main institutions responsible for urban development in the 6th of October City:

- The Ministry of Housing, Utilities and Urban Communities (MHUUC);
- The New Urban Communities Authority (NUCA); and
- City Authority.

Beyond these key institutions, various other actors play a role in implementing the GCAP actions. As noted, MOIC has spearheaded rolling out the Green Cities programme across specific cities in Egypt including 6th of October City. Table 2-1 gives an overview of responsibilities across the following sectors:





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A more detailed description of their responsibility for each GCAP action can be found in the action proformas in Appendix A





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Table 2-1 – Stakeholder responsible for the implementation of the GCAP sectors

Institution	Sectors	Responsibility
The Ministry of Housing, Utilities and Urban Communities (MHUCC)		MHUCC is the ministry responsible for the construction, and infrastructure of urban communities and utilities, and has the mandate to plan and establish new cities, then delegate the management and planning to the New Urban Communities Authority. In terms of land use, it is responsible for the construction of urban infrastructure and utilities. In the water and wastewater sector, it aligns operations with national objectives, formulates policies, and sets visions. For solid waste management, it oversees management in new urban communities and allocates hazardous waste disposal sites. In the buildings sector, MHUCC collaborates with the Housing and Building Research Centre to develop building codes and ensures compliance across the City's buildings.
The New Urban Communities Authority (NUCA)		NUCA is tasked with identifying new City sites and formulating their development strategies. It ensures the functioning and management of infrastructure and public facilities in new cities and provides residential land lots to individuals, and investment companies. ¹⁶ As an 'economic institution' it is able to carry out economic activities generating financial revenues for the state and has the autonomy to manage its own budget. NUCA oversees project planning and implementation in new cities. It provides residential land lots to individuals and investment companies, generating financial revenues for the state while maintaining budget autonomy. NUCA's responsibilities in land use involve proposing, planning, setting, and implementing plans, programs, and policies for establishing new urban communities. In the buildings and industry sectors, its involvement relates to land allocation, land use, and utility supplies. While in the water and wastewater sector, NUCA ensures the practical implementation of plants and adherence to construction standards.
City Authority		The City Authority acts as an executive administration subject to the plans set by NUCA and manages City utilities and projects. Once the public utilities and services projects (e.g., buildings and networks) are completed, they are transferred to the relevant ministry or holding company for operation, maintenance, and revenue collection. It enforces building codes and, in terms of energy and industry, supports NUCA with allocations and land use matters. In the water and wastewater sector, it plays a crucial role in implementing water and wastewater plants, ensuring construction standards, and operating plants. For solid waste management, it oversees waste collection and tariff determination, with future tariff revenues earmarked for the Solid Waste Authority.
Industrial Development Authority (IDA)		IDA, under the guidance of the Ministry of Trade and Industry, promotes investment in the sector, sets and implements policies regarding industrial zone development, and facilitates obtaining industrial licenses. In collaboration with the Environmental Affairs Agency, the IDA ensures industrial entities comply with waste management best practices, a prerequisite for obtaining or renewing industrial licenses.
The Ministry of Electricity and Renewable Energy (MoERE)		MoERE governs the energy sector, establishing policies and strategies, and managing the implementation of the energy strategy through its subsidiary entities, ensuring a coherent and sustainable approach to energy management and development across the City.

¹⁶ Such as the Mubarak Housing Project, the Future Association Housing Project, the Non-affiliated Housing Projects, and the Family Housing Project





South Cairo Distribution Company	South Cairo Distribution Company owns and operates the low and medium-voltage electricity network, managing the sale of electricity to consumers and the collection of tariffs, ensuring a stable and reliable energy supply across the City.
Egyptian Water Regulatory Agency (EWRA)	EWRA is the primary regulator of the water and wastewater sector. It monitors service quality, ensures fair pricing, and safeguards the interests of both consumers and service providers, maintaining a balance between economic viability and consumer protection.
The Industrial Control Authority (ICA)	The ICA plays a supervisory role, ensuring industries manage waste in alignment with established industrial standards, extending its jurisdiction to the operational phase of factories, and ensuring compliance with waste management standards across the industrial sector.
Ministry of Environmental Affairs and the Egyptian Environmental Affairs Agency	The Environmental Affairs Agency, in cooperation with the City Authority and the Industrial Development Authority, gives environmental approvals to all establishments that are subject to environmental impact assessment, inspection, and control of pollutants resulting from establishments, and provides technical support to improve performance and conserve resources. The Waste Management Regulatory Authority also issues the necessary licenses for waste handling in cooperation with the administrative authorities and 6 th of October City Authority through the Environmental Department.

Baseline Review of the City



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3. Baseline Review

3.1. Introduction

The GCAP for 6th of October City was shaped by a comprehensive technical assessment. This assessment, in collaboration with local stakeholders, identified the City's most pressing challenges. Addressing these challenges is important in order to enhance living conditions for residents and open up opportunities for investment in the City. To maximise the City's potential the following key challenges and opportunities should be addressed:

Urban Development and Transport: The City's layout is characterised by lowdensity and segregated zones, which leads to a heavy reliance on private vehicles. Transport projects such as the monorail and BRT are in the pipeline. However, they won't fully address the City's internal mobility issues. A TOD approach, linking with planned transport infrastructure and last-mile connectivity, can support economic activities and provide sustainable mobility options.

Environmental Performance: The City grapples with a scarcity of green spaces, a lack of biodiversity, and pockets of fluctuating air quality, primarily due to highly polluting vehicles, industrial activity and open waste burning which occurs intermittently.

Climate Risks: Rising temperatures, decreasing precipitation, and the looming threat of water scarcity pose significant challenges. The City's desert location makes it susceptible to heatwaves, sandstorms, and water shortages, all exacerbated by climate change.

Municipal Infrastructure: The water sector faces challenges, such as ageing infrastructure and the need to expand wastewater treatment capacity. Solid waste management is primarily focused on collection, recycling and treatment. The energy sector's heavy dependence on the national grid and limited renewable energy infrastructure highlights the need for strategic interventions to improve efficiency and expand renewable energy use.

Industrial Zone: Accounting for a quarter of the City's GDP, the industrial sector struggles with challenges related to elevated electricity consumption and minimal waste recycling. The industrial zone holds significant opportunities for enhancing 6th of October City's environmental

performance, especially concerning water, energy, waste management, and air quality.

3.2. Overview of policy direction

The GCAP is well aligned with the existing policy context on climate change, environmental issues and urban development in the sectors land use, transport, buildings, industry, energy, water and wastewater at the national and international level.

For climate change, the National Determined Contributions from 2022 and the National Climate Change Policy 2050 set the framework and strategic direction of climate action in Egypt nationally and locally. In these strategic policies emission reduction targets are set and high-level mitigation and adaptation measures are proposed.

The Egypt Environmental Law from 1994 is the key legislation for environmental protection and covers regulations on air quality, wastewater, and biodiversity. Development in the 6th of October City is obliged to follow these regulations locally, however, there are no specific environmental regulations for the City. The extent to which enforcement is successful is difficult to assess because local environmental data monitoring structures are weak.

In terms of urban development, policies focus on achieving balanced urbanisation and are vertically mainstreamed from national to regional and local levels. Egypt has the National Strategic Plan for Urban Development 2052, which provides a guiding framework for urbanisation in Egypt. It aims to accommodate the population increase over the next 40 years through the establishment of new urban areas, such as 6th of October City. At the regional level, the Greater Cairo Urban Development Strategic Plan supports the vision of 6th of October as an industrial hub within Egypt's western sector of Greater Cairo and provides strategic direction to the land use, transport, buildings, industry, energy, waste, and water sectors in the City. Within the urban sectors, additional selected policies include:

- Master Plan for Nationwide Transport System (2012);
- National Energy Efficiency Action Plan and national buildings codes;






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- 2030 Egypt Vision Strategy; and
- Law No.203/2014 i.e., "the renewable energy law".

Climate change adaptation is not well mainstreamed into local policy and regulation. A more integrated policy approach is needed both at the national and local level, that combines climate change, and environmental and urban sector issues.

The renewable energy sector is primarily governed by Law 87 of 2015 (New Electricity Law) and Law 203/2014 "renewable energy law". The former opened the door for private sector participation in the electricity sector aiming to transform it from a vertically integrated to a single buyer model. Conversely, Law 203, allowed privately owned RE plants to sell electricity to the grid through various schemes including feed-in-tariff, typical Build, Own, Operate and the Independent Power Producer modalities. However, only the Build, Own, Operate modality is currently available for large-scale RE plants. For small-scale/distributed generation, self-consumption and net-metering schemes are available. In addition, renewable energy application is mainly guided by the Sustainable Integrated Energy Strategy which sets an ambitious target for 42% of electricity to be generated by renewable energy by 2040.

3.3. Climate risk profile

3.3.1. Mitigation

At the national level, GHG emissions in Egypt are relatively low. The World Bank CO_2 country profile for Egypt¹⁷ outlines annual national level CO_2 per capita emissions as 2.5 tonnes per capita in 2019. Electricity and heat had the greatest level of GHG emissions (112.89 million tonnes CO_2eq), followed by transport (55.27 million tonnes CO_2eq) and manufacturing and construction (39.29 million tonnes CO_2eq). The NDC outlines the country's ambition to accelerate the development and deployment of renewable energy, in particular wind and solar, kick-start Green Hydrogen use, and decrease dependencies on natural gas and transport-related emissions.

At the local level, there is no overall GHG model for the City nor a framework run by the City authority or NUCA to account for GHG emissions within 6th of October City. In the absence of specific city-level data, national-level data provides a generalised perspective. Egypt has set specific targets for reducing GHG emissions in key sectors in 2030. Figures are only provided for the electricity and transport sectors, given the absence of oil and gas activities in 6th of October City.

In terms of the electricity sector, the baseline data from 2015 indicates GHG emissions of 1,264 GgCO₂e. Under the Business As Usual (BAU) scenario emissions are projected to escalate to 3,097 GgCO₂e. However, the mitigation target for 2030 is quite ambitious and set at 2,089 GgCO₂e. This requires a significant reduction of emissions by 1,008 GgCO₂e, which translates to a 33% decrease from the BAU scenario.

In relation to the transport sector, the 2015 baseline GHG emissions were recorded at 695 GgCO₂e. The BAU projections for 2030 see a rise to 1,793 GgCO₂e. The mitigation target for this sector is more conservative, set at 1,664 GgCO₂e for 2030, which requires a reduction of 129 GgCO₂e, or a 7% decrease compared to the BAU scenario.

Projections indicate a population increase of 6 to 7 million residents from 2030 to 2040. This growth is expected to increase GHG emissions across all sectors, especially if no mitigation actions are taken (BAU scenario).

Emissions from electricity are projected to reach 5,807 GgCO2e, while those from transport are expected to hit 3,663 GgCO₂e¹⁸. These projections are formulated based on national-level data and use the GHG emissions growth rate from 2015 to 2030, as outlined in the NDCs.

The increase in GHG emissions is likely to be fuelled by residential development and industrial activity, alongside the population growth. The expansion of the City will increase demand for electricity to power homes, workplaces, and industrial areas, particularly in a BAU scenario which assumes a continued reliance on non-renewable energy sources. Additionally, if road transport remains the dominant mode of transport, emissions in 6th of October City are likely to continue their upward trend, unless alternative, more sustainable transport options are developed and embraced.

3.3.2. Adaptation and Resilience

The City faces several climate risks which exacerbate existing urban development challenges:

¹⁷ CO2 emissions (metric tons per capita) - Egypt, Arab Rep. | Data (worldbank.org)

¹⁸ Figures extrapolated from 2030 GHG emissions assuming a uniform growth rate annually.

- Minimum, maximum, and mean temperatures will continue to increase driving greater a greater number of extremely high temperatures. The frequency and magnitude of extremely hot conditions, with potentially damaging conditions for infrastructure and health, will increase significantly;
- Average rainfall is likely to decrease for the City itself¹⁹. More importantly, combined changes in temperature, evaporation, and precipitation, will decrease water supply in the City. The water supply system is almost completely dependent on the Nile system, making it vulnerable to changes within this system. There is a need therefore to strengthen the resilience of water supply systems as demand for household and industrial water increases; and
- Other risks include sand/dust storms, which affect the health of communities and increase the incidence of non-infectious diseases and respiratory problems and flash floods following heavy rains/ storms that can disrupt urban infrastructure, transport, and industrial activity.

The projected changes in climate risks have significant implications for key sectors in the city, which are outlined in the sectoral review in section 3.5. For the development of GCAP actions, the following points were considered for climate change adaptation:

- Actions need to improve enabling conditions (e.g., policies, awareness raising) as well as physical infrastructure development;
- Climate risks need to be better integrated into urban development projects, rather than being treated as a separate topic;
- Measures need to prioritise reducing the vulnerability of marginalised groups in the City, as they are more vulnerable to the impacts of climate change;
- Prioritise Nature Based Solutions, where possible; and
- The priority is to improve the systems water supply system as demand for household and industrial water increases.



¹⁹ World Bank Group(2021).Climate Risk Profile: Egypt): The 15723-WB_Egypt Country Profile-WEB-2_0.pdf (worldbank.org)





3.4. Environmental review

Table 3-1 below summarises the environmental performance and key challenges that were identified through the technical assessment based on qualitative indicators and technical expert advice. The benchmark green, yellow and red related only to the technical assessment. The table also outlines the main linkages with the urban sectors and indicates how activities within these sectors contribute to environmental performance.

Table 3-1 – Environmental Review

Envir onme ntal Indic ators	Evalu ated Benc hmar k	Key Findings and Challenges
Air quality		• The City has relatively better air quality compared to Cairo mainly due to its open spaces, low population density and
		 elevated and open location of the City. The City's air quality is acceptable when it comes to SOx, NOx, and CO with hot spots either coming from industrial activities or transport in parts particularly close to Cairo. The main challenge is PM10 levels which are above the standard for 30% of the year mainly due to dust from construction (difficult to avoid) and open burning of waste which occurs intermittently. Key contributors & linkages to infrastructure provision Land use: Restricted open and green areas, lower or dispersed development which increases transport requirements and location of industrial activities close to residential areas. Transport: High traffic emissions Industry: Increased activities located within the City Energy: Mainly use of fossil fuels for energy generation
		Solid waste: Lack of landfill and open burning of waste which occurs intermittently
Water quality and availability		 Drinking water quality in the City is above the required Egyptian drinking water quality standards. The water from the Nile is treated by two local water purification plants and is used by both the municipal and industrial sectors. The City invests in wastewater treatment and encourages industrial facilities to do so. One key challenge the City faces is in relation to water availability in the long-term. Given water scarcity, the City Authority and NUCA need to continue to address wastewater reuse in all sectors, improving demand side, transmission efficiency, and protecting underground water aquifers. The City has access to an underground water reservoir (Moghra aquifer), used mainly for agriculture. It is at high risk of pollution. Key contributors & linkages to infrastructure provision Industry: Wastewater discharge affecting underground resources used for agriculture Water: Inefficient use adding pressure to already constrained water resources Solid waste: Lack of a proper sanitary landfill²⁰ which may pollute underground water resources

²⁰ A new sanitary landfill is to be constructed in New October city serving the 4 cities of New October, Hadaek October, Sheikh Zayed and 6th of October





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Soil quality	 Soil quality is not being regularly monitored in the City.
	• The main risks are illegal dumping of waste in open spaces and the excessive use of pesticides and fertilizers (on a
	smaller scale), e.g., in green space management.
	Key contributors & linkages to infrastructure provision
	 Land use: Unmanaged construction activities leaving rubble in open space.
	 Industry: Wastewater discharge from industrial activities can have a significant impact in the surrounding area
	 Solid waste: Lack of a proper sanitary landfill which may pollute the soil
Green space	• There are limited green spaces in the City, particularly in the northeast of the City and the industrial zone.
	• There is a clear correlation between green areas and lower temperatures in the City. Open spaces have the highest
	temperature due to being part of an exposed desert. There is however lack of open green spaces in the city, especially
5	large public gardens.
	Key contributors & linkages to infrastructure provision
	 Land use: Infringement of open/green spaces from development
	 Water: Treated wastewater required for the maintenance of green spaces
	Solid waste: Open spaces used for disposal of waste
Biodiversity	 The City is part of the Sahara Desert where numerous fauna and flora are threatened by climate change and various animal species endangered.
	 The City's fringes are on the route of a few migratory birds. There is limited enforcement of relevant national laws in relation to biodiversity and there are no local policies to address the topic.
	• The city's development is expanding to uninhabited areas and areas in the desert, hence could stress biodiversity,
	which is due to the transformation from a desert environment to an urban one, which led to the replacement or
	proliferation of biological species that did not exist.
	Key contributors & linkages to infrastructure provision
	• Land use: Expansion of urban areas into the Desert impacting vulnerable flora and fauna. Existing green spaces are
	limited to promote biodiversity within the City.
	Transport: Increased traffic and emissions
	 Industry: Activities located in close proximity to vulnerable ecosystems
	Water: Wastewater discharge polluting environment
	 Solid waste: Disposal and burning of waste in open areas

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3.5. Sectoral review

The sector assessment of the GCAP analysed the land use, transport, buildings, energy, industry, water and wastewater and solid waste sectors.

There has been significant progress made over recent years, especially in the water sector. However, there is still room to improve the service provision and to move towards a low-carbon and climate-resilient pathway. The review provides an overview of key areas of concern as a baseline for developing the GCAP actions supporting this transition.

Overall and across sectors, the City would benefit from more effectively implementing existing policies and strategies and enforcing regulation better through improved monitoring of environmental indicators at the local level.

In the following paragraphs, the main gaps in infrastructure provision are identified also highlighting climate change considerations, where appropriate.



Land use – The main land use challenges in the city are linked to low density and segregated land uses, which lead to long travel times, given the high reliance on private vehicles, and is linked with congestion issues. Nonetheless, there is the potential for better

implementing TOD principles around key infrastructure routes such as the monorail and BRT routes. Using these potentials requires better planning of the use of vacant land with the aim of increasing densities and mixed land use development within the catchment of TOD circles along transportation networks. Evidently, the land use sector is closely linked with the transport sector.



Transport – There have been efforts to enhance the public transport systems in 6th of October, but challenges still exist. These include the reliance on private high-polluting vehicles (including issues around vehicle age, the type of fuel that is used and the lack of efficiency standards)^{21,22} The sector also suffers from inefficient

public transport network management (including disruption from informal public transport; and a lack of dedicated lanes for public transport, with bike lanes often being used by private vehicles).

The transport sector is adversely impacted by climate change. Extreme heatwaves and heavy rains could damage vital infrastructure that connects 6th of October City to other cities. The obstruction of train routes, roads, bridges, and the anticipated dry port infrastructure could further impact the City's tourism, and marketing and movement of agricultural produce. Vulnerable communities within the City will be impacted the most as they lack alternative transportation means.

The 3rd National Communication recommended that mapping transportation areas at risk and modernising them is critical as well as enhancing public transport planning by considering future climate impacts to transport infrastructure.



Buildings – A large proportion of electricity consumption is within residential buildings with higher densities²³ with the highest consumption of electricity within buildings coming from HVAC and cooling equipment. Electricity consumption in residential buildings in

6th of October City is likely to be between 26 and 64.5 kWh/m² due to higher ownership of air conditioners and electrical appliances. Electricity consumption in non-residential buildings is very high at 328 kWh/m², particularly for commercial buildings, such as malls which use ACs more intensively. The absence of entities that provide certification and guidelines, along with enforcing standards represent the biggest challenge. It is important for the City to engage the private sector in the process, providing them with incentives related to building design taking into account the significant increase in risk of extreme temperatures, labelling, and moving towards more energy efficient practices.

For the City the main climate risks to buildings relate to extreme temperatures and dust storms. Air conditioning is widespread, however under heatwave conditions there are risks of failure of AC units, which could lead to heat stress and overheating. Additionally, the widespread use of air conditioning, in the absence of strong contributions from RE, increases City-level emissions. A better enforcement of NUCA's building design standards is needed as well as updating them to account for increasing temperatures and extreme heat.



Industry - the industrial sector is a dominant economic activity within 6th of October contributing significantly to the City's GDP. Challenges for the industrial zone include higher than average electricity consumption, with limited renewable energy power

²¹ Estimated average age of cars at 16 years.

²² Corroborated by the SUMP 2021 study which found that 16.1% of residents in the City used private cars while 6.5% used active travel. Based on a survey conducted in 2020 with 1600 participants from the 6th of October City.

²³ Accounting for approx. 40% of electricity usage in Egypt

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generation; low levels of industrial waste recycled, with approx. 57% of waste is recycled, and only 75% of industrial wastewater is treated onsite with the remaining being dealt with at the municipal WWT plant. The industrial zone presents a major opportunity to improve the environmental performance of 6th of October City particularly in terms of water, energy, waste management and air quality. Solutions for the industrial sector need to be considered in tandem with the energy, water and wastewater, and solid waste sectors. For example, synergy between RE options proposed in the energy sector or waste-to-energy solutions proposed in the waste sector. It is critical to take an integrated approach in order to maximise the outcomes from infrastructure investments.

The industrial zone is subject to climate risks such as increased average temperatures and heat waves which lead to lower efficiency operations of equipment, equipment failure and stressful working conditions for labour particularly when it comes to hot summer days and heat waves. Currently, it is becoming difficult to rely on passive cooling in production lines for labour and shifting to active cooling which has its technical complication and increased associated emissions. Heavy rain episodes rarely amount to destructive floods, nonetheless, could lead to disruption of inputs transportation and logistics as well as labour access to facilities a few days per year. Certain sectors are affected by wider climate risks, particularly in the food sector (which accounts for 11% of the 6th of October's Industry), where risks such as heat waves and unpredictable weather could lead to crop loss disrupting inputs to the sector.



Energy – The GoE has succeeded in extending the electricity network to more than 99% of the households within 6^{th} of October City. However, there are key challenges in relation to high electrical losses in the distribution network which are estimated to be at

approx. 15%, due in part to electricity theft. Regarding RE usage, 6th of October only has small-scale distributed solar PV systems with an estimated 8.4 MWp of output²⁴. There is significant potential for distributed solar PV systems to be installed throughout the City. Many residential compounds have roofs suitable for

solar installation and factories in the industrial zone are likely to have large roof areas that are suitable, although this needs to be verified. The same applies for solar hot water systems.

The City's energy infrastructure assets are at risk from water scarcity, and extreme temperatures. Power plants and solar infrastructure could be damaged during dust storms and extreme temperatures. This could disrupt the electricity supply across the City, with more impact felt in the industrial zones. The City vision highlights the potential for the City to be an exporter of electricity. PV solar, both residential, and industrial and commercial buildings, is a big opportunity, however, maintenance schedules need to take into account regular cleaning from dust storms, and potentially faster repair cycles as a result of high temperatures. Despite these challenges, solar power remains a significant opportunity for the City.



Water and wastewater – The per capita consumption of water of 200 I/day/capita in the City is lower than the value set by the Egyptian Code of Practice while NRW is relatively high (estimated to be 22% in 2021) due to old pipes, malfunctioning valves in the network, and water theft. In the 6th of October Strategic Plan WWT

plant capacity was reported to be insufficient but will improve with added capacity in the future^{25.} 100% of wastewater is treated however there are some occasional issues with the network. Reusing grey water in non-industrial buildings is not permitted in Egypt although there are plans to implement such measures in commercial buildings in the future. Treated wastewater is only used for irrigation purposes while sludge treatment in the City undergoes aerobic treatment.

Freshwater availability in Egypt will continue to decline due to growing water demands. In the short-term, the filling of Ethiopia's Grand Renaissance dam will decrease flow through the Nile system, and in the medium to long-term, the combination of climate change and basin-wide water demand will also impact on the amount of water reaching Lake Nasser. Overall precipitation is more likely to increase than decrease across the Nile basin as a whole, however, the combination of increased temperature and evapotranspiration, and increased population growth and water demand, means that runoff is likely to decrease. In addition, projections show increased interannual variability in rainfall and runoff, with an increased likelihood of severe droughts. Taken as a whole, the amount of water available to Egypt through the Nile is likely to decrease, with the World

²⁴ In August 2022, South Cairo Distribution Company has 4.5 MWp of PV systems > 500 kWp and 16.4 MWp < 500 kWp. It is estimated that 80% such capacity is installed in 6th of October and Zayed Cities split equally.

²⁵ 150,000 m³/day out of which currently only 100,000 m³/day is in service.

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Bank Country Climate and Development Report anticipating a reduction in flow from 55bn m^3 to 45bn m^3 .

These changes could further constrain water availability for 6th of October City as surface water from the Nile River is the City's main water supply. The planned population increase from 1.5 to 6 million over the next decade²⁶ will place significant strain on the water supply system to the City. In addition, the reduced water flow could impact on water supply infrastructure such as canals, water, and wastewater treatment facilities which rely on a minimum water flow and will exacerbate existing issues of poor water pressure in some areas of the City. The same infrastructure could be damaged by extreme heat and flash floods occurrence in the City.

Solid waste – Total solid waste generation per capita is lower than average and the majority of the City's population has access to regular waste collection services. However, the proportion of dry recyclables, organic waste and municipal solid waste that is being separated at the source, or from the mixed municipal solid waste stream, is below average. All waste produced in the City is collected and disposed at an open dumpsite. Following that, waste is sorted, treated and recycled illegally. There are no landfills available in the City but there are plans for establishing a sanitary landfill to accommodate waste for a period of 20-30 years. The focus of the entire SWM sector in the City is primarily on collection and disposal, with little consideration for other stages within the waste management cycle. Waste pickers provide essential support in recycling, filling a critical gap in the waste management cycle, and their inclusion within the waste management system needs to be considered carefully. Investments in a holistic SWM system should be supported. Finally, opportunities to link options to the industry sector should be explored to address the low levels of industrial waste recycling.

3.6. Priority Challenges

Green City challenges were prioritised based on the assessment of the climate risk profile, environment performance, urban infrastructure provision, gender and economic inclusion, and smart maturity considerations, and institutional structure, which were summarised in previous sections.

Together with inputs and feedback gained as part of the second stakeholder engagement workshop and the Project Working Group (PWG) workshop, the environmental challenges were assessed as high, medium and low priority. The PWG consisted of both NUCA and City Authority sector technical specialists that were engaged on several occasions to validate and prioritize the key challenges identified through the Baseline Assessment for each sector, as well as to validate and agree on priority and long-term projects and policies needed to address these challenges.

Table 3-2 – Prioritisation of Green City Challenges

Environmental indicator and priority	Benchmark from IDB	Evaluated Benchmark ²⁷	Stakeholder perception	Political Prioritisation ²⁸	Priority Challenge Level
Air quality			High	High	High
Water quality and availability			High	High	High
Soil quality			Low	Medium	Low
Green space			High	High	High
Biodiversity			Low	Low	Low
GHG emissions			Medium	Medium	Medium
Adaptation & resilience			Medium	Low	Medium

²⁶ Website access <u>here</u>

²⁷ The Evaluated Benchmark represents the conclusions and expert judgment of the Consultant Team based on qualitative evidence and research conducted for the Baseline assessment report.

²⁸ Based on the PWG and PSC engagement meetings held in late December 2022 and January 2023.



Building upon the assessment of the priority environmental challenges, the Consultant's Team explored appropriate actions to address these challenges with the PWG, the Project Steering Committee (PSC)²⁹ and wider stakeholder groups, these are presented as part of the key sectors in Section 4.

The prioritised environmental challenge areas are illustrated in Figure 3-1.

Figure 3-1 – Green City Challenges





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²⁹ The PSC consist of senior stakeholders within the City whose role is to provide feedback and steering throughout the GCAP process to ensure that the GCAP is realistic, implementable and closely aligned to the approval process.

³⁰ These environmental indicators have been assessed as low priority. This is not to argue that no challenges exist within these areas, but only to highlight that, when compared to major issues of water availability and quality, soil quality and green spaces, these areas pose lower urgency to the 6th of October City.

6th October Green City Action Plan





EBRD GREEN CITIES 6th of October Green City Action Plan

This Chapter presents the 6th of October GCAP along with its Green City Vision, Strategic Goals, and Actions presented under each key sector.

4.1. GCAP vision

Following the EBRD methodology, the City Authority and NUCA have engaged in extensive stakeholder engagement to develop a clear understanding and agreement on the priority challenges facing the City. This engagement process included workshops with city stakeholders at each, as well as a series of internal city workshops. These internal sessions involved sector experts and senior officials from NUCA and the City Authority. Together, these workshops have helped articulate a clear vision and a politically and economically feasible plan of investments and policies to support its delivery. The following vision takes the form of a Green City strategy statement which provides an image of the city and a general principle that will lead the development of the GCAP and its implementation.

6th October City aspires to be a leading Egyptian city, championing sustainability, green investment, digitalisation, and inclusive growth. As a thriving educational and industrial hub, the city is committed to enhancing the living standards of its residents and attracting a diverse population of students, entrepreneurs, and industries. Emphasising eco-industrial development and resource efficiency, 6th October City envisions itself as a beacon of economic prosperity, embracing digitalisation, and solidifying its status as a regional educational powerhouse.

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4.2. Development of Roadmaps and Strategic Goals

A comprehensive approach has been taken to establish sector-specific roadmaps for Green City development in 6th of October City. These roadmaps are designed to deliver the agreed-upon 'Vision' and guide the City's development over the next 10 to 15 years.

Strategic Goals serve as the foundation for implementing the Green City Action Plan, addressing priority environmental challenges and key pressure areas identified during the Baseline assessment phase. Developed through collaboration with stakeholders and the City Authority / NUCA, these goals are further refined into Mid-term Targets, which operationalise the GCAP by setting benchmarks.

Following the identification of Strategic Goals and Mid-Term Targets, we established a list of priority projects and a set of policies to support these projects. Identified projects and policies are based on 100+ potential interventions presented and discussed during workshops, which were then prioritised with stakeholders.

The final set of projects consists of both short-term (0-2 years) 'Anchor Projects' and longer-term (3-15 years) follow-on projects. Anchor projects are seen as catalytic projects which would spur wider change within the sector and have been selected based on their technical feasibility, maturity for implementation, and alignment with the City's Strategic Goals. Enabling policies are also identified that would be required to support the implementation of 'Anchor Projects' and subsequent follow-on projects, ensuring the City's progress towards becoming a Green City.

By implementing the proposed Roadmap for each sector, the 6th of October City can effectively transition towards a greener and more sustainable urban development pathway, in both the short and long term.

4.3. Sector and action overview

Chapters 5, 6, 7, and 8 present the key sectors, including Land Use and Transport, Energy, Buildings, and Industry, Water and Wastewater, and Solid Waste sectors. A brief overview of Actions is presented in each sector with more detailed project proformas contained in Appendix A. Project proformas provide as much detail as possible on the following information:

- The project's technical description and potential location where possible;
- Stakeholder involvement;
- Funding requirements;
- High-level estimate of capital and operational cost (CAPEX/OPEX);
- Timescales for implementation;
- Potential benefits offered, such as, smart technology opportunities, other environmental benefits, G&EI considerations, climate resilience and estimated carbon saving, and how these should be maximised; and
- Case studies of best practices.

In total, the GCAP contains 14 Anchor Projects, 17 longer-term projects, and 23 policies and supporting studies:

- Anchor and longer-term projects short- and long-term actions focused on capital expenditure to improve the environmental performance of infrastructure. This includes design, procurement of services, equipment, works, construction, and other implementation activities. A summary of the GCAP Actions can be seen in Table 4-1 below.
- Supporting studies and enabling policies policies concerned with legislation, regulation and standard setting measures, development and approval of implementation of strategic documents, institutional capacity building and enhanced governance processes relating to green City areas. Supporting and feasibility studies to support the implementation of Anchor Projects are outlined in more detail in project proformas and in Chapters 5, 6, 7, and 8.





4.4. GCAP Actions overview

Table 4-1 – GCAP Actions Overview

Public sector-led actions (with potential private sector participation)		
Sector	Investment	Benefits
Land Use and Transport	(LU&T 1) Urban Greening Programme	Improving air quality and noise, reducing the urban heat island effect, in addition to improving biodiversity. An increase in green space that can include recreational use can support improvements in public health.
	(LU&T 2) Transit-Orientated Development Plan and Pilot Project	Promote brownfield infill development and increased density of existing urban areas which can support reduction in requirements for private transportation reducing GHG emissions and improving air quality furthermore, the concentration of land uses can support increased economic activity in the area, improving job creation in the City.
	(LU&T 3) Implement BRT scheme, preferably with E-buses fleet	A shift to public transportation will reduce GHG emissions and reduce pollution while increasing access to sustainable and safe mobility.
	(LU&T 5) Multi-modal Integrated Transport Network	Improved access to sustainable mobility, which will support environmental improvements in the City, and create more attractive and safe streets and places
Energy, Buildings	(EBI 2) Installing Photovoltaic Systems in Buildings	Cost savings and reduced emissions, further support the creation of green jobs
and Industry	(EBI 3) Solar-Powered Street and Public Spaces Lighting	Cost savings and reduced energy consumption- which will reduce GHG emissions
	(W&WW 1) Development of Smart Data Systems	Improved water supply efficiency and reduced waste, contributing towards climate resilience address water scarcity and cost savings.
Water and	(W&WW 2) Energy Efficiency Improvement in Water and Wastewater Treatment Plants	Reduced energy consumption and reduced carbon footprint
Wastewater	(W&WW 3) Expansion of Western Wastewater Treatment Plant for the Fourth Phase	Increased plant capacity, improved environmental health and resilience
	(W&WW 4) Sludge to energy plant serving existing phase 1 and 2 of the western wastewater treatment plant	Improved valorisation of sludge, reduced GHG emissions and better land use. It further supports the development of a circular economy in the City
	(SWM 1) The Door-to-Door Waste Collection initiative	Increase collection efficiency and recycling rates, supporting reduction in GHG emissions, and improved environmental performance in the City.
Solid Waste	(SWM 2) Remediation of Existing Dumpsite and Construction of New Sanitary Landfill combined with a recycling plant (MBT Facility)	Reduce soil and air pollution, and improve environmental health
	(SWM 3) Development of a Transfer Station	Improved efficiency of waste management and improved environmental conditions.
Land Use and Transport	(LU&T 4) Transitioning Commercial Fleets to EVs	Zero tailpipe emission transport, improving air quality and public health
Energy, Buildings and Industry	(EBI 1) Sustainable Energy Residential Compound Package	Improvement in energy efficiency, access to sustainable energy and cost savings, while contributing to a reduction in GHG emissions.



4.5. Spatial framework for development

6th of October City serves as a key urban node within a region grappling with rapid urbanisation and significant infrastructural pressures. The City aims to alleviate these challenges by reducing the strain on services and utilities in the Greater Cairo Region, offering an attractive living and working environment. The City has a vision to be a leading Egyptian City that champions sustainability, green investment, digitalisation, and inclusive growth. As an educational and industrial hub, the City aims to elevate the living standards of its residents while attracting a diverse population of students, entrepreneurs, and businesses.

This spatial framework outlines the City's unique characteristics and development typologies, providing a comprehensive approach to delivering projects that align with its ambitious vision. As part of this, it is important to recognise that the City is divided into three distinct areas, each requiring a tailored approach to investment:

Industrial Zone: Located in the City's western region, this zone covers approximately 19% of the City's area and consists of both private and public operators. The focus here is on eco-industrial development, resource efficiency and the reduction of GHG emissions from polluting industries in the zone.

Residential Compounds: These are spread across six districts in the Eastern and Northern parts of the City, covering about 50% of the area. Characterised by high-value, low-to-medium-density housing, these zones also host universities and sporting clubs. The focus within these compounds is the promotion of renewable energy and a modal shift to less polluting forms of transport.

Old Residential District: This is the City's core, where 26% of the area is residential, followed by services (10%) and commercial use (5.7%). This district is nearly fully developed, with only 7% of the area still vacant. The focus in this area is the rejuvenation of the commercial centre through the development of Transit Orientated Development, maximising the benefits from significant transport infrastructure in the City, and creating a more liveable environment for the City's residents.

The Old Residential District is managed by the City Authority, which is responsible for public utilities and services. In contrast, residential compounds are led by private sector developers who handle infrastructure within these areas. Projects in the GCAP have identified the specific roles





and responsibilities of stakeholders withinst defined areas in the City to ensure effective delivery of projects.

6th of October City is also strategically located next to other new urban communities, including October Gardens to the South, New October City to the West, and Sheikh Zayed City to the East. These adjacent cities share services and infrastructure, making it essential to consider them as part of one urban agglomeration.

The City is well-connected through a network of regional roads, including the 26th of July Corridor, which links it directly to Cairo. These roads not only connect 6th of October City to the GCR but also to other regions, thereby supporting the flow of population movement, inward investments, and developmental activities.

The spatial framework for 6th of October City aims to align the delivery of green City projects with the City's broader vision of becoming a sustainable, inclusive, and digitally advanced urban centre.

This framework provides a roadmap for the effective delivery of projects that will shape the City's future, ensuring that 6th of October City not only contributes to its own development, but also plays a pivotal role in the growth and sustainability of the Greater Cairo Region. The map on the next page shows the specific locations of 'Anchor Projects' within the City.



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4.6. Climate Resilience

The assessments for this GCAP have highlighted a number of key climate risks which have impacts across a large number of sectors and threaten the sustainable development of the city. Climate resilience has been integrated into the development of the GCAP projects, and specific resilience considerations for each project are outlined in the project proformas in Appendix A.

A number of projects and policy recommendations can be considered to be adaptation-focused, in particular in the Land-use and Transport, and Water sectors, and are designed to enhance resilience to water scarcity and urban heat.

As a policy measure, LU&T 11 recommends the integration of resilience measures into the permitting process for new developments, and the development of a city adaptation and preparedness plan. This will significantly improve building standards and enhance the resilience of new developments in the city, including assessing their ability to withstand future temperature extremes and other environmental challenges. Given the threats of climate change, detailed hazard maps that highlight risks to infrastructure and implementing disaster risk management plans would ensure that the City's infrastructure is designed to handle potential extreme weather conditions.

Urban Greening

LU&T 1 proposes a series of measures to develop and promote the use of green spaces in the city, and urban greening measures such as the promotion of tree cover, public space, and green walls and roofs where possible. The projects will incorporate and drought-tolerant vegetation to combat the loss of existing and developed green spaces. It should be noted that urban greening can be integrated with other investments to improve their resilience to climate change. Urban greening is proposed to be carried out in a way that promotes biodiversity through incorporating perennial trees that attract birds and native species to the city, making them a protected area and a tourist attraction for the city; which would also result improving the city's air quality.

Overall, prioritising green space will have multiple benefits, including reducing the urban heat island effect, creating attractive and comfortable environments, improving air quality, and enhancing biodiversity in the City.

