



Ganja Green City Action Plan

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CITIES

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Abbreviations

Abbreviation	Description
AARSA	Azerbaijan Automobile Road State Agency
AC	Air Conditioning
AERA	Azerbaijan Energy Regulation Agency
AIC	Azerbaijan Industrial Corporation
AIDD	Agency for Innovation and Digital Development
ANRE	Moldovan National Agency for Energy Regulation
AWAM	Azerbaijan Water Amelioration and Management OJSC
AYNA	Azerbaijan Ground Transport Agency
AZN	Azerbaijani Manat ₼
BAP	Best Available Practice
BAR	Baseline Assessment Report
BOD	Biochemical Oxygen Demand
CBO	Community-Based Organisations
CC	Climate Change
CCS	Carbon Capture Storage
CEEP	Caucasus Energy Efficiency Programme
CIF	Climate Investment Fund
CPZ	Controlled Parking Zone
CSM	Conceptual Site Model
CSO	Combine Sewer Overflow
CUSPU	Communal Utility Services Production Unit
DBFO	Design-Build-Finance-Operate
DMA	District Metering Areas
EBRD	European Bank for Reconstruction and Development
EGA	Emirates Global Aluminium
EISAP	Estonian Industrial Symbiosis Agro-Park
EPC	Energy Performance Certificate
ESCO	Energy Service Companies
ESIA	Environmental and Social Impact Assessment

Abbreviation	Description
EU	European Union
EUR	Euro €
EV	Electric Vehicle
FGD	Focus Group Discussions
FI	Financial Institution
FRBs	French Reed Beds
FTE	Full Time Employees
GBI	Green and Blue Infrastructure
GBVH	Gender Based Violence and Harassment
GC	Ganja City
GCAP	Green City Action Plan
GCEA	Ganja City Executive Authority
GCF	Green Climate Fund
GDP	Gross Domestic Product
GGF	Green for Growth Fund
GHG	Greenhouse Gas
GI	Green Infrastructure
GIS	Geographic Information System
Ha	hectares
IDB	Indicators Database
IDP	Internally Displaced Peoples
IFI	International Finance Institution
IMP	Impacts Monitoring Plan
IVIA	Ida-Virumma Industrial Areas
KII	Key Informal Interviews
LULUCF	Land Use, Land-Use Change and Forestry
M&E	Monitoring and Evaluation
MA	Ministry of Agriculture
MC	Ministry of Culture

Abbreviation	Description
MDDT	Ministry of Digital Development and Transport
MECON	Ministry of Economy
MEDU	Ministry of Education
MENG	Ministry of Energy
MENR	Ministry of Ecology and Natural Resources
MES	Ministry of Emergency Situations
MF	Ministry of Finance
MH	Ministry of Health
MRF	Materials Recovery Facility
MW	Mega Watt
NBS	Nature-Based Solutions
NDC	National Determined Contributions
NGO	Non-Government Organisation
NMT	Non-Motorised Transport
NRW	Non-Revenue Water
NSWMS	National Solid Waste Management Strategy
O&M	Operation and Management
OJSC	Open Joint Stock Company
PMP	Progress Monitoring Plan
PPP	Public-Private-Partnership
PSC	Project Steering Committee
PV	Photovoltaic
PWD	Persons With Disabilities
PWG	Project Working Group
RAP	Resettlement Action Plan
RECP	Resource Efficiency and Cleaner Production Clubs
SAARES	State Agency on Alternative and Renewable Energy Sources

Abbreviation	Description
SCCF	Special Climate Change Fund
sCDE	Spatial Common Data Environment
SCPI	State Committee on Property Issues
SCUPA	State Committee of Urban Planning and Architecture
SDE	Sénégalaise des Eaux
SDGs	Sustainable Development Goals
SEZ	Special Economic Zone
SLCC	State Land and Cartography Committee
SMBDA	Small and Medium Business Development Agency
SME	Small and Medium Enterprise
SOCAR	State Oil Company of Azerbaijan
SSC	State Statistical Committee of the Republic of Azerbaijan
SuDS	Sustainable Urban Drainage Systems
SUMP	Sustainable Urban Mobility Plan
SWM	Solid Waste Management
UN	United Nations
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations United Nations Industrial Development Organisation
UNFCCC	United Nations Framework Convention on Climate Change
UNIDO	United Nations Industrial Development Organisation
USD	United States Dollar \$
USSR	Union of Soviet Socialist Republics
VFTW	Vertical-Flow Treatment Wetland
WEEE	Waste Electronic and Electrical Equipment
WRA	Water Resource Agency
WWTP	Wastewater Treatment Plant

Mayor's Foreword

Green growth and a clean environment are Azerbaijan's national priorities, as stated in the “Azerbaijan 2030: National Priorities of Socio-Economic Development Plan” approved by the Decree of the President of the Republic of Azerbaijan, dated the 2nd of February 2021. A high-quality environment and transforming the country into a green energy hub are amongst the goals that have been set in this Plan. In accordance with the mentioned priority, several activities are currently being carried out in Azerbaijan to improve the environment, increase green spaces, and ensure the efficient use of water resources and sustainable energy sources. The Ganja Green City Action Plan (GCAP) and the proposed Actions from this plan largely support national priorities.

The development of the Ganja GCAP coincides with several important events that will take place in the context of the environment and green growth in Azerbaijan. The 29th session of the Conference of the Parties to the UN Framework Convention on Climate Change (COP29) will be held in Azerbaijan in 2024. At the same time, 2024 was declared the "Green World Solidarity Year" in the Republic of Azerbaijan. Activities like these demonstrate that Azerbaijan is willing to protect the environment and tackle climate change at the regional, national and global levels.

It is no coincidence that as part of these activities, by the order of the President of the Country, Mr. Ilham Aliyev, Ganja joined the European Bank for Reconstruction and Development's (EBRD) “Green Cities” programme in 2020. This is a clear example of the special attention and care given by the Honourable President, Mr. Ilham Aliyev, to Ganja City and the city's environmental challenges. Actions to be implemented within the framework of the EBRD Green Cities programme will assist Ganja in identifying and prioritising the most urgent environmental problems and climate change risks. The Ganja GCAP project will play an important role in improving the environment of the city while aiming to systematically help solve its environmental and sustainability challenges. The Ganja GCAP will focus on several sectors, such as climate change and environmental governance, transport, energy, solid waste management, water and wastewater, land use and other sectors associated with environmental challenges across the city.

I believe that the Ganja GCAP will support the country's work in the field of green growth and will contribute to tackling the consequences of climate change in Ganja.

Niyazi Bayramov

Head of Ganja City Executive Authority



Executive Summary

In July 2022, Ganja 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 development. Ganja is the first city in Azerbaijan to join the European Bank of Reconstruction and Development (EBRD) Green Cities Programme demonstrating its contribution to help achieve the Nationally Determined Contributions (NDC) as part of the Paris Agreement. In addition, the GCAP offers an opportunity to align its environmental and sustainability goals with the City’s long-term development plans, including its aspirational green urban agenda, as set out in the draft GC Master Plan.

Following the EBRD methodology, the Ganja City Executive Authority (GCEA), Project Working Group (PWG), Project Steering Committee (PSC), and wider group of stakeholders have been involved in extensive stakeholder engagement to develop a clear understanding and agreement on priority challenges facing the City. This included in-person workshops with more than 100 city officials and stakeholders at each, as well as a series of online, in-person and hybrid one-to-one meetings, focus group discussions and informal interviews. These involved meetings with sector experts and senior officials from the GCEA, Ministries and State Agencies. Together, the workshops and meetings helped to articulate a clear vision and set of sector goals, and in particular a politically and economically feasible plan of investments and policies to support its deliver.

Green City Baseline

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

Ganja is found within the west of the country, along the key Baku-Georgia transport corridor and acts as a gateway for travellers and freight. The City is framed by the Lesser Caucasus Mountains to the south, agricultural land and the Kura river to the north, therefore the City has developed along the Ganja River, which runs south to north through its core.

Today, Ganja is home to around 335,000 people, although anecdotal evidence suggests this is higher due to the large number of internally

Ganja Green City Vision:

*The City of Ganja will continue to develop a strong industrial backbone, while tackling environmental issues through remediation of contaminated land and enhanced building and industry energy efficiency through the implementation of smart and low-carbon technology. **Walking and Cycling will be the preferred mode of travel, embracing the City's compact nature and providing pedestrian and cycle networks which are safe, accessible and well connected. The GCAP will help to deliver high quality and well-connected green spaces, as well as reliable public services – including well-functioning water and wastewater infrastructure, a robust solid waste management strategy employing principles of the circular economy, and a smart and well-integrated public transport network.***

displaced people in the region as a result of the Karabakh wars. With the implementation of the draft Ganja City Master Plan, currently under development by the State Committee of Urban Planning and Architecture (SCUPA), this is predicted to grow to 500,000 by 2040.

The City has a **rich cultural and industrial heritage** influenced by its positioning along the old silk road and industrial soviet legacy. This industrial legacy continues to today with a mix of industrial activities representing a large proportion of the City’s GDP and employment with the presence of key industries such as the aluminium processing plant, ceramic and carpet manufacturing facilities, food processing and car assembly plant.

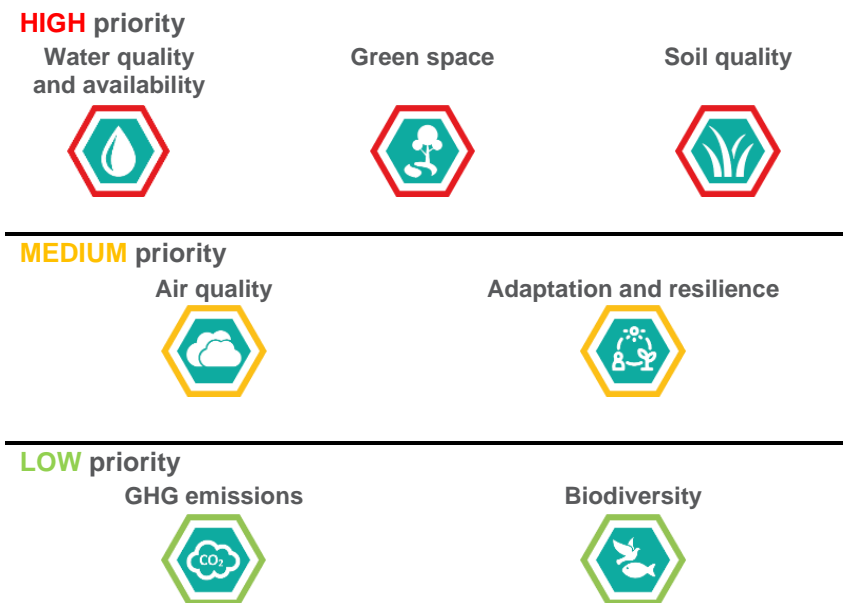
The City is currently dominated by residential uses, in the form of single-family dwellings and apartment blocks, key industrial sites located in the northwest and northeast of the City, and agricultural uses in the north.

Supporting the City in achieving green and sustainable growth, the technical assessment identified several key challenges and opportunities which have been taken into account when developing the GCAP; these include:

- **Water quality and availability** is negatively impacted by the lack of wastewater treatment plant and ageing sewerage network leading to leaking of wastewater into the local environment, the lack of solid waste management also contributed to poor water quality. Additionally, low levels of water along the Ganja River, will be exacerbated by climate change. Investing in wastewater and solid waste management will aid with improving water quality in the City;
- **Green Spaces** are limited, not easily accessible, not well-connected and unevenly distributed, with most of the green public areas concentrated around the City centre. These issues are mainly due to encroachment from development, lack of enforcement and building control. Investing in nature-based solutions (NBS) will help increase availability and accessibility to open spaces, and enforcement of the draft Master Plan will help to rationalise land uses.
- **Soil quality** has been impacted by legacy industrial activities, poor solid waste management practices and leakage of raw sewerage into the environment, in particular around the aluminium processing plant and existing dumpsite. Implementing and investing in solid waste management, land remediation and wastewater treatment will help to reduce soil pollution;
- **Air quality** is arguably better than other urban centres, such as Baku, however, the ageing vehicle stock and outdated equipment in buildings and old technology in industrial processes has a negative effect on the air quality in Ganja. Investing in non-motorised and public transport, modern industrial equipment and NBS will help to improve the local air quality;
- **Adaptation and Resilience** is impacting Ganja through an observed increase in average temperatures, heatwaves and drought events, with an overall decrease in annual precipitation, however, increased intensity of rainfall events could lead to an increased risk of surface water flooding and further exacerbate the availability of water resources. Investing in adaptation measures, such as implementing NBS and resilient infrastructure, mainstream climate adaption into spatial planning will help to address local climate risks;

- **GHG emissions** has decreased in the country, mainly as a result of cleaner technologies deployed and the transition of thermal plants to natural gas. Investing in low-carbon transport, active travel infrastructure, energy-efficient technology, and decarbonisation of municipal infrastructure will help to mitigate climate change.
- **Biodiversity** the city lies within a rich biodiversity area, even though biodiversity is not monitored hence there is no evidence of decrease of species.

Through rigorous technical assessments, benchmarking and stakeholder engagement, key environmental challenges were identified and prioritised. These priority challenges, detailed below, formed the baseline for the development of targeted actions with the Ganja GCAP.



The Ganja Green City Action Plan

The GCAP's formulation is a demonstration of strong collaboration between key stakeholders, such as the GCEA, Ministry of Economy, Ministry of Ecology and Natural Resources, state-owned utilities companies and SCUPA. 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 in Ganja. A prime example of this is the EBRD investments in Ganja with the sovereign loans of up to EUR 10 million Euro to upgrade the solid waste collection infrastructure and up to EUR 12.5 million Euro for modernisation of street lighting infrastructure, which marked a significant milestone in this collaborative journey, and acted as trigger projects for the Ganja GCAP.

The GCAP identifies a **total of 26 actions** across seven key sectors (see table below). These actions have been prioritised based on their alignment with the City's overarching Strategic Goals and vision, alignment to address priority environmental challenges, technical feasibility, stakeholders buy-in and are tailored to address the unique geographic and local context. The GCAP has been developed in a holistic multi-disciplinary approach, born out of extensive stakeholder engagement, and guided by a vision that promotes green industrial development while offering a coordinated sustainable green path where nature is protected, and infrastructure provision is climate resilient and accessible to all. Supporting activities and enabling policies have also been presented to support the implementation of projects and the green agenda. Similarly alternative mechanisms and financial modalities are outline for the government to consider when delivering the projects.

- **Land use and Planning** – Actions will help to increase the quantity and quality of accessible green spaces for all, while promoting densification and rationalisation of land uses and protecting heritage assets to stimulate the local economy and promote the sustainable development of Ganja as a compact city;
- **Transport** – Capitalising on the compact nature of the City, actions have been developed to facilitate a modal shift to public transport and promote non-motorised transport, while providing opportunities to decarbonise the existing public transport fleet to improve local air quality;
- **Energy and Buildings** – Modernising the electricity network and the district heating network, implementing energy efficiency measures in buildings and industries, and unlocking the full potential of renewable energy to decrease GHG emissions and adopt a low-carbon development;

- **Industry** – Maintaining the City's strong industrial backbone by promoting green economy principles and cleaner production, while tackling legacy environmental issues particularly soil pollution, are the main drivers of the actions within this sector;
- **Water and Wastewater** – Actions have been developed to ensure water resources, in particulate Ganja river basin, are protected to decrease the ever-growing challenge of water scarcity, guarantee everyone has 24/7 access to potable water and adequate wastewater treatment;
- **Solid Waste Management** – Establishing robust and holistic solid waste management practices, through implementing circular economy principles that encourage reduce reuse and recycle rather than disposal, is the main aim of the proposed actions. Closing down and remediating the current dumpsite will help to reduce pollution ending up in local waterways and soils; and
- **Climate and Environmental Governance** – Enhancing the environmental governance system by investing in modern environmental monitoring equipment, developing and enforcing policies to protect the environment, such as Ganja River management plan, climate change action plan and disaster risk management plan will help Ganja to revitalise its local environment and ensure a resilient future

Ambitious yet realistic in its implementation, the GCAP and its actions have been developed in co-ordination to maximise co-benefits in reducing pollution and GHG emissions (approx. 0.42 mega tCO₂e per annum), improving the local environment, supporting green growth through the potential for 200 green jobs, and improving accessibility to services for all, while reducing costs and resource requirements by offering opportunities to implement actions in parallel to minimise disturbance and save resources.

Implementation of these actions will not only lead to a green transition and urban transformation of the City but will also enable the implementation of the draft Master Plan and enhance local institutional capacity in dealing with climate risks, environmental and social challenges. Aligning with international standards and frameworks for environmental quality, Ganja is not only setting a benchmark for urban sustainability in Azerbaijan, but it is also positioning itself as a regional exemplar of best practice.

The Ganja GCAP identifies a total of **1,988.92 million AZN** (1,038.63 million Euro) investment across the actions. Potential alternative funding options for the actions have been identified including IFIs and development partners, climate financing and PPP opportunities despite the county being its infancy for PPP implementation.

Summary of Ganja GCAP Actions, including, title, timeframe, implementation agency, funding options, CAPEX and OPEX (AZN)

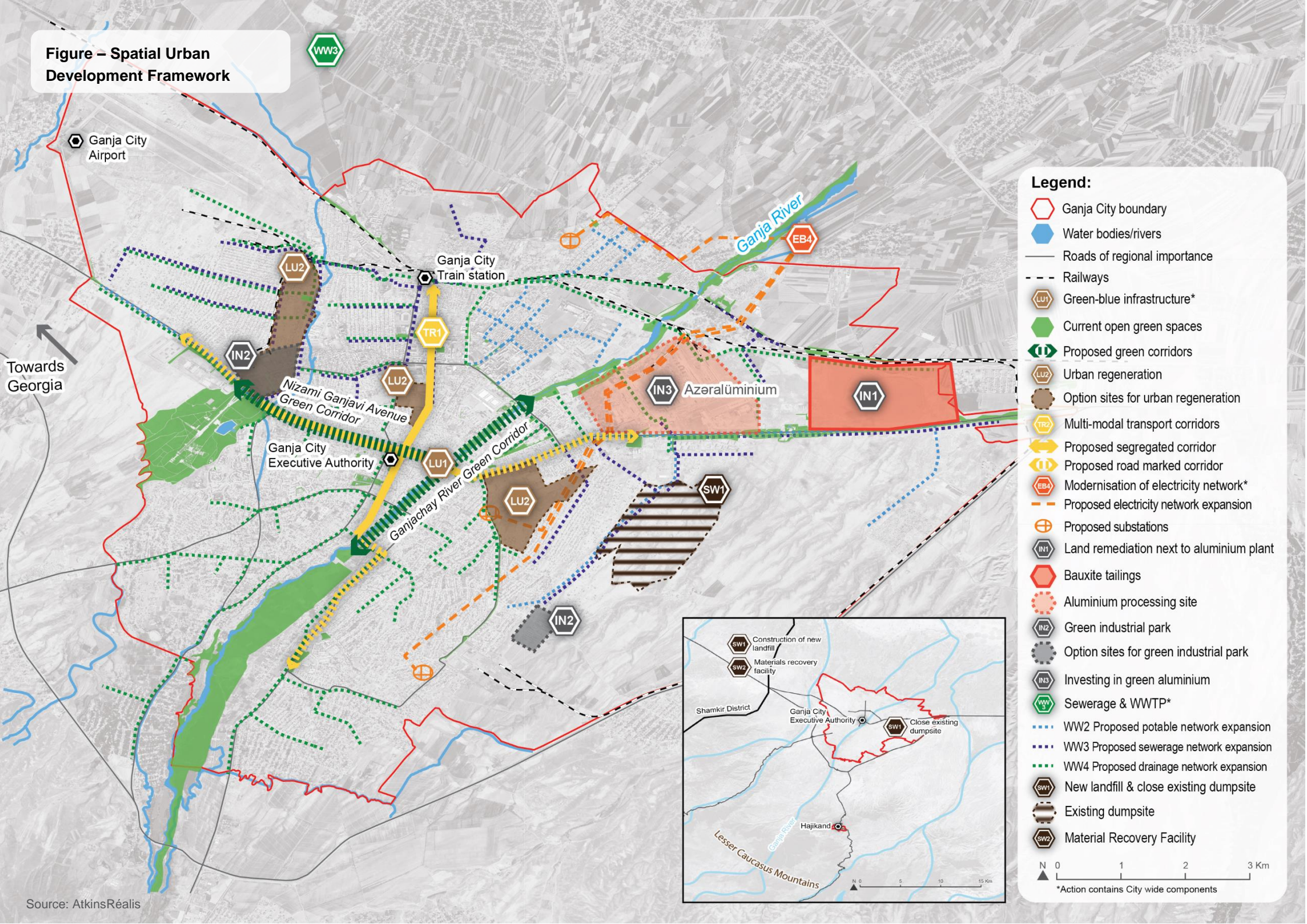
Action reference and title	Timeframe					Implementation agency	Funding options	CAPEX (AZN)	OPEX (AZN)
	2024	2025	2026	2027	2028				
Land Use and Planning								10.84 million	126,200
LU1 - Improvement of green spaces and network of green-blue infrastructure						GCEA greening department	State budget. IFI/Donor Agencies. Climate funds.	9.15 million	78,400
LU2 - Urban regeneration and brownfield development						SCUPA	State budget. IFI/Donor Agencies.	820,000	N/A
LU3 - Heritage Protection and Management Plan						MC & STA	State budget. IFI/Donor Agencies.	220,000	N/A
LU4 - sCDE to enhance GIS data collation and reporting						MENR	State budget. IFI/Donor Agencies.	650,000	47,800
Transport								57.60 million	4.50 million
TR1 - Parking control measures and implementation						AYNA	GCEA budget. Private sector. PPP	2 million	88,400
TR2 - Multi-modal transport corridors						AYNA/ AARSA	State budget. Existing maintenance budgets. Parking fees. IFIs/Donor Agencies.	12.68 million	126,865
TR3 - Modernisation and decarbonisation of the bus fleet and SUMP						AYNA	Sovereign loan. IFIs/Donor Agencies.	42.91 million	4.29 million
Energy and Buildings								89.10 million	7.80 million
EB1 - Public buildings renovation scheme (including Renewable energy in buildings)						MENG	State budget. IFIs/Donor Agencies.	28.65 million	841,500
EB2 - Private buildings renovation scheme (including Renewable energy in buildings)						MENG	IFIs/Donor Agencies.	28.65 million	841,500
EB3 - District and household heating renewal and decarbonisation						MENG	IFIs/Donor Agencies.	9.35 million	1.87 million
EB4 - Modernisation of electricity distribution network						Azerishiq and Azerienergy OJSC	State budget. IFIs/Donor Agencies.	18.70 million	3.74 million
EB5 - Smart street lighting						GCEA (lighting department)	State budget. IFIs/Donor Agencies. PPP	3.74 million	470,000

Action reference and title	Timeframe					Implementation agency	Funding options	CAPEX (AZN)	OPEX (AZN)
	2024	2025	2026	2027	2028				
Industry								910.20 million	36.77 million
IN1 - Remediation of contaminated land next to aluminium plant						Azerialuminium	State budget. IFIs/Donor Agencies.	174 million	N/A
IN2 - Green industrial park						MECON	Sovereign loan. State budget. IFI/Donor Agencies.	760,000	N/A
IN3 - Investing in green aluminium						Azerialuminium	Sovereign loan. IFI/Donor Agencies. Private led investment	735.4 million	36.7 million
Water and Wastewater								753.60 million	15 million
WW1 - Water and Sanitation Master Plan						AzerSu (or WRA)	State budget. IFIs/Donor Agencies.	3 million	N/A
WW2 - Increasing potable water availability						AzerSu (or WRA)	State budget. IFIs/Donor Agencies.	250 million	5 million
WW3 - Sewerage and wastewater treatment plant						AzerSu (or WRA)	State budget. IFIs/Donor Agencies.	500 million	10 million
WW4 - Upgrade of the urban drainage system						AzerSu (or WRA)/ AYNA	State budget. IFIs/Donor Agencies.	600,000	N/A
Solid Waste Management								156.19 million	4.09 million
SW1 - Build new EU compliant landfill and close down existing dumpsite						GCEA CUSPU	State budget. IFIs/Donor Agencies.	106 million	1.59 million
SW2 - Materials Recovery Facility						GCEA CUSPU	State budget. IFIs/Donor Agencies. PPP.	50 million	2.5 million
SW3 - Solid waste management strategy						GCEA CUSPU	State budget. IFIs/Donor Agencies.	185,000	N/A
Climate and Environmental Governance								11.41 million	69,200
CEG1 - Ganja River management plan and urban green corridor						MENR	State budget, water utilities and IFI/Donor agencies.	8.65 million	22,800
CEG2 - Disaster Risk Management and Emergency Plans						MENR/MES	State budget. IFIs/Donor Agencies.	140,000	N/A
CEG3 - Climate Change Action Plan						MENR	State budget. IFIs/Donor Agencies.	250,000	N/A
CEG4 - Enhanced environmental monitoring						MENR	State budget. IFIs/Donor Agencies.	2.37 million	23,600
Total estimated cost of GCAP*								1,988.92 million	68.34 million

Note*: The CAPEX and OPEX should be treated as preliminary indicative estimates appropriate at this stage. These are not detailed cost estimates, owing to the need for actions to be elaborated, and the legal and regulatory investment framework reviewed in more depth, before more detailed cost estimates can be generated.

- Implementation of action as per description
- Preparation of actions

Figure – Spatial Urban Development Framework



- Legend:**
- ⬡ Ganja City boundary
 - ⬢ Water bodies/ rivers
 - Roads of regional importance
 - - - Railways
 - LU1 Green-blue infrastructure*
 - ⬢ Current open green spaces
 - G Proposed green corridors
 - LU2 Urban regeneration
 - O Option sites for urban regeneration
 - TR1 Multi-modal transport corridors
 - S Proposed segregated corridor
 - R Proposed road marked corridor
 - EB4 Modernisation of electricity network*
 - E Proposed electricity network expansion
 - S Proposed substations
 - IN1 Land remediation next to aluminium plant
 - B Bauxite tailings
 - A Aluminium processing site
 - IN2 Green industrial park
 - O Option sites for green industrial park
 - IN3 Investing in green aluminium
 - W Sewerage & WWTP*
 - W2 WW2 Proposed potable network expansion
 - W3 WW3 Proposed sewerage network expansion
 - W4 WW4 Proposed drainage network expansion
 - SW1 New landfill & close existing dumpsite
 - D Existing dumpsite
 - SW2 Material Recovery Facility
- *Action contains City wide components

1. About the GCAP

Due to their high concentration of people, infrastructure, housing and economic activity, cities are particularly vulnerable to the impacts of climate change and natural disasters. However, the world’s cities also represent major 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, in order to provide a comprehensive set of solutions which can be translated 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. In recognition of this, the European Bank of Reconstruction and Development (EBRD) has been supporting cities in achieving their environmental and sustainability objectives through the Green Cities Programme and its adoption of the Green Economy Transition approach, which aims for green projects to represent 50% of the Banks’ investment portfolio.

1.1. Purpose of the GCAP and the Development Process

In June 2022, the EBRD appointed AtkinsRéalis, in consortium with the Regional Environmental Centre for the Caucasus (RECC Azerbaijan) and the Center for Smart Cities and Regions named after Nizami Ganjavi within the Ganja State University (the “Consultant Team” hereafter), to support and deliver the Green City Action Plan (GCAP) for the City of Ganja, Azerbaijan.

Following the EBRD GCAP methodology¹, the GCAP aims to assist Ganja City (GC) to address its environmental issues. The GCAP methodology presents a systematic process of identifying, benchmarking, prioritising and guiding Green City actions, involving four clear steps:

1. Establishing the Policy and Urban Framework (PUF), developing the environmental baseline and prioritising Green City challenges² – which

includes assessing the current state of environmental challenges in the City, based on approximately 70 core indicators and identifying those priority environmental challenges that need to be addressed;

2. Developing a GCAP, which includes preparing a document that articulates the City’s green vision, strategic goals, mid-term targets, and priority actions and investments to address the previously identified environmental challenges and meet the GCAP strategic goals and vision;
3. Implementation, i.e., execution of the GCAP; and
4. Monitoring and evaluation of the GCAP results and updating the GCAP as necessary.

Additionally, the GCAP offers an opportunity to align with the City’s long-term development goals, including its aspirational green urbanisation agenda, as set out in the draft GC Master Plan which is currently being developed by the State Committee of Urban Planning and Architecture (SCUPA). The Master Plan provides the City with a long-term vision and a land use framework to guide the future development across multiple sectors – including municipal infrastructure, public services and environmental sectors, demonstrating its commitment to the United Nations’ (UN) Sustainable Development Goals (SDGs).

1.1.1. Consultation Process and Contributors to the Ganja GCAP

The Development of the GCAP has been guided by multiple rounds of stakeholder engagement and consultation – comprised of a series of in-person and virtual workshops, meetings, focus groups and thematic discussions. In addition, the development of the GCAP has been overseen by the Project Steering Committee (PSC) and the Project Working Group (PWG), represented by official and technical experts from the City and high-rank officials from Ministries and State Agencies.

Appendix B. provides a summary of the stakeholder engagement and consultation undertaken.

¹ EBRD, Green City Action Plan Methodology, (2022), Available at: https://www.ebrdgreencities.com/assets/Uploads/PDF/GCAP_2-1_Methodology_January2022.pdf, (Accessed 24/06/2022).

² The Policy and Urban Framework and City Environmental Baseline and Prioritisation are presented as a combined Baseline Assessment Report (BAR), which is available to be shared upon request.

1.2. Structure of the Document

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

- Chapter 2 provides an overview of the City’s geographic, socio-economic and institutional context;
- Chapter 3 sets out a brief overview of the Baseline Assessment Report (BAR) and the identified Green City Challenges for Ganja;
- Chapter 4 introduces the Ganja GCAP Green City Vision, along with the strategic goals, a summary of actions and the spatial framework. The chapter also highlights several benefits of the GCAP and how these have been maximised in the action proformas;
- Chapter 5 Land Use and Planning sector including its strategic goal, mid-term targets, key stakeholders, best practices of financial modalities, alternative mechanisms and the sector actions (in the form of proformas);
- Chapter 6 Transport sector in the same format as Chapter 5;
- Chapter 7 Energy and Buildings sector in the same format as Chapter 5;
- Chapter 8 Industry sector in the same format as Chapter 5;
- Chapter 9 Water and Wastewater sector in the same format as Chapter 5;
- Chapter 10 Solid Waste Management sector in the same format as Chapter 5;
- Chapter 11 Climate and Environmental Governance sector in the same format as Chapter 5;
- Chapter 12 sets out an implementation plan for the GCAP and its actions, including how the implementation of the GCAP should be monitored and evaluated, and summarises the costs associated with the actions as part of the investment plan; and
- Chapter 13 sets out the next steps of the GCAP, including its approval, implementation and monitoring.

The GCAP is supported by a series of appendices including:

- Appendix A – Summary of Stakeholder Engagement;
- Appendix B – Gender and Economic Inclusion Assessment ;
- Appendix C – Explanatory Note on Carbon Saving Potential and EBRD tool; and
- Appendix D – The Monitoring and Evaluation Plan (in Excel format).

2. Ganja City Profile

This Chapter provides an overview of the national, regional and local contexts of GC – including its socio-economic context, the environmental and climate objectives of Azerbaijan, and the wider institutional and policy setting (including the Nationally Determined Contributions (NDC)).

2.1. City Context

GC is located near the western border of the Ganja-Dashkasan region, found in the west of Azerbaijan. The region borders Georgia to the north, Shaki-Zagatala and Central Aran region to the east, Karabakh and East Zangezur regions to the south and the Gazakh-Tovuz region to the west.

GC is Azerbaijan’s third largest City³, with an official population of around 335,800 in 2021 (within the jurisdiction of the City) and a varying population density of between 2,500 and 3,000 people per km².

The City is found at the foothills of the Lesser Caucasus Mountains and has developed along the Ganja River over time, which runs south to north through its core. GC currently covers an official area of 110km², however, there are proposals to expand this boundary as part of the draft GC Master Plan, which would extend the area to just under 125km²⁴.

The City’s topography has influenced its urban development, with mountains restricting growth to the City’s south, whilst key transport corridors (the E60 and the Baku-Georgia railway) and the presence of agricultural land also restrict growth to the north. As a result, the City has developed to the east and west, and this is expected to continue in line with the draft GC Master Plan once approved.

GC has a rich cultural heritage and is one of the key cities found along the Old Silk Road bridging the Eurasian East and West, see Figure 2-1. In addition, Ganja was home to the poet Nizami Ganjavi, an influential 12th-century Azerbaijani poet whose legacy is still valued to date. In 2016, the City was the first outside of the European Union (EU) to be selected as the European Youth Capital.

The City is currently dominated by residential uses (in the form of single-family dwellings and apartment blocks), agricultural uses (particularly in the north), and industry (with key sites located in the northwest and northeast of the City, along the main transport corridors).

Further details on the city context including urban background information and land uses can be found in the BAR.

Figure 2-1 – Nizami Ganjavi Mausoleum (top) and Philharmonic Hall (bottom)

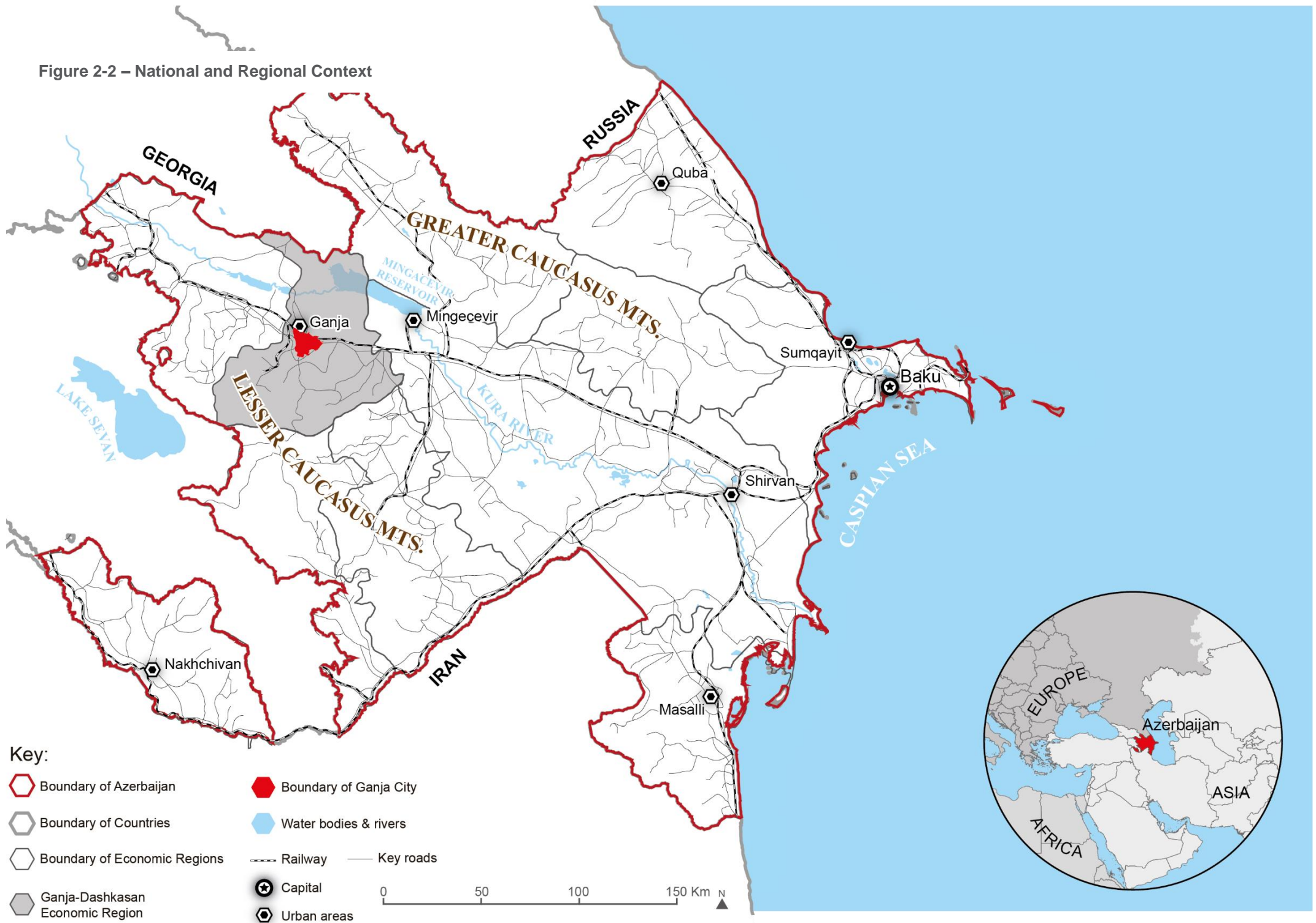


Source: AtkinsRéalis site visit and Remote Lands.