Ensuring reliable water supply in the face of likely reductions in water availability is an essential part of creating a sustainable 6th of October City. Projects proposed in the Water sector are designed to improve water efficiency in the city and enhance the overall resilience to drought and water scarcity. Key activities include:

Developing the use of "smart" data systems for assessing water losses: This project integrates advanced digital technologies into the existing water supply network, with the aim to improve the City's water management and, by reducing losses, increase resilience to drought. By using smart water technology, such as acoustic sensors and advanced analytics, the City can swiftly detect and repair leaks, ensuring predictive maintenance and optimising water usage.

Water conservation: Prioritising water-saving technologies, especially in highconsumption areas, and launching a city-wide awareness campaign about the importance of water conservation.

Wastewater reuse: Promoting the recycling of grey water, harnessing air conditioning drain water, for landscaping and maintaining green spaces, as well as reusing backwash water in water treatment plants.

Increasing industrial wastewater reuse: Encouraging industrial facilities to treat wastewater on-site, promoting sustainable industrial practices, and reducing environmental pollution.

Enhanced Water Storage: To support the City's preparedness for drought, emergencies and fire-related events, there should be an increase in underground water storage capacities. This would ensure a rapid response in critical situations, safeguarding both property and lives. Underground tanks should also be designed to collect and store rainwater, which can be used for green spaces and enhancing the City's green cover.



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4.7. Aligning with SDG co-benefits

The GCAP and its actions have been developed to maximise co-benefits and provide a holistic approach in improving the City, aligning directly with the UN Sustainable Development Goals (SDGs) and in particular:



SDG 11 – Sustainable Cities and Communities, and SDG 13 – Climate Action: These have been key drivers in developing the GCAP and ensuring its implementation in GC will result in a more sustainable and climate-resilient future for the City.



Water and Wastewater: Actions in the Water and Wastewater sector (see Chapter 8) will help to provide clean water and sanitation to 6th of October City by rebalancing water resources and providing residents with improved sanitation. Moreover, interventions to expand water and wastewater infrastructure and reduce inefficiencies in the water distribution network help to build

climate resilience.



Circular economy: Employing circular economy principles and the 3 R's have been embedded as part of the Solid Waste actions (see Chapter 9) ensuring the application of the most sustainable means of managing waste while reducing the potential for negative environmental impacts from waste where possible, particularly in the City's Industrial Zone.



Green spaces: Proposals to enhance the quantity and quality of open green space across the City are aimed at helping to improve biodiversity, improve the liveability of residents and mitigate climate change-related risks, such as the urban heat island effect.



Energy efficiency: Actions have been developed to improve the energy efficiency of buildings and lead to energy savings, and where possible, promote the use of renewable energy to unlock the potential for affordable and clean energy This will also have a positive effect in reducing GHG emissions and help to mitigate against climate change.



Climate resilience: 6th of October City is susceptible to a number of climate related risks which continue to be exacerbated as the climate emergency continues. Moreover, there are several vulnerable groups, such as, woman, refugees and the elderly, in the City which are at greater risk from climate related disasters.

The GCAP has been developed with this in mind ensuring that each action will lead to increased climate resilience, in particular when it comes to City infrastructure. Climate resilience is the backbone of all GCAP actions and have been specifically designed to provide several climate resilience benefits.



Gender and economic inclusion: The GCAP for the 6th of October City adopts a holistic approach to embed gender equality and economic inclusion. Drawing from the G&EI Assessment conducted during the Baseline Assessment Report and GCAP formulation, each action proforma encapsulates G&EI considerations, offering recommendations to champion gender and

inclusion in 6th of October City. The overarching goal of the GCAP and its proposed actions is to transform 6th of October City into a City that champions inclusivity and provides infrastructure for all its residents.



Smart technology opportunity: The GCAP for 6th of October City has been designed to incorporate smart technologies. While the City is in the early stages of its Smart City journey, the GCAP and its proposed actions seek to accelerate this transformation and support the City in its aim to develop into a digitally connected, sustainable, and efficient urban environment. Specific smart

actions have been integrated into proposed GCAP interventions.

Land Use and Transport Roadmap

Sector goals:

In 15 years, the City will - enhance the liveability of the City for all residents, reducing the reliance on private transport through better land use planning; and increase travel choice and minimise traffic congestion by improving quality and connectivity to public transport and active travel options.

Building upon existing initiatives, the identified projects aim to:

- 1. Increase provision of accessible, well maintained, environmentally sensitive areas of public green spaces throughout the city;
- Enhance the city centre by ensuring integration between land uses and transportation provision through TOD, incorporating densification and mixed uses to develop a vibrant urban core;
- Implement Resilience Planning to enhance the city's ability to adapt to and recover from adverse situations and ensure sustainability in the face of climate challenges; and
- 4. Support the development of a local integrated transport system, low-carbon public transportation, providing last-mile connectivity, and making provisions for NMT.







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5. Land use and transport sector roadmap

5.1. Introduction

The Land Use and Transport Sector Roadmap focuses on five Anchor projects that can help 6th of October City realise immediate benefits. The selection of Anchor Projects is based on their maturity for implementation, their potential to address key challenges, their alignment with the City's strategic objectives, and their multiple benefits. These are:

- **Urban Greening:** The development of a network of urban green spaces in the City;
- **Transit-Orientated Development Plan and Pilot Project:** The development of a TOD Pilot project and a plan for its implementation and subsequent expansion across the City;
- **Support in BRT implementation:** Investment in a BRT system with 119 CNG buses which could be potentially upgraded with the full or partial integration of E-bus fleet or once feasibility studies and charging strategies are carried out;
- Transitioning private sector fleets to EV's: Investment in converting existing vehicles to e-vehicles and/ or the purchase of new e-vehicles. The project would target 100 small buses (micro-buses/minibuses) for industrial entities transitioning them to EVs; and
- **Integrated Transport Network:** Action includes revising the existing SUMP to foster a modal shift in 6th of October City by developing an integrated transport network as well as the required infrastructure including NMT and bus feeders.

These projects build on existing initiatives and ongoing planned activities in the City and have been extensively tested with the relevant stakeholder both in terms of their implementation requirements and potential impact. Some of these projects incorporate both CAPEX and also further studies to ensure successful implementation while others are either CAPEX investment or purely a study. For example, the Transport Masterplan, while a study, will significantly amplify the impact of other projects, such as the TOD Pilot and BRT Project, by integrating them into the city-wide transport network. At the same time, the master plan will support the expansion of sustainable transport options across the City, including non-motorised transit (NMT), bus feeder services and park and ride, ensuring a seamless and sustainable transport experience. Similarly, the Regeneration Strategy is an important

study which provides a guide for the development of the TOD Pilot Project as well as outlining the expansion of the project across the commercial spine of the city ensuring that the development is integrated with public transport networks.

The Roadmap includes recommendations for the implementation of additional policies that can support sustainable urban development:

- Adaptation measures & preparedness plan: Integration of resilience measures into the permitting process for new developments; and
- Enhancement of GIS capabilities: Regular updating of GIS maps and enhanced data collection processes that cover vital services and infrastructure. Developing proper and accurate GIS maps is not only needed for urban development but for other sectors especially the water and solid waste sectors.

Following on from the successful delivery of Anchor Projects, the Roadmap proposes longer-term interventions that are intended to sustain and build upon the initial momentum developed by these projects:

- **Expansion of TOD across the City**: Expansion of TOD Pilot across the commercial centre of the City;
- **Expansion of EV charging points:** Expand the number of charging points throughout the City from the current 11 charging points³¹ specifically around new integrated mobility hubs connecting with monorail and BRT;
- New Services provided by private operators to be run through dedicated bus lanes: Provision of dedicated bus lanes across multiple corridors in the City;
- **Private operator's fleet size expansion:** Encourage operators to expand their services, prioritising electric or CNG vehicles; and
- **Bridge Construction:** Improve connectivity across the SOMID line, bridging the gap between segregated areas which in turn will help relieve traffic congestion and improve mobility within the City and accessibility, especially for public modes of transportation.

³¹ Obtained from Infinity EV Charge Website. Access <u>here</u>



	Key Considerations
Synergies	 Urban Greening, TOD Pilot Project, and Transport Masterplan: Urban Greening will be implemented in the TOD Pilot area, improving the urban environment. The Transport Masterplan will ensure both open green spaces and TOD areas are connected through sustainable transport options. The Urban Greening project can be aligned with BRT routes, ensuring that transit corridors are provided with green spaces, improving air quality, the environment and liveability for residents in the City. BRT Electric Vehicles, Transitioning Private Sector Fleets to EVs, and Expansion of EV Charging Points: The introduction of BRT EVs and private sector EV fleets will create a demand for charging infrastructure. The project to expand EV charging points addresses this demand and supports a transition to electric mobility across public and private transportation. TOD Pilot Project, Transport Masterplan, and Integrated Urban Mobility: The Transport Masterplan provides the overarching strategy for city-wide transport development which paves the way for an integrated transport network, ensuring that transport modes are seamlessly connected. The TOD Pilot Project would develop a transit hub around planned infrastructure in the commercial centre of the City and the Top Pilot Project Wasterplan defining here Top Pulot Project to expand the transport methods.
Describer of 1116 a	I ransport Masterplan is important for defining how TOD would be integrated into the wider transport network.
Replicability:	 The TOD project offers a blueprint for integrating land use and transport planning in new cities facing challenges with land use segregation and limited public transport options. The Urban Greening project provides a scalable model for enhancing urban liveability and biodiversity through a network of green spaces. Projects focusing on transitioning to EVs in public and private sector transport, and expanding EV charging infrastructure, present replicable strategies for other cities aiming to mitigate vehicle emissions and promote low-carbon mobility options.
Challenges and precursors to implementation:	 Funding for land-based developments and the development of green spaces might pose a challenge considering the scale and complexity of these projects in the City. A clear development framework is required to set out roles and expectations for the private and public sectors for their involvement. Ensuring all stakeholders, including government entities, private sectors, and the community, are aligned with the projects' objectives and
	implementation approach is critical, especially in projects that impact everyday operations. Adequate stakeholder engagement needs to be undertaken and a GCAP champion should be identified to drive the process forward.
	 Implementing projects like the BRT to EVs and expanding EV charging points require the implementation of new technology, which might be hindered by limitations in existing infrastructure, policy environment or a lack of capacity to implement the project.
	 There are also challenges regarding the current business model for EV charging stations (high power/fast charging). Currently, the government set fixed tariffs for charging. Those are not sufficient to ensure profitability for EV charging station developers/installers. In the current model, the developer installs the charging station for the client (usually semi-public/commercial areas) without charges. The developer and the client receive a small portion of the government pre-set tariff which is not sufficient to ensure any profitability; while the rest goes to the relevant DISCO. On top of that, while the current fast-charging high tariffs (1.89 EGP /kWh for AC charging and 3.75 EGP/kWh for DC fast charging) are suitable since the majority of EV users are high-income households, this could pose affordability issues for low-income users once projects such as the conversion of individually owned public transport mini/microbuses to e-buses are widely adopted.



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5.2. Key actors and stakeholders

Land use & transport	
The Ministry of Housing, Utilities and Urban Communities (MHUUC)	MHUUC is the ministry responsible for the construction, and infrastructure of urban communities and utilities, and has the mandate to plan and establish new cities, then delegate the management and planning to the New Urban Communities Authority (NUCA).
The New Urban Communities Authority (NUCA)	NUCA is tasked with identifying new City sites and formulating their development strategies. NUCA is responsible for proposing, planning, setting, and implementing of plans, programs and policies for establishing new urban communities including setting rules for land use.
The City Authority	The City Authority acts an executive administration subject to the plans set by NUCA and manages City utilities and infrastructure projects.
Ministry of Transport	The MoT establishes policies, ensures strategic alignment, facilitates collaborations, provides funding, and steers the transport sector towards through regulatory compliance and oversight.
Private operators	Private operators play a role in implementing and operating various transport services, managing and maintaining quality and safety standards, and partnering with government entities to improve transport networks.
Private developers	Private developers influence urban development in the City, construct residential and commercial developments, invest in infrastructure, and collaborate with government entities to ensure alignment with the City's objectives.

5.3. Summary of actions and policies

Anchor projects			CAPEX		
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
(LU&T 1) Urban Greening	The action will involve the development of a network of urban green spaces and linking opportunity sites throughout the City. The action will be enhanced with heat and drought- tolerant vegetation to combat the loss of existing and developed green spaces. Urban greening is proposed to be carried out in a way that promotes biodiversity through for example incorporating perennial trees that attract different birds and native species to the city, making them a protected area and a tourist attraction for the city, which would also result improving the city's air quality. Urban greening can be integrated with other green investments to improve the City's resilience to climate change.	The action will provide open spaces for public use, reduce the urban heat island effect, create attractive and comfortable environments, increase air quality, and enhance biodiversity in the City. This action indirectly reduces emissions by mitigating the urban heat island effect, thereby decreasing the energy demand for cooling buildings.	NUCA or private developers.	15.3 million	504 million
(LU&T 2) Transit-	The TOD related action is designed to enhance the accessibility and connectivity of public transportation	The action is designed to improve the City's public transportation systems, focusing on	The City Authority and	500,000 to 800,000 (for	16 to 22 million
Orientated	systems within 6 th of October City. The action comprises	enhanced accessibility and connectivity.	New Urban	pre-action	
Development Plan and Pilot	Component 1: Regeneration Strategy and Action Plan:	I his initiative will boost the appeal of the central commercial area for commercial,	Communities Authority	addition to	



	Anchor projects	\$		CAP	CAPEX	
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP	
Project	This component involves the development of a roadmap for the Pilot TOD Project, detailing the design packages to guide public and private sector involvement. The strategy also ensures that all developments align with the vision for the TOD in the City. Component 2: Implementation of Pilot Mixed-use Development: This component focuses on the redevelopment and enhancement of the identified Pilot in the central commercial area, turning it into a vibrant destination within the City. In the longer term, an expansion and integration of TOD across the City can be promoted. Building upon the Pilot TOD initiative for the Commercial Centre and Development of the Regeneration and Action Plan, the next step is to expand the TOD sites across 6 th of October City. For further details on the expansion of TOD please see the action - (LU&T 6) Extension of TOD development across the commercial centre of the City.	leisure, public sector, and residential activities. Improved connectivity is expected to attract inward investment and enhance the area's liveability. Additionally, the action will upgrade public spaces and aims to reduce congestion and emissions by promoting sustainable transport modes and decreasing the use of private vehicles.	(NUCA).	CAPEX for TOD pilot		
(LU&T 3) Implement BRT scheme, preferably with E-buses fleet	The action involves investment in a BRT fleet of 119 CNG buses, with potential integration of e-buses fleet or its future integration, once feasibility studies and charging studies are conducted. The upgraded BRT system, servicing 6 th of October City and connecting to other New Communities in central Giza, will improve public transport in the region. With the capacity to accommodate 126,000 passengers daily, the system will enhance accessibility and mobility for residents. The BRT system will span approximately 42 kilometres and feature 34 stations, including depots and terminals (not included in the action), reducing trip time by 15 minutes per trip.	The introduction of a BRT system will contribute to environmental sustainability and offer a cost-effective solution for mass transit. This action will not only modernise the City's public transport system but also pave the way for a greener and more sustainable future. The use of CNG BRT has the potential to reduce the City's carbon footprint with even more reduction expected if e-buses are used. Under the BAU scenario (diesel buses) GHG emissions are estimated to be 16,786 t CO2e. Upgrading the buses to electric vehicles would result in a reduction in GHG emissions down to 6,017 t CO2e, providing a saving of 10,769 t CO2e. Conversely, 4 to 18% reduction in GhG are expected if CNG buses are used.	New Urban Communities Authority (NUCA), Ministry of Transport.	68 million for the CNG case 85 million for the e-buses case	2.2 billion for the CNG case 2.8 billion for the e- buses case	
(LU&T 4) Transitioning	The action involves investment in converting existing relevant fleet to EV's and/or the purchase of new EV fleet	The action aims to support the transition from fossil fuel-dependent vehicles to	Commercial and industrial	550,000 to 650,000 for	18 to 22 million for	



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Anchor projects			CAPEX		
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
private sector fleets to EVs	The action would target 100 EVs (micro- buses/minibuses/mini-vans for transitioning, buses of various sizes, e-vans and e-cars for new purchases) for industrial entities. The number of vehicles, however, will depend on the interest of industrial entities to convert their fleet. A market study will be also required to determine the level of demand for new e-buses and converting existing fleets.	electric vehicles (EVs). This shift will improve air quality and contribute to a healthier urban environment. The action has the potential to significantly reduce the City's carbon footprint. Compared to the BAU case of micro-buses using diesel, converting micro-buses to electric could result in 60% reduction in GHG emissions.	fleet owners as well as private developers. Government e.g., MoF, also could be involved.	converting buses. 700,000 to 3,000,000 for purchasing new e-buses	converting buses. 23 to100 million for purchasing new e- buses ³²
(LU&T 5) Multi-modal Integrated Transport Network	The focus of this action is to establish an integrated transport network in the City based on detailed analyses of current use and demand for different modes in the City and taking into account new and ongoing studies and initiatives to identify key areas for investment in new or upgraded infrastructure. The action, accordingly, will also include revising and updating the 6th of October Sustainable Urban Mobility Plan (SUMP). Following the revision of the SUMP, the action would move into the implementation of identified work packages.	This action is designed to foster a modal shift in 6 th of October City by prioritising the development of an integrated transport network. This initiative addresses the City's high reliance on private vehicles by offering sustainable, integrated alternatives, including NMT, bus feeder services, and park-and-ride facilities. By reducing reliance on private vehicles, the action will decrease fossil fuel consumption and associated CO2 emissions.	New Urban Communities Authority (NUCA), City Authority, and the Ministry of Transport.	1 to 1.5 million (for pre-action study in addition to CAPEX for infrastructure construction)	33 million to 49 million

	Longer term actions				
Action	Technical Description	Action Impact / Benefits	Action Owner		
(LU&T 6) Extension of TOD development across the commercial centre of the City	Building upon the Pilot TOD initiative for the Commercial Centre, the next step is to expand the Transit Oriented Development (TOD) sites across 6 th of October City. The process will include analysis to identify areas that are close to current or planned transit hubs and have development potential. This analysis will integrate data on population density, land use, traffic flows, and public transport usage to identify the most promising locations for TOD. Investment in infrastructure will be	By extending the TOD Pilot, the City will promote sustainable urban growth, reduce traffic congestion, and create a pedestrian-friendly environment. This approach will also boost local businesses in the commercial centre and enhance the overall quality of life for residents.	The City Authority and New Urban Communities Authority (NUCA)		

³² Note: average cost estimated assuming 11 to 17 seaters buses are purchased



Longer term actions			
Action	Technical Description	Action Impact / Benefits	Action Owner
	prioritised to enhance accessibility and stimulate development within these areas. The expansion of TOD will build upon the pilot project as part of the action (LU&T 2) Transit Orientated Development Plan and Pilot Project. Further details of the process for selection of future areas for TOD can be found in the LU&T 2 Action Proforma in the Appendices.		
(LU&T 7) Expansion of EV charging points	Recognising the limited availability of EV charging stations, this action seeks to significantly expand the number of charging points throughout the City. Innovative solutions, such as integrating charging points into street lighting, will be explored. The initiative aligns with the Ministry of Electricity's (MoE) regulations and leverages the private sector's existing developments.	The expansion will facilitate the adoption of electric vehicles, reducing the City's carbon footprint. With the flexibility of EV charging points and the urban area's extensive electric grid coverage, residents will find it convenient, promoting a shift towards cleaner transportation.	Public and private operators of EV charging infrastructure.
(LU&T 8) New Services provided by private operators to be run through dedicated bus lanes	This initiative aims to expand dedicated bus lanes across multiple City corridors. Private operators will be incentivised to run EV buses and minibuses along these lanes, integrated with smart ticketing and user information systems.	The action will offer faster, eco-friendly mobility options, reducing reliance on unlicensed services. It will also enhance sustainable transport modes, benefiting developments along these corridors and promoting a greener urban environment.	City Authority provides the dedicated lanes/private sector provides the system.
(LU&T 9) Private operators fleet size expansion	To address the City's inadequate public transport service coverage, this action encourages operators to expand their services, prioritising electric or CNG vehicles. The City will either bundle profitable and non-profitable lines or provide compensation for potential losses, following international best practices.	The initiative will enhance public transport coverage, offering residents lower-carbon travel options. It will also stimulate economic growth by attracting more businesses to newly serviced areas.	City Authority provides the dedicated lanes/private sector provides the system.
(LU&T 10) Bridge Construction	This action focuses on constructing bridges to enhance connectivity across the SOMID line, bridging the gap between divided areas. The proposed bridges will have 2-3 lanes in each direction, ensuring smooth traffic flow.	The bridges will improve inter-area connectivity, reduce travel times, and enhance land value in the surrounding areas. This improved infrastructure will also attract more developments, boosting the local economy. The action will also help relieve traffic congestion and improve mobility within the City and accessibility, especially for public modes of transportation.	The City Authority and New Urban Communities Authority (NUCA).



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5.4. Enabling policies

(LU&T 11) Adaptation measures & preparedness plan: The City Authority should consider integrating resilience measures into the permitting process for new developments. This would involve assessing their ability to withstand future temperature extremes and other environmental challenges. Given the threats of climate change, detailed hazard maps that highlight risks to infrastructure and implementing disaster risk management plans would ensure that the City's infrastructure is designed to handle potential extreme weather conditions.

(LU&T 12) Enhancement of GIS capabilities: The City Authority should prioritise the regular updating of GIS maps. This should be coupled with enhanced data collection processes that cover vital services and infrastructure in the City. Additionally, ongoing technical support should be provided to the City Authority's secondary GIS unit, with an emphasis on capacity building for land use planning.

5.5. Sequencing of the Roadmap

The implementation of the Roadmap starts with the Anchor Projects, which have been chosen for their immediate impact, maturity and ability to catalyse further interventions within the sector. The Urban Greening project seeks to address the immediate need for open, green spaces in the City, enhancing air quality and biodiversity while mitigating the urban heat island effect. The TOD Plan and Pilot Project will be implemented in parallel to enhance public transport accessibility and connectivity, making public transport a more viable option for residents and reducing the dependency on private vehicles. The shift towards electric vehicles, through projects like the BRT Project and transitioning private sector fleets to EVs, directly aligns with the sector's goal of promoting sustainable transport modes and reducing emissions in the City.

Following on from the Anchor Projects, longer-term projects, such as the extension of TOD development and expansion of EV charging infrastructure, will be implemented. These projects will build upon TOD Pilot and EV infrastructure, ensuring that the improvements in sustainable transport and urban development are sustained and expanded upon, in order to develop a mixed-use urban core and facilitate the wider adoption of electric vehicles.

Supporting studies and policies are sequenced to enable and enhance the implementation of these projects. The Regeneration Strategy and Action Plan will guide the TOD Pilot project and the urban greening program, ensuring that developments are in alignment with the City's vision.

The **Revision of the 6th of October Sustainable Urban Mobility Plan (SUMP)** will need to be undertaken ahead of any of the identified transport interventions in order to ensure that transport initiatives are integrated, and the transport network is developed without exacerbating environmental challenges.

In parallel, enabling policies such as the Adaptation Measures & Preparedness Plan and **Enhancement of GIS capabilities** will be implemented to create a wider enabling environment for the projects. These policies will ensure safe, efficient, and resilient transport and land-use practices, safeguarding the City's infrastructure against potential future climate challenges. This sequencing ensures a structured approach to achieving the sector's strategic objectives, building towards a sustainable, liveable, and connected City.





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Energy, Buildings, and Industry Roadmap

Sector goals:

In 15 years, the City will - decrease its reliance on fossil fuel generated energy sources, integrating more renewable energy (specifically decentralised solar) & improve energy efficiency

Building upon existing initiatives, the identified projects aim to:

- 1. Increase the generation of energy from renewable sources, ensuring sectors have access to sustainable power;
- 2. Increase energy efficiency across all sectors, with a focus on enhancing industrial resource efficiency; and
- 3. Develop and integrate smart energy management systems, utilising technology to optimise energy use and distribution.





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6. Energy, buildings and industry

6.1. Introduction

The roadmap for the Buildings, Energy, and Industry sector in 6th of October City focuses on three main Anchor Projects, chosen for their readiness for implementation and their potential to address key challenges and alignment with the City's strategic goals. These projects are:

- Sustainable Energy Residential Compound Package: This project aims to integrate renewable energy and energy efficiency technologies, into residential compounds, providing a leasing model for solar PV systems and considering the potential for district cooling;
- Investing in Photovoltaic Systems in Buildings: This initiative supports the installation of decentralised PV systems on the rooftops of various types of buildings and also supports the installation of solar water heating systems; and
- Automated Solar-Powered Street Lighting: This project plans to install approximately 3000 solar-powered lighting units on the City's main roads while introducing smart lighting in the process.

These projects build on existing and planned activities in the City and have been thoroughly evaluated with relevant stakeholders in terms of their implementation requirements and potential impact. Some of these projects involve both CAPEX and further studies to ensure successful implementation, while others are just CAPEX investments.

The Roadmap also recommends the implementation of additional policies to for the successful implementation of projects in the sector. However, other wider and complementing policies are also proposed to enhance the sector that are not necessarily specific or related to the projects including national level policies, requiring buy-in from the appropriate ministries. The project specific policies are summarised in the roadmap and the Enabling Policies section below, while the wider policies are presented here and include:

- **Comprehensive Building Codes:** A policy to review and update existing building codes to focus on energy and water conservation;
- **Modernisation of Existing Buildings:** A policy to provide financial incentives for the modernisation of outdated buildings;
- Awareness and Promotion of Energy Efficiency: A city-wide campaign to raise awareness about energy-efficient technologies across various sectors;
- Green Investments and Efficiency Standards: A national policy to implement minimum efficiency performance standards for industrial motors; and
- Streamlined Energy Systems Regulations: A national policy to introduce regulations that combine the application of net metering and self-consumption PV systems.

Following the successful implementation of the Anchor Projects, the Roadmap proposes longer-term interventions to sustain and build upon the initial momentum developed by these projects, such as:

- **Residential Green Buildings for Government Developed Housing:** A project supporting the government-led programme to develop residential housing units for youth, designed with green building principles;
- **Smart Distribution Networks:** A project to modernize the distribution network's capacity and transition to digital and smart/prepaid meters;
- **Demand Side Management and Peak Chopping:** A project to manage energy demand by implementing peak clipping in the industrial sector; and
- Industrial Zones Eco Operations: A project to encourage industrial developers to invest in centralized green shared infrastructure and services.



	Key Considerations
Synergies	 Sustainable Energy Residential Compound and Investing in Photovoltaic Systems: The integration of renewable energy and energy efficiency technologies, including green building design measures, in residential compounds can be linked with investment in decentralised PV systems on building rooftops. The installation of PV systems, both in residential compounds and other buildings, can create a network of renewable energy sources across the City. The leasing model for solar PV systems in residential compounds could potentially be expanded and applied to other building types, leading to more widespread adoption of solar energy across the City. Investing in Photovoltaic Systems and Comprehensive Energy Management in Industrial Facilities: The investment in photovoltaic systems can be linked with comprehensive energy management in industrial facilities. By integrating decentralised PV systems into industrial buildings, the energy management of these facilities can be optimised. This synergy can also improve the reliability of energy supply to the industrial sector and reduce dependency on non-renewable sources. Residential Green Buildings for Government Developed Housing and TOD Pilot: The development of government-funded residential housing units with green building principles within the TOD pilot would help initiate the regeneration process within the City and set the ambition for the private sector. Combined with Urban Greening and NMT provision it will provide an exemplar for sustainable construction and liveable places.
Replicability	 Sustainable Energy Residential Compound Package: The leasing model for solar PV systems and the incorporation of energy-efficient technologies can be implemented in new residential developments in other cities. Investing in Photovoltaic Systems or Solar Thermal Systems in Private and Public Sector Buildings: The decentralised PV systems and solar water heating systems project can be replicated in new cities to promote the adoption of solar energy. The technical and financial models developed through this project can be a guide for implementing similar initiatives in other new cities. Automated Solar-Powered Street Lighting for Public Places and Roads: The installation and maintenance model of solar-powered lighting units developed through this project can be replicated in new cities, particularly in areas where establishing traditional grid-connected lighting may be challenging or costly.
Challenges for implementation and precursors to implementation:	 Supply chain challenges: A reliable supply of materials, especially for projects that involve specialised components, like solar PV systems, may be challenging. Identifying and managing the supply chain for materials and ensuring that projects are not delayed due to supply chain issues will be important. Capacity and capability: Implementing projects that involve new technologies, such as smart distribution networks and automated solar-powered street lighting, may encounter challenges due to a lack of local expertise and capabilities. It is important to ensure that there is sufficient knowledge and skill to manage and maintain these technologies. Slow uptake of RE opportunities: Lack of incentives and existing subsidy system might hinder quick progress in the sector. Affordability challenge: Consideration is required on how support can be provided to low-income households to ensure wider benefit from key measures such as the replacement of old appliances to energy-efficient ones.

6.2. Key actors and stakeholders

Energy, buildings & industr	ту Г
The Ministry of Housing, Utilities and Urban Communities (MHUUC)	MHUUC is the ministry responsible for the construction, and infrastructure of urban communities and utilities, and has the mandate to plan and establish new cities, then delegate the management and planning to the NUCA. In terms of the Buildings sector, MHUUC works with the Housing and Building Research Centre to develop building codes.
The New Urban Communities Authority (NUCA)	NUCA is responsible for proposing, planning, setting, and implementing plans, programmes and policies for establishing new urban communities. In relation to Buildings and Industry, NUCA's involvement relates to land allocation, land use, and utility supplies. In relation to the Industry sector, there is limited involvement of NUCA in relation to approvals for building aerial transmission lines and laying cables. The



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	same applies for natural gas networks.
The City Authority	The City Authority acts as an executive administration subject to the plans set by NUCA and manages City utilities and infrastructure projects. In relation to the Buildings sector, the City Authority enforces existing policies and regulations, such as building codes (e.g., building heights etc). In relation to energy and Industry, there is limited involvement from the City Authority, with some support provided to NUCA on land allocations and land use matters.
Industrial Development Authority (IDA)	The IDA implements policies set by the Ministry of Trade and Industry (MoTI). IDA promotes investment in the sector, sets and implements policies regarding industrial zone development and facilitates the procedure to obtain industrial licenses.
The Ministry of Electricity and Renewable Energy (MoERE)	The Ministry of Electricity and Renewable Energy (MoERE) oversees the Energy sector and sets policy and strategies. The ministry coordinates its activities with other entities on the energy level through the Supreme Energy Council (SEC) as well as the cabinet of ministers. MoERE manages the implementation of the energy strategy through its subsidiary entities among which is the state-owned Egyptian Electricity Holding Company (EEHC), and in coordination with the Egyptian Electric Utility and Consumer Protection Regulatory Agency (Egypt ERA).
South Cairo Distribution Company	South Cairo Distribution Company owns and operates the low and medium-voltage electricity network, selling electricity to, and collecting tariffs from the consumers.

6.3. Summary of actions and policies

	S		CAPE	EX	
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
(EBI 1) Sustainable energy residential compound package	The action is focused on renewable energy (RE) and energy efficiency investments targeted at residential compounds. The action aims to integrate renewable energy and energy efficiency technologies including green building design measures, alongside advanced distribution networks into residential compounds. This action offers a leasing model for solar PV systems, allowing homeowners to incorporate costs into their regular housing payments, making renewable energy more accessible. The potential for district cooling is also being considered, subject to a feasibility study. The action encompasses solar installations (PV and hot water systems), energy management, upgraded distribution networks, and smart metering.	This action will not only reduce the city's carbon footprint but also lead to cost savings for residents in the long run. The project will reduce the barriers to accessing renewable energy sources and energy-efficient equipment. The integration of renewable energy sources and energy-efficient technologies in residential compounds would significantly reduce greenhouse gas (GHG) emissions. The implementation of a 7 kWp PV system could potentially reduce GHG emissions by approximately 5 t CO2/year.	The action will be implemented by compound developers or by ESCO's.	170,000 to 630,000	6 to 21 million
(EBI 2) Investing in photovoltaic systems or solar thermal systems in private and public sector buildings	This action aims to support the installation of decentralised PV systems (below 25 MWp to qualify for either the net metering or the self-consumption scheme) on rooftops of residential, industrial, commercial, and public buildings. The systems are	The action will also foster the growth of the renewable energy sector and create opportunities for local employment. In terms of GHG reduction, the implementation of a 4 kWp PV system could potentially reduce GHG emissions by approximately 2.8 t	The New Urban Communities Authority (NUCA) will be the primary implementing	2 million	66 million



Anchor projects		S		CAPE	EX
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
	expected to be below 1MWp each. In addition, the first phase of this action will support the installation of solar water heating systems, with units of 100 to 300 litres ³³ . The action has the potential to build upon and scale up ongoing activity in the city, including the UNDP-funded Jannah October Project ³⁴ . There are approx. 259 buildings where PV can be installed.	CO2/year. For larger commercial/industrial users, a 100 kWp PV system would offset 70 t CO2/year.	agency for this action.		
(EBI 3) Expanding the use of automated solar powered street lighting for public places and roads	The action involves the installation and maintenance of approximately 3000 solar-powered lighting units along the City's main roads. Each unit, equipped with a 75-100 Wp solar panel, will replace traditional grid- connected lighting poles, eliminating the need for extensive and costly infrastructure such as transformers and cables. Moreover, the action introduces the concept of smart lighting.	The action will reduce energy consumption in the City's. The use of sensors and digital control switches extends the lifetime of the lamps and batteries and reduces the size of the solar panel and battery required, leading to significant cost savings. The action is also expected to achieve a GHG reduction of 696 tons of CO2 per year, assuming up to 75-100 Wp per pole and about 3000 units to cover the main roads around the City, with an operation time of 12 hours.	The City Authority will be responsible for the implementation of the action.	4.8 million	158 million

Longer term projects			
Action	Technical Description	Action Impact / Benefits	Action Owner
(EBI 4) Residential green buildings for Government developed housing (social housing ³⁵)	The initiative involves the application of green design concepts in the newly established development of residential housing units targeted at the youth. These units are offered at competitive prices with flexible payment terms and are designed with green building principles in mind. Key features include thermal insulation, reflective paint, shading, insulating windows, and solar heaters.	Integrating green building principles into housing projects promotes sustainable living practices, reduces energy consumption, and offers affordable housing solutions. With a potential scale of 50-100 buildings, this action would provide a positive environmental impact.	The City Authority and New Urban Communities Authority (NUCA).

 ³³ This aligns with the 6th of October Strategic Plan's goal to promote the use of solar hot water systems and their local manufacturing.
 ³⁴ Government funded housing project for youth on low incomes.
 ³⁵ Social youth housing targets youth aged 21 to 45 with maximum annual income of 30,000 EGP for singles and 42,000 EGP for married



	Longer terr	n projects	
Action	Technical Description	Action Impact / Benefits	Action Owner
(EBI 5) Smart distribution networks in residential complexes and citywide, including gradual replacement of old meters with smart meters	This action focuses on modernising the distribution network's capacity. The aim is to enhance efficiency and integrate advanced control elements for increased grid flexibility. A significant part of this action is the transition to digital and smart/prepaid meters, ensuring precise energy consumption tracking and investments in cables, transformers, shifters, and FACTs.	An upgraded network will provide electricity savings through greater efficiency, minimised losses, and optimised demand management. The introduction of smart meters will ensure improved collection rates and reduced subsidy burdens.	The action will be implemented by compound developers or by ESCO's.
(EBI 6) Implementation of demand side management and peak chopping (Industry focused)	This initiative is designed to manage energy demand by implementing peak clipping in the industrial sector. By investing in communication systems and data loggers, the South Cairo Electricity Distribution Company can coordinate with factories to modulate peak production, thereby alleviating grid stress.	Managing peak energy demands will ensure a more resilient energy grid, diminish the risk of outages, and foster efficient energy consumption within the industrial sector.	The action will be implemented by the Distribution Company or Industrial Developer.
(EBI 7) Industrial Zones Eco Operations and Sustainable Shared Infrastructure	This action encourages industrial developers and park operators to invest in centralized green shared infrastructure and services. Potential components of this action include distributed solar systems, centralized energy distribution solutions, energy management systems, and specific energy-saving technologies.	By promoting centralized green infrastructure, this action ensures sustainable industrial operations, reduces individual energy costs for tenants, and encourages a collaborative approach to energy management. The integration of shared PV systems and energy-efficient equipment further diminishes the carbon footprint of industrial zones.	The action will be implemented by Industrial Zone developers.



6.4. Enabling policies

(EBI 8) Urban Energy Efficiency Initiative: This initiative involves the City Authority promoting the use of energy-efficient appliances to replace outdated ones, aiming to reduce energy consumption and save long-term costs for households. In addition, a city-wide awareness campaign would educate residents about energy-efficient technologies in various sectors, with a focus on energy-efficient buildings and operations. A key aspect of the policy is advocating for energy performance contracts in new developments, integrating energy efficiency into the city's growth. In collaboration with the Ministry of Electricity and Renewable Energy (MoERE), this policy also seeks to phase out low-efficiency appliance manufacturing, ensuring only the most efficient products are available.

(EBI 9) Solar Energy Initiative: This initiative led by the City Authority focuses on training public sector workers in solar energy system design and operation, alongside a city-wide campaign educating residents on solar energy benefits and system maintenance. Working with MHUUC and NUCA, the City Authority will promote solar water heater installation in new buildings, as part of a broader initiative to revise building codes for energy and water conservation, including efficient energy use, green space provision, and reflective materials to mitigate urban heat. The initiative also involves modernising existing buildings, with MHUUC support in providing incentives for upgrades such as thermal insulation and energy-efficient glass. This initiative aims to foster a sustainable, energy-efficient urban environment, showcasing the city as a leader in sustainable urban development. There is potential for the City to become a centre of expertise and demonstrate the implications of the best available technologies. Some portions of public buildings operated by the City could undergo deep modernisation.

(EBI 10) Comprehensive Energy Management in Industrial Facilities: The City Authority should enforce the Electricity Law, mandating industrial facilities to maintain an energy register and appoint an Energy Manager. This would ensure that industries actively monitor their energy consumption and implement demandside management programs. Additionally, industrial establishments should be encouraged to frequently monitor combustion efficiency, with a particular focus on boiler analysis and emission assessments from industrial processes.

6.5. Sequencing of the Roadmap

The Buildings, Energy, and Industry sector has a strategic objective to reduce air pollution and GHG emissions from fossil fuel-generated energy sources and to significantly enhance energy efficiency over the next 15 years.

The Anchor Projects are designed to provide tangible benefits and address the pressing challenges faced by the City in the short term. The Sustainable Energy

Residential Compound Package will reduce the City's carbon footprint by integrating renewable energy and energy efficiency technologies in residential compounds. It not only promotes sustainability through the use of renewable energy, but also makes the technology more accessible to homeowners. Similarly, the initiatives to invest in Photovoltaic Systems in Public Sector Buildings and expand Solar-Powered Street Lighting are pivotal steps towards reducing the carbon footprint of the City and moving towards a more sustainable energy model. These projects will also foster the growth of the renewable energy sector and create opportunities for local employment.