³ Based on official statistics from the State Statistics Committee of the Republic of Azerbaijan.

⁴ The analysis in the BAR was undertaken using the new boundary of the City based on the draft GC Master Plan.

Figure 2-2 – National and Regional Context



2.2. Socio-Economic Context

2.2.1. Demographic Context

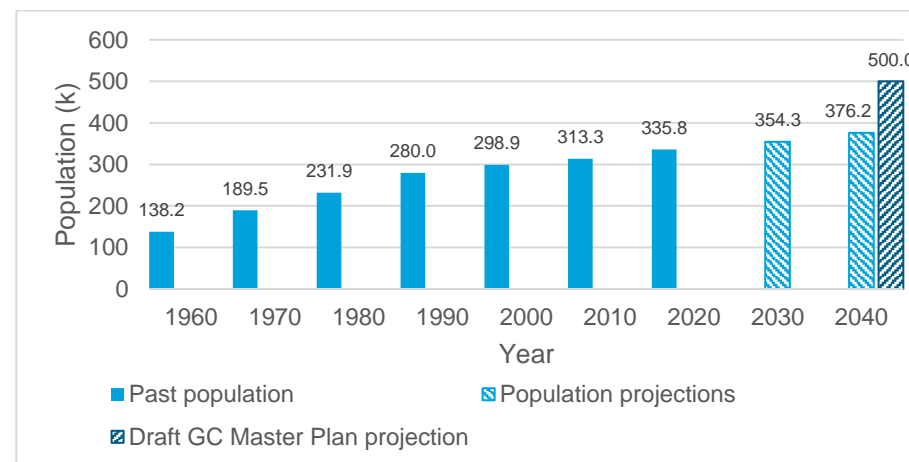
As discussed in Section 2.1, the population within GC is around 335,800; however, anecdotal evidence suggests that the current unofficial population is more than 450,000 inhabitants, due to internally displaced people (IDPs) living in the City⁵.

The population increased by 22,751 inhabitants between 2009 and 2021, with population densities increasing from around 2,475 residents/km² in 2007 to around 2,680 residents/km² in 2021, this is an increase of around 0.6% year on year. If the population continues to grow at this rate, the population of GC is estimated at 376,000 by 2040, however, the draft GC Master Plan has estimated growth of up to 500,000 inhabitants by 2040⁶ (see Figure 2-3). As of 2021, approximately 48.8% of the population were male and 51.2% were female⁷.

GC traditionally hosts many young people and students from different backgrounds and regions across Azerbaijan, as it is home to several higher education institutions – including the Ganja State University and Azerbaijan Technology University. The total number of students in the City can fluctuate seasonally as students enrol into university.

There are several vulnerable/disadvantaged groups found in the City, these include, elderly people; women; IDPs; persons with disabilities (PWD); veterans and civilians affected by the first and second Karabakh wars and their families; persons with low-literacy levels; low-income families including single mothers/female-headed households, and persons with no digital literacy or access to digital tools. Appendix A provides a further assessment of the G&EI considerations in GC.

Figure 2-3 –Population per year Time in within Ganja City



Source: Adapted from the State Statistical Committee of the Republic of Azerbaijan and draft GC Master Plan.

2.2.2. Economic Context

Despite being the third largest city in Azerbaijan by population size, Ganja has a total economic output of 1.16bn manat (2021), which represents just 1.2% of the national output. This significantly lags behind the capital of Baku (61 billion manats, representing 61% of national output) and other major cities such as Sumgayit (4 billion manats) and Nakchivan (2 billion manats)^{8,9}.

Given its large population and relatively low output, Ganja has one of the lowest outputs per capita (3,000 manat) of Azerbaijan’s main cities. Ganja’s economic output has grown significantly over the past decade, almost tripling since 2010 from 370 million manat. A similar level of growth can be seen across Azerbaijan’s largest cities.

⁵ The State Statistical Committee of the Republic of Azerbaijan (2021), 1.15. Territories, number, and density of population by economic regions and administrative cities and districts of the Republic of Azerbaijan, Available at: <https://stat.gov.az/source/demography/?lang=en>, (Accessed: 17/08/2022).

⁶ SCUPA and Vasconi Architects (2022), draft GC Master Plan.

⁷ Ibid.

⁸ The State Statistical Committee of the Republic of Azerbaijan (2021), 2.6. System of national accounts and balance of payments, Gross domestic product, Available at: https://stat.gov.az/source/system_nat_accounts/?lang=en, (Accessed: 17/08/2022).

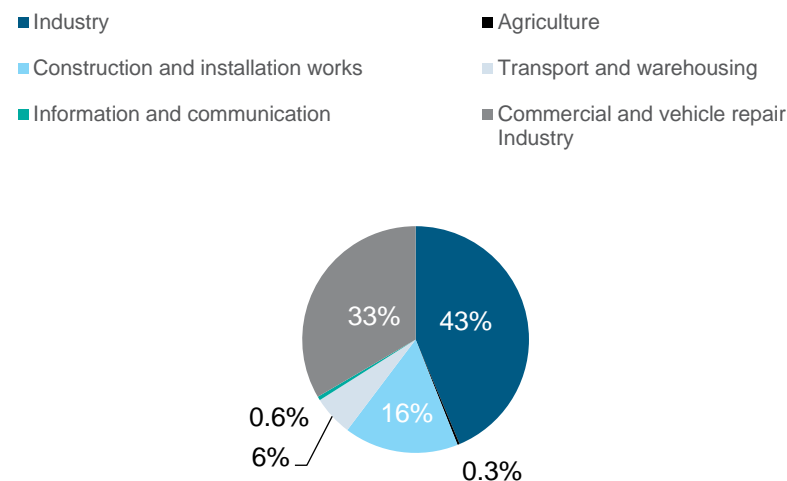
⁹ The State Statistical Committee of the Republic of Azerbaijan (2021), Production account – proportions, Volume of production output in the regions Available at: https://www.stat.gov.az/source/system_nat_accounts/az/034.xls (Accessed: 17/08/2022).

GC is one of the largest industrial cities in the country and hosts a mix of heavy, light and food manufacturing activities around the outskirts of the City. Much of the City’s industrial success is a result of the rich pool of natural resources within the wider region. The majority of the City’s industrial output is accounted for by non-ferrous metallurgy and light industries – including, food processing, electronics and home appliances¹⁰. The City is also home to one of the largest textile conglomerates in Azerbaijan, famous for a fabric named Ganja silk and a key exporter to neighbouring countries/the Middle East, as well as the Azeraluminium-owned aluminium processing plant¹¹. GC’s construction industry is predominantly made up of activities including household building companies, metal concrete, brick ceramics and marble plants¹².

Currently, 7,783 business entities are operating in GC – including 7,665 micros, and 85 small and 33 medium business entities¹³. As a result of national funding and loans, micro, small and medium business activities have been strengthening¹⁴.

As shown in Figure 2-4, the main economic sectors (in terms of output) are general industry, alongside commercial and vehicle repair activities.

Figure 2-4 – Ganja’s Economic Output (GDP %) by Sector



Source: SCUPA and Vasconi Architects, draft GC Master Plan (2022)

2.3. Institutional and Policy Setting

2.3.1. Institutional Setting and Financial Capacity

As set out in the Constitution of the Republic of Azerbaijan 1995 (amended), the country is a presidential republic with three branches of power. This includes the legislative power, which is exercised by the Parliament called the Milli Majlis; the executive power vested in the President, and the judicial power administered by courts. The local tier of government is exercised through the Ganja City Executive Authority (GCEA), established as the territorial branch of the executive power. The GCEA has limited independence in decision-making and implements decisions on local affairs on behalf of the Government and the President. In addition, municipal

infrastructure is mainly designed, planned, delivered and managed by the Government, with support from the Ministries’ regional offices in Ganja.

There are three Municipalities found in GC, including the Kapaz Municipality, the Nizami Municipality, and the Hajikend Municipality (located around 10km north of GC). Municipalities are independent self-governing bodies that grant citizens the ability to resolve important issues independently and freely of Government. However, due to constrained budgets and resources, the GCEA undertakes many of the duties vested to them under part four of the Constitution and Law of the Azerbaijan Republic “On the Status of Municipalities”.

¹⁰ The State Statistical Committee of the Republic of Azerbaijan (2021), Regions of Azerbaijan, Statistical portrait of regions, Available at: <https://stat.gov.az/source/regions/?lang=en> (Accessed: 17/08/2022).

¹¹ "Gəncənin tarixi". gdu-ri.com (in Azerbaijani). Faculty of Mathematics and Informatics, Ganja State University. Archived from the original on 24 August 2010.

¹² SCUPA and Vasconi Architects, draft GC Master Plan (2022).

¹³ The State Statistical Committee of the Republic of Azerbaijan (2021), 3.4, System of national accounts and balance of payments, Output and income of population in regions, Available at: https://stat.gov.az/source/system_nat_accounts/?lang=en (Accessed: 17/08/2022).

¹⁴ SCUPA and Vasconi Architects (2022), draft GC Master Plan.

The Jurisdiction of the GCEA and various stakeholders across the key sectors of the GCAP is discussed in further detail as part of Chapters 5 to 11. Further details on the institutional structure can be found in the BAR.

The GCEA or Municipalities do not have any credit rating or borrowing capacity. This is determined by Government policies and strategies focused on decreasing foreign debt and access to international credits/loans. While the budget to GCEA is allocated and transferred from the Ministry of Finance (MF), the Municipalities are self-funded through raising and collecting taxes, as well as leasing land. However, the Municipalities are occasionally subsidised by the State.

The absence of borrowing capacity from the GCEA means that the Ministry of Finance is the only entity able to apply for credits and loans and will then transfer to the relevant entity or implementing agency – be that the GCEA, the Municipalities or other Ministries. The State Agencies can apply for credits and additional funds with the approval of the Ministry of Finance. Alternative financing mechanisms are highlighted under each sector in Chapters 5 to 11.

2.3.2. Key Policy Drivers

The Ganja GCAP has been built upon the Order of the President “[Azerbaijan 2030 National Priorities for Socio-Economic Development](#)”, approved in 2021. The 2030 plan sets out five national priorities to improve socio-economic to be implemented over the next decade:

1. Steadily growing, competitive economy;
2. Developing a society which is dynamic, inclusive and socially just;
3. Developing competitive human capital and a space for modern innovation;
4. Focusing on the great return to the territories liberated from occupation; and
5. Creating a clean environment and fostering green growth in the country.

Moreover, the “State Programme for Socio-Economic Development of the Regions 2019 -2023” and the “Socio-Economic Development Strategy of the Republic of Azerbaijan in 2022–2026” were developed to outline the country’s development priorities and goals every five years. Specific to Ganja, the following were included:

- Improve transport and connectivity through improvements to the Baku-Georgia railway and auxiliary infrastructure, and highway improvements;

- Revitalisation of industrial activities through construction of an industrial park, expansion and redevelopment of the aluminium processing plant and restoration of other key industries including carpet making and clay soil processing;
- Repair and construction of social services including the elderly care home, medical institutions, schools and cultural venues; and
- Improved the gas network.

At the City level, [a Master Plan is being developed](#), aimed at stimulating economic growth, protecting the natural environment and increasing the wellbeing of citizens through implementing principles of sustainable development. The draft GC Master Plan, led by the SCUPA, is expected to be adopted later in 2023 and guide the development of GC for the next 20 years. The key aims include:

- Clearly define functional zoning across the City to rebalance development;
- Promote sustainability, increase the density of the built-up area, and increase the amount of green space, sports facilities and recreational areas; and
- Redevelop and unlock the space around the Ganja River through the introduction of a protection zone along the river to control development.

The draft GC Master Plan also includes improvements to urban infrastructure such as the potable water and wastewater networks, improvements to the sewage treatment plant and the implementation of a modern landfill. Synergies between the Green City actions and the Master Plan are highlighted within each action proforma in Chapters 5 to 11.

Further information on the key policy drivers can be found in the BAR.

3. Baseline Assessment Review

Ganja has historically been one of the industrial centres in the country and this legacy is still seen to this day. However, this has impacted its overall environmental performance due to the high level of pollution from industrial activities, very limited availability of green spaces, and water scarcity which is exacerbated by climate change.

The City’s environmental position is better when compared with other urban areas, such as Baku or the Absheron peninsula, where the main oil and gas exploration and processing industries are located. A summary of the key findings from the BAR are provided below with the priority Green City Challenges highlighted in section 3.4. Further detailed analysis of the challenges and sectors can be found in the BAR.

It is noteworthy that due to the limitations and constraints in data disaggregated at the City level, qualitative assessment, key informal interviews (KIIs) and focus group discussions (FGDs) were carried out with relevant GCEA departments, Ministries and State Agencies to overcome the data gaps. The evidence of the assessment is also supported by expert judgement alongside qualitative information.

There are several ongoing initiatives that evidence the willingness of the City to transition towards a greener and more sustainable urban development. These include the current development of the draft GC Master Plan, the Strategic Environmental Assessment for the Master Plan supported by the United Nations Economic Commission for Europe (UNECE), the United Nations Industrial Development Organisation (UNIDO) Resource Efficiency and Circular Economy Club (RECP), and EBRD’s current investments in solid waste management (SWM) and solar street lighting.

3.1. Environmental Review



Air Quality - Is mainly impacted by the usage of old pollutant vehicles and industrial activities. Industries deploy old and outdated equipment and have energy-intensive processes. There is only one automatic air quality monitoring station in the Heydar Aliyev Park, the largest park in GC, hence more stations should be installed across the City, particularly closer



to industrial and residential areas to monitor the impact of human activity on air quality.

Water Quality and Availability - These are affected by the disposal of wastewater without prior treatment and poor SWM. Additionally, low levels of water along the Ganja River, the main water body running through the City, will be exacerbated by climate change. Wastewater is currently used for informal irrigation of plants, greenery and agricultural land in raions around Ganja due to already scarce water resources. There are no water monitoring stations in Ganja or downstream.



Soil Quality - Has detrimentally been affected due to legacy industrial activities and remaining industrial polluters. There has been no remediation of contaminated land and the absence of an engineered landfill exacerbates this issue across the City. However, these issues focus on localised sources of pollution, instead of a general issue across the City.



Green Space - There is a lack of publicly accessible green open spaces across GC. Those that exist are often not well connected, difficult to access and are unevenly distributed, with most being concentrated around the centre. Very limited pocket parks and open spaces exist within residential areas, and these are often poorly maintained.



Biodiversity - The surrounding region can be described as rich in biodiversity, even though biodiversity is not monitored across the City. Moreover, about 240 sycamore trees have been registered as natural monuments and therefore protected. In addition, there are several national parks and protected areas outside the City.

3.2. Climate Risk Profile

A summary of GHG emissions at a national level and in GC, its climate risk profile and the main challenges associated with climate change are provided below. Detailed information relating to GC’s climate risk profile can be found in the Climate Vulnerability Risk Assessment presented as part of the BAR.



Carbon Emissions and Mitigation - Statistical information collected in Azerbaijan does not cover the amount of GHG emitted in GC. However, a more comprehensive GHG emissions inventory is prepared annually on a national level and disaggregated by sector (see Table 3-1). One can observe a decline in total GHG emissions between 1995 to 2015, which is associated with the fall of the Union of Soviet Socialist Republics (USSR) in 1991 and the subsequent reduction in emissions from the energy and industrial sectors. Despite a general fall in GHG emissions, emissions related to industrial processes have risen since 2005, as industrial activity and economic growth have slowly recovered. The fall in GHG emissions from the energy sector is due to the transition of thermal power plants to natural gas.

Table 3-1 – GHG Emissions and Removals by Sectors in Azerbaijan

Sector	GHG emissions and removals (Gg CO ₂ e.)					
	1990	1995	2000	2005	2010	2015
Energy	74134	47222	40360	40915	41000	47650
Industrial Processes and Product Use (IPPU)	1505	481	452	1868	1977	3676
Agriculture, Forestry and other Land-Use (AFOLU)	6264	3799	5370	6469	7243	8647
Waste	772	846	917	1004	1155	1332
Total emission	82675	52348	47099	50256	51375	61306
Removals	-3690	-2456	-4870	-5349	-5410	-7119
Net emission	78985	49892	42229	44907	45965	54187

Source: Ministry of Ecology and Natural Resources, Fourth National Communication to the UNFCCC15, (2021)



Despite the lack of a GHG emissions inventory at the City level, it is assumed that the main sources of GHG emissions in Ganja are the transport, residential and industry sectors¹⁶. The only GHG emissions data found at the GC level is related to the aluminium processing plant, as one of the main sources of GHG emissions within the City. The Azerialuminium processing plant is the only aluminium processing plant in the country and produces several primary aluminium products. The plant has an annual production capacity of 50,000 tons and in 2016 contributed to around 520 thousand tCO₂e, as reported in the fourth NDC¹⁷.

Climate Adaptation and Resilience - Ganja has a cool, semi-arid climate, and experiences a wide range of temperatures across the year. The average annual temperature for the region is 11.7°C, with temperatures in the City slightly higher at 13°C. Maximum temperatures average 30°C in July, while the record temperature recorded for the City is 42°C. Such temperature variations have a high impact on resource use, in particular natural gas for heating and electricity for AC and cooling especially given the relatively inefficient and poor quality of the buildings in GC. Winters are cold, and the minimum temperature recorded is -18°C. Average annual rainfall is low, at just 287mm/year.

- **Mean annual temperatures are projected to rise in Ganja.** Higher temperatures will increase the rate of evapotranspiration and place further pressure on water resources and river flows which, coinciding with population growth¹⁸ and increased demand for water resources, could lead to a shortfall of water supply.
- **The risk of heatwaves will increase and will be more frequent.** High temperatures are a threat to human health, as they increase the risk of heat-related medical issues such as heat stroke and cardiovascular disease. This can also lead to overheating in buildings and infrastructure and reduce the productivity of the labour force which would directly

¹⁵ Ministry of Ecology and Natural Resources, Fourth national communication to the United Nations framework convention on climate change, (2021) Available at: <https://unfccc.int/sites/default/files/resource/FNC%20report.pdf>, (Accessed: 10/10/2022).