Longer-term projects are designed to further the sector's goals and to sustain and amplify the momentum developed by initial projects.

- **Residential Green Buildings Development** will build upon the Sustainable Energy Residential Compound Package, extending the integration of green technologies across more residential units;
- **Smart Distribution Networks** will be implemented to ensure that the energy distribution network is modernised and capable of managing the increased load and diversified energy sources;
- **Demand Side Management and Peak Chopping** will ensure that the City's energy grid is resilient and capable of managing the fluctuations in energy demand, especially in the industrial sector; and
- **Industrial Zones Eco Operations** will be implemented to ensure that green infrastructure and services are integrated into the industrial zones, improving resource efficiency.

Several policies have been identified to support and enable the implementation of projects in the sector. These will be sequenced to ensure that the projects are viable and sustainable in the long term.

- Energy Efficiency and Solar Energy Capacity Building and Awareness policies will be important in the immediate term to support the Sustainable Energy Residential Compound and Photovoltaic Systems projects, ensuring that residents are equipped and aware of the benefits and maintenance of energy-efficient and solar technologies; and
- Comprehensive Energy Management in Industrial Facilities and Green Investments and Efficiency Standards will be important in the short to medium term to ensure that the industrial sector is adopting and maintaining energy-efficient practices. However, the Green Investments policy would need to be implemented at the national level making it a longer-term ambition on the Roadmap.







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Short term projects (0-2 years)	Medium term projects (3-5 years)	Longer term projects (5-15 years)
(EBI 1) Sustainable energy residential compound package		
(EBI 2) Investing in photovoltaic systems or solar thermal in public sector buildings (including industry, residential, offices & schools/hospitals)		
(EBI 3) Expanding the use of street lighting and public place lighting that are powered by photovoltaic solar energy, and expansion of automated street and public space lighting	(EBI 4) Residential Green buildings Development (social housing)	
(EBI 5) Smart distribution networks in residential complex meters with sm	es and citywide, including gradual replacement of old nart meters	
(EBI 6) Implementation of demand side manage	ement and peak chopping (Industry focused)	
(EBI 7) Industrial Zones Eco Operations a	and Sustainable Shared Infrastructure	
(EBI 8) Urban Energy Efficiency Initiative		
(EBI 9) Solar Energy Initiative		
(EBI 10) Comprehensive Energy Ma	inagement in Industrial Facilities	

Water and Wastewater Roadmap

Sector goals:

In 15 years, the city will - improve water supply network and efficiency; water conservation; and treatment and reuse of wastewater.

Building upon existing initiatives, the identified projects aim to:

- 1. Implement strategies to reduce water consumption through the promotion of water-efficient practices;
- 2. Enhance the water supply network, focusing on minimizing losses and ensuring consistent, reliable supply to all areas of the city; and
- 3. Upgrade the wastewater network, ensuring efficient, environmentally responsible disposal and treatment of wastewater.







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7. Water and wastewater

7.1. Introduction

The Water and Wastewater Sector Roadmap focuses on three Anchor projects that are important for 6th of October City to address immediate challenges related to water conservation, wastewater management, and ensuring a sustainable water supply within the context of the growing population and changing climate conditions. Anchor Projects are selected due to their immediate impact, readiness for implementation, and their potential to catalyse further interventions within the sector. The Anchor Projects are:

- Developing the use of "smart" data systems for assessing water losses: This project integrates advanced digital technologies into the existing water supply network, with the aim to improve the City's water management and, by reducing losses, increase resilience to drought. By using smart water technology, such as acoustic sensors and advanced analytics, the City can swiftly detect and repair leaks, ensuring predictive maintenance and optimising water usage;
- Energy efficiency improvement in water and wastewater treatment plants: This project aims to modernise the City's water and wastewater treatment facilities through infrastructure upgrades and the implementation of energy-efficient technologies. This will lead to less energy consumption, reduced GHG emissions, and address inefficiencies in water infrastructure;
- Expansion of the western wastewater treatment plant for the fourth phase: This project focuses on improving the City's wastewater treatment capabilities. By increasing the plant's capacity and integrating advanced treatment modules, the City ensures its environmental health and future resilience within the context of a growing population; and
- Implementing a sludge to energy plant serving the existing capacity of the western wastewater treatment plant: The project is in line with MHUCC direction to improve the valorisation of sludge. The plant will be, however, designed to be able to accommodate further sludge once phases 3 and 4 are constructed and operated as well as to accommodate sludge generated from neighbouring cities, The

project will also help the City to reduce its GHG emissions and free up land that could be used in a more beneficial manner³⁶.

These Anchor Projects build upon existing and planned activities in the City and have been thoroughly evaluated with relevant stakeholders in terms of their implementation requirements and potential impact. Some of these projects involve both CAPEX and further studies to ensure successful implementation, while others are either CAPEX investments or purely a study. For example, the **expansion of the western wastewater treatment plant for the fourth phase** will require environmental and design studies, studies into developing an effective contractual framework for off-take agreements, the availability and access to land, and developing a capacity-building plan for staff. These steps will ensure that the project is feasible, sustainable, and implementable.

The Roadmap also recommends the implementation of additional policies to for the successful implementation of projects in the sector. However, other wider and complementing policies are also proposed to enhance the sector that are not necessarily specific or related to the projects including national level policies, requiring buy-in from the appropriate ministries. The project specific policies are summarised in the roadmap and the Enabling Policies section below, while the wider policies are presented here and include:

- Enhanced Water Storage: Increasing underground water storage capacities to support emergency preparedness and fire-related events;
- **Performance Monitoring:** Introducing key performance indicators for the water network to drive continuous improvement;
- **Quality Assurance:** Ensuring a high-quality freshwater network through regular monitoring and testing; and

³⁶ It is worth noting that while this action has specific prerequisites and challenges to materialize mainly in terms of bankability, it has been chosen to be an Anchor Project as an ambition to trial this technology in Egypt to align with current MHUCC direction.
• **Prioritising Energy Efficiency in Treatment Plants:** Conduct regular audits of water and wastewater treatment plants to promote the adoption of energy-efficient practices.

Following the successful implementation of the Anchor Projects, the Roadmap proposes longer-term interventions to sustain and build upon the initial momentum developed by these projects:

- Expansion of October water treatment plant for the fourth phase: Increasing the plant's capacity to ensure water security for future residents of the City;
- Increasing the number of factories that treat and recycle wastewater on-premises: Encouraging industrial facilities to treat wastewater on-site, promoting sustainable industrial practices, and reducing environmental pollution; and
- **Grey water treatment and reuse for new service buildings:** Recycling grey water for landscaping and service buildings in new development areas, promoting water conservation and efficient resource management.





Key Considerations				
Synergies	 Expansion of Western WWTP and Sludge to Energy projects: As the treatment plant expands and generates additional sludge the sludge can be utilised to produce biogas. This synergy will ensure that the City is able to efficiently manage the sludge from the wastewater treatment process. 			
	• Smart Data Systems and Energy Efficiency Improvement in Water and WWTP projects: The data collected through smart systems can be used to optimise the operation of the treatment plants. This synergy would ensure that the City reduces water losses while also managing its water and wastewater treatment processes in an energy-efficient manner.			
	 Grey water treatment and reuse and Urban Greening: Recycling grey water for landscaping purposes, particularly in dedicated green spaces development around the City. 			
Replicability:	 Developing the use of "smart" data systems for assessing water losses: This project could be replicated in new cities that are grappling with non-revenue water losses due to leaks, theft, or ageing infrastructure. Energy efficiency improvement in water and wastewater treatment plants: The approach of integrating energy-efficient technologies can be replicated in new cities. The project can serve as a model for cities looking to modernise their water and wastewater treatment facilities. Grey Water Treatment and Reuse: The project is a scalable model for cities aiming to conserve freshwater resources and promote sustainable water management. The approach ensures that new development areas promote water conservation and efficient resource management. Sludge to energy: The concept of building a centralized sludge-to-energy plant that can handle sludge generated from neighbouring cities can be replicated in many other locations in Egypt especially the new cities east of Cairo. 			
Challenges for implementation	 Lack of appropriate incentives to support shift: The development of certain interventions is hindered by the existing tariff structure and subsidies making them financially not viable and unaffordable. This includes the Sludge to Energy project as well as efforts on water 			
and precursors	conservation measures such as grey water treatment and reuse.			
to	• An increase in the feed-in tariff, which is currently set at 1.03 EGP/kWh according to Decree No.41 of 2019, is critical for the bankability of			
implementation:	sludge to energy projects and to guarantee a profitable revenue for private investors.			

7.2. Key actors and stakeholders

Water and wastewater	
The Ministry of Housing, Utilities and Urban Communities (MHUUC)	The MHUUC holds a pivotal role in the water and wastewater sector. It is tasked with overseeing the entire sector, ensuring that operations align with the nation's broader objectives. The Ministry sets the general vision for the sector, formulating policies that guide the development, management, and sustainability of water and wastewater services.
The New Urban Communities Authority (NUCA)	Both NUCA and the City Authority are instrumental in the practical aspects of the water and wastewater sector. They are responsible for the implementation of water and wastewater plants, ensuring that these facilities are constructed to the highest standards. Post-construction, they own and operate these plants, ensuring that they function optimally and serve the needs of the city's residents.
The City Authority	Both NUCA and the City Authority are instrumental in the practical aspects of the water and wastewater sector. They are responsible for the implementation of water and wastewater plants, ensuring that these facilities are constructed to the highest standards. Post-construction, they own and operate these plants, ensuring that they function optimally and serve the needs of the city's residents.
Egyptian Water Regulatory Agency (EWRA)	EWRA acts as the watchdog of the water and wastewater sector. As the primary regulator, it ensures that all operations within the sector adhere to established standards and regulations. EWRA's mandate includes monitoring service quality, ensuring fair pricing, and safeguarding the interests of both consumers and service providers.
The Ministry of Health and	The MoHP plays a crucial role in ensuring the health and safety of the city's residents in relation to water resources. It is tasked with monitoring the quality of municipal water, ensuring that it is free from contaminants and safe for consumption. The Ministry also oversees





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Population (MoHP)	the potability of various water resources, including water wells. Furthermore, it enforces drinking water standards, ensuring that all water supplied to residents meets or exceeds these benchmarks.
The Ministry of Trade and Industry (MoTI)	MoTI has a specialized role in the water and wastewater sector, focusing on the industrial domain. It controls and manages the water supply specifically for the industrial sector, ensuring that industries have consistent access to quality water for their operations. This includes both the provision of water and the treatment of wastewater generated by industrial activities.

7.3. Summary of actions and policies

Anchor projects			CAI	PEX	
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
(W&WW 1) Developing the use of "smart" data systems (network digital monitoring and smart performance optimisation) for assessing water losses	This action integrates advanced digital technologies into the existing water supply network and aims to significantly improve the City's water management. The action will initially focus on a combined area of 10 km ² , encompassing residential districts 7 and 8, as well as the Almotameyz district. The use of smart water technology, such as acoustic sensors and advanced analytics, will enable precise leak detection and efficient water management. The action will also include the development of GIS maps of the water network which could be integrated with the actions LU&T 1 and 2 where accurate GIS maps are required	This initiative will significantly reduce non-revenue water losses, swiftly detect and repair leaks, and ensure predictive maintenance. This will not only optimise water usage but also guarantee a consistent and sustainable water supply. By detecting and addressing leaks promptly, the action can also save approximately 370,000 MWh ³⁷ . This energy efficiency translates into a reduction in GHG emissions, with an estimated decrease of 200 tons of CO2 equivalent per year.	The New Urban Communities Authority (NUCA) and the City Authority will jointly oversee the implementation of the action.	2.5 to 3.5 million	82 to 115 million
(W&WW 2) Energy efficiency improvement in water and wastewater treatment plants	This action supports infrastructure upgrades and technology implementation to improve energy efficiency in water and wastewater treatment plants (the Old Water Treatment Plant, and Phase I Wastewater Treatment Plant). Energy-efficient technologies include variable speed drives (VSDs), high-efficiency motors, pump system optimisation, power factor improvement, improved coupling, control systems for aerators, and efficient lighting.	The action will modernise the City's water and wastewater treatment facilities. By integrating energy-saving technologies, the initiative will address inefficiencies in water infrastructure. This approach will streamline energy consumption and reduce GHG emissions. The action aims to achieve a GHG reduction of 4,840 tons of CO2e per year, resulting in a 20% saving in emissions.	The New Urban Communities Authority (NUCA) and the City Authority will jointly oversee the implementation of the action.	300,000	10 million

 $^{\rm 37}$ Assuming NRW is reduced by 50% over the city .



	Anchor projec	ts		CA	PEX
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
(W&WW 3) Expansion of the western wastewater treatment plant for the fourth phase, with a design capacity of 150,000 m3/day	This action focuses on the enhancement of the City's wastewater treatment capabilities with the expansion of the western wastewater treatment plant. The fourth phase of this expansion aims to upgrade the plant's design capacity by an additional 150,000 m3/day, culminating in a total capacity of 600,000 m3/day post-completion. This includes the addition of six primary sedimentation tanks, six aeration tanks, twelve final sedimentation tanks, twelve filters, and a contact tank,	The expansion of the western WWTP will ensure that the City's wastewater treatment infrastructure remains efficient, even as the population increases to an estimated 6 million residents. By increasing the plant's capacity and integrating advanced treatment modules, the City will safeguard its environmental health and future resilience.	The New Urban Communities Authority (NUCA) and the City Authority will jointly oversee the implementation of the action.	150 million	4.95 billion
(W&WW 4) Sludge to Energy	The action aims to convert the sludge generated from the existing western wastewater treatment plant into electricity. This is achieved through anaerobic treatment, which generates biogas. The action is a sustainable solution to manage the increasing volume of sludge, turning a waste product into a valuable energy resource. It is worth noting that while this action has specific prerequisites and challenges to materialize mainly in terms of bankability, it has been chosen to be an Anchor Project as an ambition to trial this technology in Egypt to align with current MHUCC direction.	The Sludge to Energy initiative has two key benefits. Firstly, it provides an efficient method to manage the increasing volumes of sludge, eliminating the need for expansive drying beds and the traditional practice of selling dried sludge as fertiliser. Secondly, by converting sludge into biogas, the City gains an additional, sustainable energy source, reducing its reliance on conventional power sources.	The New Urban Communities Authority (NUCA) and the City Authority will jointly oversee the implementation of the action.	90 million	3 billion



Longer term projects						
Action	Technical Description	Action Impact / Benefits	Action Owner			
(W&WW 5) Expansion of October water treatment plant for the fourth phase, with a design capacity of 400,000 m3/day	The expansion of the October water treatment plant for its fourth phase is designed to have a capacity of 400,000 m ³ /day. This expansion is in anticipation of the City's future population growth, projected to reach 6 million residents. The action will allocate a dedicated area within the main water treatment plant to install a new treatment module. The design includes 10 clariflocculators (each with a capacity of 40,000 m ³ /day), 30 filters (each with a capacity of 13,500 m ³ /day), a ground water tank (700,000 m ³), The estimated cost for this expansion is around 270 million euros.	The expansion of the October water treatment plant ensures that the City's water infrastructure is prepared to accommodate its growing population. By proactively increasing the plant's capacity, the city will safeguard its water supply, ensuring that residents have consistent and clean water access. This forward-thinking approach will ensure water security for future residents of the City.	The New Urban Communities Authority (NUCA) and the City Authority will jointly oversee the implementation of the action.			
(W&WW 6) Increasing the number of factories that treat and recycle wastewater on- premises and developing the industrial sewage network	This action promotes the establishment of on-site wastewater treatment facilities within industrial units. The initiative aims to address the fact that 25% of industrial wastewater, amounting to 15,000 m ³ /day, is currently not treated on-premises. The action encompasses integrated treatment units, water recycling mechanisms, water conservation strategies, and measures to reduce the pollution load on sewers. The specific cost for this treatment ranges between 500 – 1000 Euros/m ³ /day.	By encouraging industrial facilities to treat wastewater on-site, the City will ensure better water quality and reduce the strain on the central sewage system. This initiative promotes sustainable industrial practices, conserves water, and significantly reduces environmental pollution, contributing to a cleaner urban environment.	The action will be implemented by the private sector industrial facilities and NUCA.			
(W&WW 7) Grey water treatment and reuse for new service buildings and landscaping of new project areas (new compounds, new commercial)	The action focuses on the treatment and reuse of grey water for new service buildings and landscaping in new development areas. It involves the separation of the sewage network to specifically collect grey water and the installation of compact units to treat this water for irrigation purposes. The infrastructure includes uPVC pipes ranging from 160 - 250 mm in diameter, inspection chambers, manholes, treatment units, ground tanks, and pumps leading to the irrigation system. The action will initiate with a pilot study covering an area of 2 km ² . The expected costs are in the range of 450,000 – 500,000 Euros/km ² .	By recycling grey water for landscaping and service buildings, the City will conserve its freshwater resources and reduce the load on its wastewater treatment facilities. This approach ensures that new development areas are designed with sustainability in mind, promoting water conservation and efficient resource management ³⁸ .	NUCA and the City Authority will jointly oversee the implementation of the action.			

³⁸ It should be noted that large scale adoption of grey water re-use may negatively impact the wastewater due to the increase in pollutant concentration. However, as the project primarily focused on service/commercial new buildings, minimal impact on the sewage system is expected. Commercial/public building water use accounts for only 22% of total city water use (as of 2021).



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7.4. Enabling policies

(W&WW 8) Water conservation: In 6th of October City, there is a need to prioritise water conservation given future water scarcity issues in Egypt. The City Authority should actively promote and incentivise investments in water-saving technologies, especially in high-consumption areas like shopping centres, restaurants, and commercial zones. These properties should be encouraged to adopt modern water-efficient fixtures and practices. Similarly, for residential areas and compounds, the City Authority should encourage the use of advanced drip irrigation systems, for green spaces, which not only conserve water but also ensure optimal water usage for plants, contributing to a greener urban environment. To further strengthen water conservation efforts, the City Authority should introduce and enforce regulations that set limits on water consumption, ensuring sustainable water use. Alongside these measures, a city-wide awareness campaign should be launched, educating residents about the importance of water conservation and offering guidance on how they can contribute to this cause.

(W&WW 9) Wastewater reuse: The City Authority should pursue sustainable water management through innovative reuse strategies. This includes promoting the recycling of grey water, harnessing air conditioning drain water as a potential source of distilled water and re-using backwashing water in water treatment plants. Excess treated water can also be directed towards landscaping and maintaining green spaces. This approach not only conserves freshwater resources but also enhances the City's green spaces. This policy aligns with broader water conservation efforts, ensuring that the City proactively addresses its future water needs in the face of future water scarcity risks.

(W&WW 10) Sustainable Water Management and Efficiency: This policy seeks to support energy efficiency in treatment plants, performance monitoring, and quality assurance. The City Authority, together with NUCA and the Water Company, should conduct regular audits of water and wastewater treatment plants to identify areas needing improvement. This will include promoting the adoption of energy-efficient practices, such as integrating high-efficiency motors, to optimise operations and reduce energy consumption. The introduction of Performance Monitoring plays an important role in this policy. The establishment of key performance indicators for the water network will set benchmarks for service quality. Regular monitoring against these indicators will enable continuous improvement, aiming to enhance the efficiency and reliability of the water system. Quality Assurance

is another critical component of this policy. The City Authority should ensure the highest quality of its freshwater network through regular monitoring and testing to confirm that the water supplied adheres to stringent quality standards, thereby safeguarding the health and well-being of the City's residents.

7.5. Sequencing of the Roadmap

The Roadmap is structured to achieve the City's strategic objectives over the next 15 years delivering an efficient and resilient water management system for the City. Anchor Projects are sequenced to be implemented immediately because of their maturity and ability to catalyse further interventions within the sector.

The Development of Smart Data Systems is prioritised to address the immediate challenges of ageing infrastructure and water theft, ensuring efficient water usage and a reliable water supply. At the same time, the Energy Efficiency Improvement project is prioritised as it is a 'quick win' within the sector and a relatively low-cost project which addresses the significant inefficiencies in the water infrastructure. The Expansion of the Western Wastewater Treatment Plant is prioritised as a proactive step to ensure that wastewater treatment infrastructure remains efficient and effective as the City's population grows to 6 million people over the coming years. This project is also a clear priority of NUCA and the City Authority.

Following the successful implementation of the Anchor Projects, the longer-term projects are then sequenced to build upon these:

- Sludge to Energy: This is a medium project with the opportunity to be brought forward to a short-term project if proper incentives apply including increasing the current feed-in tariff rate. However, this project is dependent on national-level policy changes in relation to energy tariffs and an adequate level of sludge to be provided to ensure the facility is viable;
- Expansion of October water treatment plant for the fourth phase: Similarly, to the Expansion of the WWTP, the expansion of the October water treatment plant is a proactive step to accommodate the City's growing population, ensuring consistent and clean water access;
- Increasing the number of factories that treat and recycle wastewater on-premises: This project builds upon Anchor Projects to promote more efficient wastewater treatment in the City ensuring better water quality and promoting sustainable industrial practices; and
- Grey water treatment and reuse for new service buildings: This project builds upon Anchor Projects which aim to develop more efficient



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water processes in the City, ensuring that new development areas are designed with water conservation processes in mind.

In terms of supporting policies, the Water Conservation policy is prioritised due to its immediate impact on water conservation, ensuring sustainable water use. The Wastewater Reuse policy has synergies with water conservation efforts, ensuring resilience against potential water scarcity. The **Sustainable Water Management and Efficiency** policy is important for ensuring consistent service quality and sustainable and efficient operations in the City's water and wastewater treatment plants and is prioritised in order to enable Anchor Projects and longer-term projects related to water and wastewater treatment. The sequencing of policies has been developed to address immediate challenges within the sector while laying the foundations for future projects and policies.





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Short term projects (0-2 years)	Medium term projects (3-5 years)	Longer term projects (5-15 years)
(W&WW 1) Developing the use of "smart" data systems (network digital monitoring and smart performance optimization) for assessing water losses		
(W&WW 2) Energy efficiency improvement in water and wastewater treatment plants		
(W&WW 3) Expansion of western wastewater treatment plant for the fourth phase, with a design capacity of 150,000 m3/day		
(W&WW 4) Sludget	to Energy	
	(W&WW 5) Expansion of October water capacity	treatment plant for the fourth phase, with a design of 400,000 m3/day
(W&WW 6) Increasing the number of factories t	hat treat and recycle wastewater on-premises and	d developing the industrial sewage network
(W&WW 7) Grey water treatment and reuse for n	ew service buildings and landscaping of new proje	ect areas (new compounds, new commercial)
(W&WW 8) Water co	nservation	
(W&WW 9) Wastewa	ater reuse	
(W&WW 10) Sustainable Water Ma	nagement and Efficiency	

Solid Waste Roadmap

Sector goals:

In 15 years, the city will - deliver a waste management system based on the waste management hierarchy.

Building upon existing initiatives, the identified projects aim to:

- 1. Construct new solid waste management facilities, ensuring the City has the capacity to manage waste effectively;
- 2. Enhance collection and upstream activities, ensuring waste is managed effectively from source to disposal;
- 3. Encourage investment in recycling within the Industrial Zone and develop a culture of waste reduction and reuse among businesses; and
- 4. Implement smart waste management solutions, using technology to improve waste collection, processing, and disposal.





8. Solid waste

8.1. Introduction

The Solid Waste Sector Roadmap focuses on three Anchor projects that can support 6th of October City to realise immediate benefits in the sector. The selection of Anchor Projects is based on their maturity for implementation and their potential to address key challenges, such as improving waste segregation, managing solid waste in an environmentally sustainable manner, and integrating informal waste collectors into the system. Anchor projects are also closely aligned with the City's strategic objectives. Anchor projects include:

- **Door-to-door waste collection:** Aims to expand waste collection services beyond the current areas of operation, introducing a three-bin system for segregating waste into dry recycling, organic waste, and residual waste;
- Feasibility study for closure and remediation of existing dumpsite and construction of a new sanitary landfill with an MBT facility: Seeks to remediate the existing dumpsite and construct a new sanitary landfill with an MBT facility; and
- **Development of a transfer station:** This project involves the construction and operation of a waste transfer station, ensuring comprehensive coverage across the City.

These projects build on existing initiatives and ongoing planned activities in the City and have been extensively tested with the relevant stakeholders both in terms of their implementation requirements and potential impact. Some of these projects incorporate both CAPEX and further studies to ensure successful implementation, while others are either CAPEX investments or purely a study. For example, the Solid Waste Management Study is a critical study to understand and address the challenges and opportunities within the waste sector and is required to enable future interventions, ensuring that they are not only technically feasible but also economically viable, environmentally beneficial, and socially inclusive. See section 8.4 for more details on this study.

The Roadmap also recommends the implementation of additional policies to for the successful implementation of projects in the sector which are summarised in the roadmap and the Enabling Policies section below.

Following on from the successful delivery of Anchor Projects, the Roadmap proposes longer-term interventions:

- **Promote waste pre-treatment on-site at related facilities (shredding and baling):** Focusing on on-site waste pre-treatment, particularly shredding and baling, to ensure efficient waste reduction and facilitate easier transportation and treatment;
- **Financing high-priority recycling facilities:** Addressing the current unsustainable practices seen in large-scale recycling facilities by establishing official or licensed recycling facilities for industrial waste; and
- Establishing designated areas for pre-treatment of construction and demolition waste: Addressing the challenges posed by construction waste by designating specific areas for its pre-treatment, ensuring that construction waste is treated and managed appropriately.





	Key Considerations
Synergies	 Door-to-door Waste Collection and Development of a Transfer Station: The segregated waste collected from households can be efficiently managed at the transfer station, where it is sorted further, processed, and then directed to treatment or disposal facilities. The Landfill and Waste Pre-treatment on Site projects: Pre-treatment on site, whether through an MBT facility or a bioreactor, ensures that waste directed to the landfill is managed efficiently, maximizing the landfill's operational lifespan and improving its waste-to-energy conversion potential.
Replicability:	 Door-to-door waste collection: This project improves waste collection efficiency and also promotes recycling and responsible waste disposal among residents. New cities can adopt this model to ensure that waste is managed efficiently from collection to disposal. Development of a transfer station: This project supports better waste management coverage and facilitates the efficient sorting, processing, and redirection of waste, which is replicable in new cities for a more systematic waste management system.
Challenges for implementation	 Integration of Informal Waste Pickers (Nabasheen): Integrating them into the waste management system without disrupting their livelihoods or social structures can be a complex challenge.
and precursors to	 Affordability issues: Careful consideration is needed to ensure Door-to-door waste collection is city-wide with appropriate support provided to lower-income households.
implementation:	 Public Participation and Behaviour Change: Ensuring consistent and effective segregation of waste at the source, and maintaining this practice over the long term, can be challenging and will require ongoing public education and engagement.

8.2. Key actors and stakeholders

Solid waste management	
The Ministry of Housing, Utilities and Urban Communities (MHUUC)	MHUUC holds the responsibility for overseeing the collection and transportation of solid wastes in new urban communities. Additionally, it plays an important role in identifying, providing, and allocating designated sites for the disposal of hazardous waste.
The New Urban Communities Authority (NUCA)	NUCA coordinates with other governmental bodies on solid waste management and supports the development of waste management masterplans for new urban communities to mitigate the impacts of unplanned waste disposal. NUCA aims to improve waste management systems as part of its commitment to creating more sustainable new urban communities in Egypt.
The City Authority	The City Authority's responsibility for solid waste management is around the collection of waste and the determination of tariffs. In the future, the revenue generated from these tariffs will be directed to the Solid Waste Authority.
Ministry of Environmental Affairs (MoE)	The MoE is the main body that formulates rules and regulations governing the waste sector. It also plays an active role in enforcing environmental laws to ensure compliance.
The Ministry of Health and Population (MoHP)	MoHP is responsible for managing environmental health. This includes environmental protection and specialised activities, notably the management of medical waste.
Waste Management Regulatory Authority (WMRA)	WMRA oversees comprehensive management, monitoring, and enforcement of regulations related to all categories of solid waste.
Ministry of Agriculture and Land Reclamation (MRLA)	MRLA's responsibility extends to the management of agricultural hazardous waste, particularly focusing on substances like pesticides and fertilisers.
Ministry of Petroleum	The Ministry of Petroleum is dedicated to the management and safe disposal of hazardous waste originating from petroleum activities.





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(MoP)	
The Ministry of Trade and Industry (MoTI)	MoTI's responsibilities encompass the oversight of hazardous waste generated from industrial activities.
The Industrial Development Authority (IDA)	IDA, in collaboration with the Environmental Affairs Agency, ensures that industrial entities adhere to best practices for waste management. This adherence is a prerequisite for factories to obtain or renew their industrial licenses.
The Industrial Control Authority (ICA)	ICA plays a supervisory role, ensuring that industries manage waste in alignment with established industrial standards. ICA's jurisdiction extends to the operational phase of factories.

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8.3. Summary of actions and policies

Anchor projects				CAF	PEX
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
(SWM 1) Door-to- door waste collection	This action involves investment in a door-to-door waste collection system which is designed to increase the participation of citizens in waste separation at source and collection. The door-to- door waste collection initiative will expand services beyond the current areas of operation. The project will introduce a three-bin system, designed for segregating waste into dry recycling, organic waste, and residual waste. To ensure the project's success, a public education campaign will be launched, emphasising the importance of waste segregation. Additionally, a capacity-building plan will be implemented to facilitate the application of the collection system.	The door-to-door waste collection initiative ensures efficient waste collection, thereby reducing the environmental footprint of waste disposal. By promoting recycling through the segregation system, the amount of waste sent to landfills is significantly reduced. The educational campaign will develop a culture of responsible waste disposal and recycling among residents, ensuring a more sustainable approach to waste management in the City.	The New Urban Communities Authority (NUCA) will be the implementing agency for this action.	-	-
(SWM 2) Feasibility study for closure and remediation of existing dumpsite in addition to the construction of a new sanitary landfill with an MBT facility	This action aims to improve waste management in the City by closing and remediating the existing dumpsite and constructing a new sanitary landfill with an MBT facility. The landfill and recycling plant, on 70 feddans of land allocated by NUCA, will cater to four cities, including 6 th of October. The plant is projected to handle 1,200 tonnes of waste daily, with 80% being recycled or reused, and the remaining 20% sent to the landfill.	The action 's approach to replacing open dumpsites with a structured system will integrate informal waste collectors. The landfill design's emphasis on resource recovery will facilitate the extraction of valuable materials from waste.	The New Urban Communities Authority (NUCA) will be the implementing agency for this action.	19-22 million	630-730 million
(SWM 3)	This action involves an investment in the	The development of a transfer	The New Urban	1.6 and 2	52 to 65



Anchor projects				CAPEX	
Action	Technical Description	Action Impact / Benefits	Action Owner	Euros	EGP
Development of a transfer station	construction and operation of a waste transfer station aiming to address the limited coverage of waste collection services in the City. This station will serve as a temporary storage facility for municipal solid waste (MSW), ensuring comprehensive coverage across the City. The facility will serve as a crucial node in the waste management network, enabling efficient sorting, processing, and redirection of waste to appropriate treatment or disposal facilities. The proposed transfer station will have a daily capacity of 500 tons. Waste collection vehicles will deposit their loads here, after which the waste will be aggregated and transported to its final disposal site or recycling facility.	station will enhance the efficiency of waste management in the City. By reducing the distance travelled by waste collection vehicles, the City will see time and fuel savings. This approach will also lead to improved environmental conditions by minimising waste dumping in unauthorised areas. The organised system introduced by the transfer station paves the way for potential future waste treatment and recycling initiatives, ensuring a holistic approach to waste management in the City.	Communities Authority (NUCA) will be the primary agency responsible for implementing this action.	million	million

Longer term projects										
Action	Technical Description	Action Impact / Benefits	Action Owner							
(SWM 4) Promote waste pre-treatment on-site at related facilities (shredding and baling)	The action focuses on on-site waste pre-treatment, particularly shredding and baling, depending on the chosen technology for solid waste treatment. The action will utilise shredders, which can be produced locally, and are designed to operate with two lines, each having a capacity of 30 tons/hr. This action will link to the closure and rehabilitation of the existing dumpsite to construct a new sanitary landfill with an integrated treatment plant.	On-site waste pre-treatment, particularly through shredding and baling, offers a streamlined approach to waste management. By integrating these processes, the City can ensure efficient waste reduction, facilitating easier transportation and further treatment. The inclusion of an RDF facility directly on-site further enhances waste-to- energy conversion potential, offering a sustainable approach to managing the City's waste while also generating energy.	The New Urban Communities Authority (NUCA) will be the primary agency responsible for implementing this action.							
(SWM 5) Financing high- priority recycling facilities	This action aims to address the current unsustainable practices seen in large-scale recycling facilities. Given the absence of official or licensed recycling facilities for industrial waste, the action 's focus will be on establishing such facilities based on the volume and type of waste	Establishing high-priority recycling facilities will significantly enhance the City's waste management capabilities. By focusing on industrial waste, the City can ensure efficient resource recovery and reduce the environmental impact of waste disposal. In addition, by introducing licensed	The New Urban Communities Authority (NUCA) will be the primary agency responsible for implementing this action.							



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	generated. The initiative will involve a comprehensive assessment of the industrial waste generation rate and the specific types of industrial waste produced within the City's industrial zone.	and official recycling facilities, the City can standardise recycling practices, ensuring consistency, efficiency, and adherence to environmental standards.	
(SWM 6) Establishing designated areas for pre- treatment of construction waste	The action seeks to address the challenges posed by construction waste by designating specific areas for its pre-treatment. Given the limited space available and the lack of data on the volume of construction waste generated in the City, the action will involve a detailed study to determine the facility's specifications. This will be the first time such technologies are applied in Egypt, requiring a comprehensive assessment of construction and demolition waste produced in the City.	Designating areas specifically for the pre- treatment of construction waste will significantly reduce the environmental impact of construction activities within the city. By ensuring that construction waste is treated and managed appropriately, the City can prevent unauthorised dumping, promote recycling of construction materials, and reduce the strain on landfills. Introducing such facilities also paves the way for the City to adopt more sustainable construction practices, ensuring that waste is minimised, and resources are used efficiently.	The New Urban Communities Authority (NUCA) will be the primary agency responsible for implementing this action.

8.4. Enabling policies

(SWM 7) Solid Waste Management Study: This is a critical study to understand and address the challenges and opportunities within the waste sector and is required to enable future interventions, ensuring that they are not only technically feasible but also economically viable, environmentally beneficial, and socially inclusive. The following are the key components of the study:

- Waste Market Study: The primary objective of this component is to gain an understanding of waste composition and volumes in the City. By determining the types and quantities of waste, the City can design facilities tailored to handle specific waste streams. This study also evaluates the economic viability of potential projects, guiding the selection of appropriate technology solutions based on the City's waste profile. Furthermore, it identifies environmental benefits, such as potential reductions in greenhouse gas emissions. From a regulatory perspective, this study is crucial for aligning interventions with the existing framework or pinpointing policy gaps that need addressing;
- Strategy to Introduce Waste Hierarchy and Promote 'Zero Waste': This strategy emphasises the principles of waste hierarchy, prioritising waste prevention and reduction. By promoting 'zero waste' initiatives across commercial, industrial, and residential sectors, the City can integrate systematic solid waste management planning. This strategy also aims to engage stakeholders, from businesses to residents, fostering a city-wide commitment to sustainable waste practices and driving the transition towards a circular economy;
- Waste Management Regulations and Recycling Initiatives: To ensure compliance and promote recycling, the City Authority should enforce stringent waste management regulations. Large waste producers should be mandated to maintain comprehensive documentation and waste management plans. In industrial areas, a non-disposal policy should be enforced, coupled with the promotion of investments in recycling and waste reduction initiatives. This component also focuses on targeting the organic component of waste management within industrial zones;
- Waste Sorting, Pre-treatment, and On-site Management: Promoting waste sorting and pre-treatment practices is essential for efficient waste management. The City Authority should encourage on-site composting, especially in compounds, malls, and villas, focusing on the organic fraction of municipal waste. Additionally, there's a need to champion the use of reusable bags in retail sectors and advocate for reduced

packaging material and the adoption of refillable green products in commercial areas; and

• Integration of Informal Waste Pickers (Nabasheen): The invaluable role of waste pickers, or Nabasheen, in the City's waste management processes, cannot be overlooked. Recognising and integrating their role ensures that waste management is inclusive and socially responsible. By leveraging the expertise of the Nabasheen community, the City can enhance the efficiency of waste collection and recycling processes.

(SWM 8) Engagement and Education: The invaluable role of waste pickers, or Nabasheen, should be recognised and integrated into the City's waste management processes. They should be incentivised for their involvement in the sector and provided access to finance for equipment modernisation. Educational and cultural centres should be established to promote recycling and environmental values in the youth. Schools should be integrated into recycling projects, building upon the Youth Engagement Activity undertaken as part of the GCAP process.

(SWM 9) Eco-Industrial Development: The City Authority should, together with IDA and the Ministry of Environment, encourage eco-friendly industrial practices, such as the implementation of eco-industrial park operational principles and the promotion of industrial symbiosis. Industrial operators will be tasked with developing roadmaps for environmentally friendly industrial parks, and areas designated for recyclers in industrial zones should be expanded.

(SWM 10) Financial Incentives and Regulatory Framework: Green investments should be promoted through financial incentives. Linkages will be established between green financing facilities and industrial entities, and efforts should be made to educate both the banking sector and industrial businesses on green investment techniques. The City Authority should also enforce environmental laws regulating waste and waste management. An online waste database should be established in coordination with NUCA to ensure transparency and efficient tracking.

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8.5. Sequencing of the Roadmap

Over the next 15 years, the City has set a strategic objective to improve its waste management practices, addressing key challenges in the sector and capitalising on opportunities. Anchor projects tackle the most pressing issues, laying the groundwork for longer-term projects that seek to address specific waste streams and introduce more advanced waste management techniques. Anchor Projects are followed by longer-term projects and supported by studies and policies to facilitate and enable projects in the sector.

- **Door-to-door waste collection:** This project is important as a first step due to its direct impact on waste segregation at the source;
- Feasibility study for closure and remediation of existing dumpsite and construction of a new sanitary landfill: Implementing this project early in the roadmap is important to address the environmental hazards of the current open dumpsite and the tackle open burning of waste. The project is also a clear priority for NUCA and the City Authority; and
- **Development of a transfer station:** This project is a foundational project for the sector aimed at streamlining the waste collection and transportation process and spreading the coverage of waste collection services across the City.