¹⁶ Stakeholder engagement with Climate Change Expert from MENR in 10/2022.

¹⁷ Ministry of Ecology and Natural Resources, Fourth national communication to the United

Nations framework convention on climate change, (2021) Available at: <https://unfccc.int/sites/default/files/resource/FNC%20report.pdf>, (Accessed: 10/10/2022).

¹⁸ Ministry of Ecology and Natural Resources, Fourth national communication to the United Nations framework convention on climate change, (2021) Available at: <https://unfccc.int/sites/default/files/resource/FNC%20report.pdf>, (Accessed: 10/10/2022).

impact operations, such as in the agricultural sector and energy production.

- **Precipitation is likely to become more variable.** Precipitation is projected to decrease in the summer months and increase in winter. Population growth, economic growth and uneven distribution of water resources have led to increased water demands and significant abstraction to meet household and irrigation farming needs, in particular in upstream regions of the Ganja River. Climate change has already caused higher temperatures and rates of evaporation, and reduced rainfall in the area with this trend projected to continue. As a result, water discharges recorded at the Zurnabad station on the Ganja River have decreased by 20% annually.¹⁹ Increasing temperatures are likely to accelerate the spring snowmelt which feeds the river, potentially causing earlier pulses of floodwater, but reduced flow in the summer months. The lack of water resources can be observed by the lack of water flow in the Ganja River during several months of the year, as in Figure 3-1.

Figure 3-1 – Photo of Dried Up Ganja River in Autumn 2022



Source: AtkinsRéalis site visit

- **The risk of drought is expected to increase in Ganja.** There have been a number of drought events recorded in the past decade²⁰, which have reduced agricultural productivity in Ganja.²¹ Rainfall projections are variable but show a decreasing trend overall, particularly in the summer months. This is likely to increase the risk of drought, which will impact agriculture and water supply and could contribute to desertification.
- **The intensity of extreme rainfall events will increase,** potentially leading to a greater number of flash floods and surface water flooding in the City, in particular, if drainage infrastructure is not able to cope with the heavier rainfall. Localised surface water flooding is already experienced across the City, in particular in the central areas where there is a lack of drainage.

3.2.1. Alignment with the Paris Agreement

Azerbaijan is a Non-Annex I party to the United Nations Framework Convention on Climate Change (UNFCCC) and has committed to cut GHG emissions by 35% by 2030 under the Paris Agreement, as stated in its NDCs²². This target is on a national level compared to 1990 (baseline). The EBRD is fully committed in supporting the country in meeting this target. Further information relating to the carbon saving potential of the GCAP actions in relation to the business as usual and Paris-aligned trajectories can be found in Section 4.3 and Appendix C.

By focusing on GHG emissions and adaptation through infrastructure sector measures, the GCAP will create a robust environmental plan that addresses identified priority areas and challenges and it will also align with the ambitions of the Paris Agreement in terms of contributing to decarbonisation and limiting global temperature increases. Similarly, the focus on adaptation will ensure investment in other environmental assets to increase their resilience and ability to withstand climate extremes. In addition, the package of actions proposed provides targeted financing to support climate action within the mid and long-term financing horizons.

¹⁹ IHPA NGO (2013) Available at: <https://docslib.org/doc/9937751/agstafachay-tovuzchay-shamkirchay-and-ganjachay-river-basins>, (Accessed: 10/10/2022).

²⁰ Mammadov, A. and Caladova, V. (2022) Manifestations of Global Warming in Azerbaijan. *Sciences of Europe*, p34-42.

²¹ Ibid.

²² The Republic of Azerbaijan, Information to the United Nations Framework Convention on Climate Change (UNFCCC) on the Intended Nationally Determined Contribution (INDC) of the Republic of Azerbaijan, (2022), Available at: <https://unfccc.int/sites/default/files/NDC/2022-06/INDC%20Azerbaijan.pdf>, (Accessed: 22/09/2022).

3.3. Sectoral Review

Recognised gaps in infrastructure provision are summarised below:



Land Use - The main challenge is the lack of an up-to-date and approved Master Plan to guide development and provide a clear functional zoning strategy. Zoning is inorganically scattered across the City, in particular with regard to industrial zones, which has impacted the environmental performance and citizens' wellbeing. Urbanisation (including rapid population growth due to an influx of IDPs), uncontrolled urban sprawl and encroachment onto sanitary protection zones have also resulted in the exposure of residents to pollutants and adverse environmental impacts. This has also resulted in unplanned settlements with poor infrastructure services and access to water, electricity, and waste collection, as well as a lack of publicly accessible green spaces. The City's natural and historic assets are similarly threatened by urban sprawl and a lack of enforcement of planning regulations.



Transport - Despite walking being one of the most common transport modes, there is a lack of safe pedestrian facilities. In particular, accessibility to pedestrian facilities and public transport is limited for PWDs, the elderly, and mothers with children in buggies. Public transport is regulated and managed by the Government, while its operation is carried out by private operators' companies. Old, polluting private and public vehicles are contributing to a deterioration of air quality and carbon emissions. At present, congestion only occurs during peak hours and along specific roads, mainly due to the lack of rationalisation of the road hierarchy and parking. There are no smart clean technologies available, such as integrated ticketing or electronic timetables, as well as a lack of electric vehicle charging points.



Buildings - There are several challenges within the building sector, mainly related to electricity consumption and the use of natural gas for heating purposes. Additionally, there is a lack of energy efficiency measures and air conditioning (AC) equipment, a limited number of centralised boilers and district heating in residential buildings, and a limited smart technologies such as metering and solar photovoltaic (PV). The existing above-ground gas distribution network, in place across several residential areas in Ganja, is deemed to be unsafe and poses a health and safety risk to communities. Furthermore, the poor efficiency of the building stock is coupled with an absence of water efficiency measures. The adoption and enforcement of green energy certifications, such as those developed by the Azerbaijan Green Building Council, and an energy efficiency action plan will benefit GC if policies to encourage the restoration/retrofitting of existing buildings are also implemented.



Industry – This sector continues to be the main economic activity in GC and provides significant employment opportunities. The City has historically been an industrial hub for the country and encompasses several derelict and contaminated areas. Industrial equipment is generally outdated and has poor efficiency, which has contributed to the pollution of air, water bodies and soil. There are initiatives planned to better use these vacant and derelict industrial land, however, it is essential to ensure that contaminated land is remediated before further development can take place.



Energy - Azerbaijan is rich in oil and natural gas resources, and therefore access to electricity has been estimated at 100% with government-subsidised tariffs. The country also has the potential for the implementation of renewable energy, particularly for solar, wind and hydropower, with the latter currently being developed to a certain extent alongside some private investment in wind and solar plants. The GCEA has no jurisdiction to amend central policy or tariffs but has the opportunity to introduce parallel or complimentary policies.



Water and Wastewater - The main water sources in Ganja are Gogyol and its affluent rivers, as well as groundwater. Surface water is treated and piped at Seyfali treatment facilities, while groundwater is extracted but is non-potable and therefore mainly used for industrial and irrigation purposes. Some settlements are not connected to the network and supplies can often be limited to 4-6 hours a day; hence water is often distributed using water tanks. Poorly maintained pipes and old pipes lead to about 30% losses. Water management is also a big challenge, as tariffs do not generate enough revenue to cover operation and maintenance (O&M) costs or capital investment.

With regards to wastewater, there is no operational wastewater treatment plant (WWTP) in Ganja and about 68% of the population is connected to the sewerage network, whilst the rest rely on unlined septic tanks. Wastewater from the sewerage and unlined septic tanks often leaks into the local environment and is used for irrigation purposes, due to the damaged network and lack of WWTP. These unsafe practices have contributed to the pollution of water bodies, groundwater, and soil. Moreover, there is a lack of stormwater drainage along major and secondary roads, which has led to surface water flooding in particular locations.



Solid Waste - Total solid waste generation in GC averages 450kg/year/capita, which is below international standards. The majority of waste is collected across GC, but there is no separation at source and recycling – with this carried out informally and at a limited scale. Waste is disposed of in a non-compliant waste disposal site that has exceeded four times its initial capacity. The disposal site also does not currently employ any appropriate best available practice (BAP) or technical measures. This results in the leaching of pollutants contaminating the soils and groundwater, foul odour affecting the population living in proximity to the site and the release of air pollutants when waste is burnt. There is no recycling or materials recovery facility (MRF) in the City, however, there are conversations in progress with regard to the exploration of circular economy opportunities through the UNIDO project, as well as the expansion of the aluminium plant to process recycled aluminium. The collection of fees from waste is very low, hence there is a limited budget available for waste management and capital investment.

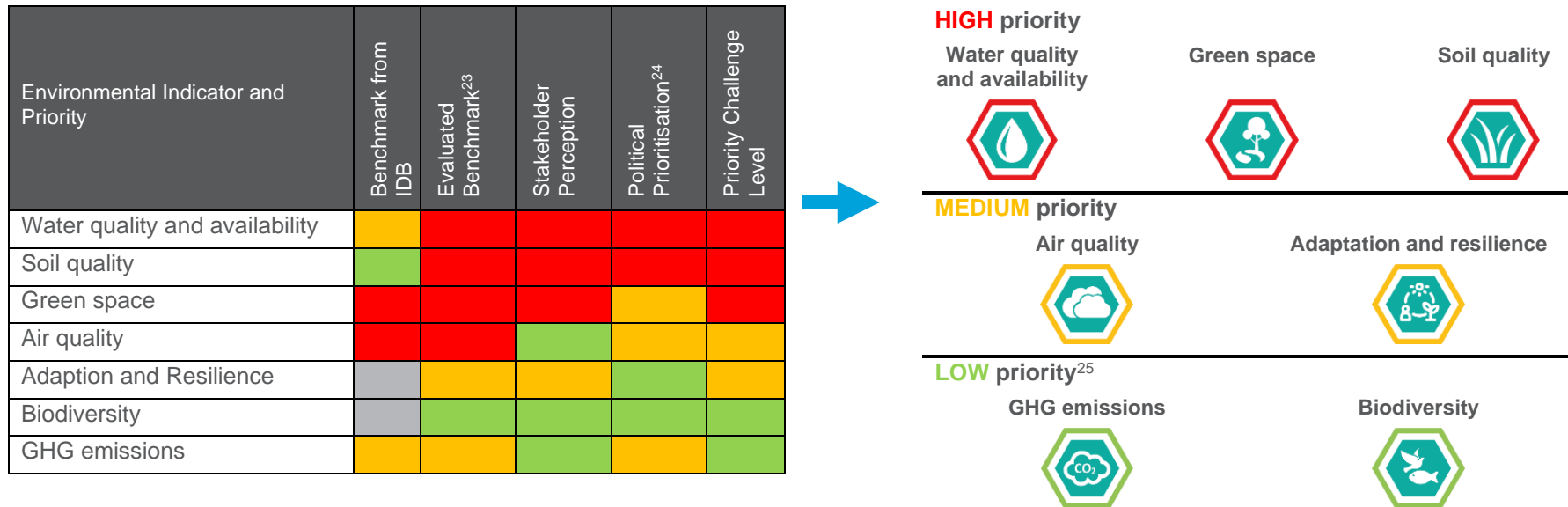
Infrastructure gaps are not only contributing to poor environmental performance and pollution but also leading to interrelated challenges across the City's other sectors.

3.4. Priority Green City Challenges

Green City Challenges were prioritised based on the findings of the BAR, together with inputs and feedback gained as part of the stakeholder engagement workshops and PWG and PSC meetings held during the development of the GCAP. The results of these can be found in the BAR. The environmental challenges were assessed as **High**, **Medium** and **Low** priority, as shown in Figure 3-2.

Building upon the assessment of the priority environmental challenges, the Consultant Team explored appropriate actions to address these challenges with the PWG, PSC and wider stakeholder groups. These actions are presented within the key sectors in Chapters 5 to 11. It is important to note that the proposed actions have been developed to address all the identified Green City Challenges, regardless of their priority.

Figure 3-2 – Priority Green City Challenges



²³ The Evaluated Benchmark represents the conclusions and expert judgment of the Consultant Team, based on qualitative evidence and research conducted for the BAR.

²⁴ Based on the PWG and PSC engagement meetings held in late December 2022 and January 2023.

²⁵ These environmental indicators have been assessed as low priority. This is not to argue that no challenges exist within these areas, but rather to highlight that, when compared to major issues of water availability and quality, soil quality and green spaces, these areas pose lower urgency to GC.

4. Integrated Green City Vision and Goals to Maximise Co-benefits

This Chapter presents the Ganja GCAP along with its Green City Vision, Strategic Goals, Mid-Term Targets and Actions presented under each key sector.

4.1. Green City Vision

The purpose of the Vision is to guide the City's development, provide a framework for the GCAP and enable the implementation of the Master Plan as a long-term land use framework. The vision aims to address the priority challenges and thematic areas that were identified in the BAR. It takes the form of a Green City strategy statement, which provides an image of the city and a general principle to lead the development of the GCAP and its implementation. The Vision for the Ganja GCAP has been developed based on feedback and involvement from stakeholders, the PSC and PWG.²⁶

*The City of Ganja will continue to develop a strong industrial backbone, while tackling environmental issues through remediation of contaminated land and enhanced building and industry energy efficiency through the implementation of smart and low-carbon technology. **Walking and Cycling will be the preferred mode of travel**, embracing the City's compact nature and providing **pedestrian and cycle networks which are safe, accessible and well connected**. The GCAP will help to deliver **high quality and well-connected green spaces**, as well as reliable public services – including **well-functioning water and wastewater infrastructure, a robust solid waste management strategy** employing principles of the circular economy, and a **smart and well-integrated public transport network**.*










²⁶ Further information on how the Green City Vision has been developed and agreed is explained in the SEP

4.2. Sector Strategic Goals and Targets

The following strategic goals are intended to contribute to the Green City vision by defining the scope of the City’s most immediate work for implementing the GCAP. Strategic goals have been developed based on data, information and key pressure areas identified as part of the BAR and priority Green City challenges identified.

Table 4-1 – GCAP Sector, Strategic Goals and Targets

Sector		Strategic Goal
Land Use/Planning		Ganja will be renowned as a healthy, compact, sustainable place to live, work and visit with a connected network of good quality green spaces accessible to everyone and an efficient system of land uses. Mainstream NBS, environmental and climate aspects into urban development planning, as well as project investment and delivery.
Transport		Improve the existing public transport network and develop a high-quality pedestrian and cycling environment capitalising on the City's compact nature to encourage active travel, creating a pedestrian-oriented City. Ensure public transport and the active travel network are accessible for all to increase safety and improve mobility.
Buildings and Energy		Adopt and implement energy efficient technologies to minimise losses and promote decarbonisation across all types of building stock, industries and energy infrastructure. Maximise the use of renewable energy sources.
Industry		Develop a green industrial sector in the City that fosters economic growth, while minimising environmental degradation by promoting green technology and cleaner production.
Water and Wastewater		Ensure the 24/7 provision of potable water for all. Ensure the protection of key water resources and the efficient use of these resources. Implement and maintain a functioning wastewater treatment plant and network.
Solid Waste		Adopt a circular economy approach by prioritising the 4Rs principles: Reduce, Reuse, Recycling, Recover, while minimising disposal.
Climate and Environmental Governance		Enhance the environmental governance system by improving, modernising and automating the environmental monitoring system and implementing and enforcing policies to protect the local environment. Reduce environmental pollution by strengthening the environmental governance systems, enforcing environmental auditing and reporting, increasing technical capacity, and deploying green technology and green infrastructure projects. Improve resilience to climate change, particularly water scarcity, through coordinated and effective land planning and delivery of infrastructure.

4.3. Spatial Urban Development Framework

GC has the advantages of being a compact and walkable city, with a rich local heritage and cultural history, legacy industrial activity which bolsters the economy, and rich biodiversity due to the surrounding natural landscape. However, as highlighted in Chapter 3, there are challenges which are restricting its development as a green and sustainable city.

The GCAP has been developed in a holistic multi-disciplinary approach, guided by a vision that promotes green industrial development while offering a coordinated sustainable growth path where nature is protected, and infrastructure provision is climate resilient and accessible to all. The GCAP includes several actions and projects which are aligned with this vision and aspirations, whilst also anchored on GC's unique characteristics, opportunities, and challenges.

Ambitious yet realistic in its implementation, the GCAP and its actions have been developed in coordination to maximise co-benefits in reducing pollution, improving the local environment, supporting sustainable growth, and improving accessibility to services, while reducing costs and resource requirements by offering opportunities to implement actions in parallel to minimise disturbance and save resources. Implementation of these actions will not only lead to a green transition and urban transformation of the City but will also enable the implementation of the draft GC Master Plan and the enhancement of local institutional capacity in dealing with climate risks, and environmental and social challenges.

There are some projects within the urban limits that could be grouped to accelerate the transformation and green transition of GC, maximise efficiency across multiple sectors and enable the implementation of the land use framework established by the draft Master Plan, these include:

Urban Transformational Projects Group 1 - Reconstructing urban roads as **multi-modal transport corridors** to improve sidewalks and pedestrian infrastructure (TR2), in conjunction with the **green corridor along Nizami Ganjavi Avenue** (LU1) and the **smart street lighting** (EB5) will be cost-efficient as time and resources will be minimised, as well as disturbance to the local population. Further opportunities exist to align these with the construction of the **stormwater drainage and SuDS** (WW4), renewal of the **potable water pipelines** (WW2) and **sewerage networks** (WW3).

Further benefits can be unlocked by co-locating and coordinating the redevelopment of **brownfield development sites** (LU2) and the **green industrial park** (IN2) to be well-integrated with the NMT network. This will encourage active travel, reduce the need for private cars and ultimately improve air quality, reduce GHG emissions and mitigate urban sprawl. Moreover, new and refurbished buildings within these areas should look at better insulation options, solar PV, LED lighting, smart energy and water metering and rainwater harvesting (EB1, EB2) presenting another opportunity to transform GC and improve the local environment.