Longer-term projects provide more advanced waste management technologies and approaches and are sequenced to build upon the Anchor Projects:

- **Promote waste pre-treatment on-site at related facilities:** This project builds upon the structured waste management system, introducing advanced waste processing and management techniques;
- **Financing high-priority recycling facilities:** This project addresses the recycling of industrial waste; and
- Establishing designated areas for pre-treatment of construction waste: This project comes into play to manage specialised waste streams effectively, with a focus on construction waste.

Supporting studies and policies are integrated throughout the implementation of projects to provide the necessary data, enabling policy framework, and regulatory support:

- Solid Waste Management Study: This would ensure that Anchor and longer-term projects are tailored to the City's specific waste composition, volumes, and management challenges;
- Engagement and Education: This would promote the importance of waste segregation, recycling, and sustainable waste practices to communities and stakeholders in the City;
- **Eco-Industrial Development:** This would promote sustainability and resource recovery within the industrial sector; and
- **Financial Incentives and Regulatory Framework:** This would ensure that financial and regulatory support is in place, promoting green investments and ensuring compliance with waste management regulations.





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Short term projects (0-2 years)	Medium term projects (3-5 years)	Longer term projects (5-15 years)				
(SWM 1) Door-to-door waste collection						
(SWM 2) Feasibility study for closure and rehabilitation of existing dumpsite to Construct a new sanitary (bioreactor) landfill with a treatment plant						
(SWM 3) Development of a transfer station						
	(SWM 4) Promote waste pre-treatment on site at related facilities (shredding and baling)					
	(SWM 5) Financing high priority recycling facilities					
(SWM 6) Establishing designated areas for	pre-treatment of construction waste					
(SWM 7) Solid Waste Management Study						
(SWM 8) Engagement	and Education					
(SWM 9) Eco-Industria	al Development					
(SWM 10) Financial Incentives and Regulatory Framework						

Implementation of the GCAP





9. Implementation plan

9.1. Introduction

The Implementation Plan provides a strategic framework for implementing the identified GCAP projects. The plan aims to address immediate urban challenges, starting with Anchor Projects, which provide a foundation for subsequent long-term initiatives.

The section emphasises the important role of strong urban governance, involving both vertical and horizontal coordination across various government levels and sectors, to address the complexities of urban project implementation. In addition, the Implementation Plan explores potential funding sources and financing mechanisms, ensuring the sustainability and feasibility of the proposed projects.

9.2. Partnerships and institutional structures

The strength of urban governance is one of the critical components enabling cities to respond to major environmental challenges. Regardless of the level of autonomy and decentralisation a city enjoys, successful implementation of urban projects is characterised by proactive and effective multi-level governance:

- 1. Vertical governance refers to the strength of coordination across multiple levels of government at national and local levels; and
- 2. Horizontal governance refers to the coordination of activities across different sectors of society from local governments to the private sector, civil society, academia, and grassroots organisations.

Additionally, integrated planning that can support the sustainability of projects requires technical departments within city authorities to collaborate on the design and implementation of projects to ensure synergies, efficiencies and maximisation of benefits are achieved.

The development of this GCAP reflects a collaboration between different levels of governance. It is recommended that its implementation be built on the platform that was established through the Stakeholder Engagement Plan. Key considerations include:

City Level coordination: For the purposes of the GCAP a Project Working Group was established consisting of technical sector experts from the City Authority and NUCA to work closely with the Consultant Team. It is

recommended that a similar group is maintained during the implementation stage, chaired by a dedicated GCAP Manager/Champion and meeting on a quarterly basis to discuss and monitor progress and implementation requirements. This could include representatives from the following departments:

- Sustainable Development Unit City Authority;
- Projects Department -City Authority;
- Electricity Department-City Authority;
- Facilities Management -City Authority;
- Road Design Projects Department City Authority;
- Public Relations Officer- City Authority;
- Department of Agriculture-City Authority;
- Waste Recycling Department-City Authority;
- Department for Environmental Aspects City Authority;
- Renewable energy unit City Authority; and
- Water treatment plant and industrial waste control unit City Authority.

Vertical governance: As a 1st generation new city, 6th of October City already benefits from a close link with the Ministry of Housing, Utilities and Urban Communities, through NUCA. It is recommended that this is further strengthened to ensure a sufficient budget is allocated for funding the identified projects. Beyond MHUUC, it is suggested that the GCAP is utilised to build relationships with other national-level agencies to ensure the backing of key projects such as the:

- Ministry of Transport;
- Industrial Development Authority, Ministry of Trade and Industry;
- Ministry of Electricity and Renewable Energy (MoERE);
- Ministry of Environment (EEAA);
- Waste Management Regulatory Authority (WMRA);
- Climate Change Central Department;
- Ministry of Water Resources and Irrigation; and
- Water and wastewater holding company.

Horizontal governance: The implementation of the GCAP will be additionally dependent on critical links with interested parties and key stakeholders in the City. This will be important in order to consider cross-cutting issues of investment,



climate, and social development aspects for implementation. It is recommended that the City Authority maintains links as appropriate for each project with the following organisations:

- Investors Association in 6th of October City reflecting the nature and requirements of the industrial zone of 6th of October City;
- The Board of Trustees is formed of (6) investors proposed by the investors association, and (9) residents to represent different committees;
- Real Estate Developer's representation;
- Private sector active in key relevant sectors such as transportation, waste, renewable energy;
- NGOs and local community organisations that have been involved in the GCAP and further support the implementation of inclusive infrastructure projects; and
- Local Universities to both foster innovation and engage youth as the future generation of citizens.

9.3. Investment plan & Funding Sources

9.3.1. GCAP Anchor Projects costs

The following provides a summary of CAPEX estimates for the GCAP Anchor projects by sector. The figures in this section should be treated as preliminary at this stage due to the lack of detailed feasibility studies.

The cost estimates have been determined by drawing on knowledge of similar domestic if available and international projects, and local expert knowledge of appropriate adjustments that need to be made, for example regarding the cost of local materials and labour. Cost estimates have been discussed with NUCA and EBRD, with feedback incorporated into final cost estimates as applicable.

It is important to note that these costs do not include various cost items including land acquisition, design and planning (unless stated, where this could reflect 10% to 30% of the CAPEX costs). Inflation and optimism bias have not been included at this stage, where this would uplift the cost estimates. There will also often be sizeable operational expenditure which will need to be factored in where this is not indicated already.

The total CAPEX estimate of Anchor projects is presented by sector, in Table 9-1.

The proformas for each GCAP action, presented in Appendix A, contain notes that indicate how CAPEX and OPEX, where provided, were derived and how the costs were split up into individual activities and components.



Table 9-1 – Overall cost estimate by sector for GCAP priority actions

Sector	Total CAPEX (EUR)	Total CAPEX (EGP)
Land Use & Transport	66.05 to 88.25 million	2.14 to 2.87 billion
Buildings, Energy & Industry	6.97 to 7.43 million	226 to 241 million
Water and Wastewater	152.8 to 154.1 million	4.96 to 5 billion
Solid Waste	22.6 to 23 million	734 to 747 million
Total	248.42 to 272.78	8.06 to 8.858

It is expected that the implementation of the Anchor projects would provide the platform for further future infrastructure investments in the City with the realization of long-term projects.

9.3.2. Funding sources

This section outlines the various methods for funding and financing projects outlined in the GCAP.

For projects that do not generate revenue but provide a public good or public service in the City, it has been identified that the NUCA budget would serve as a primary source of funding.

For smaller bankable projects, these projects qualify for loans through commercial banks and could also be eligible for financing through the EBRD's Green Economy Financing Facility (GEFF)³⁹.

While Multilateral Development Banks (MDBs) generally would not directly finance projects of this scale on a standalone basis, there is an exception worth noting. If an MDB expresses interest in a small green project, it could potentially be included in a green bond package issued by NUCA. In this innovative approach,

³⁹ The (GEFF Egypt II) now offers €150 million for green initiatives aimed at SMEs and households. The facility provides capital investment in multiple currencies and free technical assistance. Investment incentives of 10% to 15% are available upon project completion. GEFF Egypt II supports a broad range of green economy transitions, including energy and water efficiency. The program operates through local banks and is backed by the European Union and the Green Climate Fund (GCF).

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the project would be bundled with other green initiatives, thereby creating a diversified and attractive package for investors.

Green Bonds offer a promising avenue for packaging various actions outlined in the GCAP to attract investment for sustainable urban development. These bonds can be issued, to fund projects that contribute to low-carbon and climate-resilient cities. The key is that the proceeds are earmarked for qualifying green projects, such as clean transportation, green infrastructure, and waste management, among others. It is worth noting that . as part of the EBRD investment in NUCA's 7th bond local currency issuance, the Bank is providing grant-funded technical assistance to support NUCA in issuing its forthcoming bond as a green bond. This approach could be replicated across multiple NUCA cities, scaling up technologies and actions for broader impact.

For larger projects, there are more potential financing options. In addition to the NUCA budget and commercial bank loans, MDBs can play a direct role. These institutions could either finance a private sector partner, if a Public-Private Partnership (PPP) model is adopted or provide funding directly to NUCA through a sovereign loan or a green bond. This opens opportunities for larger, more impactful projects that can significantly contribute to the City's sustainability goals.

For TOD projects land-based financing mechanisms can be integrated. Landbased financing would capture the increased land value that results from urban development projects, allowing the City Authority/NUCA to reinvest it into further development in the City.

Other mechanisms include, the EBRD's Green Economy Financing Facility (GEFF Eqypt II)3 now offers €150 million for green initiatives aimed at SMEs and households. The Advisory for Small and Medium Business (ASB) program within EBRD is designed to support Industrial, Service and trade sectors that fit within the EU definition of SMEs in Egypt. This is done through assessing business growth needs per company and addressing challenges through linking them with the technical experts in all business-related functions within a consultant's database, on a grant support basis. Strategically, ASB supports the themes of green transition, innovation, digitalization and inclusion. As SMEs can be important stakeholders and action owners that support the implementation of some of the actions and objectives within the GCAP, EBRD's ASB offering can support these entities and foster possible collaborations. The facility provides capital investment in multiple currencies and free technical assistance. Investment incentives of 10% to 15% are available upon project completion. GEFF Eqypt II supports a broad range of green economy transitions, including energy and water efficiency. The program operates through local banks and is backed by the European Union and the Green Climate Fund (GCF).

By leveraging these diverse financing structures, 6th of October City has the opportunity to implement a comprehensive range of green projects, from small-scale initiatives to large infrastructure developments.

9.4. Implementation programme

The GCAP implementation programme, in Figure 9-1, begins with the implementation of Anchor Projects, which are designed to address immediate challenges and deliver quick, visible improvements in the City. These projects are not only important but also serve as a foundation for longer-term initiatives.

Supporting studies and policies are integrated into the implementation of Anchor Projects, providing necessary guidance, data and information to ensure each action is viable, compliant, and aligned with the city's strategic objectives.

Following the completion of the Anchor Projects, the focus will shift to longer-term projects. These are designed to build upon Anchor Projects to ensure a sustained approach to achieving the City's long-term vision. The GCAP implementation programme provides a clear pathway guiding the 6th of October City through each phase of the implementation of the plan.





Figure 9-1 – The 6th of October GCAP implementation programme

						Tim	efram	ie (20	24 - 20	034)			
GCAP sector	#	Action	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	(LU&T 1)	Urban Greening											
	(LU&T 2)	Transit-Orientated Development Plan and Pilot Project											
ort	(LU&T 3)	Implement BRT scheme, preferably with E-bus fleet											
uspi	(LU&T 4)	Transitioning private sector fleets to EVs											
La	(LU&T 5)	Multi-Modal Integrated Transport Network											
Use &	(LU&T 6)	Extension of TOD development across the commercial centre of the City											
and	(LU&T 7)	Expansion of EV charging points											
Га	(LU&T 8)	New Services provided by private operators to be run through dedicated bus lanes											
	(LU&T 9)	Private operator's fleet size expansion											
	(LU&T 10)	Bridge Construction											
	(EBI 1)	Sustainable energy residential compound package											
dustry	(EBI 2)	Investing in photovoltaic systems or solar thermal systems in private and public sector buildings											
s & In	(EBI 3)	Expanding the use of automated solar-powered street lighting for public places and roads											
ding	(EBI 4)	Residential Green buildings Development (social housing)											
, Build	(EBI 5)	Smart distribution networks in residential complexes and citywide, including gradual replacement of old meters with smart meters											
lergy,	(EBI 6)	Implementation of demand side management and peak chopping (Industry focused)											
Ш	(EBI 7)	Industrial Zones Eco Operations and Sustainable Shared Infrastructure											
Water and Waste water	(W&WW 1)	Developing the use of "smart" data systems (network digital monitoring and smart performance optimisation) for assessing water losses											



					Timeframe (2024 - 2034)				r green city				
GCAP sector	#	Action	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
	(W&WW 2)	Energy efficiency improvement in water and wastewater treatment plants											
	(W&WW 3)	Expansion of the western wastewater treatment plant for the fourth phase, with a design capacity of 150,000 m ³ /day											
	(W&WW 4)	Sludge to Energy											
	(W&WW 5)	Expansion of October water treatment plant for the fourth phase, with a design capacity of 400,000 m3/day											
	(W&WW 6)	Increasing the number of factories that treat and recycle wastewater on-premises and developing the industrial sewage network											
	(W&WW 7)	Grey water treatment and reuse for new service buildings and landscaping of new project areas (new compounds, new commercial)											
	(SWM 1)	Door-to-door waste collection											
e	(SWM 2)	Feasibility study for closure and remediation of existing dumpsite in addition to the construction of a new sanitary landfill with an MBT facility											
Was	(SWM 3)	Development of a transfer station											
Solid	(SWM 4)	Promote waste pre-treatment on-site at related facilities (shredding and baling)											
	(SWM 5)	Financing high-priority recycling facilities											
	(SWM 6)	Establishing designated areas for pre-treatment of construction waste											



9.5. Monitoring, evaluation, and reporting

A monitoring and evaluation process is strongly recommended to ensure the success of the GCAP programme. Monitoring allows the application of a learning-by-doing approach, and correcting implementation issues.

9.5.1. Scope and purpose of GCAP monitoring and evaluation

Monitoring and evaluation (M&E) are two distinct but complementary processes, with evaluation providing context to monitoring. Table 9-2 summarises the distinction between the two activities as used in this section and as applied in relation to the GCAP.

Table 9-2 – The distinction between monitoring and evaluation

Monitoring

- A continuous process involving the systematic collection of data in relation to specific indicators;
- Links actions with strategic goals;
- Provides an indication of the extent of progress and achievement of strategic goals; and
- Describes where an action is in relation to outcomes and mid-term targets.

Evaluation

- The systematic and objective assessment of an ongoing or completed action's design, implementation and results;
- Examines an action's implementation process;
- Informs decision-making process by determining the relevance and fulfilment of objectives and the efficiency, effectiveness, impact and sustainability of related actions and their impact; and
- Describes why outcomes and mid-term targets are or are not being achieved.

These indicators have been selected as they directly link to benefits arising from the implementation of Anchor projects and can clearly signal progress towards achieving the vision and strategic goals of the 6th of October GCAP. Certain indicators such as those related to the improvement of air quality and reduction of



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These indicators have been selected as they directly link to benefits arising from the implementation of Anchor projects and can clearly signal progress towards achieving the vision and strategic goals of the 6th of October GCAP. Certain indicators such as those related to the improvement of air quality and reduction of emissions (highlighted in grey) would be the impact of several interventions and not just those related to Land Use and Transportation. As such the City Authority should consider the cumulative impact across different sectoral interventions towards reaching the set target. It is suggested that where values are not available, the City and relevant stakeholders can undertake work to establish the baseline position. The timeframe to achieve the proposed targets should be discussed and agreed upon between the City Authority and NUCA.

9.5.2. M&E process, reporting and frequency

Monitoring is an ongoing process to ensure the GCAP actions are being pursued in the right direction and in line with the agreed scope, identify emerging issues and address these early. There are two main components that support this process:

1. **Progress Monitoring Plan (PMP)** summarising the implementation status of actions included in the GCAP, which could adopt the format of a template found in **Error! Reference source not found.** This table should be populated at the end of the GCAP development process and will be updated within a year of the GCAP being adopted, and then at least annually thereafter. The aim is to have an updated understanding of the status of action implementation over time including budget spent alignment with deadlines and achievements of key milestones; and

Impact Monitoring Plan (IMP) summarising the status and likelihood of achieving the GCAP vision, strategic goals and mid-term targets. Similarly, to the PMP, the IMP should be populated at the end of the GCAP development process and will be updated after three years and five years to report on the impact of the GCAP. The suggested IMP in

emissions (highlighted in grey) would be the impact of several interventions and not just those related to Land Use and Transportation. As such the City Authority should consider the cumulative impact across different sectoral interventions towards reaching the set target. It is suggested that where values are not available, the City and relevant stakeholders can undertake work to establish the





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baseline position. The timeframe to achieve the proposed targets should be discussed and agreed upon between the City Authority and NUCA.

Table 9-4 has been populated by drawing on the relevant indicators used for the development of 6th of October City Integrated Baseline report. Where indicators are not available it is suggested that the City Authority undertakes work to identify an accurate baseline against which to monitor and evaluate progress.

In order to monitor and evaluate the implementation and impact of the GCAP actions and the GCAP as a whole, data will need to be collected regarding:

- The implementation status of each GCAP action: this should be recorded as 'No action', 'In preparation', 'Implementation underway', or 'Completed', with an explanatory note provided;
- Any changes to the implementation programme for the GCAP and each sector; details regarding the budget, scope and implementation programme of each action should be collected; and
- Indicators that will be used to determine the impact of the GCAP actions; it is anticipated that these will largely comprise indicators used in the Integrated Baseline Report and featuring the overall targets, that can be monitored to determine the impact of GCAP actions⁴⁰.

This data, once verified, will be analysed to determine factors including:

- The likelihood of the GCAP vision, strategic goals and mid-term targets being achieved;
- Lessons learnt (notably what has gone well and where there is room for improvement);
- The need to take and corrective action, for example, the revision of an element of the GCAP implementation programme;
- Cost-effectiveness of investment;
- The effectiveness of the monitoring process; and
- whether there should be a refresh of the GCAP.

⁴⁰ Although it is not necessary to collect data to update all indicators in the IDB, doing do would constitute good practice and facilitate a holistic understanding of the PSR indicators in 6th of October. This can be a valuable tool for informing future decision-making and enable the periodic revision of GCAP challenges, strategic goals, mid-term targets and action and its ultimate refresh.





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The responsibility for the M&E process should ideally stay with the identified GCAP co-ordinator drawing the support of technical experts from the City Authority and relevant national stakeholders.

These reports are circulated internally to inform internal decision-making and communicate them with other stakeholders as appropriate.

The PMP aims to capture the implementation status and progress of key projects and provide the platform to consider and explore reasons behind potential shifts or delays from the initial plan. The PMP can be developed across the following areas

These indicators have been selected as they directly link to benefits arising from the implementation of Anchor projects and can clearly signal progress towards achieving the vision and strategic goals of the 6th of October GCAP. Certain indicators such as those related to the improvement of air quality and reduction of emissions (highlighted in grey) would be the impact of several interventions and not just those related to Land Use and Transportation. As such the City Authority should consider the cumulative impact across different sectoral interventions towards reaching the set target. It is suggested that where values are not available, the City and relevant stakeholders can undertake work to establish the baseline position. The timeframe to achieve the proposed targets should be discussed and agreed upon between the City Authority and NUCA. and expanded further in accordance with internal processes within the city administration.

Table 9-3 – PMP reporting template.

GCAP Action	Implementing Body	Key Stakeholders	Source of funding	Status against planned	Description notes (inc. CAPEX/OPEX)	Date





Carlos

Table 9-4 – IMP reporting

Green Benefit as articulated by Strategic goals	Indicators to monitor progress	Current	Target
	Average annual concentration of PM2.5 (µg/m ³)	N/A	10 - 20
Land use and Transport sector:	Average annual concentration of PM10 (µg/m ³)	70	20-50
Enhance the livability of the City for	Open green space area per capita (ha/100,000 Capita)	N/A	7-10
all residents, reducing the reliance	Annual CO2 equivalent emissions per capita (Tonne/year/capita)	2.5	2.5
on private transport through better	Proportion of the population living within 20 minutes to everyday services (grocery stores, clinics etc) (%)	N/A	75
travel choice and minimize traffic	Population density on urban land (Residents/km ²)	6804	4000-7000
congestion by improving quality	Share of total passenger car fleet run by alternative energy (total and by type %)	1	3
and connectivity to public transport	Transport modal share in commuting cars motorcycles taxi bus metro tram bicycle pedestrian (private transport %)	N/A	30-50
and active travel options	Share of population having access to public transport within 15min by foot (%)	N/A	60-80
	Kilometres of dedicated bicycle path per 100000 population (km)	0	15-25
	Average annual concentration of PM2.5 (µg/m ³)	N/A	10 - 20
Buildings, Energy and Industry:	Share of renewable in total energy consumption (%)	12	20
Reduce air pollution and GHG	Electricity consumption in residential building (kWh/m ²)	64.5	21-26
emissions from tossil fuel	Electricity consumption in commercial buildings (kWh/m ²)	328	122-213
improve energy efficiency	Electricity consumption in public buildings(kWh/m ²)	140	122
	Share of industrial energy consumption from renewable energy (%)	12	20
	Domestic water consumption per capita (L/day/capita)	200	120-200
Water and Wastewater:	Percentage of buildings non-industrial equipped to reuse grey water (%)	0	60-80
Improve water supply network and	Non-revenue water (%)	22	20
treatment and reuse of wastewater	Sludge safely treated disposed of and safely used for energy generation (%)	0	100
	Percentage of residential and commercial wastewater treated (%) separately to industrial	0	100
	Share of industrial waste recycled as a share of total industrial waste produced (%)	57	90
Solid Waste:	Municipal solid waste treated in sorting, processing and treatment plants (%)	25	75
Deliver a waste management system based on the waste	Percentage of MSW which is disposed of in open dump sites, controlled dump sites or bodies of water or is burnt (%)	100	10
management hierarchy	Municipal solid waste disposed in EU-compliant/equivalent sanitary landfills (%)	0	90
	Proportion of dry recyclables (%)	0	35
	Proportion of organic waste (%)	5	20





9.6. Climate-smart considerations

As the City Authority and NUCA proceed with the implementation of the GCAP, it is recommended that the GCAP team and technical experts continue to consider and prioritise low-carbon and resilient alternatives of the proposed interventions. While the Anchor projects have been developed with climate-smart considerations embedded, more long-term projects have been considered in less detail. These will also require further studies later on. Thus, it is suggested as the GCAP implementation moves into mid/longer-term projects it is ensured that climate change-related risks and opportunities are thoroughly considered including different options for delivery.

Key questions designed to help improve project design are provided below with the aim of leading to stronger projects more closely aligned with climate action priorities⁴¹:

- Which climate risks could impact the performance of the project?;
- How do the specific project activities address local climate vulnerability?;
- Is there a possibility that the project increases vulnerability elsewhere (for example increasing flood risk downstream)?;
- Are there opportunities to reduce water use?;
- Could the project be eligible for sources of green or climate finance?;
- Will the project increase or reduce carbon emissions? (e.g., green/low carbon development?);
- Are there plans to reduce the capital/embedded carbon emissions of the project?;
- Are there plans to reduce the operational carbon emissions of the project?;
- Is there an opportunity for onsite renewable energy generation?;
- Does the project use the best available standards for energy efficiency?;
- Will the project increase air pollution and/or lead to environmental degradation?;
- Does the project support minimisation of waste and efficient use of resources including land and water?;
- Consider Carbon Hierarchy Can You Build Nothing/Build Less?;
- Are there opportunities in this project to Maintain, Reuse, Repurpose?;
- Does the project have the potential to catalyse further investment in or around the area of intervention?;
- Will the project have a positive/neutral or negative impact on public health and wellbeing?; and
- Does the project directly benefit marginalised groups?

⁴¹ Based on Atkins / UN Habitat work on the Addis Ababa Climate Prioritisation Framework under the City Climate Finance Gap Fund.

10. Next Steps

6th of October GCAP is a document plan that will be used by NUCA and the City Authority to communicate its green city vision and as a roadmap for realising ambitions. It presents long-term aspirations and priority actions for the City in the medium and short term.

The expected improvements in environmental, economic and social performance by implementing the GCAP are reflected in the strategic objectives and mid-term targets that will be used to measure the GCAP's progress. However, to realise the transformation potential of the GCAP the momentum generated during its development will need to be maintained.

10.1. GCAP implementation

A concerted effort will be made to help to ensure the GCAP implementation period begins in late 2023 as planned. This will mark the start of the 60-to-72-month implementation period, over which time a series of GCAP actions will be delivered using a holistic and integrated approach that is fully aligned with, and embedded in, its wider sustainable framework.

NUCA and the City Authority will need to decide which of the GCAP actions to implement. This will require further analysis of each proposal, including with regard to the funding needs, and their potential to generate revenue. Feasibility and modelling studies, which are objective assessments of the practicality of proposed interventions and actions, will need to be conducted as part of this process.

In the course of developing the GCAP, numerous examples of how the implementation and operationalisation of well-conceived measures have been identified and compromised, and in some instances abandoned, owing to factors including insufficient political support, supporting actions, institutional framework, capacity, affordability, stakeholder engagement and data. The presented actions have been developed reflecting the lessons learnt during the GCAP development process.

The risks associated with operationalising the GCAP must be identified and rigorously reviewed at the beginning of the implementation stage, risk management measures should be designed and adopted. The effectiveness of these mitigation measures will be apparent in the GCAP Monitoring stage,

where the implementation progress of GCAP actions and their impacts on the local environment will be recorded and analysed.

10.2. GCAP monitoring

6th of October City GCAP Monitoring is the final stage of the GCAP process which aims to identify what has been achieved, how, and what are the opportunities for future improvement. Chapter 9 provides an indicative approach to guide the monitoring process and will be used as a starting point, but this will need to be refined at the onset of the monitoring stage which is planned to begin no less than 6 months after the approval of the 6th of October GCAP.

The GCAP process is iterative, the identified Green City challenges, strategic objectives, mid-term targets and actions will need to be periodically reviewed to identify changes in the State, Pressure and Response indicators that could require revised approaches to be adopted and the GCAP to be updated. The effectiveness of the process will depend on the continued political support and clear and consistent ownership by a committed individual within NUCA.

A series of next steps, in the form of activities and suggested timelines, is outlined in Figure 10-1.







Figure 10-1 – Programme of next steps for the 6th of October GCAP

	Activity			Year					
		2023	2024	2025	2026	2027	2028		
	Approve the GCAP								
	Confirm GCAP Co-ordinator for implementation phase								
ion	Engage ministries and other decision-makers								
ntat	Include the GCAP actions in the annual budget and mid/long-term development plans								
nei	Review and mitigate GCAP implementation risk								
oler	Commission feasibility studies for GCAP actions								
lml	Pursue sources of funding								
AP	Select key GCAP measures and prepare a detailed implementation plan								
C) C)	Establish and formalise implementation partnerships								
•	Implement GCAP actions								
	Agree and refine the monitoring process								
D	Monitoring GCAP implementation								
orin	Monitor the contribution of GCAP towards goals and mid-term targets								
nito	Report GCAP implementation progress and plan and implement any necessary corrective								
Mo	measures								
ЧP	Report the contribution of GCAP actions towards targets and plan and implement any								
SC	necessary corrective measures								
0	Identify and report on changes in environmental indicators								
	Prepare for the next GCAP cycle								







Appendix A. Detailed action proformas

1. Land Use

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Project Aim	Status	Impact / GHG reduction	Possible Location						
The project aims to transform the 6 th of October City into a green, sustainable urban environment. By integrating open spaces into the City's fabric, the project seeks to mitigate the urban heat island effect, improve air quality, and enhance biodiversity. It also aims to create attractive, comfortable environments that promote social interaction and community cohesion. Urban greening can be integrated with other investments to improve their resiliency to climate change.	 No open green parks exist in the 6th of October. Previously allocated lands for open green spaces as per the Strategic Plan are either re-allocated for other uses or used informally; High interest from City authority; Plots of land already allocated by the City Authority; and Feasibility study and identification of proper financial model needed. 	This project indirectly reduces emissions by mitigating the urban heat island effect, thereby decreasing the energy demand for cooling buildings. Additionally, trees planted in green areas will further sequester carbon dioxide from the atmosphere. The amount of sequestered carbon will depend on tree coverage and type.	The Urban Greening project will span across the 6 th of October City, focusing on key areas including the Lower and Upper sections of the Residential-Industrial Separation Zone, the SOMID Line Buffer Zone, and areas surrounding the Monorail- BRT-HSR stations. Additionally, the current location of the high-voltage line will be transformed into green spaces. An area of 50 feddans of area is dedicated for urban green space in the Southern Residential District. These strategic locations will maximise the project's impact.						

Project Description

The Urban Greening project is an initiative aimed at enhancing the quality of life in the 6th of October City by increasing the quantity and quality of open and green spaces. The project is designed to address the current shortage of public parks and green spaces, which is a significant issue given the City's rapid urban development. Key features of the project include:

- Network of Urban Green Spaces: The creation of a network of urban green spaces to compensate for the loss of the green belt area located to the north-west and connects various opportunity sites throughout the city;
- Biodiversity Enhancement: By introducing native plant and tree species and creating habitats, the project aims to attract a diverse range of flora and fauna;
- Mitigating Urban Heat Island Effect: By increasing green spaces, the project aims to combat this effect, providing shaded and cooler areas for residents and reducing energy consumption in buildings;
- Air Quality Improvement: Trees and plants will absorb pollutants, providing cleaner air for the city's inhabitants; and
- Safeguard green areas: Develop guidelines as a requirement for any proposed new development in green areas. These guidelines will prioritise the preservation and





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creation of green spaces and promote eco-friendly practices.

• Enhance biodiversity: Urban greening is proposed to be carried out in a way that promotes biodiversity through incorporating perennial trees that attract birds and native species to the city, making them a protected area and a tourist attraction for the city; which would also result improving the city's air quality.

Technical Description

The project will focus on several key areas in the City for the development of green spaces. These include:

- The lower southwest area of the residential industrial separation zone, covering approximately 364 feddans (1,528,800 m²);
- The area to be released once the high voltage line has been buried underground, covering approximately 95 feddans (400,000 m²);
- The public park area, covering approximately 181 feddans (760,000 m²);
- The buffer zone of the SOMID line, covering approximately 119 feddans (500,000 m²); and
- 50 feddans of area is dedicated for urban green space in the Southern Residential District (210,000 m²).

The total available area is 809 feddans (3.4 km²).

Key Considerations

Several key considerations will be crucial to the successful implementation of the Urban Greening project. These include:

- Mapping and prioritisation of locations for the development of green spaces;
- The use of international benchmark designs in urban planning and engineering;
- Conducting environmental impact studies to assess the potential effects of the project on the local environment;
- Opportunity cost (use the land for green spaces rather than commercially developing it) should be considered through proper engagement and agreements with real estate developers;
- Participatory planning and design to ensure that the project is responsive to the needs of residents and businesses;
- Monitoring and evaluation of the project's progress to ensure that it is achieving its goals; and
- Regular maintenance and irrigation of the green spaces including securing the necessary irrigation water is critical. Maintenance could be delegated to the private sector.

Implementing Agency	Stakeholders
Implementation can be either done through NUCA or private developers, especially real estate developers.	 This project involves a broad range of stakeholders, including: The Ministry of Housing, Utilities, and Urban Communities (MHUUC) and the New Urban Communities Authority (NUCA), are key governmental entities involved in urban development; The Ministry of Electricity & Distribution Company, who will provide permissions and support for high voltage line burial; The City Authority oversees local governance and urban planning; Private developers, who will be instrumental in implementing the green infrastructure; Local businesses and residents will directly benefit from the improved urban environment; and Non-profit organizations, community organizations, and environmental groups can provide valuable input and support for the project's sustainability goals.



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CAPEX	OPEX	Potential funding sources	Timeframe for Implementation					
The CAPEX for urban greening is expected to cost an average of 20 Euros per square meter, which includes landscaping, irrigation and the planting of small trees. An indicative CAPEX for this initiative has been calculated based on the lower south- west area of the residential industrial separation zone, which covers approximately 364 feddans in total (1,528,800 m2). In the calculation, it is assumed that 50% of this area will be leased to the private sector to generate revenue which can be used for funding the initiative. The CAPEX relates to the remaining area which would be funded by the public sector. Total CAPEX for this area equals 15.3 million Euros (504 million EGP).	 The operating expenditure for this project includes ongoing costs associated with the maintenance, operation, and enhancement of the green spaces. These include: Routine Maintenance: Regular activities such as watering, mowing, pruning, and weeding to maintain the health and aesthetics of the green spaces; Water Management: Costs associated with stormwater management, particularly during hot weather, to maintain optimal moisture levels without waste; Pest and Disease Control: Expenses for services to diagnose and control pests and diseases that could harm the green spaces; Trash and Debris Removal: Regular cleaning activities to maintain cleanliness and avoid legal fines; Signage and Wayfinding: Costs for the placement and updating of signs, maps, and placards to guide users and enhance their experience; and Public Safety and Security: Expenses for lighting, surveillance cameras, security patrols, and emergency response services to ensure the safety of the users. 	 This project could be financed through a variety of sources, including: NUCA/City Funding New Urban Communities Authority (NUCA) Budget: As the main authority responsible for the development of new urban communities; and Sustainability Linked Bonds (SLB): Bonds where the financial characteristics can vary depending on whether the issuer achieves predefined sustainability objectives. The KPI could be related to the improvement in air quality due to the increase in green spaces. Banks Commercial Banks: Loans or other financial products from commercial banks could be used to finance the project. Only applicable for revenue generating green spaces such as those where part of the land will be leased to private developers and commercial entities; and Sustainability Linked Loans (SLL): Loan instruments where the financial terms can be adjusted based on the borrower's performance against pre-set sustainability/ESG objectives. For the Urban Greening project, the KPI could be the percentage increase in green space, or the number of native species planted. Private Sector Temporary Uses and Leasing Arrangements: Revenue generated from 	 The implementation of this project is expected to span over a period of approximately 3 to 4 years. This timeframe includes: The initial planning and design stages, including Feasibility Study; Land Ownership Assessment; Mapping and Prioritisation; and Benchmarking Study (12 to 24 months) Environmental Impact Assessment (6 to 12 months) Securing necessary permissions and funding (6 to 12 months) The actual construction and development of the green spaces (24 months) It's important to note that this is an estimated timeframe and actual implementation may vary based on a variety of factors. 					



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	temporary uses of the green leasing arrangements with th addition to advertising reven contribute to the project's fur Privately Owned Public La (PoPs): Under this model, p developers provide public ar of their development projects providing additional funding; Business Improvement Dis (BIDs): Businesses within a agree to pay an additional ta improvements within the dist boundaries, which could incl development and maintenan spaces.	spaces or ne private in ue sector could nding; nd Model rivate menities as part s, potentially and strict Model defined area ax to fund trict's ude the nee of green	
Notes on cost estimate			
Costs are dependent on the average unit cost per m2 at the time of implementation and the type of work to be done at each site.			
Prerequisite steps for Implementation			
• Feasibility Study: Assess potential for green space development, identify constraints, and evaluate maintenance business models;			
Land Ownership Assessment: Investigate land ownership issues to avoid legal disputes; Menning and Disprision: Develop a map of potential logations and prioritize based on quitability:			
Mapping and Prioritisation: Develop a map of potential locations and prioritize based on suitability; Penchmarking Study: Study international groop space designs for best practices; and			
• Environmental Impact Assessment: Identify and mitigate potential environmental impacts. These steps ensure a sustainable, successful project that maximises			
benefits and minimises risks.			
Social considerations (Gender and Inclusion)	Climate adaptation mainstreaming	Smart considerations	
This project will prioritise inclusive design standards to	The Urban Greening project, through the	The project will integrate smart technology in several ways	
ensure social, economic and spatial accessibility and	development of a network of green spaces	to optimise its efficiency, sustainability, and community	
usability for all. This is particularly relevant to the 6 th of	across the City, will bolster climate resilience	engagement:	
October City as there are limited public spaces in the city	in multiple ways. Green spaces, as nature-	 Smart Irrigation: IoT sensors will be used to create an 	
that women can safely enjoy. Moreover, the gendered class	based solutions, can mitigate the urban heat	automated irrigation system. These sensors will collect	
divide observed in similar Egyptian urban communities (i.e.,	island effect, reducing cooling loads in	real-time data on soil moisture and temperature, ensuring	
the social and economic class system) has led to reduced	buildings and alleviating heat impacts during	the nearth of the green spaces, optimising water usage,	
equitable access to green spaces.	extreme temperatures. In the event of heavy	and reducing waste. This is crucial as maintaining open areen areas is a challenge in all governorates in Egypt.	
The project will also incorporate features such as ramps and	rainfall and flooding, well-designed green	and	
tactile paving for easy navigation, benches designed for the	infrastructure can reduce the impact by	• GIS Maps: Developing proper and accurate land use GIS	

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elderly and people with reduced mobility, and materials for footways that are firm and non-slippery. Signage will be designed to cater to people with hearing and visual impairments or learning disabilities. Adequate lighting systems will be installed to increase safety, particularly for women, children, and elderly people. Awareness-raising campaigns , in partnership with the National Council for Women (NCW), will be implemented to	facilitating water absorption and runoff management. However, maintaining green spaces in a water-scarce City like the 6 th of October can be challenging, particularly with projected increases in average drought days and rainfall scarcity. To address this, the project will incorporate drought-resistant and less water-intensive vegetation, ensuring the	 maps for the City indicating all areas allocated to be open green spaces or already used as open green spaces. Digital maps and applications to guide visitors on available green spaces; could be linked to TOD intervention. Future projects to be considered pending proper GIS maps are developed and proper capacity building for the GIS/IT 	
ensure safety against sexual harassment. The project will also consider the implementation of best practices in disability inclusion . The design of the green spaces will be guided by principles of social sustainability, encouraging social inclusion, interaction, and participation as a by-product of movement and other attractive activities.	sustainability of the green spaces under changing climate conditions	 department: Adaptive Management: A data-driven adaptive management strategy will be implemented. Regular monitoring and evaluation of the green spaces will inform necessary modifications, ensuring the spaces continue to serve their intended purpose effectively; and Weather Monitoring: Open green spaces could also include air quality and weather monitoring stations. 	
Related Case Study:			
Eldoret City, in Kenya, embarked on an ambitious urban regeneration project to catalyse development and enhance the city's appeal for the region's residents, businesses, and institutions. With its proximity to the River Sosiani and Nandi Park, Eldoret presented a unique opportunity to integrate green corridors with public realm upgrades, aiming to enhance the amenity, user experience, and green credentials of the city. The vision for the area north of the Eldoret Kitale Road was to create a modern walkable neighbourhood on approximately 80 hectares of land. This vision was inspired by the 15/20 minutes city concept, aiming to make every essential service accessible within a short walk or bike ride. Eldoret's new City Centre is strategically positioned between the Sosiani River Park to the south and the railway corridor to the north, creating a harmonious blend of nature and urban development. Key			
 Kitondo Street Park: The Kitondo Street Park was developed on 4 hectares of remediated industrial land. It is Eldoret's first urban park, offering recreational and green space for local communities. Sustainable Infrastructure: The planning and design of the new City Centre incorporated sustainable, climate-resilient infrastructure. This was crucial to manage rainfall events effectively and mitigate the existing flooding impacts. This project was developed as part of the UK Govt Sustainable Urban Economic Development programme. Grant funding was seen as an important source of finance to improve the financial viability of projects. The World Bank's Kenya Urban Support Programme (KUSP) was identified as a potential funding source. Private sector finance 			

from both local and international sources, including impact investors and venture capitalists, was also sought. Additionally, projects benefited from non-financial support in the form of social capital, such as volunteer efforts from the community. Climate change resilience funding was another significant aspect, with funds like the Green Climate Fund (GCF) and The Adaptation Fund being explored. Source : <u>5. Eldoret Development Framework - Issuu</u>
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Funding Modalities for Operations and Maintenance of Green Spaces in 6thf of October City

Privately Owned Public Land Model (PoPs): In 6th of October City PoPs can be used as a tool for enhancing urban green spaces, particularly in areas where private developers aim to boost footfall for commercial purposes. PoPs, while owned and maintained by private entities, are dedicated to public use, serving as inviting spaces that can incentivise people to visit. These spaces, when strategically located near commercial hubs, can enhance the attractiveness of the area, drawing in more visitors and potential customers. This approach would be particularly relevant for the central commercial area in the City. By integrating inviting public spaces in these commercial areas, developers can create a win-win situation, promoting both business interests and public well-being.