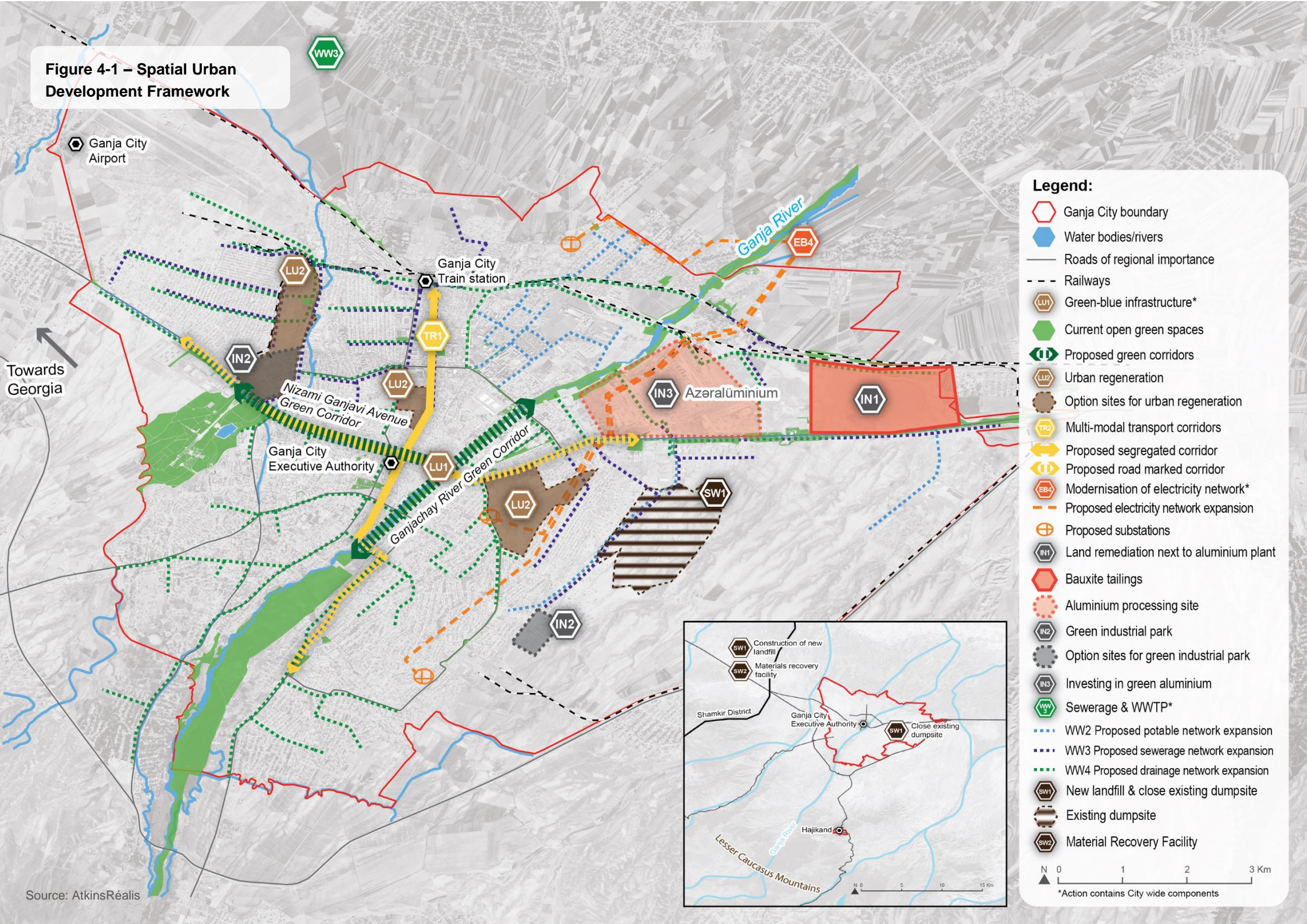
Urban Transformational Projects Group 2 - Several actions can be grouped to improve the quantity and quality of water resources as the highest priority challenge, whilst maximising climate resilience benefits and ensuring efforts are not duplicated. The development of **Ganja River Management Plan** (CEG3) should be a priority well-coordinated with the **Water and Sanitation Master Plan** (WW1), to ensure water sources are protected and sustainably managed in a coordinated manner at the regional and local level. NBS such as the **Green Corridor along the river Ganja** within the urban area will showcase how multiple benefits of climate adaptation, river flow, soil stabilisation, improvement of water and air quality could be achieved when addressing climate change in an integrated manner.

The closure of the **existing dumpsite and subsequent remediation** (SW1) will improve the quality of groundwater and nearby streams that could be potentially polluted by percolation and infiltration from untreated leachates. Undertaking upgrades to the **stormwater drainage network and SUDS** (WW4) and implementing the green corridors and rehabilitation of existing open spaces around residential blocks (LU1) and installing rainwater harvesting and water efficiency devices in buildings (EB1, EB2) in unison will also help to mitigate surface water flooding, attenuate water resources, improve water quality, enhance carbon sequestration, reduce the urban heat island effect and offer several mental and physical health benefits to residents. These efforts will be further bolstered by improving the sewerage network and implementing a fully functioning WWTP (WW3).

Figure 4-1 presents these projects and actions and their spatial location. Details sector maps are also provided as part of Chapters 5 to 10²⁷.

²⁷ The spatial urban development framework and action locations have been developed based on stakeholder engagement and information from SCUPA regarding the draft GC Master Plan.

Figure 4-1 – Spatial Urban Development Framework



Legend:

- Ganja City boundary
- Water bodies/ rivers
- Roads of regional importance
- Railways
- Green-blue infrastructure*
- Current open green spaces
- Proposed green corridors
- Urban regeneration
- Option sites for urban regeneration
- Multi-modal transport corridors
- Proposed segregated corridor
- Proposed road marked corridor
- Modernisation of electricity network*
- Proposed electricity network expansion
- Proposed substations
- Land remediation next to aluminium plant
- Bauxite tailings
- Aluminium processing site
- Green industrial park
- Option sites for green industrial park
- Investing in green aluminium
- Sewerage & WWTP*
- WW2 Proposed potable network expansion
- WW3 Proposed sewerage network expansion
- WW4 Proposed drainage network expansion
- New landfill & close existing dumpsite
- Existing dumpsite
- Material Recovery Facility

N 0 1 2 3 Km

*Action contains City wide components

Source: AtkinsRéalis

4.4. Maximising Co-benefits

The GCAP and its actions have been developed to maximise co-benefits and provide a holistic approach to improving the local environment, municipal infrastructure and citizen health and wellbeing. Similarly, the UN SDGs have guided the development of the GCAP.

Through the implementation of the proposed actions, the GCAP will directly help to address several SDGs, most importantly 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.



One of the main drivers for the GCAP is to deliver sustainable urban growth and improved local environmental quality, while also ensuring the provision of green jobs and better infrastructure for local communities.



The GCAP and its actions have been developed with climate resilience as the backbone while ensuring that they are all low carbon and have a net positive impact on the local environment. The GCAP also helps to establish the need for further climate action in GC in order to reduce exposure to climate risk.

It is important to highlight that the GCAP will also have indirect contribution to a number of SDGs. For example, SDG1 – No Poverty, helping to provide green jobs and improve the quality of life for residents; ‘SDG2 – Zero Hunger’ looking at water resources in an integrated manner to harmonise resources, which will ultimately support the agriculture industry and food production; ‘SDG3 – Good Health and Well-being’ through a wide range of nature-based solutions (NBS) and increased green spaces, as well as improved sanitation and environmental quality across the City, and finally ‘SDG4 – Quality Education’ through the numerous capacity building, vocational training and awareness raising activities proposed as part the actions.

Holistic and Integrated Approach to Planning

The GCAP has been developed alongside the draft GC Master Plan. This has been fundamental in ensuring the actions will be delivered and ultimately have a positive impact on the local environment. In undertaking this holistic and integrated approach to planning, the GCAP and its actions have built

synergies with the draft GC Master Plan and provide a clear route for the improvement of the City’s environment to ensure sustainable development.

Considerations on how the GCAP and draft Master Plan are aligned have been woven into each of the action proformas presented in Chapters 5 to 11.



By implementing a multi-disciplinary and holistic approach in developing the GCAP while proposing actions which help to address multiple SDGs, the GCAP demonstrates a strong partnership across the various SDGs and commits to achieving multiple benefits for the City. Section 4.5 also groups actions to enhance partnerships and deliver across multiple sectors to minimise resources and disturbance.

Climate Resilience

As discussed in Section 3.2, GC and the wider region is vulnerable to climate-related risks including droughts and water scarcity, erratic precipitation leading to flash floods and more frequent heatwaves.

The GCAP has been developed with this in mind and its actions have been purposely designed to maximise climate resilience benefits, in particular when it comes to resilient infrastructure. For example, sustainable urban drainage systems (SuDS) proposals do not only aid the beautification of an area, but also alleviate surface water flooding and build climate resilience.



Proposals to enhance the quantity and quality of open green space across the City, while maximising the opportunities to implement and embed NBS, are aimed at helping to improve biodiversity, safeguarding life on land and mitigating both surface water flooding and the urban heat island effect.



Actions in the Water and Wastewater sector (see Chapter 9) will help to provide clean water and sanitation to GC by rebalancing water resources and providing residents with improved sanitation while implementing SuDS and green infrastructure to help mitigate surface water flooding.

There are several actions in the Climate and Environmental Governance sector (Chapter 11) which have been developed specifically to tackle climate change in a holistic way, in order to help GC to become a more resilient City. Moreover, the actions proposed are all aligned with the Paris Agreement and seek to reduce GHG emissions as far as possible.

Circular Economy and Resource Efficiency

The GCAP and its actions are designed to not only minimise and save water, energy, materials and resources but also to ensure efficiency.



Circular economy principles and the 4R's are embedded within the Solid Waste actions (see Chapter 10), ensuring the most responsible means of managing waste are implemented, while reducing the potential for new waste where possible. Smart solutions have also been maximised to improve resource efficiency and infrastructure delivery, such as smart leak detection on the water network.

There are several actions in the Climate and Environmental Governance sector (Chapter 11) which have been developed to monitor environmental quality and identify pollution hotspots.

Carbon Saving Potential

Azerbaijan is an oil and natural gas rich nation. As discussed in section 3.2, GHG emissions on a national level have steadily fallen from 2010. Efforts are currently underway to decarbonise the energy and transport sector, with several large solar and wind power projects across the country and the introduction of electric buses and expansion of the metro in Baku and railways facilitating a modal shift away from private vehicles in the capital.

The ADB has identified the use of alternative energy and implementation of low carbon measures in the commercial and residential sectors as a priority, with the potential for 32.7 million tCO₂ emissions reductions across the country by 2030²⁸. Currently, the main factors affecting the selection of mitigation measures are their cost effectiveness in terms of capital investment, operation/maintenance and the level of co-benefits offered.

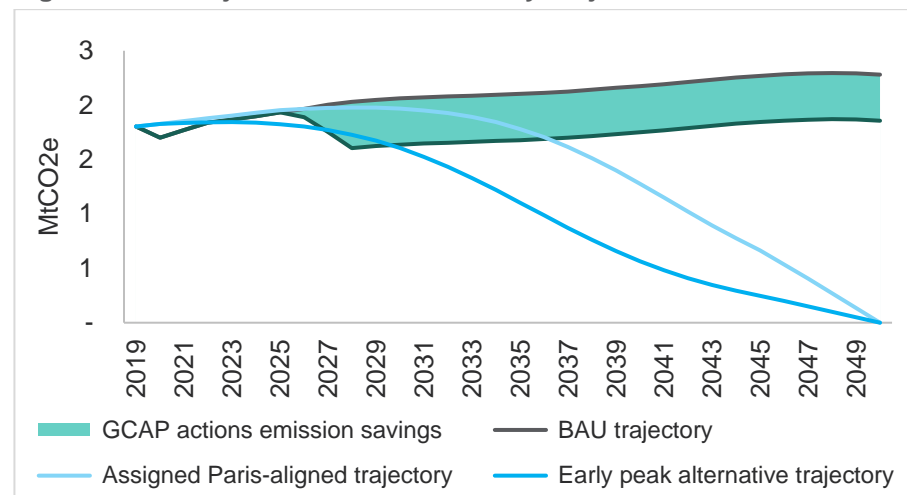
Although there is little data at the GC level, anecdotal evidence suggests that ageing vehicles, outdated equipment in industrial processes, and low building stock efficiency are the major contributors to the City's GHG emissions, with aluminium processing having the highest impact on GHG emissions in GC.

Although there is a lack of data regarding GHG inventories and emission factors in Azerbaijan and Ganja, where possible, an estimation of potential CO₂ saving has been developed for some of the proposed actions. This has

been supplemented by a qualitative assessment, where information regarding the potential decarbonisation measures has been elaborated upon under each action proforma.

Of the actions for which CO₂ reduction potential was calculated, a save 0.42 mega tCO₂e/annum is expected assuming they are fully implemented, see Figure 4-2. This represents 48% of the required emissions reduction targets between business as usual and a Paris agreement-aligned pathway for GC.

Figure 4-2 – Ganja GCAP tCO₂e Summary Trajectories



Source: AtkinsRéalis analysis using EBRD City Emissions Trajectories tool

It is noted that further GHG savings can be achieved by undertaking a shift towards renewable energy sources for the supply of electricity from the national grid resulting in the potential for further decarbonisation.



Actions have been developed to improve the energy efficiency of buildings leading to energy savings, where possible promoting the use of renewable energy in unlocking the potential for affordable and clean energy (see Chapter 7). This will also have a positive effect in reducing GHG emissions and helping to mitigate climate change.

²⁸ ADB, Azerbaijan: Country Environmental Note, (2014), Available at: <https://www.adb.org/sites/default/files/linked-documents/cps-aze-2014-2018-sd-04.pdf>, (Accessed: 10/10/2022).

Gender and Economic Inclusion

Over the past decade, significant efforts have been made across Azerbaijan to mainstream G&EI. Below summarises the main G&EI challenges, these are discussed in further detail in the G&EI assessment (found in Appendix A):

- There are more than half a million internally displaced people (IDPs) in Azerbaijan as a result of the first and second Karabakh wars. GC was severely affected by the second war (September-November 2020). IDPs have often limited access to education, employment, health, housing and protection from gender based violence and harassment (GBVH). IDPs need to be considered when improving accessibility and delivering municipal infrastructure across the City;
- While Azerbaijan has high numbers of girls enrolled in primary and tertiary education, they tend to be concentrated on traditionally female-dominated fields of study (i.e., pedagogy, natural science, culture, and art) and they are underrepresented in the areas of science, technology, engineering, and mathematics, key areas for the green growth transition;
- Despite some improvements in the last few years, women’s participation in decision-making and leadership positions is lagging. GCEA and subsequent municipalities’ positions are primarily held by men; and
- Social norms still impose disproportionate burdens on women in terms of domestic and community work; 92.7% of unpaid household work is undertaken by women. GBVH continue to be a significant barrier to women’s development and empowerment.

The GCAP has taken a comprehensive approach to integrating gender equality and economic inclusion throughout its development. Based on the G&EI Assessment undertaken as part of the BAR and GCAP development, each action proforma includes a summary of G&EI considerations and recommendations to address gender and inclusion in Ganja.

Climate change exacerbates the threat to vulnerable groups, owing to inequalities in the capacity to which people and communities can adapt and protect themselves against its adverse impacts. Disadvantaged groups and communities, such as IDPs in GC, are already affected by poor quality water infrastructure, lack of diversified income sources and assets, and are less able to adapt their livelihoods to risks such as extreme heat and drought. The

GCAP actions and recommendations aim to address inequalities, but also to ensure that vulnerable groups are not further impacted.

Recommendations range from improving the accessibility to services through good design and implementation, training and awareness raising, and ensuring employment is provided to women and IDPs in the City. The outcomes of the GCAP and proposed actions are aimed at making Ganja a more inclusive City, with high-quality infrastructure provisions for all.



Integrating G&EI into the GCAP will help to bring about gender equality within Ganja and help to shed light on gender issues in the country, in particular those relating to the delivery of municipal infrastructure, and thus contribute to SDG 5.

Job Creation and Stimulating the Local Economy

Despite the fall in industrial activity in the City following the collapse of the USSR, nowadays the industry and manufacturing sector not only contribute the highest percentage amount to the City’s GDP, as discussed in Section 2.2.2, but is also the largest employer in the City, employing around 8.8% of the working population. The largest employer operating in Ganja is Azeraluminium, followed by Ganja Auto Plant and Ganja Winery Plant²⁹.

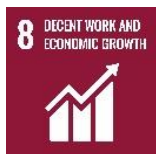
Tourism is another major employer in the City and the wider region. Ganja lies along the Old Silk Road and has a rich heritage, including several assets which draw in tourists from across the country and neighbouring regions. However, assets are threatened by a lack of protection and management. If left unresolved, this could adversely impact the local economy.

The Ganja GCAP therefore looks to propose actions which not only provide environmental benefits but also seek to capitalise on the City’s current economic drivers and assets to stimulate economic growth. The actions would have a direct benefit in creating new green jobs in the region, for example through stimulating the uptake of renewable energy equipment, which would require people to install and maintain these in future or creating a new green industrial park to co-locate businesses and industries. Several indirect economic benefits will also be felt, for example, through increased tourism potential due to improved heritage protection and management, and improving the quality and accessibility of open green spaces across the City. Moreover, the actions will help to develop local skills through, training and

²⁹ Executive Authority of Ganja, *Economic Summary* (2022). Available at: <http://ganja-ih.gov.az/az/page/14.html> (Accessed: 02/09/2022).

capacity building initiatives for Local Government officials and residents, in particularly vulnerable groups such as, women, IDPs and the youth.

As a result of the proposed actions, it is estimated that there are potentially more than 200 new jobs which could be created through the implementation of the actions. This includes permanent jobs (Full-time employees) as part of the O&M of new assets, however temporary jobs during the construction or building phase are not considered. As stated above, several actions will indirectly benefit the local economy and thus have an impact on job creation, although this could not be calculated at the current stage.



The proposed actions will help to stimulate the green economy in GC and lead to the delivery of decent work through the provision of green jobs across all sectors. The economic inclusion of vulnerable groups has also been woven into each sector and action.



The GCAP actions have been developed to maximise smart considerations, ensuring that infrastructure is clean, low carbon and sustainable. Specific actions relating to green industry have been proposed to highlight, and continue, the industrial legacy of GC while ensuring it is clean and sustainable (see Chapter 8).