Steps for Implementation:

- Assessment: Confirm the areas within the City that will be developed as PoPs. Areas identified in Figure 1 above would act as a starting point for this step;
- Engagement: Collaborate with private developers and property owners to discuss the benefits and responsibilities of establishing PoPs;
- Regulation: The City Authority would be required to support the development and enforcement of zoning regulations that incentivise or mandate the creation of PoPs in exchange for development benefits, such as bonus floor areas or waivers;
- Design: Ensure that PoPs adhere to design principles that make green spaces open, accessible, safe, comfortable, and engaging. This includes considerations such as maintaining clear sightlines, providing seating amenities, and ensuring accessibility for all residents in the City; and
- Maintenance: Establish agreements with private owners for the upkeep and maintenance of these spaces, ensuring they remain open and beneficial to the public.

Business Improvement District Model (BIDs): The Business Improvement District Model (BIDs) provides an alternative mechanism for the operations, maintenance, and management of green spaces in the City. This approach would be particularly relevant in areas with high footfall such as the commercial centre in the City. BIDs can be effectively implemented and established in densely populated areas with an emphasis on rejuvenating them. Moreover, BIDs can be operationalised in the Industrial zone, where green spaces can serve as essential buffers and open areas for workers. Through the BID model, businesses that enjoy the advantages of these green spaces can actively participate in their upkeep, ensuring a harmonious and sustainable urban environment in the 6th of October City.

Steps for Implementation:

- Stakeholder Engagement: Initiate discussions with local businesses to gauge interest in forming a BID;
- Area Definition: The City Authority would clearly demarcate the boundaries of the proposed BID. Areas identified in Figure 1 above would act as a starting point for this step;
- Proposal Development: Create a detailed proposal outlining the benefits of the BID, the green spaces it will fund (as well as other possible projects), and the additional tax structure. Where the City Authority and/or NUCA have developed green spaces, the BID could take the role of maintaining them;
- Approval: Secure approval from a majority of businesses within the proposed BID area;
- Management: Establish a BID management entity responsible for collecting the additional taxes and overseeing the funded projects;
- Implementation: Use the funds collected to develop and maintain green spaces, among other projects. Ensure transparency in the use of funds and regularly communicate the benefits realised to the contributing businesses; and
- Evaluation: Periodically assess the impact of the BID on property values, business sales, and vacancy rates to ensure its continued relevance and effectiveness. Temporary Uses, Leasing, and Advertising Revenue: To ensure sustainable funding for the maintenance and operations of green spaces in the 6th of October City, an approach including temporary uses, leasing and advertising can be adopted. These mechanisms involve generating revenue from temporary activities or events held within green spaces, leasing specific sections to private entities, and strategically placing advertisements within these areas. These approaches are particularly relevant for the Industrial-Residential Separation Area. This area, serving as a proposed buffer between industrial and residential zones, presents unique opportunities for revenue generation. Temporary uses could encompass hosting events, pop-up markets, or exhibitions that not only generate funds but also enhance community engagement. Leasing sections of these green spaces to private entities, such as cafes or recreational facilities, can provide consistent revenue streams while offering amenities to the



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public. Additionally, strategically placed advertisements can generate funds for the maintenance and enhancement of green spaces.

Steps for Implementation:

- Assessment and Zoning: The City Authority would identify and categorise different green spaces suitable for temporary uses, leasing, and advertising. It would be important to ensure that the designated zones do not disrupt the primary purpose of the green spaces or negatively impact the environment;
- Stakeholder Engagement: Engage with local businesses, event organisers, and advertising agencies to gauge interest and gather feedback on potential collaborations;
- Regulation and Guidelines: Develop clear guidelines on the type, size, and duration of temporary uses and advertisements allowed. Set leasing terms that are favourable to both the City and private entities, ensuring that the green spaces' integrity is maintained;
- Tendering and Partnerships: Release tenders for advertising spots and leasing areas, ensuring transparency in the selection process;
- Revenue Management: Establish a dedicated fund where all revenues from these mechanisms are deposited. Ensure that the funds are exclusively used for the development, maintenance, and enhancement of green spaces in the city; and
- Monitoring and Evaluation: Regularly monitor the activities, leased areas, and advertisements to ensure compliance with the set guidelines. Evaluate the effectiveness of the combined funding mechanism in terms of revenue generation and its impact on the green spaces' quality and accessibility.

By using PoPs and BID models with approaches for temporary uses, leasing, and advertising revenue, the City can establish a sustainable funding framework for green spaces. This will ensure that the public benefit from green spaces while generating a consistent revenue stream for their maintenance and enhancement.



(LU & T 2 Transit Orientated Development Plan and Pilot Project			
Project Aim	Status	Impact / GHG reduction	Possible Location
The project aims to significantly enhance the urban fabric of the 6 th of October City by increasing mixed land use provision in the centre of the City around key transport nodes. This will improve accessibility and connectivity by integrating public transportation systems with urban development, promoting sustainable growth through pedestrian and non-motorised transport. The project aims to transform the City's central commercial spine into a vibrant hub for diverse activities, investments, and dynamic public spaces. This initiative is a strategic step towards creating a more sustainable, liveable, and economically vibrant city.	 The TOD Pilot and expansion requires the construction of both monorail and BRT stations as well as the park-n-ride parking lots. Monorail stations are being constructed, yet it is not clear where the location of stations will be sited or when park-n-ride lots will be constructed. The BRT project connecting the City to Giza Governorate through the 26th of July Corridor has not been yet constructed; and High interest from City Authority to develop the areas connecting the monorail and BRT stations; yet not lands clearly allocated 	The project will contribute to reduced congestion, emissions, and improved air quality by promoting the use of sustainable modes of transportation and reducing reliance on private vehicles. It will attract new businesses and investments, creating economic opportunities and enhancing the vibrancy of the urban environment. The project will result in a more liveable City, with better accessibility, enhanced public spaces, and a more sustainable urban fabric.	The pilot project will be implemented in the central commercial area in 6 th of October City, with potential for expansion along the commercial spine. Please refer to Figures 1 and 2 for detailed location information.
Project Description			
 The Transit Orientated Development Plan and Pilot project consists of two components: 1. Regeneration Strategy and Action Plan: This strategy provides a plan to revitalise the central spine of the City capitalising on the implementation of two major transport interventions, the BRT and Monorail. The strategy will include a more detailed roadmap for the Pilot TOD Project, located in the centre of the City, detailing the design packages to guide public and private sector involvement; and 2. Pilot TOD Project Implementation: This component is focused on the implementation of TOD pilot. It involves the delivery of specific work packages in the central commercial area by a collaborative approach between the public and the private sector. The project is designed to enhance the accessibility and connectivity of public transportation systems within 6th of October City. By promoting pedestrian and nonmotorised transport, the project aims to encourage sustainable urban development. The initiative will focus on enhancing the central commercial area's attractiveness for various activities, including commercial, leisure, public sector, and residential activities. The project leverages connectivity improvements in monorail and Bus Rapid Transit (BRT) transport to improve the accessibility and liveability of the area, providing a catalyst for attracting inward investment. The quality of the public realm and key public spaces will be enhanced, providing adequate supporting amenities including signage, wayfinding, visitor welcome facilities, and public amenities. 			
The decision to initiate the Transit Orientated Development (TOD) pilot project in the central commercial area of the 6 th of October City was based on a combination of factors:			
 The central commercial area's locat The area has several public building 	ion is strategically aligned with the planne	ed and existing BRT and Monorail station	IS;
	g opportunity sites, which present a chang	se to develop a civic centre for the Oily,	

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- The central commercial area is already a hub of commercial activity;
- The area is situated along the main arterial route that runs through the city;
- The presence of empty plots of land in the central commercial area can be utilized for a range of purposes, from green spaces and recreational areas to new commercial and residential developments, all in line with the TOD guidelines; and
- Given its commercial significance, revitalizing this area can serve as a catalyst for economic growth.

The project's funding strategy will seek to use both public and private resources. It is expected that significant funding can come from private developers and investors who are interested in commercial and residential development in the Pilot Area, while the public sector can provide enabling infrastructure, incentives to attract developers and potentially take on a role for development through the provision of affordable housing following green principles.

Technical Description

The project comprises two main components:

Component 1: Planning - Preparation of Regeneration Strategy and Action Plan: This component involves defining the Vision, Outcomes for the wider area, and Developing the detailed Brief for the TOD Pilot Area in the Commercial Centre. The plan will formulate a vision that aligns with the 6th of October City's strategic goals. focusing on the sustainable, long-term development of the Commercial Centre, starting with the Pilot Area. This vision will serve as a foundation for the TOD pilot, acting as a demonstrator for future city-wide initiatives. This study is a critical public sector led enabling factor to leverage private sector investments in the area and would encapsulate the following:

The Wider Area Regenertation Plan will consider:

- '15-minute city' concept: Complement TOD by ensuring residents can access daily needs within a short walk or bike ride, creating 'complete' neighbourhoods that enhance quality of life and ensure equitable public transport access. Refer to 'Introducing Spotlight On: 15-minute cities' for more information on 15-minute cities⁴²;
- Set Transit Access Targets: Establish clear TOD targets, drawing inspiration from international best practice. Use tools like the 'People Near Transit Metric' to assess and monitor transit access levels⁴³;
- Identify and Optimise TOD Areas: Commission studies to pinpoint potential TOD zones, determining suitable densities and development mixes. Utilise the World Bank's Three Values (3V)⁴⁴ framework to balance node, place, and market potential value. This tool can be used to first optimise the Pilot Area identified in the Commercial Centre of the City (in Figure 1 below), and then to identify and optimise other potential sites in the City;
- Implement Effective Tools and Standards: Leverage tools and resources from the Global Platform for Sustainable Cities (GPSC) Transit-Oriented Development site to guide investment and densification⁴⁵:
- Revise Regulations and Boost Public Transport: Collaborate across departments to align land use with transport infrastructure. The City Authority should update regulations, including transitioning to mixed-use zoning and introducing 'parking maximums'. As TOD evolves, the City Authority should prioritise investments in walking, cycling, and public transport infrastructure. Refer to 'Real parking needs at five TODs' for guidance on how much parking is needed in transit-oriented developments⁴⁶;
- Engage and Educate the Community: Promote TOD benefits, such as enhanced liveability and economic advantages, to gain local support. Maintain ongoing

- ⁴³ Website access <u>here</u>
- ⁴⁴ Website access here
- ⁴⁵ Website access here
- ⁴⁶ Website access here

⁴² Website access here



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engagement to address evolving concerns and ensure community buy-in. For more details on the benefits of TOD refer to 'Why shifting to green and healthy transport modes delivers vast rewards for cities'^{47;}

- Prioritise Inclusive Development: Address potential gentrification risks by preserving and creating affordable housing. Ensure a diverse mix of housing options that cater to varying income levels. It is also important to maintain a balance between community and developer interests to ensure TOD's success and broad acceptance. Refer to 'Policy and Planning Tools for Urban Green Justice'⁴⁸ and 'Steps to avoid stalled equitable TOD projects'⁴⁹ for more information on how to make equitable TOD work; and
- Secure Financing and Share Risks: Explore financing mechanisms like green bonds and land value capture. Emphasise the importance of infrastructure investment, focusing on efficient transit networks complemented by pedestrian-friendly amenities. For more information on land value capture refer to 'Financing Transit-Oriented Development with Land Values⁵⁰.

The Pilot Action Plan will include:

- Multidisciplinary Brief Development: Translate this overarching vision into a comprehensive 'brief' that outlines:
 - Core priorities and non-negotiable 'red lines';
 - o Essential due diligence, such as land ownership considerations;
 - \circ Physical assets to be developed, including infrastructure and amenities;
 - \circ Development parameters and guidelines;
 - Services and utilities to be provided by the City;
 - \circ Expected economic, environmental, and social outcomes; and
 - The roles and responsibilities of public and private sectors, emphasising a flexible partnership approach. Given the distinct characteristics of the Commercial Centre, a balanced collaboration between public and private entities is essential. For example, while the City Authority could offer incentives like deferred land receipts, the private sector could take on associated risks and provide necessary capital.
- Highlighting Wider Benefits: Emphasise the broader socio-economic advantages of the TOD pilot, showcasing the transformative potential of strategic investments in the area;
- Promoting Social Inclusion: Address aspects such as Gender Equality and Social Inclusion (GESI) to ensure that the development is inclusive and caters to the diverse needs of the community; and
- Integrating Climate Considerations: Incorporate sustainable practices and climate-resilient strategies into the development plan, ensuring that the TOD pilot not only meets current needs but is also future-proofed against environmental challenges.

Component 2: Implementation of Pilot Mixed-use Development: This component focuses on the redevelopment and enhancement of identified Pilot in the central commercial area, turning it into a vibrant destination within the City. It includes:

• Public Realm Scheme: An area-wide public realm scheme will be implemented, connecting key spaces around the monorail and BRT stations. This will enhance the

⁴⁷ Website access <u>here</u>

⁴⁸ Website access <u>here</u>

⁴⁹ Website access <u>here</u>

⁵⁰ Website access <u>here</u>



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City's walkability and accessibility;

- Network of Parks and Green Spaces: A network of parks and green spaces will be developed, enhancing the City's environmental sustainability and providing recreational spaces for residents and visitors;
- Street Lighting Systems: The project will improve street lighting systems to adapt the area for night-time use, including lighting of key buildings and public spaces;
- Road Safety Initiatives: Initiatives will be introduced to support non-motorized transport and enhance the walkability of the City. This may include pedestrian-friendly infrastructure and traffic calming measures; and
- Affordable Housing: A key aspect of this component is the potential to guide development in this area and in particular provision of mixed uses including affordable housing. This ensures that the benefits of the TOD project are accessible to a wide range of people, contributing to social equity and inclusivity.

In the longer term an expansion and integration of TOD across the City can be promoted. Building upon the Pilot TOD initiative for the Commercial Centre and Development of the Regeneration and Action Plan, the next step is to expand the Transit Oriented Development (TOD) sites across the 6th of October City.

Key Considerations

Several key considerations will be crucial to the successful implementation of the TOD Framework and Design Guidelines project. These include:

- Strong political support from elected officials, government agencies, and community organisations;
- A well-designed transit system to ensure the success of TOD projects;
- The provision of affordable housing to ensure that TOD projects are accessible to a wide range of people;
- Environmentally sustainable design, including the use of green building materials, reducing energy consumption, and promoting walkability and Cyclability.
- Effective marketing and outreach to attract residents, businesses, and visitors; and
- Participatory planning to ensure that the projects are responsive to the needs of the local residents and businesses.

Implementing Agency	Stakehold	lers			
The City Authority and New Urba	an The TOD F	The TOD Framework and Design Guidelines project involves the collaboration of various stakeholders, including:			
Communities Authority (NUCA) key implementation actors with t	are the • The Mini • The City	 The Ministry of Housing, Utilities, and Urban Communities (MHUUC) and the New Urban Communities Authority (NUCA); The City Authority; 			
the implementation of the TOD	ng the BRT, monorail and high-speed rail infrastructure;				
Plan and Design Guidelines for	the Local bu	he local businesses contributing to the economic development of the area:			
public spaces.	Local res	 Local residents who will directly benefit from improved accessibility and urban amenities; 			
	Non-prof	Non-profit and community organisations representing the interests and concerns of the local community;			
	Public ut Environn	Public utilities providers ensure the provision of necessary infrastructure and services;			
CAPEX	OPEX	Potential funding sources	Timeframe for Implementation		
The Regeneration Strategy and Action Plan would provide detailed guidance on the optimum mix and	-	 Potential funding sources for the project could include: New Urban Communities Authority (NUCA) Budget: allocation of funds for the 	 Phase 1: Pedestrianisation and Pilot Area Enhancement (1-2 years) The initial phase will focus on the pedestrianisation of the area, creating a high street, enhancing civic spaces, and 		
scale of uses to be		implementation of transit-oriented development	implementing greening initiatives in the pilot area.		



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implemented within the TOD pilot area through design briefs to enable private sector involvement in the implementation as well as guiding targeted public sector initiatives. The study would further include an overall high-level strategy on how enhancement and regeneration of the wider area can be promoted in later stages. A study of this scale would cost approximately 800,000 Euros (126.4 million EGP). The CAPEX for the delivery of the Pilot TOD Project would be dependent on the type and quantum of development and is not costed.	 initiatives, including affordable housing. Private Developers and Investors: Private developers and investors could provide significant funding for the project. This could be in the form of direct investment in the project or partnerships with the City. Commercial Banks: Loans or other financial products utilised to provide the necessary capital for infrastructure development and public transportation improvements. Temporary Uses and Leasing Arrangements: Revenue generated from temporary uses of the developed areas or leasing arrangements with the private sector can contribute to the project's funding. Privately Owned Public Land Model (PoPs): Collaborating with private developers who provide public amenities as part of their development projects. Business Improvement District Model (BIDs): Establishing a Business Improvement District where businesses within a defined area agree to pay an additional tax to generate funds to support improvements within the district, including the development of TOD. 	 This phase will involve infrastructure upgrades, street design improvements, and the integration of sustainable transportation options. Phase 2: Development Packages and Investment Attraction (1-5 years) Building upon the successful implementation of Phase 1, Phase 2 will involve the development of comprehensive development packages to attract investments and further enhance the central commercial spine. This phase will include the implementation of mixed-use development projects, the establishment of public amenities and facilities, and the integration of smart technologies to enhance the overall urban experience. The timeframe for the implementation of the project is estimated to be between 1 to 5 years, with Phase 1 taking 1 to 2 years and Phase 2 extending beyond that. The phased approach allows for iterative development and stakeholder engagement to ensure the successful transformation of the central commercial spine into a sustainable and economically thriving hub in the 6th of October City. 			
Notes on cost estimate					

N/A

Key steps for Implementation

This action should closely align and operate in parallel with the development of a revised SUMP for the City (LU & T5) which will assess and define optimum transportation flows and modes, including public transit, walking, and cycling to support the principles of Transport Oriented Development and modal shift. It should also build on other studies conducted such as the UN Habitat led on NMT.

Maintenance of public spaces is a critical factor for long-term success in regenerated areas. There will need to be an investigation into Privately Owned Public Spaces (POPs) and Business Improvement Districts (BIDs) as models for maintaining public areas.as defined under LU &T1.



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Social considerations (Gender and Inclusion)	Climate adaptation mainstrea	ming Smart considerations	
 The project offers opportunities for social inclusion and gender equality including: Shared mobility services like bicycle sharing will provide affordable transportation for local students and low-income groups; Increased pedestrian movement will boost local businesses, creating employment opportunities; and The transport hub will improve access to community facilities, education, employment, trade, and last-mile logistics, benefiting marginalized groups. To ensure successful implementation the project will: Communicate regularly with local residents and businesses about the project's schedule to mitigate disruption; Adopt inclusive design standards for new public spaces, including ramps, tactile paving, suitable benches, non-slippery footways, and accommodating signage and lighting; Implement sufficient street lighting systems for increased safety; and Collaborate with the National Council for Women (NCW) for awareness-raising campaigns on safe transportation and sexual harassment. Liaise with local cooperatives and SMEs for the development and maintenance of new public spaces. 	 As a multi-use development, there are many opportunities to integrate climate resilience into the development: Affordable housing to be constructed with heat extremes considered, through the integration of both passive cooling measures and mechanical cooling where appropriate if this can be backed by renewable energy; Drainage and permeability – design measures, such as drainage and increased permeability of surfaces can be considered to reduce the impacts in the event of extreme rainfall; Public spaces – the rehabilitation of existing public spaces, and development of new green spaces will help to create cooler spaces within the city; and Shading – the project emphasises the creation of a more accessible and pedestrian-friendly space, and enhancing shading should be an active consideration, in particular as extreme temperatures disproportionately affect women and the elderly. 	 The project will integrate smart technologies to enhance the transit experience and promote environmental sustainability: Technology Integration: Implement maps, and mobile apps to show information regarding nearby stations, transportation means, and schedule. Transport simulation tools: the relevant capacity building will be also required as part of TOD project which will be needed to conduct traffic and mobility studies Future projects/Considerations: ITS integration & Adaptative Traffic Control Systems (ATCS): The project will require the installation of data collection equipment such as cameras to detect traffic flows, to help reduce congestion and increase safety. An ITS will also require proper capacity building for the operating staff. Otherwise, data analysis and collection could be delegated to the private sector, pending security approvals from the Ministry of Interior. The status of data warehouses and relevant infrastructure in the City is also not clear and needs to be further examined in case further improvement is needed; Traffic management centre: building on ITS, such centres are necessary to conduct efficient traffic management, incident response, and information dissemination. The centre will highly depend on GIS maps for decision-making and sharing the right response to different weather/traffic/incident situations. This intervention will also build on ITS existing infrastructure; and Real-time Info: Technology integration could include real-time transit information once various modes of transport such as BRT, monorail and government-operated buses start having tracking systems. 	



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Case Study: Old Oak & Park Royal Environmental Case Study (London)

Old Oak and Park Royal Development Corporation (OPDC) led a pioneering urban development project in the UK, utilising a Transit Orientated Development (TOD) approach. The project aimed to maximise the benefits of the new High Speed 2 (HS2) and Crossrail stations, promoting public transit use, reducing reliance on private vehicles, and encouraging walkability and cycling. Covering 650 hectares, with over 135 hectares of developable land, the TOD approach ensured residential, commercial, and recreational spaces were in close proximity to transit stations, fostering a vibrant, mixed-use community. The project's ambitious environmental sustainability targets, exceeding those in the London Plan and Mayoral strategies, aligned with TOD principles, integrating efficient transportation systems with sustainable urban design to create a low-carbon community. The OPDC project will serve as a blueprint for future urban developments, demonstrating the potential for sustainability to be at the heart of urban regeneration.



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2. Transport



(LU & T 3) Implement BRT scheme potentially with the full or partial integration of E-bus fleet			
Project Aim	Status	Impact / GHG reduction	Possible Location
This project supports the implementation of the BRT project that has already been defined by the government which aims to reduce the City's, reliance on private cars. Implementation of this intervention will enhance air quality by minimising the use of polluting vehicles and shifting to lower-carbon mass transportation modes. It further aims to improve city connectivity, incorporate innovative technologies, and ensure gender- inclusive access to the network. Additionally, it has the potential to develop a skilled workforce and present opportunities for green investment by adopting eco-friendly practices and infrastructure, including future conversion of e-bus fleet.	 The project is yet to be tendered by the Ministry of Housing, Utilities, and Urban Communities (MHUUC). The exact time of tender release is unknown with the project's initial study currently being revisited; The initial feasibility study was carried out by UN-Habitat which included the business model and the service plan; No feasibility study or charging strategy for the use of electric buses has been carried out; and A new study will be released by UN-Habitat with ITDP to integrate informal transport and NMT 	Under the business-as-usual (BAU) scenario, where 119 diesel buses are in operation, the GHG emissions are estimated to be 16,786 tonnes of CO2 equivalent (t CO2e). Using public buses will reduce emissions by servicing some 126,000 potential passengers as they switch from using private cars or other forms of high-emissions transport such as petroleum-run minibuses. Upgrading the buses to electric vehicles would result in a reduction in GHG emissions down to 6,017 t CO2e. The calculations are based on a typical 12 m-long bus. However, the BRT for this line is expected to be larger (articulated bus). If CNG buses are used, a study by NREL showed that compared to diesel-run large transit buses, a 53% reduction in NOx is expected, 85% in total particulate matter and 89% lower CO ⁵¹ . CNG buses generally result in 4 to 18% reduction in GHG emissions ⁵² . This excludes potential emissions reduction.	The project is envisaged to establish a connection between Giza downtown and the 6 th of October City. The initial line was planned to start from Al-Mohandesin district passing through Cairo Zoo/Cairo University then through Hadaek October. This will maximise accessibility for the City's residents. The route, however, could be modified under the to be carried out study by ITDP.

⁵¹ NREL, Evaluating the Emission Reduction Benefits of PROJECT IMPACT WMATA Natural Gas Buses (2003), Website access <u>here</u>

⁵² ICCT, A COMPARISON OF THE LIFE-CYCLE GREENHOUSE GAS EMISSIONS OF EUROPEAN HEAVY-DUTY VEHICLES AND FUELS (2023), Website access <u>here</u>

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(LU & T 3) Implement BRT scheme potentially with the full or partial integration of E-bus fleet

Project Description

The City's current high reliance on private vehicles and less efficient micro/minibuses contributes to environmental pollution and GHG emissions. To address these challenges, this project supports the establishment of a BRT line connecting Giza downtown to 6th of October City, in line with the current plans of the Ministry of Housing, Utilities and Urban Communities (MHUUC) and the Ministry of Transport (MoT). In the first instance the BRT could be set up with the use of CNG buses, however, it is strongly recommended that the line is upgraded to e-buses once the necessary feasibility studies and charging strategies are available. The use of CNG or e-buses aligns with the Government of Egypt's (GoE) current interest and direction ⁵³. The introduction of an electric or CNG BRT system will help reduce the City's carbon footprint, contribute to environmental sustainability, and offer a cost-effective solution for mass transit. This project will not only modernise the City's public transport system but also pave the way for a greener and more sustainable future. In the case of using e-buses, charging stations could be implemented as part of a hub with leased commercial areas to guarantee proper revenue generation for the private developer.

Note that civil works, bus depot as well as other relevant components such as the ticketing system are not included in this project. Such work is expected to be carried out by the government.

Technical Description

The project involves investment in a BRT CNG fleet of 119 buses to operate the line. Before this, the project would require a review and update if needed of the feasibility study done by UN-Habitat to finalise design and infrastructure development for the BRT as well as a detailed operational plan to support concession with private operators. The BRT system, servicing the 6th of October City and connecting to other New Communities in central Giza, will improve public transport in the region. With the capacity to accommodate 126,000 passengers daily, the system will enhance accessibility and mobility for residents. The BRT system will span approximately 42 kilometres and feature 34 stations, including depots and terminals, reducing trip time by 15 minutes per trip.

As noted above, the BRT would preferably start operations with electric buses to maximise environmental benefits and reduce conversion costs later on. In this case, there will need to be a detailed assessment of EVs, defining the type of fleet and design optimisation for the route, including specifications for charging (for example possible use of in-motion charging particularly for high-volume e-buses) and implementation plan.

Key Considerations

- Delivery agency and organisational structure: A delivery agency/public authority with the powers and remit to deliver the BRT is crucial for the success of the project. The project could build upon recommendations made by UN-Habitat in terms of the service and business model for the BRT. The delivery and service model includes information such as the organisational structure, roles and responsibilities of the BRT delivery agency.
- Charging strategy: In the case e-buses are used, a study to determine the location of charging stations, and the study of the topography of the routes are crucial to ensure the system's effectiveness, feasibility, and seamless passenger experience. A competitive electricity tariff will also be required to ensure a modal shift.
- Ensure future adaptability: The design will accommodate future expansion, allowing for new routes or integration with other transport forms, ensuring long-term viability.

• Link with Transit-Oriented Development (TOD): Ensure the project aligns with the proposed TOD project.

⁵³ As demonstrated by the production of 100 electric buses model SETIBUS C120E.V in collaboration with MCV, a private vehicle manufacturer.

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(LU & T 3) Implement BRT scheme potentially with the full or partial integration of E-bus fleet

- Charging infrastructure: In the case, that e-buses are used, sufficient infrastructure will be required for convenient access to recharging for the BRT buses. The incorporation of solar photovoltaics into charging infrastructure could also be considered to improve the sustainability of the project and minimise GHG emissions.
- Local assembly of batteries: The local manufacturing of batteries will ensure more consistent access to lower-cost battery units for the e-buses; and
- Last-mile connectivity and linkages with the informal sector: Last-mile transport linking with the BRT is crucial. In addition, integrating the informal transport sector to the BRT is an important consideration.

Implementing Agency	Stakeholders			
The BRT project would be implemented through a partnership between the Ministry of Housing, Utilities and Urban Communities (MHUUC) and the Ministry of Transport (MoT) with potential NUCA involvement	 Ministry of Housing, Utilities and Urbasystem. Ministry for Transport: Will need to ensals oplay a crucial role in the implementation of the implementation of the implementation of the ensals oplay a crucial role in the implementation. Private Operators: Their involvement of City Authority: Will need to coordinate with the ensals oplay and the ensals oplay a crucial and the ensals oplay a crucial role in the implementation. Private Operators: Their involvement operators opera	an Communities: Will pla sure that the new BRT system ation of the project. ould help to increase the of with other stakeholders and sistance and support for the supplying/manufacturing eck the suitability of the gr or infrastructure for CNG s	ay a crucial role in the implementation stem aligns with national transport str efficiency and effectiveness of the sys and ensure that the system meets the the project, ensuring that the BRT syst the e-buses and implementing charg id for the charging stations; and tations and supply.	and operation of the new BRT ategies and regulations. They will stem. needs of the City's residents. tem is sustainable and inclusive. jing infrastructure.
	CAPEX	OPEX	Potential funding sources	Timeframe for Implementation

CAPEX	OPEX	Potential funding sources	I imetrame for implementation
 The estimated capital expenditure for this project includes: Electric bus (regular 12 m bus): Expected to cost between 650,000 Euros on average. Articulated buses would cost more typically 30% more cost than the 12m version. CNG fuel station: 4 million euros. 12 m CNG bus is expected to cost 500,000 Euros on average; and E-bus Charging Point: Expected cost between 50,000 – 80,000 Euros. A total CAPEX for this project is expected to be in the range of 85 million Euros if e-buses are used. This includes the cost of 119 12m e-buses in addition to 119 charging stations. For the CNG case, the total CAPEX is expected to be in the range of 68 million Euros. This includes the cost of two CNG medium size fuelling stations that can fuel 50-60 buses at a time. 	Operational expenses are expected to be reduced by 40% for fuel and 60% for maintenance due to the efficiency of electric vehicles. Operating costs of CNG-powered buses are also expected to be lower due to the lower fuel price.	 Potential sources of funding for this project include: Commercial Banks: Commercial banks could provide loans or other forms of financing for the project; and Multilateral Development Banks (MDBs) could potentially finance either i) the private sector partner, if a PPP model is adopted, or ii) NUCA through a sovereign loan or a green bond. 	The project implementation timeline includes the tendering process time plus an additional 24-36 months for procurement and installation of the EV/CNG infrastructure.



(LU & T 3) Implement BRT scheme potentially with the full or partial integration of E-bus fleet

Notes on cost estimate

The project cost will encompass the EV/CNG fleet and charging points/CNG stations. The cost of the depot and civil work is not considered as it is likely to be handled by the government.

Prerequisite steps for Implementation

Before project implementation, a detailed study is required to address several key aspects, including ticket pricing, infrastructure requirements, EV range, grid capacity (grid impact study) in case of e-buses, vehicle procurement strategy, last-mile connectivity, and a comprehensive feasibility study. This will need to incorporate findings from the study conducted by UN-Habitat for the MHUCC which includes design work and technical specifications for the BRT. A detailed Transport Masterplan focusing on linking various modes of transportation in the City is also crucial for the success of the project, which links to the proposed project in LU&T 5. It is also important for the proposed Transport Masterplan to build upon existing and ongoing studies in the City being conducted by ITDP, UN-Habitat, and TfC.

Social considerations (Gender and Inclusion)	Climate adaptation mainstreaming	Smart considerations
The objective of this project is to reduce congestion and improve accessibility for a large section of the population living in 6 th of October City, with a special focus on the mobility needs of women and vulnerable groups such as persons with disabilities, children, and the elderly. The project is expected to have a unique impact and create a transformational change in the Greater Cairo Region's access and transport modality for not only women but also other vulnerable members of society. Financial incentive programs should be designed to ensure affordability for vulnerable members of society.	To address climate adaptation, the project could also look to strengthen the resilience of road infrastructure along the routes in order to reduce risks from extreme heat. For instance, bus stations and bus stops should be assessed to identify opportunities for shading and cooling measures to reduce heat stress, and the new fleet of buses should be designed to ensure passenger comfort during the increasing number of days with extreme heat. The EV charging infrastructure should also be designed to ensure good performance during heatwaves, both through the technical specification of the charging infrastructure, or by placing it in air-conditioned areas, or by ensuring adequate shading.	 The project will integrate smart technologies to enhance the user and fleet operator experience: Improving user experience: Bus Schedule: develop and organise General Transit Feed Specification (GTFS) data about transport operations and make it available to app developers and main route planners. This, however, requires enforced bus stops; and E-ticketing: switching to an E-Ticketing system (to be applied as a wide-scale project covering GCR) including the ability to purchase tickets online/through mobile apps. Improving Operation: GPS Tracking: GPS tracking for fleet management and bus stop/schedule enforcement. This also includes speed monitoring for safety. Future projects/Considerations: Real-time GPS Tracking for users: Improving user experience through real-time GPS tracking; and On-board cameras: Improving safety through installing on-board cameras.



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(LU & T 3) Implement BRT scheme potentially with the full or partial integration of E-bus fleet

Related Case Study

BRT system, Kisumu, Kenya

To ensure equitable mobility, the City of Kisumu launched the Kisumu Sustainable Mobility Plan. The ten-year roadmap acknowledges the gaps in current and upcoming infrastructure projects and offers safe, accessible, sustainable, and equitable alternatives, which includes the development of a bus rapid transit system. The public transport system consists of matatus and shared tuk-tuks, carrying volumes as high as 4,500 passengers per hour per direction on the busiest corridor, Kenyatta Highway. While these modes provide basic access for medium and long-distance trips, public transport services experience several challenges including overcrowding and unsafe driving. Additionally, most public transport stages lack bus shelters, and terminal and depot facilities are lacking. To address these issues, the plan envisions a high-quality, cost-effective, and user-friendly public transport system, integrated with accessible pedestrian and cycling networks to enhance mobility and access for all residents.

Source: Kisumu Puts Pedestrians First (itdp.org)

Image: BRT in Kisumu to improve the quality of public transport in the city.





			sustainable green city		
(LU & T 4) Transitioning private sector fleets to EVs					
Project Aim	Status	Impact / GHG	Possible Location		
		reduction			
The project aims to reduce the City's reliance on fossil fuels by reducing the use of highly polluting vehicles. This intervention will facilitate a transition to cleaner, more sustainable modes of transportation, improving air quality. The project will incorporate new technologies, improve gender access to transit, develop a skilled and enhanced workforce, and create opportunities for green investment.	 New start-ups in the market to convert existing ICE mini/microbuses as well as motorbikes and tricycles. A key player in converting ICE buses to electric in Egypt has obtained the license to convert microbuses into EVs and is in the process of obtaining a license to convert minibuses. The company is already in talks with the government to incentivise the shift from internal combustion engines (ICE) to EVs. No clear interest yet from private entities to switch to EVs (market assessment study needed); and Interest from City authorities to convert private public micro buses; yet an issue in finance exists without support from the government 	Compared to the BAU case of micro-vehicles using diesel, conversion to electric could result in 60% reduction in GHG emissions.	The project will be implemented city- wide with an initial focus on vehicles servicing the Industrial Zone.		
Project Description					
The project aims to support the transition from fossil fuel-dependent vehicles to electric vehicles (EVs). The project involves investment in converting the existing fleet to electric vehicles, including two and three-wheelers and further the purchase of new e-buses of various sizes, such as large buses, new e-vans and e-cars. This shift will reduce the City's carbon footprint and significantly improve air quality, contributing to a healthier urban environment. Despite the initial high capital costs and limited charging infrastructure in the City, the benefits of EVs outweigh the challenges. The project will run in phases as follows: • Phase I: The first phase is to focus on converting existing micro/minibuses/mini-vans or purchasing new e-buses, (including large buses), e-cars (company vehicles) and e-vans targeting industrial fleets used to transport both employees and supplies. This can be also expanded to commercial (inc. private schools and nurseries as well as transport of supplies) and residential fleet (residential compounds staff transport). • Phase II: The project focuses on the conversion of two/three-wheelers; and • Phase III: At a later stage, the project would also cover individually owned public micro/minibuses pending government support. Technical Description The project initially involves the conversion of 100 small vehicles e.g. micro-buses/mini-vans for a few industrial entities to EVs or the purchase of new 100 buses (with various sizes), e-cars and e-vans. The number of vehicles, however, will depend on the appetite/interest of the industrial entities to convert their fleet.					
micro/minibuses serving the city in terms	s of public transport.				



(LU & T 4) Transitioning private sector fleets to EVs

Key Considerations

- Regarding individually owned public micro and minibuses, the transformation of the micro-bus fleet in the City should be gradual, following a well-developed plan to ensure a smooth transition and minimal disruption to public transportation services.
- It is crucial to ensure that car maintenance and service for the converted EVs are accessible and secured. This includes establishing partnerships with service providers and training technicians on EV maintenance.
- The project should consider sufficient charging infrastructure for convenient access to recharging points for individual micro/minibuses (Phase III). The incorporation of solar photovoltaics into charging infrastructure could also be considered to improve the sustainability of the project and minimise GHG emissions.
- The project should also consider the potential impact on the City's electricity grid and plan for any necessary upgrades or adjustments.
- The project should include a comprehensive communication and engagement strategy to inform and educate various industrial and commercial entities and in a later stage individual micro and minibus owners. about the benefits of EVs and the process of conversion.
- The project should consider potential financing models for the conversion or the purchase of new vehicles, such as low-interest loans or grants especially for micro and minibus individual owners (phase III).
- The project should also consider the potential for job creation in the EV sector, including in manufacturing, maintenance, and charging station operation; and
- For two/three wheelers, following the model of battery replacement when low of charge (e.g., Blu EV), battery replacement locations should be strategically placed citywide.