Smart Technology Opportunities

Ganja is at an early stage in its Smart City maturity (further details provided in the BAR). The City has an aged IT infrastructure network, with limited digital initiatives implemented. The capacity and resources available to City officials and residents is described as low when compared to other urban centres in the country, such as Baku. However, several projects are currently underway that hope to improve the digital literacy and capacity of GC, including the installation of a fibre-optic network to improve internet speeds for residents and businesses by 2025.

The Agency for Innovation and Digital Development (AIDD) under the Ministry of Transport and Digital Development has recently developed and launched a pilot portal for the "Digitalisation of Local Executive Powers"³⁰ intended to streamline Local Government administrative services through the provision of digital alternatives to attending physical Local Government

offices, for example, to acquire personal and property information, and a range of different permits.

The GCAP and its proposed actions have the potential to support an array of smart solutions that contribute to the GCAP vision and strategic goals. Each action considers Smart City solutions and assesses the opportunity to integrate smart solutions to achieve green outcomes, for example, through reducing non-revenue water by installing smart leak detection devices along the potable water network or reducing energy consumption by implementing LEDs, smart meters, renewable energy generation in buildings and smart streetlights. This is presented in each action proforma as part of Chapters 5 to 11. Further detailed information relating to GC's Smart City maturity can be found in the BAR.

Empowered Local Government

Empowered local governments have demonstrated a positive impact on the provision of sustainable infrastructure and citizens' quality of life. While the decentralisation process in Azerbaijan is in the early stages, GC has shown its commitment to a greener urban agenda by signing to the Green Cities Programme and influencing its future urban growth to deliver sustainable low-carbon infrastructure, deploy NBS and invest in climate action. Ultimately, decentralisation will help the GCEA to make informed decisions based on a tailored supply of infrastructure and public services that respond to local demand, and cost-efficient use of public expenditure that will increase cost recovery funding from residents who are willing to pay for better services and promote accountability and transparency. Local authorities such as the GCEA should have sufficient financial and institutional capacity and procedures in place to promote engagement and enable residents to hold institutions accountable for delivering and implementing policies and programmes.





The GCAP presents several supporting and enabling policies and actions, as well as best practice case studies in delivering municipal infrastructure to help transform and strengthen the institutional setup of each sector.

³⁰ Rih.Gov, Digitalisation of Local Executive Powers, (2023), Available at: <https://rih.gov.az/>, (Accessed: 15/08/2023).

Figure 4-3 – Overview of Goals, Actions and Contribution to Co-benefits

GCAP Sector	Goal	Action	Type of action	Climate Resilience	G&EI	Job creation	CO2 saving	Smart solutions	Circular economy/resource efficiency
Land Use/Planning	Ganja will be renowned as a healthy, compact, sustainable place to live, work and visit with a connected network of good quality green spaces accessible to everyone and an efficient system of land uses. Mainstream NBS, environmental and climate aspects into urban development planning, as well as project investment and delivery.	LU1	Improvement of green open spaces and network of green-blue infrastructure	Inv					
		LU2	Urban regeneration and brownfield development	Pre					
		LU3	Heritage Protection and Management Plan	Pol					
		LU4	Spatial Common Data Environment (sCDE) to enhance GIS collation, monitoring and reporting	Inv					
Transport	Improve the existing public transport network and develop a high-quality pedestrian and cycling environment capitalising on the City's compact nature to encourage active travel, creating a pedestrian oriented City. Ensure public transport and active travel network are accessible by all to increase safety and improve mobility.	TR1	Parking control measures and implementation	Pol					
		TR2	Integrated multi-modal transport corridors	Inv					
		TR3	Modernisation and decarbonisation of the bus fleet and Sustainable Urban Mobility Plan (SUMP)	Inv					
Energy and Buildings	Adopt and implement energy efficient technologies to minimise losses and promote the decarbonisation across all types of building stock, industries and energy infrastructure. Maximise the use of renewable energy sources.	EB1	Public buildings renovation scheme	Inv					
		EB2	Private buildings renovation scheme	Inv					
		EB3	District and household heating renewal and decarbonisation	Inv					
		EB4	Modernisation of electricity distribution network	Inv					
		EB5	Smart street lighting	Inv					
Industry	Develop a green industrial sector in the City that fosters economic growth, while minimising environmental degradation by promoting green technology and cleaner production.	IN1	Remediation of contaminated land next to aluminium plant	Inv					
		IN2	Green Industrial Park	Pre					
		IN3	Investing in green aluminium	Inv					
Water and Wastewater	Ensure the 24/7 provision of potable water for all. Ensure the protection of key water resources and the efficient use of these resources. Implement and maintain functioning wastewater treatment plant and network.	WW1	Water and Sanitation Master Plan	Pol					
		WW2	Increasing potable water availability	Inv					
		WW3	Sewerage and Wastewater Treatment Plant	Inv					
		WW4	Upgrade of the urban drainage system	Pre					
Solid Waste	Adopt a circular economy approach by prioritising the 4Rs principles: Reduce, Reuse, Recycling, Recover, while minimising disposal.	SW1	Build new EU compliant landfill and close existing dumpsite	Inv					
		SW2	Combined Materials Recovery Facility and Mechanical Biological Treatment Facility	Inv					
		SW3	Solid waste management strategy	Pol					
Climate and Environmental Governance	Enhance the environmental governance system by improving, modernising and automating the environmental monitoring system and implementing and enforcing policies to protect the local environment. Reduce environmental pollution by strengthening the environmental governance systems, enforcing environmental auditing and reporting, increasing technical capacity, and deploying green technology and green infrastructure projects. Improve resilience to climate change, particularly water scarcity, through coordinated and effective land planning and delivery of infrastructure.	CEG1	Ganja River Management Plan and Urban Green Corridor	Pol					
		CEG2	Disaster Risk Management and Emergency Plans	Pol					
		CEG3	Climate Change Action Plan	Pol					
		CEG4	Enhanced environmental monitoring	Inv					

 Action **directly contributes** to co-benefit, for example by creating permanent jobs, resulting in GHG reductions or implementing smart technologies.
 Action **indirectly contributes** to co-benefit, for example it could lead to the creation of temporary jobs and stimulate the economy, GHG reduction through a behavioural change
 Type of action, Pol = Policy, Pre = Pre-investment, Inv = Investment, and Oth = Other initiative

4.5. Sector and Action Structure

Chapters 5 to 11 present the key sectors, including, Land Use and Planning; Transport; Energy and Buildings; Industry; Water and Wastewater; Solid Waste, and Climate and Environmental Governance. Each sector chapter includes:

- An overview of the sector goal, mid-term targets and proposed action;
- Key stakeholders and their responsibilities;
- Any supporting activities and enabling policies to support the implementation of the proposed actions and improve the functionality of the sector both in GC and in the country, in some cases these activities and enabling policies are targeting change at the national level; and
- Best practices of financial modalities and alternative mechanisms intend to highlight an alternative approach to delivering the actions and organising activities within the sector based on regional land global best practices. Implementing alternative mechanisms and financing options would help to bridge the gap in financing and delivering large-scale infrastructure projects which could otherwise be delivered at a slow pace of not at all.

Actions are presented for each key sector in the form of detailed proformas, in order to provide as much detail as possible on the following information:

- Action description, components and potential location where possible;
- Linkages and synergies with other actions, initiatives and the draft GC Master Plan;
- Stakeholders to be involved and engaged;
- Funding requirements;
- High-level estimate of capital and operational cost (CAPEX/OPEX);
- Timescales of implementation;
- Potential benefits offered – such as G&EI considerations, climate resilience, estimated carbon saving and smart technology opportunities – and how these should be maximised; and
- Case studies of best practice.

The GCAP encompasses 27 packaged actions containing a mixture of policy, pre-investment, investment and other initiatives:

- **Policy** - actions concerned with the development and approval of implementation of strategic documents; legislation, regulation and standard-setting measures; and enhanced governance processes.
- **Pre-investment projects** - pre-feasibility studies, technical studies and environmental/ social assessment of projects intended to unlock future investment opportunities; and
- **Investment projects** - actions focused on capital expenditure to improve the environmental performance of local infrastructure. This includes design, procurement of services, equipment, works, construction, and other implementation activities.

5. Land Use and Planning

Sector goals:

Ganja will be renowned as a healthy, compact, sustainable place to live, work and visit with a connected network of good quality green spaces accessible to everyone and an efficient system of land uses.

Mainstream NBS, environmental and climate aspects into urban development planning, as well as project investment and delivery.

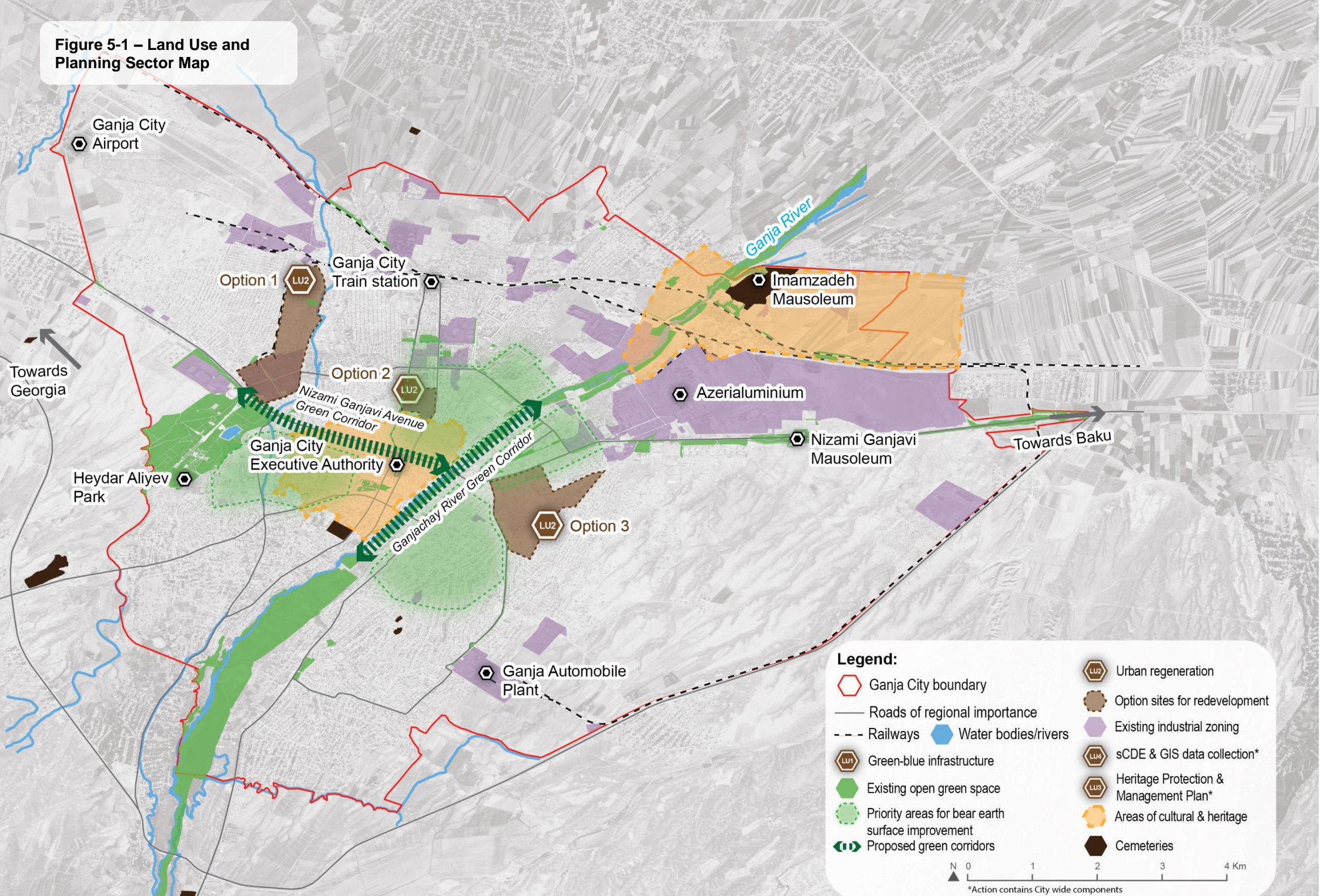


Mid-term Targets	Current value		Target
Population density on urban land (residents/km ²)	2688	↗	4000
Average commuting distance (km)	15.1	↘	10
Percentage of urban development that occurs on existing urban land rather than on greenfield land (%)	n/a	↗	20%
Share of green space areas within urban limits (%)	1.84%	↗	30%

Action Ref.	Action Title	Action Owner	CAPEX (AZN)	OPEX (AZN/Annual)	Linkages ³¹
LU1	Improvement of green spaces and network of green-blue infrastructure	GCEA greening department	9.15 million (Approx. 4.76 million EUR)	78,400 (40,768 EUR)	LU2, TR3, EB5, WW4, CEG3, CEG4, and draft GC Master Plan.
LU2	Urban regeneration and brownfield development	SCUPA	820,000 (426,400 EUR)	N/A	LU1, TR2, WW2, 3 and 4, and draft GC Master Plan.
LU3	Heritage Protection and Management Plan	MC & STA	220,000 (114,400 EUR)	N/A	LU2, EB2, and CEG3.
LU4	Spatial common data environment (sCDE) to enhance GIS data collation and reporting	MENR	650,000 (338,000 EUR)	47,800 (24,850 EUR)	CEG4 and Digitalisation of Local Executive Authorities from the AIDD.

³¹ Linkages to other actions and current initiatives in GC.

Figure 5-1 – Land Use and Planning Sector Map



Legend:

Ganja City boundary	Urban regeneration
Roads of regional importance	Option sites for redevelopment
Railways	Existing industrial zoning
Green-blue infrastructure	sCDE & GIS data collection*
Existing open green space	Heritage Protection & Management Plan*
Priority areas for bear earth surface improvement	Areas of cultural & heritage
Proposed green corridors	Cemeteries

*Action contains City wide components

Source: AtkinsRéalis

5.1. Key Actors and Stakeholders

There are several Ministries and State Agencies involved in the Land Use and Planning sector in Ganja and across Azerbaijan. SCUPA is the main authority involved in setting regulations and creating territorial zoning plans, including the draft GC Master Plan currently under development. SCUPA also provides construction permits for large-scale development in accordance with the draft GC Master Plan. The Ministry of Emergency Situations (MES) and the Ministry of Ecology and Natural Resources (MENR) also have a role to play when issuing building permits, particularly in ensuring health and safety and high environmental standards. The GCEA and Municipalities are key stakeholders in developing plans for the City, as well as developing and maintaining accessible open green spaces in GC. Additional stakeholders and responsibilities are set out in Table 5-1.

Table 5-1 – Stakeholders Involved in the Land Use and Planning Sector

Stakeholder	Role
SCUPA	Central authority implementing policy and regulations related to urban development, spatial planning and architecture. Drives the development, implementation, enforcement and monitoring of strategic plans across Azerbaijan – including General Plans for regions, Master Plans for cities and settlements, and Detailed Plans for neighbourhoods. SCUPA also issues construction permits for large developments.
MES	Issues construction permits for large developments. Also, a key stakeholder when developing strategic plans and offering construction safety advice.
MENR	Issues environmental permits and fines to polluters. Develops and implements State programmes and plans relating to the environment, as well as attracting foreign investment.
GCEA	Issues construction permits for small developments and household applications. Also

	a key stakeholder in developing plans and strategies. The GCEA and Municipalities own public land. GCEA could also operate and maintain open spaces across the City.
Municipalities of Kepez and Nizami	Municipalities as local self-government bodies that share certain responsibilities and functions with the GCEA. This includes implementing urban greening programmes (including planting trees) and maintaining and cleaning open spaces, as well as renting and leasing Municipal land and properties.
Private Developers (e.g., AzVirt LLC, Pasha Construction LLC, and Gailan Holding)	Responsible for the design, construction, and development of real estate including housing, office, and commercial buildings.

Source: AtkinsRéalis analysis

5.2. Supporting Activities and Enabling Policies

- **Develop, implementation and enforcement of strategic planning documents** - are urgently needed. Strategic planning documents such as the regional/general plan, draft GC Master Plan, and detailed plans should be developed, approved and enforced to steer sustainable future development and growth across the City. Ensure these regional and city plans address existing gaps and challenges as well as include environmental protection requirements such as buffer zones along environmentally sensitive areas, restriction of construction in green zones, promotion of compact development through densification in core areas, protection of water reservoirs and water bodies, and avoiding development in flood risk zones. The plans and strategies should also introduce sustainable planning principles, such as transit-orientated development, brownfield development and intensification of land use to avoid urban sprawl;
- **Improve enforcement of national planning regulations, rules and standards** - including the Law on Urban Development and Construction (2012). Appropriate levels of enforcement and development management and controls are needed to proactively shape and guide investment to suitable locations and create jobs, homes and infrastructure. Streamline

the permitting process to ensure appropriate levels of development management and control, as it was highlighted that the current process to apply for building permission is onerous;

- **Develop urban planning and design guidelines** - to aid private developers and investors in interpreting the regulations and the draft GC Master Plan in the local context in order to achieve better design and planning outcomes. This should include guidelines relating to sidewalk and road design to ensure inclusivity and improved pedestrian environment; green infrastructure (GI), NBS and SuDS; architectural vernacular and design; public space and play space design, and health and safety with regards to utilities such as the electricity and gas pipe network;
- **Strengthening the local capacity** - particularly GCEA Territorial Unit and SCUPA regional department to provide them with the necessary resources, tools and capacity to fulfil their role; for example, providing additional resources, staff and job-specific training;
- **Participatory planning and stakeholder engagement** - ensure to involvement of a wide group of stakeholders and interested parties in the development of any plans and actions, making sure to include vulnerable groups; women; IDPs; PWDs; the youth and elderly. Engaging stakeholders is a crucial element of plan creation to ensure that residents' voices are heard and the challenges they face are addressed through the measures, plans and actions proposed;
- **Restrict development around the city** - minimise new development of greenfield land to reduce urban sprawl and the impact of the City on the local environment. Densification of urban areas and development on vacant and brownfield land should be prioritised; and
- **Green and Blue Infrastructure (GBI)** - promote the development of a variety of GI and NBS including, green roofs and walls, increased tree planting, rain gardens, attenuation ponds, bioswales etc., particularly on public land and in public buildings. This could not only provide additional green space and improve biodiversity, but also help to improve building energy efficiency, mitigate the urban heat island effect, and improve the quantity and quality of water resources.