Implementing Agency	Stakeholders		
Phase I: Industrial fleet owners Phase II: Commercial fleet owners and residential compounds Phase III: Individual owners in collaboration with the government especially MoF which played a similar funding/incentivising role in the 2022 initiative to replace old cars (>20 years old).	 Distribution Companies (DISCOs) are responsible for providing infrastructure for the charging points for electric vehicles. Private developers: responsible for proving charging points. Private fleet owners, who will be transitioning their fleets to electric vehicles; and Ministry of Finance, who will be funding/incentivising the gradual switch to EV for individually owned public transport mini/microbuses as well as two/three wheelers. 		
CAPEX	OPEX	Potential funding sources	Timeframe for Implementation
Converting a microbus to an EV is expected to cost between 5,500 to 6,500 Euros. Converting a minibus would cost more. The cost of a new e-bus (11 to 17 seats) is expected to be from 7,000 to 30,000 Euros depending on battery size/range ⁵⁴ .	Government-regulated AC charging electricity tariff for EVs at 1.89 EGP/kWh (6 c/kWh). DC fast charging has a higher tariff of 3.75	 Commercial Banks would be appropriate for EV conversion or new purchase projects, particularly for private fleet owners (industrial/commercial). Multilateral Development Banks (MDBs) could potentially finance 	 The project's implementation is divided into several phases: Planning and Feasibility Study (3-6 months). Approvals and Procurement (6-12 months). Conversion and Testing (12-18 months). Infrastructure Development (12-24 months); and

⁵⁴ Prices are based on cost prices from China. Prices do not include additional taxes and fees for importing the vehicle excluding customs which are currently waved from EV's.



	(LU & T 4) Transitio	ning private sector fleets to l	EVs	
The total CAPEX for converting 100 buses to EVs is 550,000 to 650,000 Euros (18 to 22 million EGP). For new vehicle purchases, the CAPEX is estimated assuming 100 11-to-17-seater buses are purchased as an average knowing that e-vans and e-cars will be cheaper (1.5 to 5 million EGP); while large buses will be more expensive. The total CAPEX for purchasing new e-vehicles is 700,000 to 3 million Euros (23 to 100 million EGP). The cost expected for one entity such as a Residential Compound, based on 20-30 vehicles, would be: Conversion: 110,000 to 195,000 Euros.	EGP/kWh (11 c/kWh)	 NUCA through a sovereign green bond only if the project entire program to shift gover scale micro/minibuses. For individually owned micro/minibuses, micro finate entities could play a role in the necessary finance. This relevant to the conversion of mini/micro buses and miniver rather than purchasing new and Ministry of finance to fund p for the replacement of indiverses as two the provent of the sector. 	a loan or a ect is an ernorate- ance securing s is mainly of vans v ones; programs vidually well as	 Deployment (24-36 months). Steps 3 to 5 will be mainly relevant to Phase III of the project which includes gradual replacement of individually owned public micro/minibuses. Please note, that these are estimated timeframes and may vary based on appropriate approvals, technical challenges, and other factors.
Notes on cost estimate		two/three wheelers.		
N/A				
Prerequisite steps for Implementation				
 Priority steps that need to be taken before the implementation of this project include: Undertaking a market study to determine the level of demand for new e-vehicles and converting existing fleet. Establishing regulations and policies to promote the use of electric vehicles, including potential mandates for commercial fleets to transition to EVs; and Developing a city-level charging strategy is required if individually owned micro/min buses are to be converted or replaced (Phase III). This would also include an assessment of the number of micro/minibuses on the roads, typical routes, and stops which will be needed to develop a charging strategy. 				
Social considerations (Gender and Inclusion)	Climate adaptation	mainstreaming		Smart considerations
 The project will ensure social and gender considerations are integrated through the following strategies: Safety Measures: The project will establish effective harassment monitoring and controlling mechanisms. Safety buttons at charging stations will be installed to ensure a safe environment for all users. Promoting Gender Equality: The project will actively promote women's participation. 	Heatwaves and intense r power grid interrupting E addition to waterlogging a could destroy roads and facilities. While battery per reduce during heatwaves Bus stations and bus stop identify opportunities for a measures to reduce heat	ainfall could disrupt the V charging services. In at EV charging sites, floods disrupt access to charging erformance could significantly s. os should be assessed to shading and cooling stress, and the new fleet of	The project user and fl • GPS Tra bus stop monitorin • Mobile a • Develop fleet tran	ct will integrate smart technologies to enhance the leet operator experience: acking : GPS tracking for fleet management and b/schedule enforcement. This also includes speed ing for safety. apps for locating charging stations; and and integrate GTFS data about private sector insport.



(LU & T 4) Transitioning private sector fleets to EVs					
 including in decision-making roles and the implementation process. This will ensure that the perspectives and needs of women are considered in all stages of the project; and Inclusive Employment Opportunities: The project will also aim to create inclusive employment opportunities, ensuring that job creation from the project benefits a diverse range of social groups. 	buses should be designed to ensure passenger comfort during the increasing number of days with extreme heat. The EV charging infrastructure should also be designed to ensure good performance during heatwaves, both through the technical specification of the charging infrastructure, or either by placing it in air-conditioned areas, or ensuring adequate shading.	 Future projects/Considerations include: E-ticketing could be implemented for individually owned micro/mini public buses. This, will however, require formalizing the use of such buses. 			
Related Case Study: Shenzhen, China – Transitio	on to Electric Buses				
Shenzhen, a major city in Guangdong Province, bec	ame the first city in the world to fully electrify its bus fleet,	setting a global precedent for sustainable urban transit.			
Challenges:					
 Growing urban population causing increased demand for public transit; Pollution and greenhouse gas emission concerns from traditional diesel buses; and Need for infrastructure to support electric buses. 					
Government Support and Policy Framework: The made e-buses competitive with traditional buses in	Shenzhen government provided substantial subsidies to I a terms of pricing;	ower the upfront cost of electric buses. This financial support			
 Collaboration with Manufacturers: Shenzhen partnered with local electric vehicle manufacturers, such as BYD, to produce high-quality e-buses tailored to the city's needs; 					
 Infrastructure Development: Rapid deployment of charging stations and infrastructure was a priority. Special bus depots equipped with fast-charging stations were established across the city; 					
 Pilot Projects and Scaling: Initial pilot projects tested the feasibility and operational aspects of e-buses. After observing the success of these pilots, a city-wide rollout was initiated; and 					
 Engaging Private Operators: The transition wasn't limited to public fleets. Private bus operators were incentivised through subsidies and favourable loan terms to replace or convert their old diesel buses to electric. 					
• Full Electrification: By the end of 2017. Shenzhen	had fully transitioned its fleet of over 16.000 buses to elec	ctric.			
 Environmental Impact: The shift led to a significant reduction in CO2 emissions and pollutants, contributing to improved air quality in Shenzhen. 					
 Economic Benefits: While the initial investment was significant, the operational costs of e-buses, in terms of maintenance and fuelling, were lower than diesel buses, leading to long-term savings; and 					
• Private Sector Involvement: The clear policy framework and incentives encouraged private micro-bus operators to also make the shift, amplifying the impact. Shenzhen's success story demonstrates the potential of strategic planning, public-private partnerships, and a clear policy framework in transitioning to sustainable urban					
transit. It offers valuable lessons for other cities aimi	ng to promote e-buses, especially in engaging the private	e sector.			
Source: https://knowledge-hub.circle-lab.com/circula	rnorway/article/22912?n=China-Shenzhen%E2%80%99	s-shift-to-an-electric-mobility-system			







	(LU & T 5) Multi-modal Integrated Tra	ansport Network	
Project Aim	Status	Impact / GHG reduction	Possible Location
The project aims to foster a modal shift in 6 th of October City by developing an integrated transport network. The initiative is designed to decrease the City's dependence on private vehicles and encourage the use of sustainable, alternative modes of transport such as cycling, walking, and public transit.	The project's progress is dependent on the revision of the Greater Cairo Transport Masterplan, funded by JICA and currently in progress. The revised study includes detailed surveys and demand forecasts and will support position connectivity requirements for the 6 th of October City within the wider context. Additionally, UN-Habitat will commence work on the informal transport sector within the City which will need to be incorporated in the revised SUMP. Progress is further dependent on the development of ongoing key transport infrastructures in the City, including the BRT, Monorail, and Metro systems. While Monorail station construction is underway, the exact locations remain uncertain. The BRT project, intended to link the City with the Giza Governorate is still in the planning phase. Additionally, planned NMT projects await implementation by the City.	The project is expected to reduce GHG emissions in the City. By reducing reliance on private vehicles, the project will decrease fossil fuel consumption and associated CO2 emissions. Additionally, the project will improve air quality, reduce traffic congestion, and contribute to healthier, more active lifestyles for residents. The exact reduction in GHG emissions would require a more detailed study.	Infrastructure will be strategically placed to connect key sites such as existing bus stations, planned transport infrastructure, the commercial centre, universities, and the Industrial Zone. The exact locations will be determined based on a comprehensive Transport Masterplan considering the current usage and demand for different modes across the City.

Project Description

The focus of this project is the revision and update of the Sustainable urban plan of the City, which will serve as a framework for future multi-modal integrated transport interventions. The plan aims to identify areas for investment in new or upgraded transport infrastructure. The updated SUMP will analyse existing transport modalities, usage patterns, and infrastructure gaps, facilitating the development and integration of last-mile connectivity solutions such as Non-Motorised Transport (NMT), bus feeder services, and park-and-ride facilities. Following the update of the SUMP, the project will move into the implementation of the Integrated Urban Mobility infrastructure. The project will ensure alignment with planned infrastructure investments in Bus Rapid Transit (BRT), Monorail, Metro, and High-Speed Rail, enhancing last-mile connectivity and complementing the proposed Transit Oriented Development (TOD) project.

Technical Description

The project aims to establish an integrated transport network in the City based on detailed analyses of current use and demand for different modes in the City and taking into account new and ongoing studies and initiatives to identify key areas for investment in new or upgraded infrastructure. Following the update of the SUMP, the project would move into the implementation of identified work packages.

Integrated transport network solutions include:

- **NMT Infrastructure**: The project involves the creation of cycleways and cycle parking facilities throughout the City. These cycleways will be designed with a focus on safety, visibility, and seamless integration with key land uses. The project also involves the construction of bicycle-only paths and the establishment of a network of covered and secure parking facilities for bicycles. To promote the use of these facilities, awareness-raising campaigns will be conducted throughout the City;
- Pedestrianisation: Measures will be implemented to increase pedestrianisation throughout the City. This includes improving street lighting, creating pedestrian-friendly

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(LU & T 5) Multi-modal Integrated Transport Network

streets, and enforcing strict vehicle speed limits within city limits to ensure the safety of all road users;

- Integration with Public Transport: The project will work in tandem with planned infrastructure investments in Bus Rapid Transit (BRT), Monorail, Metro, and High-Speed Rail within the City. To further enhance this connectivity, the project will develop bus feeder services and park-and-ride facilities to support last-mile connectivity, ensuring that residents can easily access these modes of transport from their homes or workplaces;
- Formalised Bus Stops: Designated bus stops will be established at strategic locations, equipped with necessary amenities for use by private operators based on predetermined routes;
- EV charging strategy: Define the need and specifications to provide e-charging points and infrastructure that will facilitate the transition to EVs for commercial and private vehicles; and
- Private Sector Integration: The private sector will be encouraged to integrate multi-modal hubs around the BRT and monorail stations, including provisions for micro/minibus access, bikes, electric vehicle charging, taxi points, and potential integration with mall parking areas.

Key Considerations

The successful implementation of the project necessitates careful planning and consideration of several factors. These include:

- Management of Informal Transport^{55,56,57}: Effective management of informal transport in the City, including the rationalisation of Tuk-Tuk vehicles and provision of alternative options, is crucial to improve road safety for NMT users and vulnerable groups. The approach should build upon work by TfC and international best practices on the management of informal paratransit; and
- Alignment with TOD Project: The project needs to align with the proposed Transit-Oriented Development (TOD) project. This will ensure that integrated transport supports the development of transport hubs in the City and the densification of economic activity around these.

Implementing Agency	Stakeholders
The key implementing agencies for the project would include the New Urban Communities Authority (NUCA), City Authority, and the Ministry of Transport. Collaboration with local civil society groups and private sector stakeholders may also be beneficial for the project's implementation.	NUCA and the City Authority will lead the project, ensuring it aligns with local needs and national transport strategies. The Ministry for Transport would support with alignment to planned infrastructure projects (BRT, Monorail, HSR and Metro), Civil society groups will ensure diverse user needs are considered (youth, elderly, women, marginalised groups).

⁵⁵ Website access <u>here</u>

⁵⁷ Website access <u>here</u>

⁵⁶ <u>EN_Transportation_Policy.pdf (transportforcairo.com)</u>



(LU & T 5)	Multi-modal Integrated Transport N	etwork
CAPEX OPEX	Potential funding sources	Timeframe for Implementation
The cost of a detailed revised SUMP would be between 1 to 1.5 million-FWould be between 1 to 1.5 millionpEuros (33 million to 49.5 millionpEGP). This is based on the development of a transport model for the City as part of the TransportgMasterplan.p	Potential sources of funding for this project include NUCA or MDB grants or loans. Additionally, revenue generated from user fees and advertising within the developed spaces could be reinvested into the project.	This would be a medium to long-term initiative. Preliminary studies, planning, and design could commence immediately, with the implementation of the first phase potentially starting within the next two years. Full completion and operationalisation of the project could be expected within a 5–10-year timeframe.
Notes on cost estimate		
-		
Prerequisite steps for Implementation		
Prerequisite steps for the project include conducting a Transport Mas	sterplan to understand the current der	nand for different modes of transport in the City.
Social considerations (Gender and Inclusion)	Climate adaptation mainstre	aming Smart considerations
The objective of this project is to improve accessibility of the City for large section of the population living in 6 th of October, with a special focus on the mobility needs of women and vulnerable groups such a persons with disabilities, youth, and the elderly. Key factors to consider include: Spatial inclusion: Ensure sufficient street lighting systems for increas safety, particularly for women, children, youth and elderly people. Additionally, road safety measures would be prioritised, particularly in the design of cycleways and pedestrian paths, to ensure they are sat and accessible for all users. Social inclusion: Awareness raising campaigns, in partnership with National Council for Women (NCW), on safe transportation and sexu harassment (building on the "Elsekka Aman" initiative). Economic inclusion: Liaise with local cooperatives, local SMEs, for development and maintenance of the new public spaces. The project would ensure that the planning and implementation stages are incluse and participatory. This would involve engaging with diverse groups within the community, including women, the elderly, and people with disabilities, to understand their specific needs and concerns. The pro-	 a The project will incorporate clination measures across a modes. Pedestrian paths and cycleways will feature shaded and robust drainage systems to protect users from extreme we conditions, with cycleways also considering rest areas with wa fountains to mitigate heat stress feeder services will include she stops and operational continger plans to maintain service during extreme weather events. Park ride facilities will be climate-rest featuring shaded parking areas robust drainage systems, and strategically located in areas levulnerable to climate impacts. comprehensive measures ens project's resilience to climate or comprehensive measures ens project's resilience to climate or clim	 The Transport Masterplan should consider embedding various digital technologies in public transport operations such as ATCS, developing and integrating GTFS data (which can help develop online maps, bus schedules and real-time tracking systems), and e-ticketing. Simulation models would be also required to test and optimise the actions of the masterplan. Future projects/Considerations: Integrated transport platform: Pending e-ticketing and bus schedules implementation, a platform to integrate various modes of transport and route options as well as online ticketing could be established.

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(LU & T 5) Multi-	-modal Integrated Transport Network			
would also aim to promote gender equality by encouraging the	while enhancing user comfort and			
participation of women in project-related employment opportunities.	safety.			
Related Case Study: Curitiba's Integrated Transport System				
Curitiba, the capital of Paraná state in Brazil, is globally renowned for its in example of promoting sustainable and efficient urban mobility.	nnovative urban planning and transportat	tion solutions. Its integrated transportation system is an		
Challenges:				
 Rapid urban growth leads to traffic congestion and pollution; Inefficient and fragmented public transport services; and Limited infrastructure for non-motorised transport. 				
Key Strategies Implemented:				
 Bus Rapid Transit (BRT) System: Curitiba introduced one of the world boarding, and dedicated bus lanes ensure rapid transit, unaffected by trasing integration of Transport Modes: Curitiba's BRT system was designed passengers from peripheral areas to BRT stations; Promotion of Non-Motorized Transport (NMT): The City developed and the urban landscape, promoting cycling as a viable mode of transport; Integrated Fare System: A unified ticketing system allows passengers and encourages the use of public transport; and Land Use Planning: Urban planning was closely integrated with the transmaximize transit accessibility and efficiency. 	's first BRT systems. Distinctive tube-sha affic congestion; to seamlessly integrate with other transp n extensive network of pedestrian areas to transfer between different transport m nsport system. High-density developmer	aped bus stations allow for quick and accessible port options. Local feeder buses help transport and green spaces. Cycling lanes were integrated into nodes without multiple charges. This fosters convenience nt was encouraged along major transport corridors to		
Outcomes:				
 Modal Shift: A significant percentage of residents started using the BRT Environmental Benefits: The integrated system led to reduced traffic c Economic Efficiency: By leveraging the efficiency of buses (compared a fraction of the cost; and Improved Accessibility and Mobility: Residents, irrespective of their s 	F and other public transport modes, redu congestion, lower greenhouse gas emissi to building cost-intensive metros or tram cocio-economic status, benefitted from er	icing reliance on personal vehicles; ions, and improved air quality; ns), Curitiba achieved a high-quality transport system at nhanced connectivity and mobility.		
Curitiba's experience demonstrates the importance of holistic planning where transport, urban development, and sustainability are intertwined. Through visionary				
leadership and community involvement, Curitiba transformed its urban landscape and set a benchmark for integrated transportation systems.				
Source: https://www.ebrdgreencities.com/policy-tool/modernizing-bus-rapi	d-transit-curitiba-brazil/#results-and-less	sons-learned		



3. Water

(W & WW 1) Developing the use of "smart" data systems (network digital monitoring and smart performance optimisation) for assessing water losses				
Project Aim	Status	Impact / GHG reduction	Possible Location	
The primary objective of this project is to enhance the efficiency and reliability of the City's water supply network by leveraging smart data systems. This will enable the detection of leaks and the implementation of predictive maintenance measures, thereby reducing network breaks and non- revenue water (NRW) which amounted to 22% in 2021 (knowing the figure is an estimate as there are no proper measurements for water losses).	 No work has been done to reduce NRW in the City; There are also no GIS maps/data available for existing water network infrastructure; Parts of the network are old and need replacement; Clear willingness from City authority to create maps for the water network; and No feasibility study was carried out 	By detecting and addressing leaks promptly, the project can save approximately 370,000 MWh assuming NRW is reduced by 50% over the city and uniform losses all over the city ⁵⁸ . This energy efficiency translates into a reduction in greenhouse gas emissions, with an estimated decrease of 200 tons of CO_2 equivalent per year.	The project will initially focus on residential districts 7 and 8, covering an area of approximately 10 km ² . The project also holds potential for replication in other cities.	
Project Description		-		
This project integrates advanced digital technologies into the existing water supply network and aims to significantly improve the City's water management. The current Non-revenue water (NRW) situation, while satisfactory, is hampered by an ageing infrastructure and malfunctioning valves. This initiative will focus on reducing NRW by investing in digital meters and data loggers. These devices will be strategically placed throughout the water network to detect leaks and implement predictive maintenance, thereby reducing network breaks. The project will incorporate a comprehensive suite of tools including permanent flow meters, pressure devices, chambers, smart meters, quality monitoring systems, SCADA, and specialized software. The ultimate goal is to optimise water usage, minimise waste, and ensure a sustainable water supply for the City's residents.				
Technical Description				
Technical Description The project will initially focus on a combined area of 10 km ² , encompassing residential districts 7 and 8, as well as the Almotameyz district. This area represents a diverse cross-section of the City's water network, making it an ideal starting point for the project. The use of smart water technology, such as acoustic sensors and advanced analytics, will enable precise leak detection and efficient water management. The project will also include the development of GIS maps of the water network.				

⁵⁸ Emissions factor of 533 tones CO2/kWh (combined margin emissions factor as per IGES values



(W & WW 1) Developing the use of "smart" data systems (network digital monitoring and smart performance optimisation) for assessing water losses

Key Considerations

 GIS Mapping of Water Network infrastructure and enabling pre- Rollout plan: The project's su and data loggers, regular data Capacity building: Training for data provided by the smart system Awareness Campaigns: A cite educated on the importance of Meter Calibration and Upgrate Authority should continue to re Data handling: The project should 	rk: Accurate GIS mapping for 6 th o dictive maintenance, ensuring the I ccess relies on an effective rollout p analysis for timely leak detection, a r staff on the new technologies and tems; y-wide initiative should be launched responsible water consumption, fo dation: The Water Company should place traditional meters with prepai ould also be accompanied by a rob also consider potential scalability for	f October City's water network will facilitate precise m ongevity and efficiency of the water system. A hydrau olan and operational strategy. This includes careful se and prompt maintenance actions; I systems will also be a key consideration to ensure the d to raise awareness about water conservation. Throu stering a community-wide approach to sustainability; d undertake periodic calibration of water meters, ensure d or smart meters, enhancing user experience and pr ust customer database, reducing data handling errors for future expansion to other districts.	aintenance activities, minimising damage to the ilic model of the network will be also required; election of installation sites for the digital meters ney can effectively manage and respond to the igh various campaigns, residents should be uring accurate readings and billing. The City romoting responsible consumption; s and testing customers' meters; and	
Implementing Agency	Stakeholders			
The New UrbanICommunities Authority(NUCA) and the CityAuthority will jointly oversee(NUCA)the implementation of the(NUCA)project.(NUCA)	 key stakeholders include: The City Authority: Is responsible for overseeing the project's implementation and ensuring the project aligns with the City's strategic goals; Operations and Maintenance Service Providers: Are responsible for the day-to-day operation and maintenance of the water networ and Large Compounds: These are the end-users of the water supply network, and their feedback will provide valuable insights into the effectiveness of the new systems and help identify areas for improvement. 			
CAPEX	OPEX	Potential funding sources	Timeframe for Implementation	
The estimated capital expenditur for the project, which covers an area of 10 km ² , ranges from 2.5 3.5 million Euros (82 to 115 million EGP).	e The annual operational expenditure is expected to be between 125,000 and 175,000 Euros (4 to 5.7 million EGP).	 Potential funding sources: New Urban Communities Authority (NUCA) Budget: As the implementing agency, NUCA may allocate a portion of its budget to fund the project; and Some Multilateral Development Banks (MDBs) such as the World Bank could be interested in funding governorate-wide projects to reduce NRW through a sovereign loan or a green bond. 	The implementation of the project is estimated to take one year per zone (3-7 km ²).	



(W & WW 1) Developing the use of "smart" data systems (network digital monitoring and smart performance optimisation) for assessing water losses

Notes on cost estimate

The typical costs for such projects are estimated to be between 250,000 and 350,000 Euros per km², with annual OPEX typically representing 5% of CAPEX.

Prerequisite steps for Implementation

Prior to the implementation of the project, it will be necessary to carry out GIS mapping and prioritise the areas that will benefit most from the intervention. This will ensure that the project is targeted effectively and delivers maximum impact.

Capacity building for operators on DMA/DMZ concept and remote monitoring and analyses of data is also required

Social considerations (Gender and Inclusion)	Climate adaptation mainstreaming	Smart considerations
The project will integrate social and gender	The project will integrate climate adaptation by	Remote monitoring and leakage detection: The
considerations by working closely with the	addressing a key climate risk - decreasing water	integration of smart technology into the project will
National Council for Women and other gender	availability. As climate change exacerbates drought	leverage the Internet of Things (IoT) for efficient water
stakeholders. This collaboration will help identify	conditions, ensuring efficient water use becomes	management. IoT-based solutions can help detect leaks in
gender-related indicators to track and develop	critical. The project will employ smart technologies to	the water supply network, implement predictive
recommendations accordingly (e.g.,	detect and address leaks in the water supply network,	maintenance, and reduce network breaks. This particularly
introduce/promote special low tariffs for low-	reducing non-revenue water and conserving valuable	includes remote monitoring of flow meters and pressure
income or women-headed households). The	resources. This will enhance the City's resilience to	sensors in the targeted area/network. This approach will
project aims to ensure that the benefits of	drought and ensure the sustainability of water supplies.	not only optimise water management but also reduce
improved water management are accessible to	Furthermore, the project will consider the long-term	operational costs and enhance the sustainability of the
all, including women and vulnerable groups. This	rehabilitation of old infrastructure and the use of	water supply network.
approach will help reveal if these groups are	durable, climate-resilient pipes. The placement of water	
more susceptible to water losses or water quality	distribution infrastructure will also be strategically	
issues and allow for the development of targeted	planned to avoid areas prone to climate risks, thereby	
solutions. The project's commitment to inclusivity	minimising potential damage and disruptions to the	
and gender equality will contribute to its overall	water supply.	
success and sustainability.		

Related Case Study: Integrated Water Solutions and Non-Revenue Water Reduction Initiatives in Egypt

This case study highlights three water management projects in different governorates of Egypt, supported by various funding organisations. The projects aim to address water-related challenges, improve efficiency, and reduce non-revenue water (NRW). The initiatives involve the implementation of advanced technologies, including the installation of digital meters, flowmeters, pressure loggers, and a monitoring system known as SCADA (Supervisory Control and Data Acquisition).

- Integrated Water Solution Support Technical Assistance Project in Luxor, Qena, Sohag, Assuit, and Minia: Funded by USAID, this project focuses on five governorates and involves the execution of more than 15 District Metered Zones (DMZs). The DMZs play a vital role in monitoring water consumption, identifying leakages, and optimizing water distribution. Additionally, flowmeters and pressure loggers are installed to gather accurate data for better network management. The implementation of a SCADA system enables real-time monitoring and control of the water infrastructure, enhancing operational efficiency and reducing water losses;
- Non-Revenue Water Reduction Program in Sohag Governorate: In collaboration with USAID and the Coca-Cola Company, this initiative targets Sohag Governorate



(W & WW 1) Developing the use of "smart" data systems (network digital monitoring and smart performance optimisation) for assessing water losses

specifically. The project aims to minimize non-revenue water by executing three District Metered Areas (DMAs). These DMAs enable accurate measurement of water consumption and identification of areas with high leakage rates. By promptly detecting and repairing leaks, water losses are reduced, leading to improved water supply efficiency. The program focuses on enhancing the overall sustainability of the water distribution network in Sohag; and

• Pre-feasibility Study for the National Non-Revenue Water Program in Alexandria Governorate: Supported by the European Union (EU), this project focuses on conducting a pre-feasibility study for non-revenue water reduction in Alexandria Governorate. As part of the study, a sample District Metered Area (DMA) is executed in the Seouf Zone. The DMA serves as a pilot project to assess the effectiveness of NRW reduction strategies. The study aims to identify the most suitable techniques and technologies for optimizing water management and reducing water losses throughout the governorate.

These initiatives contribute to enhancing water management practices and reducing non-revenue water in the respective governorates. The implementation of digital meters, flowmeters, pressure loggers, and SCADA systems enables accurate monitoring, detection of leaks, and proactive maintenance.

Related Case Study: Integrated Water Solution Support Technical Assistance project in Luxor, Qena, Sohag, Assuit and Minia



Figure 2: Flow meter cabinet with RTU unit



OFFICIAL USE



(W & WW 1) Developing the use of "smart" data systems (network digital monitoring and smart performance optimisation) for assessing water losses

Related Case Study: Non-Revenue Water Reduction Program in Sohag Governorate, funded by USAID and Coca-Cola Company, Executing 3 DMAs in Sohag.





Related Case Study: Pre-feasibility study for the National Non-Revenue Water Program in Alexandria governorate, funded by the EU, Executing one sample DMA in Seouf ZONE.





(W & WW 2) Energy efficiency improvement in water and wastewater treatment plants					
Project Aim	Status	Impact / GHG reduction	Possible Location		
 The aim of the project is to achieve a substantial reduction in energy consumption and operational costs in water and wastewater treatment plants. By implementing energy-efficient technologies and optimising system operations, the project seeks to enhance resource efficiency and promote sustainability in the City's water The old water treatment and wastewater treatment plants could be carried out by an ESCO; and No detailed energy audit was carried out. By implementing in a 20% saving in emissions. 					
Project Description					
This project supports infrastructure upgrades and technology implementation to improve energy efficiency in water and wastewater treatment plants. The project aims to enhance the energy performance of the City's ageing water and wastewater treatment facilities. By investing in various energy-efficient technologies, such as variable speed drives (VSDs), high-efficiency motors, pump system optimisation, power factor improvement, improved coupling, control systems for aerators, and efficient lighting, the project aims to optimize energy consumption and reduce greenhouse gas (GHG) emissions. Although the average electricity consumption of water and wastewater treatment plants is reasonable at 0.3 kWh/m ³ , it has been identified that some water pumps in the pumping stations operate continuously without reason, indicating potential energy waste.					
Technical Description					
The project will focus on improving energy efficiency in two key facilities:					
• Old Water Treatment Plant: Enhancements will be implemented to optimise energy use in the City's old water treatment plant, which has a capacity of 267,000 m ³ /day;					
 Phase I Wastewater Treatment Plant: Energy efficiency measures will be applied to the Phase I wastewater treatment plants with a combined capacity of 150,000 m³/day. 					
Key Considerations					
 Prioritisation of investment: The project will prioritise investments based on the energy-saving potential and cost-effectiveness of each technology. This ensures that resources are allocated efficiently to achieve maximum energy efficiency improvements. Technology selection: The selection of appropriate energy-efficient technologies will be crucial for achieving the desired energy savings. Consideration will be given to the compatibility of the technologies with the existing infrastructure and their long-term reliability and maintainability; Operational impact: The project will carefully assess the potential operational impact of implementing energy-efficient technologies to ensure smooth plant operations and minimal disruption during the upgrade process; and Staff training and capacity building: Training programs will be developed to educate plant operators and staff on the proper operation and maintenance of the new energy-efficient equipment. This will ensure that the full benefits of the energy efficiency improvements are realized and sustained over time. By improving energy efficiency in the water and wastewater treatment plants, the project will not only reduce energy consumption and GHG emissions but also contribute 					



to the overall sustainability and environmental performance of the City's water management infrastructure. Implementing Agency Stakeholders The implementation for this project will be a collaboration between the New Urban Stakeholders involved in the energy efficiency improvement in water and wastewater treatment plants project include: Operation and Maintenance (O&M) Service Providers and ESCOs: Their active involvement and cooperation are essential for implementing energy efficiency measures and ensuring the long-term sustainability of the facilities. CAPEX OPEX Potential funding sources Timeframe for Implementation Total CAPEX is 300,000 Euros (10 trageting two plants - the old water treatment plant and phase I of the expenditure (OPEX) for the project is expected to be in the range of 1.5 to 2.5 Euros per kilowatt-hour (kVh) wastewater treatment plants. As the implementing agency, NUCA installation and Construction Phase (2 months); The estimated based on the existing energy use in the water and wastewater treatment plants. Procurement Phase (2 months); Procurement Phase (2 to 10 months); and Cost is calculated based on the existing energy use in the water and wastewater treatment plants are expected to be achieved through the implementation of various energy efficiency measures. It is important to highlight that this estimate only applies to the older plants, as the newly commissioned plants are exp	(W & WW 2) Energy efficiency improvement in water and wastewater treatment plants					
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energy audit will provide valuable insights and data to inform the development of an effective and targeted energy efficiency plan for the plants.						
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integrated into the project through: include new equipment, these should be following measures:	integrated into the project throug	s will be ih:	include new equipment. t	hese should be	following measure	s:



وزارة التعـاون الدولـي Ministry of International Cooperation

(W & WW 2) Energy efficiency improvement in water and wastewater treatment plants					
 Capacity building for women on energy efficiency audits and monitoring; and Awareness is raised by opening doors to school pupils and university students to observe the latest energy efficiency technologies. 	specified to withstand higher operating temperatures. The monitoring systems planned through the project will allow for more timely identification and rectification of leaks, thus reducing water losses. The integration of climate adaptation measures into the project will strengthen the City's ability to cope with the impacts of climate change, safeguard water resources, and enhance the overall resilience of the 6 th of October City in the face of future climate risks.	 Remote Monitoring: The project will implement remote monitoring systems that enable real-time monitoring of water and energy consumption in the treatment plants. This will allow for continuous data collection and analysis, facilitating timely detection of anomalies and issues; and Energy Management Systems: Energy management systems will be deployed to optimise energy usage in the water and wastewater treatment plants. These systems will monitor energy consumption patterns, identify areas of inefficiency, and provide recommendations for energy-saving measures. 			

Related Case Study: Madadeni Wastewater Treatment Plant, South Africa

The Madadeni WWTP in South Africa was first designed and constructed in the 1990s with a capacity of 12 million I/day. The treatment plant reached its design capacity as population numbers in the township increased over time. In 2008 extensive rehabilitation and plant upgrade works were undertaken to increase the treatment capacity of the plant to 18 million I/day. Alongside this, the treatment plant undertook energy efficiency measures which would reduce operational costs.

• Refurbishment of equipment to improve efficiency included: Refurbishment and replacement of aerators aerators as an efficiency and energy-saving initiative;

• Inlet screen replacement;

- Eroded concrete repair on the inlet channel; and
- Equipment clean out (removal of built-up silt and debris).

This was successfully completed with total savings of around USD \$ 5.3 million, compared with a complete upgrade/replacement of equipment in the plant. Since 2008 the plant has undergone further rehabilitation and works in order to increase its efficiency and increase its designed treatment capacity to around 35 million *Source : https://www.wrc.org.za/wp-content/uploads/mdocs/TT%20480-12.pdf*

with bubble upgrade I/day.



4. Wastewater

(W & WW 3) Expansion of the western wastewater treatment plant for the fourth phase, with a design capacity of 150,000 m ³ /day					
Project Aim	Status	Impact / GHG reduction	Possible Location		
Implete of the project minuFormationFormationThe project aims to accommodate the City's future wastewater quantities, resulting from an anticipated population increase to 6 million. The expansion will also contribute to environmental sustainability by improving the overall sustainability performance of the City's wastewater infrastructure system, reducing pollution from untreated wastewater discharge and increasing climate adaptation by increasing water availability (if wastewater is re-used for landscaping).Phase 4 is still to be tendered by NUCA with no current plans for this process to be initiated; NUCA's focus now is on developing Phase 3 of the WWT plant; and elimate adaptation by increasing water availability (if wastewater is re-used for landscaping).The project will result in an increase in emissions by 0.11 kg CO2 per cubic meter based on a typical specific electricity consumption of 0.3 kWh/m ³ .The project will pe situated within the main wastewater treatment plant', as depicted in Figure 1. This strategic location ensures easy integration with existing infrastructure and minimises the need for extensive land acquisition.Interest for phase 4 from City authority to match expected population increase.Interest for phase 4 from City authority to match expected population increase.Land has already been allocated from the beginning for the 4 phases of the project.Land has already been allocated from the beginning for the 4 phases of the project.Land has already been allocated from the beginning for the 4 phases of the project.Land has already been allocated from the beginning for the 4 phases of the project.Land has already been allocated from the beginning for the					
Project Description					
This project focuses on the enhancement of the City's wastewater treatment capabilities with the expansion of the western wastewater treatment plant (WWTP). This is a strategic initiative designed to accommodate the future population growth of the City, with a projected population of 6 million people. The project will ensure that the City's wastewater treatment capacity keeps pace with its growth, enhancing the City's resilience and sustainability. The fourth phase of the expansion will increase the plant's design capacity by 150,000 m ³ /day, bringing the total City WWTP capacity to 600,000 m ³ /day once completed together with phase 3. This phase will be initiated when the city's population reaches approximately 4 million people. The project will also include the installation of new treatment modules to manage the City's wastewater quantities effectively.					
Technical Description					
The technical aspects for constructing the 150,000 m ³ /day fourth phase include the installation of six primary sedimentation tanks (25,000 m ³ /day per tank), six aeration tanks (25,000 m ³ /day per tank), twelve final sedimentation tanks (12,500 m ³ /day per tank), twelve filters (12,500 m ³ /day per filter), a contact tank (4,000 m ³).					
Key Considerations					
Key considerations for the project include establishing an effective contractual framework for off-take agreements, ensuring access to land, implementing take or pay schemes, and ensuring the availability of spare parts. Continued staff training and proper operations and maintenance (O&M) are also crucial for the project's success. The project will also need to consider the potential impacts on the environment and the community and ensure that all activities are carried out in a sustainable and responsible manner.					



(W & WW 3) Expansion of the western wastewater treatment plant for the fourth phase, with a design capacity of 150,000 m³/day

It is important to consider the incorporation of renewable energy sources such as solar photovoltaics or wind farms, which could offset the increase in GHG emissions from this project. Assuming an annual energy consumption of 16,425 MWh per year, using renewable energy sources could lead to a GHG reduction of 8,705 t CO₂eq per year.

Implementing Agency	Stakeholders			
The New Urban Communities Authority (NUCA) and the City Authority will jointly oversee the project's implementation.	 Key stakeholders include: The City Authority and NU Operations & Maintenance Private developers. 	CA; e (O&M) service providers, who will er	nsure the plant's efficient functioning post-construction; and	
CAPEX	OPEX	Potential funding sources	Timeframe for Implementation	
Total CAPEX is estimated to be 150 million Euros (4.95 billion EGP). This figure includes all expenses related to the construction of the wastewater treatment plant, such as procurement of materials, labour costs, and installation of equipment. It should be noted that the CAPEX range includes the use of digestors. Without including digestors, the CAPEX is expected to be lower.	The annual operating expenses are estimated to range from 5.5 to 16.5 million Euros (180 to 540 million EGP). These costs cover routine maintenance, staff salaries, utility bills, and other recurring expenses necessary for the plant's operation.	 NUCA Budget; Loans through commercial banks (obtained by the private developer where the project is implemented through a PPP modality); and MDBs could potentially finance either i) the private sector partner, if a PPP model is adopted, or ii) NUCA through a sovereign loan or a green bond. 	 Implementation is projected to span approximately three years. This timeframe is divided into several key phases: Preliminary Studies and Design (6-9 months); Procurement (3-6 months); Construction (18-24 months); and Commissioning (3-6 months). Please note that these durations are estimates and can vary based on several factors. 	

Notes on cost estimate

The typical CAPEX for wastewater treatment plants ranges from 400 to 900 Euros/m³/day, and the OPEX ranges from 0.1 to 0.3 Euros/m³. These costs can vary depending on the technology used, such as conventional activated sludge, extended aeration - activated sludge using oxidation ditches, or sequencing batch reactors (SBR). It should be noted that the OPEX range includes the use of digestors. Without digestors, City Authority reported values in the range of 0.04 Euros/m³ which is likely to amount now to at least 0.08 Euros/m³ due to recent currency devaluation.

Prerequisite steps for Implementation

Prior to the project's commencement, several steps need to be taken. These include conducting environmental and design studies, developing an effective contractual framework for off-take agreements, studying the availability and access to land, and developing a capacity-building plan for staff. These steps will ensure that the project is feasible, sustainable, and implementable.


(W & WW 3) Expansion of the western wastewater treatment plant for the fourth phase, with a design capacity of 150,000 m ³ /day					
Social considerations (Gender and Inclusion)	Climate adaptation mainstreaming	Smart considerations			
The project will actively involve key stakeholders, including the National Council for Women (NCW), to ensure gender equity and social inclusion. The project will set gender participation targets, especially in the workforce, and monitor progress towards these targets. It will ensure gender-sensitive working conditions and adhere to workplace health and safety standards. Training will be provided to both men and women, with conditions tailored to be gender sensitive. This approach will ensure that the project is not only technically sound but also socially equitable and inclusive.	Impacts of intense rainfall, sandstorms and other extreme weather events could damage the WWTP infrastructure, and increases in temperature, and heatwaves can negatively impact both the operation of equipment and the efficiency of wastewater treatment processes. The design of the expansion should include a flood risk assessment and ensure that increases in both average and maximum temperatures are taken into account in the technical specifications for the project. In addition, climate risks should be considered in the operational policies for the WWTP, including contingency plans for extreme events. Consideration of heat stress among the workforce is also needed, particularly for vulnerable groups such as older people and those with pre-existing conditions.	 The integration of smart technology into the wastewater treatment plant will significantly enhance its efficiency and effectiveness. This includes: Remote monitoring: The Installation of advanced sensors and Supervisory Control and Data Acquisition (SCADA) systems for real-time monitoring and control of the plant's operations. These technologies will enable the detection and control of any wastewater overflow and chemicals in the wastewater, thereby facilitating the prioritisation of maintenance work; and Energy Management Systems: Energy management systems will be deployed to optimise energy usage in the wastewater treatment plant. These systems will monitor energy consumption patterns, identify areas of inefficiency, and provide recommendations for energy-saving measures. 			



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(W & WW 3) Expansion of the western wastewater treatment plant for the fourth phase, with a design capacity of 150,000 m³/day

Related Case Study: Wastewater Treatment in Cairo

The Cairo Wastewater Company operates two major wastewater treatment plants (WWTPs) on the East Bank of the Nile: the Elberka WWTP and the Balaks WWTP. Each plant has a capacity of 600,000 m³/day, and together they produce 20,000 tons of dry sludge and 5,000 tons of composite sludge per year.

One of the most significant advancements in Cairo's wastewater treatment infrastructure is the implementation of anaerobic digesters at the Gabal El-Asfar WWTP. These digesters convert the organic matter in the wastewater sludge into biogas, which is then used to generate electricity. Remarkably, the electricity produced by the anaerobic digesters is sufficient to power 60% of the plant's equipment, demonstrating the potential for energy self-sufficiency in wastewater treatment.

In addition to these operational plants, the state of Egypt has a plan for annual expansions of wastewater treatment facilities. These expansions are implemented according to the specific needs of each governorate's treatment plant service area. This approach ensures that the wastewater infrastructure keeps pace with population growth and urban development, thereby safeguarding public health and the environment.

This case study illustrates the potential for integrating advanced technologies into wastewater treatment processes, not only to improve the efficiency of treatment but also to generate valuable by-products like electricity. It also highlights the importance of strategic planning and investment in infrastructure to meet the evolving needs of urban populations.



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(W & WW 4) Sludge to Energy					
Project Aim	Status	Impact / GHG reduction	Possible Location		
The project aims to convert the sludge generated from the existing western wastewater treatment plant into electricity. This is achieved through anaerobic treatment, which generates biogas. The project is a sustainable solution to manage the increasing volume of sludge, turning a waste product into a valuable energy resource.	 The general direction of MHUUC is to implement sludge to energy in all their wastewater treatment plants; NUCA has not progressed with any plans to implement a sludge-to-energy project as the current electricity tariff set by the government to purchase sludge-generated electricity makes the project difficult to implement; and City authority shows interest as the project will allow them to get rid of the drying beds currently used to dry the sludge and re-allocate the used land for other purposes. 	The use of anaerobic digesters in the treatment of sludge can significantly reduce greenhouse gas (GHG) emissions. This technology converts sludge into energy, thereby not only minimising waste but also creating a renewable energy source. This dual benefit makes anaerobic digestion a highly sustainable and environmentally friendly method of waste management. The exact reduction in GHG emissions would depend on the specific technology and operational practices used in the project.	The project is proposed to be located adjacent to the existing wastewater treatment plant in the western side of the City, within the green belt zone. This location has been chosen for its proximity to the source of sludge and the existing infrastructure, reducing transportation costs and environmental impact. See Figure 1 below for more details on the specific location.		
Project Description					
This project is an investment in a sludge-to-energy facility which serves 6 th of October City and neighbouring cities. The Sludge to Energy project seeks to address the challenge of managing the increasing volumes of sludge generated by the City's wastewater treatment plants. The traditional method of drying and selling the sludge as fertiliser is land and cost-intensive. This project proposes a more sustainable and efficient alternative - converting sludge into electricity. This not only reduces the land area required for drying beds but also provides an additional source of energy for the City. The project will cover the existing 2 phases of the western wastewater treatment plant with an overall capacity of 300,000 m ³ /day. The plant's design, however, will be tailored to accommodate the sludge output from all four phases of the western WWT facility, i.e., an additional 300,000 m ³ /day of treatment capacity once phases 3 and 4 are constructed and operated, as well as the sludge from wastewater treatment plants in adjacent cities. A centralized sludge to electricity plant is necessary as according to an analysis from NUCA, the project's viability hinges on the facility receiving and processing a cumulative minimum of 100 tonnes of sludge.					
Technical Description					
The Sludge to Energy project will plant. The digestors will process t	The Sludge to Energy project will involve the installation of 10 anaerobic digestors, each with a capacity of 7,500 m3/unit, at the existing western wastewater treatment plant. The digestors will process the sludge generated by the plant, with a sludge time of 30 days. The process will result in the production of 15,000 to 20,000 m3/day of				

gas and generate electricity ranging from 33 to 50 MWh/day. This state-of-the-art approach to converting sludge to electricity not only addresses the issue of sludge management but also contributes to the City's energy supply.



(W & WW 4) Sludge to Energy

Key Considerations

The successful implementation of the Sludge to Energy project requires careful planning and consideration of several factors. These include:

- The establishment of an effective contractual framework for off-take agreements, ensuring access to land, and the development of take or pay schemes;
- The availability of spare parts and the continuous training of staff are also crucial for the smooth operation of the project. Additionally, proper operation and maintenance (O&M) practices need to be in place to ensure the longevity and efficiency of the installed systems; and
- The project also needs to consider the environmental implications of the process and ensure compliance with environmental regulations. In this regard, it is important to explore various technologies for sludge-to-energy conversion. Research suggests that anaerobic treatment of sludge with the use as fertilisers emits the lowest GHG emissions compared to incineration (76% lower GHG emissions) or landfilling (82% lower GHG emissions). Further using generated biogas to produce energy would further result in reducing GHG emissions from 30 to 60% based on the case study present in Zhao et al. (2020)⁵⁹.

Implementing Agency	Stakeholders			
The project will be implemented by the private sector and NUCA.	Key stakeholders in this project include NUCA and the City Authority. The private sector can play a key role in building and operating the infrastructure ⁶⁰ .			
CAPEX		OPEX	Potential funding sources	Timeframe for Implementation
The estimated capital expenditur this project is approximately 90 n This includes costs for constructi equipment, and other upfront exp necessary to start the project. Fu may incur, however, if some elem plant need to be designed to han capacity i.e. sludge generated from 4 and that generated from neight	e (CAPEX) for nillion euros. on, penses rther costs nents of the dle all future om phase 3 & pouring cities	The estimated annual operating expenditure (OPEX) is around 1.8 million euros. This covers costs for maintenance, repairs, staff salaries, and other ongoing expenses to keep the plant operational.	 NUCA Budget; Loans through commercial banks (obtained by the private developer where the project is implemented through a PPP modality); and MDBs could potentially finance either i) the private sector partner, if a PPP model is adopted, or ii) NUCA through a sovereign loan or a green bond. 	The project is expected to be implemented over 30 months. This includes time for planning, construction, and testing before the plant becomes fully operational.
Notes on cost estimate				
N/A				

⁵⁹ Zhao et. Al. (2020), Greenhouse Gas Emission Mitigation of Large-Scale Wastewater Treatment Plants (WWTPs): Optimization of Sludge Treatment

and Disposal, Environmental Studies

⁶⁰ Note: initial talks with the private sector i.e., Taqa Arabia, to build and operate the plant where the electricity can be sold to the government and generate revenue for the private developer. This may be done under a PPP arrangement.



(W & WW 4) Sludge to Energy

Prerequisite steps for Implementation

Before the project can be implemented, several steps need to be taken:

- Increase in the feed-in tariff which is currently set at 1.03 EGP/kWh according to Decree No.41 of 2019. The current tariff is not sufficient to ensure the bankability of the project and guarantee a profitable revenue for private investors;
- Confirm space availability within existing wastewater plants;
- Obtain permits to connect to the electricity grid, including conducting grid impact studies; and
- Conduct an Environmental Impact Assessment as per Ministry of Environmental Affairs (MoEA) requirements.

The City Authority should also undertake comprehensive studies that investigate the environmental impact of various sludge treatment technologies, such as anaerobic treatment, incineration, or landfilling. By understanding the GHG emissions and other environmental effects associated with each method, the City can make informed decisions that align with its strategic objectives and goals. The studies can ensure that the Sludge to Energy project complies with environmental regulations and address any other blockers that might hinder its implementation.

Social considerations (Gender and Inclusion)	Climate adaptation mainstreaming	Smart considerations
The integration of social and gender considerations into the Sludge to Energy project is crucial for its success and for ensuring equitable benefits. The project should establish a gender equity committee in collaboration with the National Council for Women (NCW). This committee will set female participation targets and monitor progress. It will also ensure gender-sensitive working conditions, such as flexible working hours and on-site safety measures. Health and safety standards will be strictly adhered to, promoting a safe and inclusive work environment. Training will be provided to both men and women, with conditions tailored to be gender-sensitive, such as considering the timing and location of training sessions. This approach ensures that the project not only contributes to energy production but also promotes gender equality and social inclusion. Inclusion efforts could also provide training and integrate informal waste pickers to work in such sludge to energy plants	The anaerobic digestion process, which is central to the project, can be affected by high temperatures. Consideration is needed of temperature monitoring of the process, and the inclusion of potential cooling measures (active or passive) if needed. This will ensure more efficient operation of the anaerobic digesters and the maximum production of biogas. Consideration of heat stress among the workforce is also needed, particularly for vulnerable groups such as older people and those with pre- existing conditions.	 Remote Control and Monitoring: The sludge-to-electricity generation process may need to be remotely controlled by the distribution company to avoid network congestion. This can be achieved through the use of advanced SCADA (Supervisory Control and Data Acquisition) systems, which allow for real-time monitoring and control of the plant's operations; Leak Detection and Control: Smart sensors can be installed throughout the plant to detect and control any wastewater overflow and chemicals in the sludge. This can help to prioritise maintenance work and ensure the safety and efficiency of the plant's operations; Energy Efficiency: Smart technologies can also be used to optimize the plant's energy use. For example, data from smart meters can be analysed to identify patterns in energy consumption and suggest ways to reduce energy use; and Data Security: As the plant will be generating and handling a large amount of data, it's crucial to ensure the security of this data. This can be achieved through the use of advanced cybersecurity measures and secure data storage solutions.



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(W & WW 4) Sludge to Energy

Related Case Study: Sludge-to-electricity Plant in Alexandria

In Alexandria, a significant stride in sustainable waste management has been made with the launch of a sludge-to-electricity plant⁶¹. Developed and operated by the French company SUEZ, the plant was a \$129 million investment that has a capacity of 800,000 m³/day⁶². The facility converts sludge, which would otherwise be disposed of in landfills, into electricity. The combustion of biogas generated from the sludge allows for the production of 6 MWh of electricity. The project received financial support from the Agence Francaise de Development (AFD) through a €50 million loan, with the remaining funds provided by the government. This case exemplifies a successful public-private partnership in advancing sustainable energy solutions.



Figure 1: City Map with location of the western wastewater treatment plant where sludge to electricity is proposed



⁶¹ Source: PUMPS AFRICA, 2022, Website access here =

⁶² Egypt Today, 2018, Website access here



5. Energy, Buildings and Industry

(EBI 1) Sustainable energy residential compound package					
Project Aim	Status	Impact / GHG reduction	Possible Location		
The project aims to increase the financial viability of renewable energy and energy- efficient appliances via economies of scale in addition to larger-scale centralised projects such as district cooling and smart grids, defined as grids that can be remotely monitored and controlled. It also supports private developers and compound operators to deliver on sustainability targets and appeal to a growing sustainability-conscious cohort. The project will greatly contribute to reducing climate impact by reducing energy use. It will also contribute to climate adaptation by reducing the city's overall energy use thus its vulnerability to energy shortages caused by climate change.	 Currently limited application of RE in 6th of October with very few compounds offering solar PV as part of the apartment purchase package; PV application is limited now due to high costs, limited incentives, and subsidized grid electricity tariffs; Real estate developers started to show interest in the concept of district cooling; Real estate developers appear to be unaware of how various distributed generation schemes, such as net metering work; and The need for smart grids is in the early stages except for smart meter applications. 	The integration of renewable energy sources and energy-efficient technologies in residential compounds can significantly reduce greenhouse gas (GHG) emissions. The exact GHG reduction will depend on various factors, including the specific technologies used, the scale of their implementation, and the existing energy infrastructure. Conversely, the implementation of a 7 kWp PV system could potentially reduce GHG emissions by approximately 5 t CO ₂ /year.	The project targets 16,000 feddans (i.e., 67 km ²) which includes areas that are under construction in the 'green belt' area and over 20,000 feddans (84 km ²) of existing compounds in other districts. There is also potential to replicate in other cities through the same developers.		

Project Descriptions

The project is focused on renewable energy (RE) and energy efficiency investments targeted at residential compounds. 6th of October City is characterised by having many residential compounds which provides an opportunity for various sustainable and green applications. Firstly, residential compounds have roofs that are suitable for solar installation, this is in contrast to other areas in the Giza governorate which typically have high-rise apartment buildings with obstructions on the roof space for solar installations. The City has a large untapped potential for renewable energy applications; however, currently, there are limited applications of small-scale distributed solar PV systems, with an estimated output of 8.4 MWp. Furthermore, the use of solar hot water systems is not yet widespread, with nation-wide installed systems in 2019 making up less than 6% of the total technical market size in Egypt. In addition, residential compounds are ideal for smart grid applications because due to their large area, they typically have their own distribution networks. Smart grids offer the opportunity to improve the performance of the network through proper monitoring and control in addition to the applications of smart meters whether on the network itself or the end user which helps the utility to better control the demand as well as reduce theft. Smart grid applications, a rarely used technology in Egypt. District cooling relies on using large chillers which are much more efficient than individual AC units. District cooling relies on using large chillers which are much more efficient than individual AC units. District cooling network as well as easy to implement from a business model perspective. This project, therefore, aims to support compound developers in investing in a carefully selected bundle of renewable energy and energy efficiency technologies, in



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(EBI 1) Sustainable energy residential compound package

addition to smart distribution networks. This will not only reduce the city's carbon footprint but also lead to cost savings for residents in the long run. For the solar PV system, the project proposes a leasing or PPA model to homeowners, which could be incorporated into the monthly instalments for the house itself. This approach aims to reduce the barriers to accessing renewable energy sources and energy-efficient appliances. District cooling could also be applicable, pending a proper feasibility study. For this project to succeed, it will be crucial to create a strong initial demand from residents.

Technical Description

The technology options for this project include solar systems (5 to 7 kWp solar PV and 300L solar hot water systems), as well as energy management, distribution network upgrade, and smart metering in addition to district centralised cooling. A compound with 100 buildings/roofs could serve as an exemplary case.

Key Considerations

The successful implementation of the project requires careful planning and consideration of several factors:

- Creating appropriate packages that are optimised and tailored to maximise returns for each compound;
- Effective tendering and implementing large batches of projects;
- Contracts with homeowners whether for solar PV or district cooling;
- Ownership of the solar system at the end of the lease period;
- Straightforward lease transfer rules (if applicable);
- Leasing options, such as operating leases and capital leases, can be explored for quick and easy setup and administration;
- Performance contracting with a private energy service company (ESCO) could be considered for managing large and complex projects including solar PV and district cooling. Energy cost savings can be used to cover the entire cost of the projects, and any surplus savings can be divided between the contracting organisation and the ESCO; and
- Power purchase agreements (PPA) and energy services agreements can be considered, where a provider installs, owns, and operates an energy system on a customer's property, and the customer agrees to purchase the system's electric output for a predetermined period.

The project will also require a careful examination of the financial aspects, including the potential for grants, rebates, and loans from utilities, government, and non-profit organisations. The Green Economy Financing Facility (GEFF) could play a key role in providing the necessary finances for such projects and potential grants. This is important as the electricity tariffs are subsidised which impacts the bankability of both solar PV and energy efficiency projects. Subsidised tariffs accompanied by currency devaluation and global inflation, have resulted in a steep increase in solar PV energy costs, resulting in solar PV applications becoming less feasible; with return on investment (ROI) reported to exceed 12 years for such projects. It is worth noting that currently, the highest residential tariff is 1.45 EGP/kWh i.e., 4.7 US c/kWh while the typical LCOE for a small-scale distributed PV system in Egypt is expected to be more than 7 US c/kWh.

		, , , , , , , , , , , , , , , , , , , ,		
Implementing Agency	Stakeho	lders		
The project will be implemented by compound developers or by ESCO's	The stakeholders include compound developers and ESCOs.			
CAPEX		OPEX	Potential funding sources	Timeframe for Implementation
The costs of energy efficiency meas depend on the type of measure	ures will	The cost of operations and maintenance of the energy	• Loans through commercial banks (obtained by the private developer	The implementation of a solar system is expected to take 2-4 weeks.



(EBI 1) Sustainable energy residential compound package				
implemented.efficiency measuresThe expected cost for a 5-7 kWp PV system ranges from 4,000 to 6,300 Euros.the type of measures the type of measure The operational expector (OPEX) for 5 and 7 k systems are expecter range of 50 and 70 E (1625 to 2275 EGP).A typical 300-litre solar hot water system would cost from 1,700 to 2,600 Euros. Total CAPEX is 170,000 to 630,000 Euros (6 to 21 million EGP) based on the implementation of 7 kWp PV systems or 300-litre solar hot water units in 100 properties. These costs are likely to be on the lower side due to economies of scale.efficiency measures the type of measure The operational expector range of 50 and 70 E (1625 to 2275 EGP). compound of 100 bu annual OPEX would 5,000 to 7,000 Euros 228,000 EGP).		ill depend on oplemented. diture Vp PV to be in the ros per year For a dings, the total e between 163,000 to	 whether the real estate devorted or the ESCO); Loans through the GEFF program; and For large-scale projects, M could potentially finance the private sector partner. 	 A much longer period is expected for major infrastructure projects such as district cooling and smart grids (particularly fibre optics network needed for data transfer). DBs e
Notes on cost estimate				
The typical specific CAPEX for a small-scale P the range of 10 Euros/kWp/Year. The costs of	V system is in the rang energy efficiency mea	ge of 800-900 sures will depe	Euros/kWp. The typical specifi nd on the type of measure imp	c OPEX for a small-scale PV system is estimated to be in plemented.
Prerequisite steps for Implementation				
• Detailed energy audit and energy modelling	exercise;			
Roof assessments to be carried out through	satellite images or sim	ilar; and		
 Feasibility study for district cooling. 				
Social considerations (Gender and	Inclusion)	Climate ada	aptation mainstreaming	Smart considerations
 This project presents an opportunity to integrate gender considerations into its implementation. ensure that the benefits of the project are accerresidents, regardless of their gender or social statis, the project could: Introduce gender-disaggregated data collect database: This would allow the project to movits impact on different genders. It would also gender-specific barriers to accessing the ber and develop strategies to overcome them; Involve NGOs in partnership with relevant lo providing awareness-raising workshops for r workshops could educate residents about th renewable energy and energy-efficient appliaaccess them. Special attention should be giv to school pupils, university students, and wo 	te social and T It is important to essible to all status. To achieve ion systems and onitor and evaluate help to identify any nefits of the project cal authorities in esidents: These e benefits of ances, and how to ren to reaching out men, who might be	he project coul daptation in se Designing res PV systems a in the project of withstand the such as heat w This could inv degradation of 0.3%/°C) and mounting struc- higher winds. inverters could and Promoting ene-	d contribute to climate veral ways: ilient infrastructure: the solar nd other technologies used could be designed to impacts of climate change, waves and extreme storms. olve using low-temperature pefficient PV cells (i.e., < - module components, and ctures that can withstand Key components such as d be placed in shaded areas;	 The project could integrate smart technology in several ways: Remote monitoring of PV systems: This would allow for real-time tracking of the performance of the solar PV systems, enabling any issues to be identified and addressed quickly. Smart grid application: The project includes the development of a smart grid that can control power flows in the residential compounds in response to changes in demand and supply; knowing that typically such compounds have high energy consumption as typical households may have more than 5 ACs for example. This could help to ensure the stability of the electricity network; even as more renewable energy is integrated into it.

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		sustainable green city	
(EBI 1) Sust	ainable energy residential compound pacl	kage	
 Set gender equity targets: The project could aim to achieve a certain level of female participation, both in terms of the beneficiaries of the project and those involved in its implementation. This would help to ensure that women are not left behind in the transition to renewable energy. Related Case Study: LA Solar 	reduce the city's overall energy consumption and thus its vulnerability to energy shortages caused by climate change.		
In many parts of the world, particularly in developed countries like th acquiring solar PV systems has gained significant traction. A prime staggering 75% of new residential solar systems were leased rather The driving force behind this shift was the high upfront costs associ- declining incentives for solar energy in the state ¹⁷ . This made leasin homeowners who wanted to harness solar power without the substa One company that capitalised on this trend was LA Solar ¹⁸ , a Califor their model, the cost of the solar system is covered through monthly broader range of consumers. The typical lease period extends betw purchase the solar system at any point during the term of the lease. In the event of a house sale, the lease terms and agreement can be of service and maintaining the benefits of the installed solar system risks associated with this model. For instance, a new buyer might be system due to additional costs such as transfer fees. Alternatively, t usage is low enough that the savings from the solar system wouldn' Despite these potential challenges, the success of the leasing mode for expanding the adoption of solar PV systems. By making solar po- crucial role in promoting renewable energy and driving the transitior	he UK, USA, and Australia, the leasing example of this trend is California, where, r than purchased outright. ated with solar system installation, coupled g an attractive option for many antial initial investment. rnia-based firm that offers solar PV leasing. r fees, making solar power more accessible reen 20-25 years, and lessees have the transferred to the new owner, ensuring . However, it's worth noting that there are e reluctant to purchase a house with a hey might not require the system if their 't cover the monthly leasing fees. el in California demonstrates its viability as ower more financially accessible, leasing n towards a more sustainable energy future.	<image/>	model for in 2012, a with Under to a option to continuity potential leased PV electricity a strategy can play a

Roles and responsibilities

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(EBI 2) Investing in photovoltaic systems in private and public sector buildings (including industry, residential, offices & schools/hospitals)					
Project Aim	Status	Impact / GHG reduction	Possible Location		
The primary objective of this project is to reduce the City's reliance on fossil fuels for energy in buildings. This will contribute significantly to meeting sustainability targets and improving resilience. The project will also foster the growth of the renewable energy sector and create opportunities for local employment.	 The "Al-Janna" project benefitted from a similar project funded by UNDP where out of 280 buildings of the project, solar PV systems (average 4 kWp) were installed on 21 buildings to cover the electricity use of common areas including elevators; Large interest from NUCA to install RE systems on public buildings though funding may not be available at this stage; Commercial and industrial sectors may show interest; Subsidized loans for the private sector exist through various programs such as GEFF and FiC; and The current subsided electricity tariff is slowing down RE applications due to poor feasibility/long payback period. 	The implementation of a 4 kWp PV system for the buildings of Al-Janna project could potentially reduce GHG emissions by approximately 2.8 t CO2/year. For larger commercial/industrial users, a 100 kWp PV system would offset 70 t CO2/year.	The project will be implemented citywide, with the initial focus on the "AI-Janna" project located northeast of the City within the green belt area as well as factories with large metal roofs in the industrial zone Virtual PPA could be also considered especially for entities with limited space for RE or those aiming for zero net emissions pending regulations clearly permit such contracts.		

Project Description

The project aims to support the installation of decentralised PV systems (below 25 MWp to qualify for the net metering or self-consumption scheme) on rooftops of residential, industrial, commercial, and public buildings. The systems are expected to be generally below 1MWp each⁶³. Recent regulatory changes have opened up significant opportunities for the installation of distributed solar PV systems in the City. With the peak demand constraint on solar PV systems removed and the cap on energy usage raised nationwide, there is increased potential for solar energy.

The project will be divided into two streams:

- The first stream will focus on public buildings including government-owned residential buildings, public schools hospitals and utilities. This activity will build upon and scale up ongoing activity in the City, particularly the UNDP-funded Jannah October Project⁶⁴ (see Figure 1 below). This project aims to expand the delivery of rooftop PV beyond Zone 1. Out of 280 buildings, 21 have solar PV installed, with a total capacity of 83 kWp. Therefore, there are 259 buildings where PV can be installed; and
- The second stream will focus on private commercial and industrial entities city-wide. This stream will be initiated with selected few industrial rooftops. The project could, therefore, consider the installation of 100 kWp PV systems on the roofs of 10 factories; this will, require further studies on available roof spaces and interest of various factories in the industrial zone.

⁶³ This aligns with the 6th of October Strategic Plan's goal to promote the use of solar hot water systems and their local manufacturing.

⁶⁴ Government funded housing project for youth on low incomes.



(EBI 2) Investing in photovoltaic systems in private and public sector buildings (including industry, residential, offices & schools/hospitals)

Technical Description

The project involves the installation of Solar Photovoltaic (PV) Systems:	These systems use solar cells to convert sunlight directly into electricity. The systems for this
project are expected to be decentralized and generally below 1MWp each.	They will be installed on the rooftops of various types of buildings, including residential,
industrial, commercial, and public buildings.	

Key Considerations

The successful implementation of the project requires careful planning and consideration of several factors:

- Access to Finance: Securing funding for the installation of the solar systems is a critical factor. Various sources, including government subsidies, loans, and private investments, could be explored;
- Effective Operation and Maintenance (O&M): Regular maintenance is important to ensure the efficient performance of the solar systems. An effective O&M plan should be put in place;
- Clarity of Regulations: It's important to have a clear understanding of the regulations and any potential changes that could impact the project.
- Impact of Grid Connection Fees: Connecting the solar systems to the grid can incur fees, which should be factored into the overall project budget; This, however, will not impact the initial stage of the project where PV systems are not exceeding 1 MWp; and
- Potential for Regulatory Enforcement: The New Urban Communities Authority (NUCA) could potentially enforce the installation of PV or solar thermal systems on new buildings and incentivise retrofitting of existing buildings. This could significantly boost the uptake of solar energy in the City.

Implementing Agency		Stakeholders			
For the public stream, the New Urban Communities Authority (NUCA) will be the primary implementing agency for this project.Key stakeholders in and Maintenance (C Taqa.		his project include the Electricity &M) service providers, and Ener	Distribution Company, the Electricity Regulator, Operation gy Service Companies (ESCOs) such as Solarize, IRSC, and		
For the private stream, private comme industrial owners will be implementing	ercial and the project				
CAPEX		OPEX	Potential funding sources	Timeframe for Implementation	
Total CAPEX is 2 million Euros (66 million EGP). This is based on an average of 4 kWp unit installed per building across 259 buildings: in addition to installing 100 kWp PV systems on the roofs of 10 factories.	The operational expenditure (OPEX) for the PV systems is estimated to be between 10,000 and 11,000 Euros per year (325,000 to 360,000 EGP). This covers the costs of maintaining and operating the systems.		 NUCA Budget; Loans through commercial banks; and Loans through the GEFF program. 	The installation of each 4 kWp system is expected to take between 2 to 4 weeks. 4 to 6 months are expected for 100 kWp systems installation with additional 2-3 months for the tendering process. The overall timeframe for implementation will depend on the number of buildings involved and the capacity of the installation teams.	
Notes on cost estimate					
The typical specific CAPEX for a small-scale PV system is in the range of 800-900 Euros/KWp. The typical specific OPEX for a small-scale PV system is estimated to be in the range of 10 Euros/kWp/Year.					



(EBI 2) Investing in photovoltaic systems in private and public sector buildings (including industry, residential, offices & schools/hospitals)

Prerequisite steps for Implementation

Before implementation can begin, a detailed study needs to be conducted to determine system sizing, access to finance, the most effective operations and management model, regulatory risks and the framework to avoid confusion in the market, and the impact of grid connection fees. This study will ensure that the project is feasible and will deliver the expected benefits. The study should also include market assessment to assess potential entities where PV installation is suitable (solar access, roof structure, space available).

Social considerations (Gender and Inclusion)	Climate adaptation mainstreaming	Smart considerations
The project will actively promote social and gender inclusion through a variety of strategies. A project gender equity committee will be established in collaboration with the National Council for Women (NCW) to oversee and guide these efforts. The committee will set female participation targets for the workforce, monitor progress towards these targets, and ensure that working conditions are gender sensitive. This includes considerations such as flexible working hours and on-site safety measures that accommodate the needs of all workers. The project will also adhere to strict workplace health and safety standards to ensure a safe and inclusive environment for all. Training opportunities will be provided to both men and women, with training conditions designed to be gender-sensitive in terms of timing and location. Collaborations with local universities (e.g., Nile University) can also be established to provide on- the-job training for university students. The focus will be on particularly targeting female students.	The project recognizes the potential climate risks associated with solar PV installations, particularly in the context of the heatwaves and high temperatures experienced in the 6 th of October City. These conditions could affect solar panel efficiency and damage related electrical appliances. As with the previous project, the solar PV systems and other technologies used in the project could be designed to withstand the impacts of climate change, such as heat waves and extreme storms. This could involve using low-temperature coefficient PV cells and module components, and mounting structures that can withstand higher winds.	The project will integrate smart technology to enhance the operation and maintenance (O&M) of the solar systems. This particularly includes remote monitoring equipment to facilitate efficient O&M practices. This will enable real-time tracking of system performance and quick identification of any issues that may arise. This is particularly needed with government-owned buildings where a solar portfolio monitoring system is essential to track the performance of multiple PV systems. Future projects/Considerations: Remote power control : Looking ahead, the project could also consider the implementation of inverter power control for the aggregated system. This would help manage the power demand curve, ensuring a stable and reliable supply of solar energy across the City.



(EBI 2) Investing in photovoltaic systems in private and public sector buildings (including industry, residential, offices & schools/hospitals)

Related Case Study 1: Cape Town Solar Homes Systems, South Africa

In South Africa, the highly subsidised National Electrification Programme (NEP) electricity coverage from about 36% in 1994 to over 70% in 2002. Even after being the national grid, many poor households could not use the electricity because they were afford it. When the government realised these people did not fully benefit from the large in electrification the Free Basic Electricity Policy was introduced, in 2004.

Those connected to the grid now receive 50 kWh free every month, sufficient for black-and-white television, radio, and occasional basic cooking. The government pays to the municipalities. However, the NEP was not able to connect every household to the part of the programme solar electrification projects were implemented in some of the rural areas. Solar Homes Systems (SHS) users in the concession areas received an monthly subsidy of R40, reducing the fee charged for maintaining and servicing the R18 per month for each household.

There are high-capacity development needs in the villages where SHS are installed. local technicians to provide operations and maintenance services creates some



increased connected to not able to investment

lighting, this subsidy grid so as more remote equivalent system to

Training employment

in disadvantaged rural areas, reduces the cost of the service and meets the villagers' expectations of getting jobs with the project. The target for the programme was to provide SHS to 300,000 households, with 50,000 for each of the initial six concession areas. The rural electrification project provided 20,000 to 30,000 households with electricity from SHS. These households would not have had electricity without the project. The initial target to roll out 300,000 SHS was not achieved in the planned timeframe, but if the government renews the payment of the capital subsidy this target may still be met in the future.

Related Case Study 2: Auchan Solar PV Agreement

Auchan, a French multinational retail group which operates shopping centres, signed an agreement with Voltalia to purchase renewable energy covering all its retail sites in different countries. The collaboration also includes energy management and energy efficiency interventions. Accordingly, Auchan Retail in Southern France signed a 20-year PPA agreement with Voltalia to purchase electricity from the constructed ground-mounted 61 MWp PV plant.

The case study, therefore, gives a clear example of how a commercial retailer signed a deal to cover all, or part of its electricity use with renewable energy at more than one location. The case can be, therefore, mimicked in the City; although due to lack of space, such a model will require a virtual PPA model where the solar developer can use the grid to supply renewable energy to the client with no need to have the solar PV plant built on-premises.







(E	EBI 3) Expanding the use of automated solar-powered street	lighting for public places a	nd roads
Project Aim	Status	Impact / GHG reduction	Possible Location
The primary goal of this project is to reduce energy consumption and contribute to the City's sustainability targets. By leveraging solar photovoltaic (PV) energy and automated control systems for street and public space lighting, the project also aims to generate significant savings on energy bills and infrastructure expenditure, thereby promoting economic efficiency.	 Some roads in the City use solar-powered street poles; The City authority currently favours the use of a centralized off-grid PV system to power a group of poles to facilitate maintenance and prevent theft/vandalism; Such centralized systems, however, would require stretching cables increasing the costs; An analysis is required to determine current and future roads where solar PV poles would be a more economical option than traditional grid-connected lighting poles which applies to areas where there is no existing electricity network infrastructure; and High interest from City Authority pending funds availability. 	Given the assumptions of up to 75-100 Wp per pole and about 3000 units to cover the main roads around the City, with an operation time of 12 hours, the project is expected to achieve a GHG reduction of 696 tons of CO ₂ per year.	The project is applicable to streets and public spaces across the City where there is no existing electricity network infrastructure. It can also be implemented within residential compounds, depending on the availability of sufficient space for the installation of solar-powered lighting units. The project also holds potential for replication in other cities.
Project Description			
The project aims to improve public and maintenance of approximately eliminating the need for extensive a Technical Description The project involves the installation	lighting in the City by integrating solar photovoltaic (PV) energy 3000 solar-powered lighting units along the City's main roads a and costly infrastructure such as transformers and cables.	and automated control system nd public areas. Each unit, is o ery (0.9-1.2 kWh). The design	ns. The project involves the installation equipped with a 75-100 Wp solar panel, of the system needs to be efficient and
secure to prevent theft and vandali	sm. The solar system can be centralized to reduce maintenance	e costs and complexity.	
Key Considerations			
 The successful implementation of t Maintenance: A proper maintena Lumens Requirement: The light Reliability: The operation of the Local Market Participation: At l economy; and Monitoring and Strategy Imple 	he project requires careful planning and consideration of severa ance scheme is crucial to ensure the longevity and efficiency of ting units should meet at least 75% of the lumens required for ac lighting units should be highly reliable, with more than 90% of th east 25% of the capital expenditure, including implementation, s mentation: Careful monitoring and implementation of effective of	I factors: the solar-powered lighting uni dequate illumination; ie poles operating effectively; should be sourced from local n operational strategies are esse	ts; narkets to support local businesses and ential for the success of the project.



(EBI 3) Expanding the use of automated solar-powered street lighting for public places and roads						
Implementing Agency		Stakeholders				
The City Authority will be responsible for the implementation of the project.The stakeholders involved in th leases the system to the compo Regulator.		involved in this to the compo	s project include large compound developers, t und and provides maintenance), the Electricity	he Energy Se Distribution C	rvice Company (which company, and the Electricity	
CAPEX	0	PEX		Potential funding sources		Timeframe for Implementation
Total CAPEX is 4.8 million Euros (160 million EGP). This is based on an average cost of 1,600 Euros per unit for 3000 units. Notes on cost estimate OPEX for maintenance and bat	The operationa (OPEX) for stre estimated to be per pole per ye EGP).	nal expenditure treet lighting is be 100 to 250 Euros year (3250 to 8145 Uoans thro a green bo a larger so (New Octo A PPP mo possible ro		dget; bugh commercial banks; bugh the GEFF program; bugh MDBs could be applicable through a sove ond. If the project combines all possible roads i ale project that includes the other 3 neighbouri ber, Sheikh Zayed and Hadaek October); and del could be also applicable if the project comb bads in the city and neighbouring cities.	reign loan or n the City, or ng cities bines all	The project is expected to take approximately 14-22 months for full implementation. This includes planning, design, pilot testing, full-scale installation of 3,000 lighting units and post- implementation maintenance training.
Prerequisite steps for Implem	nentation					
Before the project can be imple	mented, several	prerequisite steps n	eed to be take	en:		
 Mapping and Prioritisation: Market Assessment: Condu Regulatory Approval: Obtain 	 Mapping and Prioritisation: Identify and prioritize locations with sufficient space for the installation of the solar-powered lighting units; Market Assessment: Conduct a market assessment to understand the availability and suitability of the technology for this initiative; and Regulatory Approval: Obtain necessary approvals and permits from relevant authorities. 					
Social considerations (Gender and Inclusion) Climate adaptation mainstreaming Smart considerations				art considerations		
The implementation of this project will not only contribute to energy efficiency and sustainability but also significantly enhance public safety, particularly for women. Adequate street lighting is an important factor in improving safety and security, reducing the risk of accidents and crime, and promoting a sense of well-being among residents. Although the 6 th of October City's Street lighting is generally good, this is not the case everywhere. Side streets are not particularly well-lit - this is particularly true in the less wealthy areas of the city. This increases the risk of violence/crime and the perception of fear in these areas, particularly affecting			As with the previous project, the solar PV systems and other technologies used in the project could be designed to withstand the impacts of climate change, such as heat waves and extreme storms. This could involve using h low-temperature coefficient PV cells using low-temperature coefficient PV cells and module components, and mounting structures that can withstand higher winds.	The project v technologies particular rer operational s detection to facilitating m Future project • Poles coul sensing ca	will integrate smart to facilitate O&M. In mote monitoring of the status of each pole with fault easily track faulty poles aintenance. cts/Considerations: d be integrated with other apabilities to monitor traffic,	



lighting

concern.