5.3. Best Practice of Financial Modalities and Alternative Mechanisms

The GCEA or Municipalities do not have any credit rating and/or borrowing capacity, which results in the delivery of municipal infrastructure as a State responsibility.

- Fiscal incentives, including for the development of brownfield sites such as tax breaks, grants or expedited approval processes;
- Reform and encourage Public-Private Partnership (PPP) for land use development and regeneration projects. See the example from Baku White City below, where partnerships between the government and the private sector have proved to be a successful mechanism for delivering a widely acclaimed mixed-use development in a prime location;
- Business Improvement District Model: Businesses within a defined area agree to pay an additional tax to fund improvements within the district's boundaries, which could include the development of green spaces; Land value capture mechanisms allow the government to charge fees and taxes to developers and property owners in order to raise revenue that can then be reinvested into community and municipal services³².

Baku White City as best practice for urban regeneration and land use planning

Baku White City has been highly acclaimed as a best practice example of successfully delivering mixed-use development that promotes intensification within the core urban area rather than sprawl. The development is guided by core sustainability principles of transit-oriented development, remediation of polluted land and public-private partnerships³³.

The site is located on the eastern edge of Baku and straddles the main transport corridor linking the capital to its international airport. This 250-ha site was a highly polluted industrial area, which included the world's first onshore oilfield, developed by the Nobel family. This is the largest urban development opportunity in Baku; a city whose population is growing annually by around 0.75%. Azerbaijan Development Company was instructed to be

³² World Resource Institute, 2022. Developing Cities Need Cash, Land Value Capture can Help. Available at <https://www.wri.org/insights/developing-cities-need-cash-land-value-capture-can-help> (Accessed: 11/08/2023).

³³ Baku White City, News – The urban transformation of Baku White City, (2011), Available at: <https://www.bakuwhitecity.com/ru/news/13-the-urban-transformation-of-baku-white-city>, (Accessed: 11/08/2023).

responsible for the design and construction of the new mixed-use development.

Remediation of the land was a key component of the site, in order to ensure it was suitable for future redevelopment. By Presidential Decree to improve the ecological conditions of the site, a plan was undertaken to remove industrial hazards, decontaminate the land and improve the waterfront. The State Oil Company of Azerbaijan (SOCAR), acting through its subsidiary Ekol Engineering Services, oversaw the remediation and restoration of the land³⁴.

The development of the site has been guided by a detailed master plan and set of design guidelines which are underpinned by the principles of transit-orientated development and employment-led development, with a new central business district situated at the centre of the site above a new Metro station. Today the site has been transformed to host several mixed-uses,

Figure 5-2 – Satellite Image of Baku White City

including office and commercial spaces estimated to provide 48,000 new jobs. Around 75% of the project is residential, creating a new community of approximately 20,000 new households and a population of 50,000.

A network of green boulevards and interconnected public squares and parks offers residents a range of accessible open green spaces, as well as the transformation of the waterfront along the Caspian Sea for leisure and tourism.

Similarly, its prime location along the waterfront and proximity to Baku city centre have justified the successful implementation and intensification of White City, reducing the reliance on private cars, promoting cycling and walking and reducing the need for land to be developed outside the city core area.



Satellite image 2014



Satellite image 2023

Source: Esri World Imagery Wayback

³⁴ Baku White City, Introduction, (2023), Available at: <https://www.bakuwhitecity.com/en/page/1-introduction>, (Accessed: 11/08/2023).

LU1 | Improvement of green open spaces and network of green-blue infrastructure Investment

Impact: Increased quantity and quality of open green spaces. Capitalisation of ecosystem services. Improved access to all. Increased climate resilience. Improved social equity through the provision of enhanced services. Potential for job creation. Potential GHG reduction of 5.2 tCO₂e per year.

Ganja currently has limited publicly accessible green spaces, 6.8 m²/capita representing only 1.84% of the total land use and existing green spaces are poorly connected. Open green spaces are mainly concentrated around the City centre or further to the east or west, such as Heydar Aliyev Park or around Nizami Ganjavi Mausoleum, which are harder to access by foot. Moreover, green spaces within residential areas are made up of bare earth surfaces with limited vegetation and facilities such as playgrounds, pitches and sports facilities.

The aim of this action is to increase the quantity and quality of green space by rehabilitating existing spaces, creating new ones, and connecting them through GBI and NBS. Many examples around the world have demonstrated the multifaceted ecosystem benefits provided by GBI, including improved environmental quality, increased biodiversity, improved flood and drought management, carbon sequestration opportunities and reduction of the urban heat island effect. GBI also provides socio-economic benefits for local communities such as better air quality, the creation of more attractive and comfortable environments that promote social interaction and walkability, which will ultimately improve the physical and mental health of such communities.

Enhanced maintenance and protection of green spaces from uncontrolled development is also a key part of the action, in order to ensure there is no loss of or impact on the quality of green space as the City continues to develop.

Figure 5-3 – Typical open space lacking greenery and facilities



Source: AtkinsRéalis site visit

Components:

- Undertake a detailed study of existing green spaces, including their quality, accessibility and connectivity;
- Develop a plan and supporting design guidelines to identify opportunities to implement GBI and NBS across the City, including reforestation activities with native tree species, green corridors, green roofs and walls, and SuDS (e.g., retention ponds, bioswales, filter drains and permeable paving);
- Carry out the pilot schemes to showcase the benefits of improving green spaces.

Pilot schemes

- Detailed design and implementation of a **green corridor along a section of Nizami Ganjavi Avenue**, connecting Heydar Aliyev Park with the central cluster of green spaces and the Ganja River at the Nizami Ganjavi Avenue bridge (approximately 3.5 km). The land upon which Nizami Ganjavi Avenue sits is state-owned. This green corridor connects Heydar Aliyev Park with the centre of the City and Ganja River. It should include improvements to the pedestrian network and street furniture, street trees and SuDS (such as swales, rain gardens and retention ponds) where possible. The green corridor should also look to connect to some of the inner-City parks such as the Khan Gardens; and
- **Rehabilitation of existing open green spaces** and poor-quality earth surfaces around multifamily residential areas, schools playgrounds and parks (total area to rehabilitate of 10 ha). The open spaces around multifamily residential areas (including parks and playgrounds) are public land, primarily state-owned and maintained by the GCEA. This should include the creation of new green spaces where there are large extents of earth surfaces to include native planting, SuDS and NBS, spaces for social gatherings and community events, and play and sports equipment. This would also help with rainwater absorption and water retention, as well as reduction of sediment erosion and the risk of flash flooding. This project should also consider regular maintenance of green spaces.

Links with other actions and initiatives:

- LU2 – The green corridors will link up some of the proposed sites for brownfield development and regeneration;
- LU4 - Information relating to the quality and accessibility of green spaces should be linked to the sCDE to ensure key information relating to their accessibility is available to all.
- TR2 – Improving connectivity, walkability and mobility along Nizami Ganjavi Avenue;
- EB5 – This action should also incorporate smart solar street lighting;
- WW4 – Incorporate SuDS in the design and implementation of green corridors and green spaces to aid with surface water drainage;
- CEG1 – creating a network with Ganja river and the proposed green corridor along the river within the urban area;
- CEG3 – Action will directly help to aid with climate resilience in the City;
- CEG4 – This action will help to increase biodiversity in the City; and
- Draft GC Master Plan – The action aligns with and will help to implement the ambition of the Master Plan to increase green space, sports and play facilities across the City.

Key stakeholders and responsibilities:

- GCEA and Municipalities (Greening department) – **Implementation agency** as the main authority in implementing greening projects and maintaining existing green spaces;
- SCUPA – Stakeholder and potential partner in developing plans for new GI and NBS following the draft GC Master Plan;

<ul style="list-style-type: none"> • MENR – Stakeholder and owner of data regarding environmental conditions; • Azerbaijan Ground Transport Agency (AYNA) – Stakeholder and potential partner in implementing GBI and NBS along streets and transport corridors, in particular the green corridor along a section of Nizami Ganjavi Avenue; and • General public – Stakeholder in developing plans and ideas for new GBI and NBS as well as enhancement of existing bear earth surfaces across GC. 			
<p>CAPEX (AZN): 9.15 million (Approx. 4.76 million EUR)</p>	<p>OPEX (AZN): 78,400 (40,768 EUR)</p>	<p>Potential funding sources and revenue generation State budget. International Finance Institution (IFI)/Donor Agencies. Climate funds. Potential for leasing land within parks and green areas for commercial units and F&B outlets.</p>	<p>Timeframe for implementation 2024 – 2025 - Short-term, undertaking studies and creating plans; and 2026 – 2028 (onwards) - Medium to long-term, implementation of plans and interventions.</p>
<p>Notes on cost estimate (AZN): 50,000 - to undertake a comprehensive study of existing green spaces; 100,000 - to create a plan, strategy and design guidelines for green spaces; 4 million - associated with Green corridor Nizamin Ganjavi (3.5km) (including street furniture, rewilding / native trees and SuDS); 5 million – for 10 ha rehabilitation and improvement of green spaces (including greening areas, re-surfacing, street furniture, rewilding / native trees and SuDS). Costs of implementing green space can vary widely depending on a number of factors including scheme location, need to acquire land, materials, options, street furniture and rewilding / native trees (OPEX includes staff costs at 6 x FTE for maintenance of open green spaces and replanting where necessary).</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Detailed study to gain a comprehensive understanding of the current situation, including, mapping and identification of priority locations (linked to Climate Resilience Plans, for example, to understand areas of flooding, and LU4 to inform the web map); • Detailed tailored design for particular locations based on international best practices; • Determining land ownership and acquiring land if needed; and • Environmental impact studies. 			
<p>G&EI considerations and benefits Universal design principles should be used and adhered to when designing and adapting open green spaces to improve their quality. This means making the spaces accessible to all, including those with mobility, visual, and hearing impairments.</p>	<p>Climate resilience considerations By improving existing green spaces, providing new spaces and creating a network of green spaces across GC, this action will contribute to climate resilience in different ways. The Ganja green corridor will act as a multi-functional space that can also present flood resilience benefits, while increasing shading and cooling</p>	<p>Potential GHG reduction of 5.2 tCO₂e per year. Taking into account several assumptions (see Appendix C), it is expected that 2 ha of the pilot area (totalling</p>	<p>Smart considerations The information from the web-map including accessibility, environmental assets could inform the design of future green spaces, equally green spaces, green corridors and flood risk</p>

<p>The needs of different vulnerable groups (such as girls and PwD) should be considered while designing and implementing open green space projects. This includes providing accessible pathways, seating, and amenities, as well as ensuring that the spaces are safe and secure for all by equipping the spaces with CCTV cameras and good-quality lighting during evening hours to help address safety concerns for women and girls.</p> <p>There is an opportunity to increase employment opportunities for women, IDPs, and PwD by creating jobs in the green spaces sector, such as gardening, maintenance, security and the supply chain sector. It is also important to remove any barriers that prevent these groups from getting jobs.</p> <p>Develop interventions to prevent, mitigate and report GBVH which can occur in these spaces. This could include training staff on prevention and response to GBVH and harassment, providing support services for survivors, and raising awareness of GBVH and harassment in the community.</p> <p>Engage the local community in the design, maintenance and surveillance of green spaces. This can help to create a sense of ownership and responsibility for the spaces and make them more likely to be used and enjoyed by everyone.</p> <p>Improved existing green spaces can also foster social interaction among community members. This can have a positive impact on mental and physical health, especially for vulnerable groups.</p>	<p>areas will reduce the urban heat island effect and the impact of extreme temperatures, thereby decreasing the energy demand for cooling buildings. Additional green spaces will also help with water attenuation and improved surface water management through the implementation of SuDS and GBI.</p> <p>Native plants and tree species should be used in the planting, which will increase the abundance of flora and fauna.</p> <p>The action will also have a positive impact on the well-being and health of residents by increasing access to nature. Multiple studies and examples around the world have shown that living near green and blue infrastructure has a positive effect on mental and physical health. The green spaces should be open and accessible to all.</p> <p>The action will prioritise the use of sustainable, locally sourced materials in the construction and maintenance of the green spaces, reducing their environmental impact;</p>	<p>10ha) could be dedicated to tree planting, hence 5.2 tCO₂e per year reduction is expected from implementation of this activity³⁵.</p> <p>Tree planting and green areas will capture carbon dioxide from the atmosphere. Further sequestration is possible through other NBS implemented as part of the action.</p>	<p>areas should be presented in the sCDE (LU04)</p> <p>The action will also integrate smart technology to optimise its efficiency, sustainability, and social cohesion such as CCTV surveillance and smart Irrigation sensors that will be used to create an automated irrigation system. These sensors will collect real-time data on soil moisture and temperature – ensuring the health of the green spaces, optimising water usage, and reducing waste.</p> <p>Integrating smart solar street lighting (linked to EB5): The project will incorporate solar power lighting, if possible, to reduce carbon emissions.</p>
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³⁵ It should be noted that for these trees to make a significant impact on emission reduction, they will need to be mature for at least 15 years with full reductions likely not realised until 25 years +.

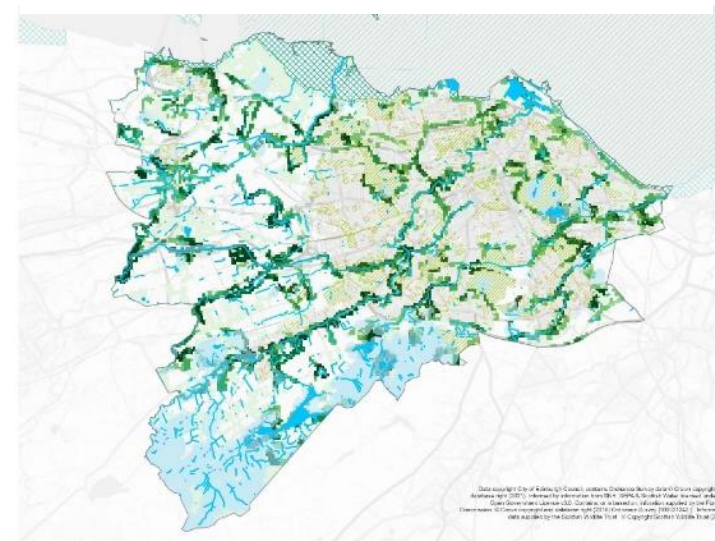
Case Studies

Assessing the green-blue network in Edinburgh, United Kingdom³⁶

The City of Edinburgh faces many climate-related risks, including urban flooding and the urban heat island effect. Using a GIS-based approach, utilising existing GIS data from stakeholders and its repository, the city undertook a comprehensive assessment of local flood risk and surface water flow paths, ecosystem services provided by its existing green-blue infrastructure, including mapping noise, recreation, biodiversity and land capacity for carbon sequestration, and identifying opportunities for improvement in its green blue network. The aim of implementing such an approach was to:

- Provide a framework to identify opportunities to integrate NBS in the city at a strategic and local scale;
- Bring together information from Edinburgh Council and key stakeholders on environmental green-blue assets, climate risks, active travel and social data;
- Safeguard and enhance a network of strategic green-blue corridors;
- Support and inform future planning and investment decisions;
- Promote joint working between partnership agencies; and
- Identify opportunities to:
 - Provide environmental, social and economic benefits for people and wildlife;
 - Sustainably manage water and flood risk; and
 - Future proof the City against the effects of climate change.

Figure 5-4 – Edinburgh Green Blue Network



Source: Landscape Institute

³⁶ Landscape Institute, Mapping the vision for a beautiful sustainable city, (2021), available at: <https://www.landscapeinstitute.org/blog/mapping-the-vision-for-a-beautiful-sustainable-city/>, (Accessed: 11/05/2023).

Connecting Nature Poznań, Poland^{37, 38}

Although the City of Poznan is rich in open green spaces, these are unequally distributed. The City lacks quality green spaces in its densely built-up historic districts and around tenement buildings across the City. The City also faces several climate-related challenges including heat waves and periodic flush flooding, which can be exacerbated by a lack of green spaces and hardened bare soil surfaces which limit water infiltration and retention.

Over the past decade, a number of NBS have been implemented across the City to tackle the unequal provision of open green space and climate-related challenges. These have included:

- Street greening and maintenance programmes since 2003;
- Wetland restoration to create new nature reserves, including the Żurawiniec Nature Reserve;
- The ‘Gardens’ programme, to establish community gardens on vacant and neglected land, and the ‘Change your backyard’ programme, a community lead initiative to green bear soil surfaces around tenement buildings;
- Warta River restoration and beach redevelopment to assist with flood mitigation; and
- The Szachty post-industrial zone redevelopment programme led to the creation of multiple lakes and wetland areas.

Stakeholder engagement and communication among implementing agencies has been a key success factor in ensuring NBS implemented and well-integrated with the existing urban fabric to capitalise on their multiple benefits.

Figure 5-5 – Nature improvements in Poznań



Source: Network Nature

Grey to Green – UK’s largest SuDS integration project, Sheffield, United Kingdom³⁹

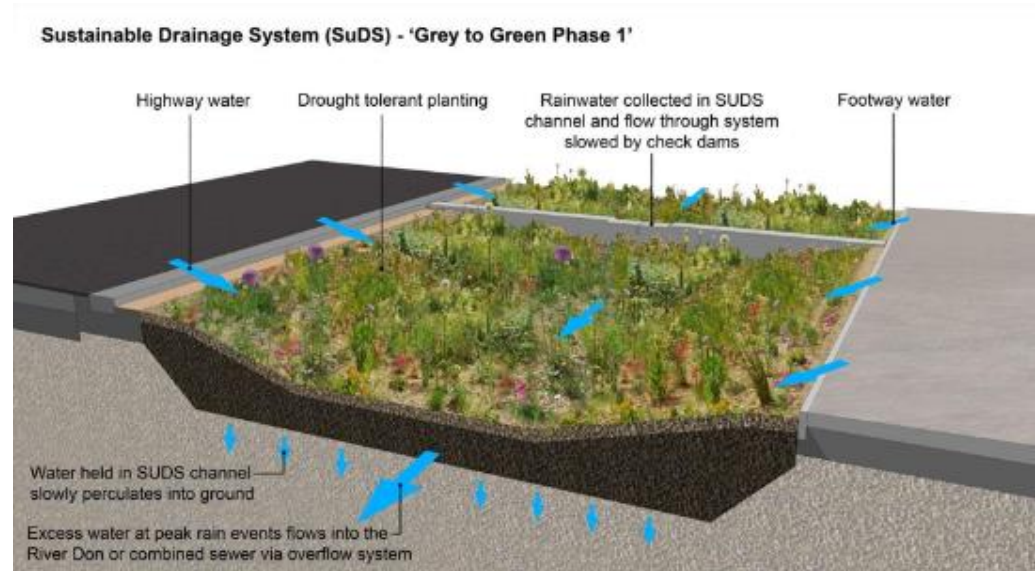
A 1.6km stretch of road in Sheffield was redeveloped to integrate bioswales, rain gardens and street trees into the urban fabric. The SuDS and green infrastructure introduced provide multiple benefits, including, water management, mitigating air pollution and improving mental and physical health.