(EBI 3) Expanding the use of automated solar-powered street lighting for public places and roads

youths.

The project will ensure that the benefits of improved lighting and spatial inclusion are equitably distributed across all sectors of the community. Furthermore, the project will aim to promote gender equality by ensuring women's participation in all stages of the project, from planning and implementation to monitoring and evaluation.

Additionally, the urban greening program will be considered around the lights to provide shade and cooling.

air quality, and pedestrian activities, providing valuable data that can be used to improve City planning and management; and

• Light control/dimming could be applied in the future to save on battery and PV system size.

Related Case Study: Quezon City, public lighting delivery models, Philippines

Quezon City (QC) has been actively exploring and implementing upgrades to its street system. Many streets and roads were not lit at night, so public safety was an ongoing The Mayor created a Task Force to look at the installation, repair, and maintenance of lighting. This body was charged with overseeing an initiative to expand night-time coverage across the city. QC subsequently embarked on a city-wide street lighting programme to illuminate 80% of the public road network. This involved installing 3,000 streetlights, with an additional 1,000 streetlights retrofitted by Meralco, a private utility company.

QC had historically relied on traditional lighting technology. However, the emergence first generation of LED streetlights prompted a rethink since any improvements in efficiency would translate into budget savings. The City funded a study to determine feasibility of upgrading its street lighting to more efficient technology. The study compared the potential costs and benefits of three technologies: ceramic metal-halide induction lamps, and LEDs. It concluded that ceramic induction lamps would be a replacement for existing street lighting, while LED luminaires, which were quite expensive at the time of the study, would only be suitable for new installations. A constraint arising from the conversion of QC's streetlights to LEDs was the split

Street
lightingImage: Note
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energy
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ownership of the assets and the flat rate charged by Meralco on a portion of the assets, as identified in the study. To solve this, the Mayor of Quezon City signed a Memorandum of Agreement with Meralco that turned over the nearly 3,000 ornamental streetlights owned by the utility to the QC government for a price of PHP 5.7 million (KES12.6 m). Meanwhile, the City installed meters on all of the ornamental streetlights so that savings from the retrofit of LEDs would yield energy cost savings. For the remaining pole-mounted streetlights that are owned by Meralco, the utility on its own authority has undertaken a project to convert the streetlights in its ownership to LEDs. Since QC continues to pay Meralco a flat rate per pole, the LED retrofit undertaken by Meralco increases its profit, and the city benefits from better lighting.





(SWM 1) Door-to-door waste collection				
Project Aim	Status	Impact / GHG reduction	Possible Location	
The project aims to support the city-wide strategy of efficient waste management and adherence to the EU waste hierarchy, thereby helping to avoid various forms of pollution. This initiative will contribute to achieving circular economy targets by reducing the amount of waste sent to landfills.	 NUCA relies on private operators of municipal waste collection; NUCA typically signs 2 years contracts with local solid waste collection private companies; and Contracts are to be signed with areas not yet covered with a collection service. 	Open burning of waste results in approximately 2,700 tonnes of CO2 equivalent (t CO2e) per 100,000 capita. By eliminating the need for open burning through efficient waste collection and proper disposal, this project can substantially reduce these emissions. Separating organic matter at source would particularly result in substantial savings by reducing the amount of methane released from landfills. as well as producing soil improvers that would contribute to the increase of vegetated areas and good maintenance of existing ones.	The project will be implemented city- wide. The existing Municipal Solid Waste (MSW) collection service covers some residential areas in the City but does not cover all areas. The goal is to expand this service to all areas for a more comprehensive waste management system.	

Project Description

This project involves investment in a door-to-door waste collection system which is designed to increase the participation of citizens in waste separation and collection. Door-to-door waste collection is currently implemented in select areas like 'Al-Qora Al-Seyaheya', the West-Somid area, and the El-Motamayez neighbourhood. The project aims to expand this service to several other areas, particularly those where residents have expressed a willingness to pay for such a service. The project involves the introduction of a three-bin system for waste segregation into dry recyclables, organic waste, and residual waste. This system is complemented by a public education and awareness campaign to inform residents about the importance of waste segregation at the source and the correct use of the bins. The project also includes a capacity-building plan to ensure the smooth application of the door-to-door waste collection system. However, before introducing a source-separation collection service, it is important to identify markets or buyers for the recyclable materials and organic waste, to prevent them from being discarded or burnt.

Technical Description

The project involves the procurement and distribution of three types of bins for waste segregation at the household level. The waste collection is carried out by professional drivers and suitably equipped and trained operatives who transport the waste to designated facilities for further processing. The project also requires the development and implementation of a public education campaign, which could involve various media and community engagement activities.



(SWM 1) Door-to-door waste collection

Key Considerations

Several factors need to be considered for the successful implementation of the project. These include:

- Licensing by NUCA: The project must comply with all relevant regulations and obtain necessary permissions from the New Urban Communities Authority (NUCA);
- Trip Length: The distance covered by the waste collection vehicles should not exceed 15 km to ensure efficiency and cost-effectiveness;
- Professional Drivers: The vehicles should be operated by professional drivers to ensure safety and compliance with traffic and waste management regulations;
- Monitoring and Maintenance: Regular monitoring and maintenance of the waste collection system is crucial to ensure its effectiveness and longevity;
- Capital Costs: Initial funding may be required to set up the collection system and run the public education campaign. Once residents see the benefits of the system, fees can be introduced;
- Revenue Generation: Over time, the revenue generated from selling recyclable materials and organic waste could offset the costs of the service, potentially eliminating the need for resident fees; and
- Receptors and Markets: Ensure that there are licensed plants that can receive and process all waste materials that are collected and market the recycled products.

The project has the potential to improve waste management in the City, contribute to environmental sustainability, and enhance the quality of life for residents.

Implementing Agency	Stakeholders
The New Urban Communities Authority (NUCA)	The stakeholders involved in this project include NUCA and the Ministry of Housing, Utilities, and Urban Communities
will be the implementing agency for this project.	(MHUUC) that in addition to private sector entities working in waste collection.

CAPEX	OPEX	Potential funding sources	Timeframe for Implementation
The CAPEX for the door-to-door waste	The Operational Expenditure (OPEX)	NUCA Budget	The implementation of the project will be
collection system will depend on several	will depend on the output from the door-		phased as follows:
factors, including collection equipment,	to-door collection study.		 Assessment Phase: 2 months;
Streets GIS, trained staff, collection			 Strategic Planning Phase: 4 months;
schedule, waste segregation and			and
packaging, communication and			 Implementation Phase: 6 months
education, and monitoring and			
evaluation.			
Notes on cost estimate			

N/A

Prerequisite steps for Implementation

Before the implementation of the project, the following steps need to be taken:

• Carry out a study of the waste generation rate in the city: This study should estimate the amount of waste generated and collected per household per day, the composition of the waste (e.g., organic, recyclables, residual), and the seasonal variations in waste generation. This information will help in determining the frequency



(SWM 1) Door-to-door waste collection

of collection, the type and capacity of collection vehicles needed, and the resources required for waste sorting and processing;

- Specify the density of waste: This is an important factor in planning the routes for waste collection and the location of waste processing and disposal facilities. Highdensity areas may require more frequent collection, while low-density areas may require more efficient routing to minimize travel distances. The density of waste can be determined from the waste generation study and the population density of the City. This information will also be useful in estimating the environmental impact of the waste collection service and the potential savings from waste reduction and recycling initiatives;
- Raising awareness and capacity building: for residents regarding the importance of waste separation is crucial for the success of this project; and
- Market pre-feasibility study: study to establish that there are licensed plants that can receive and process all waste material collected and can market their recycled products, as well as forecast headline costs and revenues across the value chain.

Social considerations (Gender and Inclusion)	Climate adaptation	Smart considerations
This project will actively promote gender equality and social inclusion by encouraging the participation of women and marginalised groups in all stages of the project, from planning and implementation to monitoring and evaluation. Specific measures could include setting KPI targets for women's employment in waste collection services, providing gender-sensitive training and capacity building, and ensuring safe and inclusive working conditions. The project will also aim to address any social stigmas associated with waste management and promote the value and dignity of this essential service. Inclusion of informal waste collectors in the formal collection process is important which should encompass capacity building as well as offering other social welfare benefits such as medical insurance and social security. General public awareness campaigns will be designed to be inclusive and accessible, taking into account the diverse needs and perspectives of the city's population. These campaigns will also aim to raise awareness about the important role of informal waste pickers in waste management and recycling, and the need to respect and support their work. To ensure effectiveness, targeted awareness campaigns is also needed to encourage and educate on the separation of waste from the source. This can be led by NGOs. Moreover, financial incentives are needed for effective engagement of various groups. For example, low-income residents could be paid for delivering their separate waste, while high-income households could pay for waste collection services as a form of social solidarity.	By ensuring efficient and regular waste collection, the project helps prevent the improper disposal of waste, which can lead to water pollution, especially during extreme weather events. The improvement in waste management can also help to improve air quality by reducing air pollution from toxic gas emissions associated with waste disposal and the production of new materials. As higher temperatures will exacerbate existing air quality issues this also acts to support the city to adapt. There is a need to consider climate risks in the planning and design of collection routes and infrastructure, such as ensuring that road infrastructure is strengthened and resilient to climate change impacts.	 The project will integrate smart technologies to improve the efficiency, effectiveness, and sustainability of the waste collection service. This includes: Route optimization: Using software to plan the most efficient collection routes, reducing fuel consumption and travel time; Real-time monitoring: Equipping collection vehicles with GPS tracking and monitoring systems to track progress and respond promptly to any issues; Smart bins: Implementing bins equipped with sensors that detect waste levels and send alerts when they are nearing capacity, optimising collection schedules; Mobile applications: Developing an app that allows residents to schedule collections, report issues, and receive updates, improving communication and convenience; and Data analytics: Analysing collected data to identify trends and opportunities for waste reduction and recycling, optimising services based on insights.

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(SWM 1) Door-to-door waste collection

Related Case Study: Marrakech's Sustainable Waste Management and Door to Door Collection

Marrakech faced challenges in managing its municipal waste due to increasing population and tourism. Illegal dumping was common, and many households didn't access to regular waste collection services.

Implementation:

- Equipment and Infrastructure: The City invested in a fleet of waste collection suitable for both narrow alleys and main roads. In addition, they set up designated points for larger waste items;
- Public-Private Partnership: Marrakech collaborated with a private sector partner to waste collection services. This partnership ensured consistent service delivery and professional management;
- Awareness Campaigns: Before implementing the door-to-door system, the city launched awareness campaigns. These focused on the importance of waste segregation, the hazards of illegal dumping, and the benefits of the new collection
- Worker Training: Waste collectors were trained not only inefficient collection but also in customer service. This ensured that residents were treated respectfully, issues were addressed promptly; and
- Pricing and Incentives: The City introduced a nominal fee for the service, with discounts for low-income households. They also introduced incentives for households that consistently segregated waste, thereby promoting recycling.



Outcomes:

- Increased Collection Efficiency: With the new system, Marrakech saw a significant increase in waste collection efficiency, ensuring that most households had their waste collected regularly;
- Reduction in Illegal Dumping: As the regularity and efficiency of waste collection increased, instances of illegal dumping decreased; and
- Promotion of Recycling: With better segregation at source, the city was able to redirect a significant portion of recyclable waste away from landfills. Source:

https://www.researchgate.net/publication/370862463 Assessing the performance of a waste management system towards a circular economy in the Global Sou th The case of Marrakech Morocco



(SWM 2) Feasibility study for cl	osure and remediation of existing dump	site, and the construction of a new s	anitary landfill with an MBT facility		
Project Aim	Status	Impact / GHG reduction	Possible Location		
The primary aim of this project is to develop a comprehensive waste management system in the city that will contribute to an improved environment, including air and soil quality. This will be achieved by transitioning from open dumpsites to sanitary landfill, which will not only manage waste more effectively but also reduce environmental pollution.	NUCA is at an advanced stage in discussion with private developers to implement a landfill and a recycling plant in 70 feddans allocated by NUCA in New October City to serve 4 cities including the 6 th of October.	The installation of a sanitary landfill could reduce GHG emissions by 40% ^{65.} This reduction will be achieved through better waste recovery, reduced transportation costs, and waste collection frequency. Further GhG reduction is expected by recycling light plastics through the MBT facility	The landfill will be located outside of the 6 th of October City, in New October City. The land for this project has been allocated by the New Urban Communities Authority (NUCA).		
Project Description					
This project aims to improve waste management in the City by closing and remediating the existing dumpsite and constructing a new sanitary landfill. The project is also expected to be combined with an MBT facility to recycle organic waste into compost and light plastics into RDF or SRF recycling plant which both recycles waste and generates RDF. NUCA has already allocated a 70 feddans area in New October City. The plant and the landfill, therefore, will serve 4 neighbouring cities including the 6 th of October. 40 feddans will be used for the landfill and 30 feddans will be used for the MBT facility. The amount of waste reaching the plant is expected to be 1,200 tonnes ber day, 80% of which is expected to be recycled and 20% will go to the landfill. NUCA is already in the process of releasing a tender for this project. All waste produced is currently collected and disposed of at an open dumpsite. Afterwards, it is sorted, treated, and recycled by informal waste collectors. This initiative will not only provide a nore sustainable and efficient waste management solution but also pave the way for the City to meet its sustainability targets. Benefits of the Landfill Project include: Efficient Waste Management: Through a structured and efficient system for waste disposal, integrating informal waste collectors and removing polluting open dumpsites. This will ensure that waste is managed in a manner that minimises environmental impact; Resource Recovery: Landfills can be designed to facilitate the recovery of valuable materials from waste; Energy Generation: Modern landfills can be equipped with technology to capture landfill gas, a by-product of waste decomposition, which can be used to generate electricity. This, however, is currently not feasible due to the current low feed-in tariff set by the government. The amount of sand and dirt mixed with the waste is also avaged the project unfacible; and					
expected to increase O&M costs making the project unfeasible; and Pollution Reduction and Control: Appropriately engineered landfills drastically reduce pollution to land, water and air as well as health impacts due to the containing leachate and emissions with their lining, leachate collection and capping systems.					

⁶⁵ Estimated based on the assumption that a semi-aerobic landfill is used



(SWM 2) Feasibility study for closure and remediation of existing dumpsite, and the construction of a new sanitary landfill with an MBT facility

Technical description

The proposed sanitary landfill, with a capacity of 1200 tonnes/day, will significantly enhance the city's waste management capacity. Such landfill would be recommended to be designed and constructed in line with EU Landfill Directive requirements.

Key considerations

Several factors need to be considered for the successful implementation of the project. These include:

- Land Ownership and Licensing: It is crucial to have official documents affirming NUCA's full ownership of the identified land for the landfill. Additionally, consent or official licensing for the rehabilitation of the dumpsite and the use of the identified land to build the sanitary landfill should be provided by NUCA. This ensures legal compliance and avoids potential disputes or conflicts in the future;
- Methane Management: it is important to have a system in place to capture and utilise or safely flare this gas. This not only reduces greenhouse gas emissions but can also provide a source of renewable energy; and
- Closure and Post-Closure Care Plan: A plan should be in place for the closure of the landfill once it reaches its capacity. This includes covering the landfill, monitoring for any environmental impacts, and maintaining the landfill gas and leachate management systems. The plan should also consider potential post-closure uses of the site.

Implementing Agency Stakehol			lers	
The New Urban CommunitiesThe key sAuthority (NUCA) will be the implementing agency for this project in addition to the private developersalso play			akeholders for this project include the New Urban Communities Auth Communities (MHUUC). Commercial banks and the European Ban a role as potential funding sources.	nority (NUCA) and the Ministry of Housing, Utilities k for Reconstruction and Development (EBRD) may
CAPEX	OPE	(Potential funding sources	Timeframe for Implementation
The construction of the first cell area of the landfill is expected to cost 1.2 to 1.6 million Euros. The cost of an MBT plant with 1,200 tons/day capacity is estimated to cost 18- 20 million euros.	The operating expenditure for project includes maintenance o equipment, whi estimated to be of the cost. It a includes the sa the staff, which 8 labourers, 2 supervisors, an drivers.	this s the f ich is e 5-10% lso laries of i includes ad 4	 NUCA Budget; Loans through commercial banks (accessed by private sector partners); MDBs could potentially finance either i) the private sector partner, if a PPP model is adopted, or ii) NUCA through a sovereign loan or a green bond; and NUCA is expected to implement this project through a PPP model where the private developer will build and operate the plant. NUCA will pay the private developer based on the amount of waste reaching the site. The private developer will then generate revenue by selling recycled waste and RDF (sold to cement factories). 	The implementation of this project will be carried out in several phases. The preliminary study for the new landfill will take about 5 months, followed by a detailed study that will also take 5 months. Project management and construction supervision will take about 10 months. Similarly, the preliminary study for closure and rehabilitation will take 5 months, followed by a detailed study that will take another 5 months. Project management and construction supervision for this phase will take about 1 year.



(SWM 2) Feasibility study for closure and remediation of existing dumpsite, and the construction of a new sanitary landfill with an MBT facility

Notes on cost estimate

The estimated cost of Landfill Civil Work is approximately 105 Euros/m² based on existing projects in Egypt such as the Baltim and Sadat landfills. This estimate is based on the average cost of constructing a landfill, which includes the cost of land preparation, construction of the landfill cell, installation of the leachate collection system, and other necessary infrastructure. However, the actual cost may vary depending on the specific conditions of the site, the local cost of materials and labour, and other factors. It's important to conduct a detailed cost analysis as part of the feasibility study to get a more accurate estimate of the project cost. Such landfill would be recommended to be designed and constructed in line with EU Landfill Directive requirements.

Prerequisite steps for Implementation

Before the implementation of the project, several steps need to be taken. These include:

- Pre-requisite Studies: Ensure the availability of the required information. This includes a full geotechnical and geophysical study of the land and the current disposal site, a topographical survey of the land and the dumpsite, an Environmental Impact Assessment for the sanitary landfill, specifying the generation rate/amount of solid waste arriving, and a Municipal Solid Waste (MSW) characterisation study and a groundwater analysis. A baseline report and feasibility study will also be required;
- Comprehensive study of the MSW generated by the City (generation rate and MSW characteristics) to choose the most suitable technology is crucia;
- Management and Monitoring: Establish a robust system for the proper management and monitoring of the landfill. This includes setting up protocols for regular inspections, waste tracking, and environmental monitoring to ensure the landfill is operating safely and efficiently;
- Operation and Maintenance: Develop a comprehensive plan for the proper operation and maintenance of the landfill. This includes routine maintenance of landfill equipment, regular training for staff, and contingency plans for handling operational issues or emergencies; and
- Market study for recyclables and RDF: Technology assessment to determine the optimal MBT configuration.

Social considerations (Gender and Inclusion) Climate	adaptation mainstreaming	Smart considerations
This project will actively promote gender equality and social inclusion by encouraging the participation of women and marginalised groups in all stages of the project, from planning and implementation to monitoring and evaluation. Specific measures could include setting KPI targets for women's employment in the waste sector, providing gender-sensitive training and capacity building, and ensuring safe and inclusive working conditions. The project will also aim to address any social stigmas associated with waste management and promote the value and dignity of this essential service. Public awareness campaigns will be designed to be inclusive and accessible, taking into account the diverse needs and perspectives of the City's population. This should be led by NGOs, together with community leaders to ensure the effectiveness of these campaigns. Since women are disproportionately in charge of unpaid work (e.g., cleaning, cooking, taking care of children, etc.), women can be empowered to play a key role in solid waste management at the household level. There is currently a lack of separation and recycling systems for solid waste at the household level.	The project is expected to construct a new sanitary landfill. Key climate risks include landfill infrastructure damage from heavy rains and flash floods, and subsequent impacts on water quality. Extreme temperatures may increase the risks of fires at the landfill site and overheating of equipment. To address these risks, the landfill should be designed with appropriate drainage systems to ensure proper function and will be designed to be resilient to	 The project will integrate smart technology to optimise operations and improve efficiency. This includes: Electronic Management Systems: Implement electronic management systems to streamline operations, track progress, and monitor key performance indicators. This can help improve efficiency and reduce costs; and Smart Landfill Design: Design the landfill to be "smart" from the ground up. This includes features like automated waste sorting and processing systems, energy recovery systems, and advanced leachate and gas management systems.



(SWM 2) Feasibility study for closure and remediation of existing dumpsite, and the construction of a new sanitary landfill with an MBT facility

These campaigns will also aim to raise awareness about the important role of informal waste pickers in waste management and recycling, and the need to respect and support their work.

higher temperatures. The effect of heat stress on workers at the landfill site should also be considered.

Related Case Study: Landfill Management in Western Macedonia

Western Macedonia has an innovative landfill structure. It has two basins, segmented further into four cells, which are designed to accommodate a significant waste influx. Beyond storage, the landfill incorporates state-of-the-art infrastructural support, making management more efficient and environmentally conscious.

The First Basin, operated from July 2005 to June 2017, with a combined space of 1,466,000 m² and an annual capacity for 120,000 tons of mixed waste. By June 2017, its operational life was complete. Subsequently, it was provided with a temporary cover, indicating its decommissioned status.

The Second Basin was completed in 2015 offering a combined capacity of 955,000 m², each cell capable of handling 120,000 tons of waste annually.

Before June 2017, the A & B cells exclusively managed mixed waste from Western Macedonia's municipalities. However, with the development of the Mechanical and Biological Treatment (MBT) and the new landfill in June 2017, their focus shifted. Presently, these cells manage non-hazardous industrial waste and residues from the mechanical processing of mixed municipal waste outside Western Macedonia.



Western Macedonia's landfill isn't just a dumping site; it is a holistic waste management ecosystem. This comprehensive approach is demonstrated through its advanced infrastructure:

- Wastewater Treatment Plant (WWTP): Featuring secondary treatment via the SBR system and tertiary treatment through reverse osmosis units, the WWTP ensures that any wastewater is treated, keeping environmental contamination at bay;
- Maintenance and other facilities: The landfill has a mobile equipment maintenance workshop, which ensures the machinery remains operational and efficient. Additional facilities include a car wash liquid fuel supply unit and scales; and
- Administration Building: Which houses an autonomous laboratory equipped to conduct physicochemical and microbiological analyses, ensuring waste quality and any potential hazards are continuously monitored.

By transitioning from the older A & B cells to the newer C & D cells and integrating advanced waste treatment infrastructure, the region ensures waste doesn't become a liability but is managed, treated, and stored with high environmental standards. This landfill sets a good example for municipalities worldwide.



	(SWM 3	3) Development of a transfer station			
Project Aim	Status	Impact / GHG reduction	Possible Location		
The primary goal of this project is to streamline the process of waste transfer, aligning it with broader circular economy strategies and reducing pollution. By doing so the project aims to contribute to sustainable development and improved environment in the City.	NUCA has allocated 10 feddans of land for a transfer station in the City.	This project contributes to the reduction of GHG emissions, by facilitating other solid waste management projects. and By improving the efficiency of waste transfer, the project enables more effective waste treatment, recycling, and disposal, all of which can contribute to GHG reduction.	Two potential sites within Areas 1 and 2 (as depicted in Figure 1) have been identified for the establishment of the waste transfer stations. However, at this point, NUCA has prioritised 10 feddans of land in Area 1.		
Project Description					
 This project involves an investment in City. This station will serve as a tempo crucial node in the waste managemen The benefits of this project include: Enhanced efficiency of waste managementations 	the construction and operation of prary storage facility for municipa at network, enabling efficient sort gement in the City by reducing th	of a waste transfer station aiming to address that al solid waste (MSW), ensuring comprehensive ing, processing, and redirection of waste to ap the distance waste collection vehicles need to t	ne limited coverage of waste collection services in the e coverage across the City. The facility will serve as a opropriate treatment or disposal facilities. aravel, thereby saving time and reducing fuel		
 Improved environmental conditions A structured and organised system 	by reducing the amount of waste for waste collection and disposal	e dumped in undesignated areas; and paving the way for potential waste treatment	and recycling initiatives in the future.		
Technical Description					
The project involves the construction of The station will serve as temporary de larger vehicles for transportation to the Key Considerations	of a transfer station, with a capac position site where local waste c e end point of disposal in a landfi	city of 500 tons of waste per day. The allocated collection vehicles can deposit their waste cargular or for recycling.	d area by NUCA for the transfer station is 10 feddans. go. The waste will then be aggregated and loaded into		
Official Documentation: It is crucia	al to obtain official documents aff	irming NUCA's full ownership of the land ident	ified for the transfer stations. Additionally, consent or		
 official licensing for the use of the identified land by the investor to build the transfer stations should be provided by NUCA; Availability of Required Information: Pre-requisite studies are necessary to ensure the feasibility and sustainability of the project. These may include studies on waste generation rates, waste composition, and potential environmental impacts; 					
• Integration: The transfer station systems and equipment must be fully compatible with the waste collection and transfer vehicle types, whilst the waste transfer vehicles would also need to have maximum capacity and compatibility with receptor site waste offloading systems;					
• Waste Management Capacity: The transfer station should have the capacity to handle 400 to 600 tons of waste per day. This ensures that the entire residential area is fully serviced by the collection system;					
• Management and Monitoring: Proper management and monitoring systems should be in place to ensure the efficient operation of the transfer stations. This includes					
Operation and Maintenance: Regulation inspections, equipment maintenance	 Operation and Maintenance: Regular operation and maintenance of the transfer stations are essential to ensure their longevity and efficiency. This includes regular inspections, equipment maintenance, and staff training; and 				
Funding and Technical Assistance	e: Adequate funding and technic	cal assistance are required for various studies	related to this project, including feasibility studies,		



(SWM 3) Development of a transfer station

environmental impact assessments, and waste management planning.

Implementing Agency Stakeholders				
The New Urban Communities Authority (NUCA) will be the primary agency responsible for implementing this project.The key stakehole (MHUUC), and per banks and the Eu sources.		ders involved in this project include NUCA, the Ministry otential investors such as Greentech Egypt, Ecaru, Environment ropean Bank for Reconstruction and Development (EB	of Housing, Utilities, and Urban Communities ironaster, Elmotaheda, and Green Plant. Commercial RD) may also play a role as potential funding	
CAPEX		OPEX	Potential funding sources	Timeframe for Implementation
The construction of a transfer station, with an area of 42,000 m ² , is estimated to cost between 1.6 and 2 million Euros. This cost is subject to variation depending on the specific design of the transfer station. The cost does not include transfer vehicles	The annu- expenditu station is up to 3,00 However, vary depe design of Station.	al operational re for the transfer estimated to be 00 Euros. this figure may ending on the the Transfer	 Funding for this project may be sourced from: NUCA Budget; MDBs could potentially finance NUCA through a sovereign loan or a green bond, under the condition the project is combined with other SWM projects, particularly the construction of a new sanitary landfill and treatment plant; and Loans through commercial banks (sought by the private developer in the case of a PPP). 	 Detailed Study for the transfer station site selection: 4 months; Design of the Transfer station: 3 months; and Project management and construction supervision: 6 months.

Notes on cost estimate

N/A

Prerequisite steps for Implementation

The prerequisite steps for the implementation of the transfer stations project are important to ensure its success and sustainability:

- Conduct a Comprehensive Geotechnical Study of the Land: This study will help in understanding the bearing capacity of the soil, its compressibility, and the potential risks of soil liquefaction. It will also provide information on the soil's ability to absorb and drain water, which is crucial for the design of the transfer stations;
- Carry out a Topographical Survey of the Land: This survey will provide a detailed map of the land, which is essential for planning the construction of the transfer stations and for ensuring that they are built-in locations that are accessible and efficient for waste collection and transfer;
- Perform an Environmental Impact Assessment for the Transfer Stations: This will help to predict the environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment, and present predictions and options to decision-makers;
- Establish a Landfill: Before the transfer station can be operational, a landfill needs to be established where the waste collected at the transfer stations can be disposed of. The landfill should be designed and managed to minimize environmental impacts, including the emission of greenhouse gases, leachate production, and the attraction of disease vectors; and
- Feasibility study: Undertake a techno-economic feasibility study to assess the headline costs, review the current and planned collection and receptor plant systems, review options and identify the best operational, process and equipment type options.

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(SWM 3) Development of a transfer station					
Social considerations (Gender and Inclusion)	Climate adaptation mainstreaming	Smart considerations			
This project will actively promote gender equality and social inclusion by encouraging the participation of women and marginalised groups in all stages of the project, from planning and implementation to monitoring and evaluation. Specific measures could include setting KPI targets for women's employment in the waste sector, providing gender-sensitive training and capacity building, and ensuring safe and inclusive working conditions. The project will also aim to address any social stigmas associated with waste management and promote the value and dignity of this essential service. Public awareness campaigns will be designed to be inclusive and accessible, taking into account the diverse needs and perspectives of the City's population. These campaigns will also aim to raise awareness about the important role of informal waste pickers in waste management and recycling, and the need to respect and support their work.	This project will help alleviate pollution and improve both water and air quality across the city. With respect to climate risks, both waste transfer stations and their operations could be vulnerable to heatwaves and extreme rainfall, causing damage, disrupting services, increasing waste odour, blocking access to waste collection points and in some cases triggering fires. The City could consider strengthening the design of the waste transfer stations. e.g., raised site construction to protect against flash floods and locating the sites outside high climate risk areas. In addition, the city could plant trees/vegetation in and around waste transfer stations to reduce heat and flood damage.	 The integration of smart technology into the project can enhance its efficiency and effectiveness. Here are some ways this can be achieved: Waste Tracking and Management: Implement a smart waste tracking system using RFID or barcode technology. This will allow for the monitoring and tracking of waste from collection points to the transfer station, facilitating efficient management of waste quantities, types, and origins; Weighing and Data Collection: Install integrated weighing systems at the transfer stations to accurately measure the weight of incoming waste. This data can be used to identify waste generation patterns, optimize collection routes, and assess the effectiveness of waste reduction initiatives; Real-Time Monitoring and Automation: Use sensors and real-time monitoring systems to capture data on waste volumes, container fill levels, and operational parameters. This will enable timely decision-making, proactive maintenance, and streamlining of operations; Integrated Data Analytics: Employ data analytics tools to analyse the collected data from various sources. This will provide insights into waste composition, generation patterns, and operational efficiency, enabling informed decision-making and continuous process improvement; and Collaboration and Communication Platforms: Utilise digital platforms and mobile applications to facilitate communication and collaboration between different stakeholders. This will streamline scheduling, reporting, and issue resolution, enhancing overall efficiency and transparency. 			

Local Waste Management Units (LWMU) play an important role in Western Macedonia's approach to waste management. They are used in transhipping waste to either

the Integrated Waste Management Central Facilities (IWMCF) or alternative recipients and final disposal sites. Each LWMU is built to streamline waste handling and ensure every waste type is sorted and allocated to its designated place. The structure of each of the LWMUs includes:

Waste Transfer Station: LWMUs feature an uneven ramp paired with hoppers dedicated to waste transhipment. Depending on the scale, larger LWMUs house three hoppers, while smaller versions incorporate two.

Recycling Transfer Infrastructure: An uneven ramp aids the recyclable materials' movement, which is brought in from source separation programs. Depending on the

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(SWM 3) Development of a transfer station

needs, LWMUs are equipped with containers tailored for paper/cardboard, glass, plastics, metals, and biowaste.

Material Storage Equipment: This component revolves around equipment specifications. Containers of varying sizes are dedicated to specific waste types. From Waste Electrical and Electronic Equipment (WEEE) to bulkier waste items and green waste, every waste form has its designated storage. Even specialised wastes like cooking oils have dedicated containers, ensuring efficient categorisation and processing.

Western Macedonia's Integrated Waste Management System (IWMS) includes 10 LWMUs and covers a broad This large network guarantees that every locality within the region has access to waste management facilities, ensuring waste is not just dumped, but processed, recycled, or appropriately disposed of.

The LWMU structure in Western Macedonia plays an important role in ensuring the region's waste management system remains streamlined and efficient. The distinction between general waste and recyclable materials at the LWMU level ensures that a significant portion of waste gets repurposed, reducing the load on landfills. Furthermore, the specialised handling of WEEE and other specific waste forms ensures that harmful

components don't seep into the environment.

Additionally, the LWMUs act as central collection points, facilitating easier and more organized transportation to IWMCF or other designated sites. This not only reduces transportation costs but also diminishes the carbon footprint associated with waste management.

Figure 1: Map of the 6th of October City Indicating Area 1 and Area 2 that need TSs for full coverage



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وزارة التعـاون الدولـي Ministry of International Cooperation





Appendix B. Summary of Enabling Policies

Land Use & Transport		
(LU&T 11) Adaptation measures & preparedness plan	The City Authority should consider integrating resilience measures into the permitting process for new developments. This would involve assessing their ability to withstand future temperature extremes and other environmental challenges. Given the threats of climate change, detailed hazard maps that highlight risks to infrastructure and implementing disaster risk management plans would ensure that the City's infrastructure is designed to handle potential extreme weather conditions.	
(LU&T 12) Enhancement of GIS capabilities	The City Authority should prioritise the regular updating of GIS maps. This should be coupled with enhanced data collection processes that cover vital services and infrastructure in the City. Additionally, ongoing technical support should be provided to the City Authority's secondary GIS unit, with an emphasis on capacity building for land use planning.	
Energy, Buildings and Industry		
(EBI 8) Urban Energy Efficiency Initiative	This initiative involves the City Authority promoting the use of energy-efficient appliances to replace outdated ones, aiming to reduce energy consumption and save long-term costs for households. In addition, a city-wide awareness campaign would educate residents about energy-efficient technologies in various sectors, with a focus on energy-efficient buildings and operations. A key aspect of the policy is advocating for energy performance contracts in new developments, integrating energy efficiency into the city's growth. In collaboration with the Ministry of Electricity and Renewable Energy (MoERE), this policy also seeks to phase out low-efficiency appliance manufacturing, ensuring only the most efficient products are available.	
(EBI 9) Solar Energy Initiative	This initiative led by the City Authority focuses on training public sector workers in solar energy system design and operation, alongside a city- wide campaign educating residents on solar energy benefits and system maintenance. Working with MHUUC and NUCA, the City Authority will promote solar water heater installation in new buildings, as part of a broader initiative to revise building codes for energy and water conservation, including efficient energy use, green space provision, and reflective materials to mitigate urban heat. The initiative also involves modernising existing buildings, with MHUUC support in providing incentives for upgrades such as thermal insulation and energy-efficient glass. This initiative aims to foster a sustainable, energy-efficient urban environment, showcasing the city as a leader in sustainable urban development. There is potential for the City to become a centre of expertise and demonstrate the implications of the best available technologies. Some portions of public buildings operated by the City could undergo deep modernisation.	
(EBI 10) Comprehensive Energy Management in Industrial Facilities	The City Authority should enforce the Electricity Law, mandating industrial facilities to maintain an energy register and appoint an Energy Manager. This would ensure that industries actively monitor their energy consumption and implement demand-side management programs. Additionally, industrial establishments should be encouraged to frequently monitor combustion efficiency, with a particular focus on boiler analysis and emission assessments from industrial processes.	
Water and Wastewater		
(W&WW 8) Water conservation	In the 6th of October City, there is a need to prioritise water conservation given future water scarcity issues in Egypt. The City Authority should actively promote and incentivise investments in water-saving technologies, especially in high-consumption areas like shopping centres, restaurants, and commercial zones. These properties should be encouraged to adopt modern water-efficient fixtures and practices. Similarly, for residential areas and compounds, the City Authority should encourage the use of advanced drip irrigation systems, for green spaces, which not only conserve water but also ensure optimal water usage for plants, contributing to a greener urban environment. To further strengthen water conservation efforts, the City Authority should introduce and enforce regulations that set limits on water consumption, ensuring sustainable water use. Alongside these measures, a city-wide awareness campaign should be launched, educating residents about the importance of water	



	conservation and offering guidance on how they can contribute to this cause.	
(W&WW 9) Wastewater reuse	The City Authority should pursue sustainable water management through innovative reuse strategies. This includes promoting the recycling of grey water, harnessing air conditioning drain water as a potential source of distilled water and re-using backwashing water in water treatment plants. Excess treated water can be directed towards landscaping and maintaining green spaces. This approach not only conserves freshwater resources but also enhances the City's green spaces. This policy aligns with broader water conservation efforts, ensuring that the City proactively addresses its future water needs in the face of future water scarcity risks.	
(W&WW 10) Sustainable Water Management and Efficiency	This policy seeks to support energy efficiency in treatment plants, performance monitoring, and quality assurance. The City Authority, together with NUCA and the Water Company, should conduct regular audits of water and wastewater treatment plants to identify areas needing improvement. This will include promoting the adoption of energy-efficient practices, such as integrating high-efficiency motors, to optimise operations and reduce energy consumption. The introduction of Performance Monitoring plays an important role in this policy. The establishment of key performance indicators for the water network will set benchmarks for service quality. Regular monitoring against these indicators will enable continuous improvement, aiming to enhance the efficiency and reliability of the water system. Quality Assurance is another critical component of this policy. The City Authority should ensure the highest quality of its freshwater network through regular monitoring and testing to confirm that the water supplied adheres to stringent quality standards, thereby safeguarding the health and well-being of the City's residents.	
Solid Waste Management		
(SWM 7) Solid Waste Management Study	This is a critical study to understand and address the challenges and opportunities within the waste sector and is required to enable future interventions, ensuring that they are not only technically feasible but also economically viable, environmentally beneficial, and socially inclusive. The key components of the study are: Waste Market Study; Strategy to Introduce Waste Hierarchy and Promote 'Zero Waste'; Waste Management Regulations and Recycling Initiatives; Waste Sorting, Pre-treatment, and On-site Management; and Integration of Informal Waste Pickers (Nabasheen)	
(SWM 8) Engagement and Education	The invaluable role of waste pickers, or Nabasheen, should be recognised and integrated into the City's waste management processes. They should be incentivised for their involvement in the sector and provided access to finance for equipment modernisation. Educational and cultural centres should be established to promote recycling and environmental values in the youth. Schools should be integrated into recycling projects, building upon the Youth Engagement Activity undertaken as part of the GCAP process.	
(SWM 9) Eco- Industrial Development	The City Authority should, together with IDA and the Ministry of Environment, encourage eco-friendly industrial practices, such as the implementation of eco-industrial park operational principles and the promotion of industrial symbiosis. Industrial operators will be tasked with developing roadmaps for environmentally friendly industrial parks, and areas designated for recyclers in industrial zones should be expanded.	
(SWM 10) Financial Incentives and Regulatory Framework	Green investments should be promoted through financial incentives. Linkages will be established between green financing facilities and industrial entities, and efforts should be made to educate both the banking sector and industrial businesses on green investment techniques. The City Authority should also enforce environmental laws regulating waste and waste management. An online waste database should be established in coordination with NUCA to ensure transparency and efficient tracking.	
OFFICIAL USE





Appendix C. Stakeholder engagement plan



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