³⁷ YouTube, Cities With Nature, UrbanbyNature@Caucasus Steps 2: Front runner city: Poznan NBS case, (2020), Available at: <https://www.youtube.com/watch?v=0xJ7TB71B6U>, (Accessed 22/06/2023).

³⁸ Network Nature, Poznan Nature-based Solution Exemplar Case Study, (2023), Available at: <https://networknature.eu/casestudy/24518>, (Accessed 22/06/2023).

³⁹ Nigel Dunnett, Grey to Green, (2023), Available at: <https://www.nigeldunnett.com/grey-to-green-2/>, (Accessed: 22/06/2023).

Figure 5-6 – SuDS Implemented as Part of the Grey to Green Project



Before:



After:



Source: Nigel Dunnett

LU2 Urban regeneration and brownfield development	Pre-investment
<p>Impact: Promoting brownfield development and avoiding urban sprawl. Increased access to sustainable housing provision. Increased green spaces. Potential job creation and revenue generation. Stimulating local economic growth and business opportunities. Improved social equity.</p>	
<p>The fall of the USSR and economic downturn in the 1990s resulted in the closing down of several large industries across Ganja. This has resulted in vacant sites scattered across the City. Various sites have become derelict and pose a safety concern as buildings are at risk of collapse. However, some of these vacant sites present an opportunity to revitalise and densify the inner core of the City, capitalising on their location close to the centre of Ganja.</p> <p>This action aims to identify sites for redevelopment, densification and regeneration, and unlock their future potential by developing business cases for their future uses, along with detailed master plans. Vacant sites located close to the inner core will assist in densifying the City while reducing urban sprawl and greenfield development. Identifying the potential future uses of the site (such as re-establishment of previously shut-down industries), and providing additional housing, commercial and office space (as well as open green space) will also contribute to job creation and enhance citizen quality of life.</p> <p>Components:</p> <ul style="list-style-type: none"> • Undertake a study to assess and identify potential vacant sites to be redeveloped and densified across the City; • Identify and assess the necessary interventions that will unlock the sites’ full potential, for example, options for land remediation, accessibility assessments, topography and geotechnical interventions, environmental impact assessments and resettlement plans or developing enabling infrastructure before bringing the site into use. Accessibility to the site should consider sustainable modes of transport; • Undertake a demand and supply study for various sectors, including housing, commercial, office and industrial space to understand what the City is currently missing; • Develop an options appraisal for the sites’ future use, for example industrial (potentially re-establishing shut-down industries such as the confectionary, porcelain, and other industries); residential, commercial and office (which can generate future job creation and revenue), and community infrastructure. Target investment in modern, green and efficient technologies; • Develop detailed master plans for the redevelopment of the site. Alongside the identified potential future uses, these should consider opportunities to maximise urban greening, sustainable drainage and water retention, deliver sustainable mobility options, enhance biodiversity and increase climate resilience; • Identify procurement modalities for the construction, management and operation of the sites depending on the future use; and • Undertake the above-mentioned studies and components in one of the identified derelict industrial sites or pilot scheme locations suggested below. <p>Three vacant sites with greater potential to be developed have been identified, owing to their close location to the city centre, size, accessibility to public transport and rail, and accessibility by foot. All three sites are in close proximity to the City centre and could therefore be redeveloped into a high-quality mixed-use development – offering new housing, as well as opportunities for work, services and commercial, entertainment options and green spaces.</p> <p>All three sites identified are within State-owned land and contain a number of buildings that need to be appraised for potential re-use. For the redevelopment of the sites, remediation is essential prior to any development due to their past industrial use. Moreover, two of these sites (Site Option 1 and 2) have been identified for regeneration purposes in the draft GC Master Plan.</p> <p>Site Option 1 – Derelict industrial area along Nizami Gajavi Avenue, in front of Heydar Aliyev Park, with a total area of circa 157ha. Potential to be developed as a mixed-used area, integrating action IN2 - green industrial park (focusing on SMEs and light industries as compatible uses with residential), with residential</p>	

development along the rest of the site. Proximity to the train station is an advantage, however, the site lacks water and sewerage infrastructure. The site is located along the proposed TR2 – multi-modal transport corridor, which will improve accessibility and promote the use of NMT to and from the site.

Site Option 2 – Derelict industrial area along Heydar Aliyev Street which sits opposite the Ganja tax administration office, with a total area of circa 29ha. The site has a number of buildings with potential heritage value, which should be appraised to be restored and integrated into the design. This should follow the guidance developed as part of LU3. Furthermore, the site is centrally located and along one of the TR2 – Integrated multi-modal transport corridors.

Site Option 3 – Military site located in the east of Ganja, with a total area of circa 155ha. The site is located relatively close to the centre and along one of the TR3 - urban transport corridors. The site could be redeveloped as a mixed-use area to consolidate the residential offer, with the potential for provision of student accommodation due to the proximity to universities, as well as green spaces and commercial uses. The draft GC Master Plan has indicated that future residential development should be located on the east of the city, and this site could help to contain growth within key areas rather than continue sprawling.

Links with other actions and initiatives:

- LU1 – The proposed development sites should incorporate NBS;
- LU4 - Brownfield sites, derelict and vacant land could be linked to the web-map
- TR2 – The proposed options are located along the proposed multi-modal transport corridors, these should be integrated into the design of the sites to promote active travel;
- WW2 and WW3 – All sites should be connected to the water and wastewater network;
- WW4 – Redevelopment should incorporate SuDS and appropriate drainage to limit surface water flooding; and
- Draft GC Master Plan – The action aligns with and will help to implement rezoning, densification and redevelopment principles embedded in the Master Plan to densify the City.

Key stakeholders and responsibilities:

- SCUPA – **Implementation agency** – To coordinate and detailed master plans for the vacant land identified, these should be aligned with the draft GC Master Plan. Provide any future permits for construction;
- GCEA and Municipalities – in collaboration with SCUPA, could be the implementation agency. To be consulted during the development of the plans and their implementation. Potentially owners of land designated for redevelopment.
- Private developers and real estate agencies – To be consulted and provide insight into the property market to ensure the best use case is proposed for the sites. Potential future implementation partners during the reconstruction of the site;
- MNER – Provide any environmental permits required during construction and operation. To be consulted to ensure no negative environmental effects as a result of the new development;
- MES – Provide health and safety permits for construction and operation of the sites if required;
- SCPI – Manage the State properties, therefore should be consulted; and
- Utility companies – To be consulted in the development and implementation of plans as well as to provide improved energy, water, wastewater and drainage services to the site.

<p>CAPEX (AZN): 820,000 (426,400 EUR)</p>	<p>OPEX (AZN): N/A</p>	<p>Potential funding sources and revenue generation State budget. IFI/Donor Agencies. State and Municipalities leasing land to private developers; property and taxes, rental of buildings and units.</p>	<p>Timeframe for implementation 2024 Identification of sites and feasibility studies, 2025 finalise detailed master plans; and 2025 -2028 (onwards) - Medium to Long-term, implementation of plan, remediation measures and redevelopment of sites.</p>
<p>Notes on cost estimate (AZN): 80,000 - undertake a detailed assessment of vacant sites; 40,000 - undertake assessment of necessary actions to remediate site (remediation cost could estimated to be around 20k EUR/ha); 50,000 - infrastructure and accessibility assessment, including to identify if industrial infrastructure can be retained due to heritage; 650,000 - strategy to develop options for future use, business cases and detailed master plan for a pilot site. Implementation of the pilot is not included in the cost.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Detailed understanding of land ownership; • Undertake a demand and supply study for various sectors, including housing, commercial, office and industrial space to understand what the City is currently missing; • Environmental and social impact assessment and resettlement plans. The results of the plans should inform the land use proposals in the developed master plan; • Infrastructure and accessibility assessment for each site before defining future land uses and developing a master plan; and • Government to partner with developers, since urban regeneration and construction of real estate require large investments. Such investment can be provided by private developers while the Government can finance and provide related infrastructure needs and upgrades. 			
<p>G&EI considerations and benefits This action will develop real estate including, housing and provision of affordable housing, commercial, offices, etc. and densify areas near the City centre. This will attract new businesses and investments, creating economic opportunities and jobs. There are many opportunities to enhance the public realm, as well as the amount and quality of open green spaces. This includes opportunities to make the public realm more user-friendly and accessible, for example</p>	<p>Climate resilience considerations The plan for brownfield sites should include strategic use of SuDS and green spaces should be incorporated as much as possible – including native trees, green roofs, bioswales and others – in order to help mitigate the urban heat island effect, reduce surface water flooding and enhance the city’s biodiversity.</p>	<p>Potential GHG reduction No direct GHG reduction impact. However, the project will contribute to reduced congestion, and emissions and improved air quality by promoting sustainable modes of transport. Active travel should be prioritised and promoted as part of the redevelopment, to minimise private car use.</p>	<p>Smart City considerations The action will include Smart City technologies in line with other actions: Integrating smart solar street lighting (linked to EB5): redevelopment should include solar-powered lighting where economically viable, to reduce carbon emissions; Smart utility sensors and energy efficiency in buildings (linked to EB2): New development should be of high energy efficiency and employ the latest technology to monitor resources;</p>

<p>through introducing wheelchair ramps and good quality lighting, thereby enhancing the vibrancy of the urban environment. The project will result in a more liveable City, with better accessibility and enhanced green spaces.</p>	<p>There is likely to be a better understanding of the risk profile of brownfield sites, and a greater opportunity to contribute to the resilience of the City than the development of new greenfield sites and associated supporting infrastructure.</p>	<p>The future development should be low/carbon neutral and deploy technology to enhance resource efficiency and limit carbon emissions where possible.</p>	<p>Sustainable Materials: The project will prioritise the use of sustainable, locally sourced materials during construction, which will reduce its environmental impact; Other technologies could be solar PV and solar water heaters, CCTV surveillance, electric vehicle charging points and carpooling schemes for residents, as well as the inclusion of cycling and pedestrian-friendly streets within the development. Information relating to the brownfield sites could be linked to the web-map, and equally sCDE could also inform the design and redevelopment of the brownfield sites.</p>
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Case Study

Coal Drops Yard, Kings Cross, United Kingdom⁴⁰

Coal Drops Yard forms the centrepiece of the wider King’s Cross Central development in London and today functions as a cultural and shopping hub, offering visitors several food and beverage outlets alongside several high-quality public spaces used for events and other activities. The wider development is a positive example of transforming a once heavily polluted rail yard into a thriving mixed-use development.

Many of the original structures and buildings on the site, such as the historically significant frames of the gasholders and other brick buildings, have been restored and offered a new lease of life by being transformed into multi-family residential buildings, shopping facilities and a campus for the University of the Arts London.

⁴⁰ The Architectural Review, The experience is everything: Could Drops Yard, London, by Heatherwick Studio, (2019), Available at: <https://www.architectural-review.com/buildings/the-experience-is-everything-coal-drops-yard-london-by-heatherwick-studio>, (Accessed: 11/08/2023).

Figure 5-7 – Photos of Kings Cross and Coal Drops Yard Before and After Development



Source: The Architectural Review

LU3 Heritage Protection and Management Plan	Policy
<p>Impact: Increase in tourism stimulating local economy and business leading to job creation. Engagement of community-based organisations (CBO) and vulnerable groups. Increased awareness of rich local heritage and cultural history.</p>	
<p>Ganja is a city rich in history and heritage. The City lies along the Old Silk Road and served as a key destination for merchants following the route, which facilitated the exchange of goods and culture in the region. GC was home to the poet Nizami Ganjavi, an influential 12th-century Azerbaijani poet whose final resting place can be found at the Nizami Ganjavi Mausoleum in the east of the City. There are several cultural and heritage sites and buildings across the City including the medieval castle walls, the Shah Abbas Mosque built in 1606 and old bath houses. However, A lack of holistic management practices and protection, coupled with urban growth, is threatening the quality and integrity of historic and cultural assets in Ganja.</p> <p>Therefore, this action aims to develop a holistic heritage protection and management plan to revitalise historic assets across the City and ensure their protection and sustainable management. This action seeks to enhance and safeguard local heritage assets while helping to develop the tourism offering, as well as offering the potential for job creation.</p> <p>Components:</p> <ul style="list-style-type: none"> • Undertake a comprehensive assessment of existing heritage assets across the City, their current quality and value. Develop an understanding of the current conditions, as well as measures implemented to protect and enhance heritage assets. This should also include an assessment of the intangible heritage such as customs and traditions, fairs and events and handcrafts linked to the Old Silk Road; and • Develop a holistic heritage protection and management plan, considering the findings of the assessment and highlighting the benefits of protecting and managing the heritage sustainably. <p>Potential interventions could include:</p> <ul style="list-style-type: none"> • Buffer zones and restrictions at key historic locations across the City, e.g., around the City Centre, the Nizami Ganjavi Mausoleum, Old City in the northeast, surroundings of the Old Silk Road and important cemeteries; • Develop opportunities to celebrate cultural heritage experiences i.e., tours, handcraft fairs and events; • Restrict the use of cars within key historic areas; • Heritage design guidelines to protect and improve the vernacular architecture of buildings; and • Improve local wayfinding through maps and signposts of key historic locations. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • LU3 – Conservation and protection of industrial buildings with cultural and heritage significance; • EB2 – Potentially undertaking retrofitting of existing heritage buildings to improve their energy and resource efficiency; and • CEG3 – In terms of incorporating policies and actions to improve the climate resilience of historic assets and the potential to decarbonise buildings. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • Ministry of Culture (MC) and State Tourism Agency of the Republic of Azerbaijan (STA) – Implementation agency (in cooperation with the SCUPA). To develop the heritage management and protection plan in line with the draft GC Master Plan; 	

<ul style="list-style-type: none"> GCEA and Municipalities – Key beneficiaries of the development of the plan and potential implementation agency of the plan. Owners of buildings, assets and land of historic and cultural value; MENR and MES – To be consulted during the development of the plan. Potential holder of data related to cultural assets and their condition; Small and Medium Enterprises (SME) and local businesses including, tourism agencies, hotels, tour operators, retail and food and beverage outlets – Stakeholders in developing the plan and potential partners for actions. Potentially owners of heritage assets which need to be protected; UNESCO – Protection and management plan should be aligned with the UNESCO Silks Roads Programme since Ganja is one of the cities located along the route and a historic trade spot with heritage values; NGOs and CBOs – Could be involved in the implementation of actions and solutions; State Committee on Property Issues (SCPI) – To be consulted due to the management of State property which may have historic and cultural value; and Universities and Academia – Potential owners of data as part of research activities undertaken by students and faculty relating to cultural heritage, as well as potential owners of property with historic and cultural value. 			
CAPEX (AZN): 220,000 (114,400 EUR)	OPEX (AZN): N/A	Potential funding sources and revenue generation State budget. IFI/Donor Agencies. Increase in tourism potential.	Timeframe for implementation 2026 – 1 year to undertake analysis and develop a plan; and 2026 onwards - 2-5 years to implement measures and enforcement where necessary – subject to improvement of transport, water and energy infrastructure and approval of the draft GC Master Plan.
<p>Notes on cost estimate (AZN): 50,000 - study assessment of historic assets. 100,000 - develop the management plan and measures (for reference, the average cost for development of a Neighbourhood Plan in the UK is around 50,000 EUR). 30,000 - wayfinding maps to be installed. 40,000 - development of app.</p> <p>The cost for O&M of assets should be estimated by the heritage management plan.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> Approve the draft GC Master Plan; Improvement of water, energy and transport infrastructure should be undertaken first, as better infrastructure will enable tourism development and will attract more tourists to visit the city; and Understanding of the UNESCO Silk Roads Programme. 			
G&EI considerations and benefits The plan should ensure that benefits for vulnerable communities are maximised and their potential contribution to the intangible culture in the City (such as handcrafts and	Climate resilience considerations No direct impacts on climate resilience, however, the effects of climate change on heritage assets should be considered when	Potential GHG reduction No direct GHG reduction impact.	Smart City considerations There is a potential to develop a digital app or platform to showcase the heritage values, provide details of the history of

<p>specific cultural events) is highlighted to help preserve their cultural identity.</p> <p>CBO and vulnerable groups should be engaged to understand how they use heritage assets and their views on how these should be protected and managed. Special attention should be given to vulnerable groups (such as IDPs, women, PwD and the youth) to ensure they actively participate in plan creation and directly feel the benefits of the plan, for instance through future jobs (e.g. tour operators), fostering of social equity and enhanced inclusivity.</p>	<p>developing the plan – for example, protecting assets from localised surface water flooding.</p> <p>Without specific consideration of the impact of climate change on key heritage sites, it will be difficult to fully protect and rejuvenate them.</p>		<p>the City, suggest walking routes along key heritage locations and integrate with wayfinding maps. The app could also include information about local businesses, products and handcraft outlets. Publish a calendar of intangible cultural heritage events to attract visitors all year-round.</p>
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Case Studies

Walled City of Baku, Azerbaijan⁴¹

The Walled City of Baku was inscribed on the UNESCO World Heritage List in 2000 and formally protected by Presidential Decrees in 2005 and 2007. In 2007, the Administration of the State Historical-Architectural Reserve “Icherisheher” was established, which developed an Integrated Area Management Action Plan (alongside a Conservation Master Plan) for the Walled City. These plans sought to establish a long-term conservation strategy to protect the immediate heritage assets and its buffer zone. The Conservation Master Plan included a framework to document and monitor the state of conservation, set standards and procedures to regulate the rehabilitation of existing buildings and future construction, maintain and improve public spaces, improve the quality of life, and organise and manage a programme of community outreach.

The Walled City plays a key role in attracting local and international tourists to Baku and features as one of the top tourist destinations on many travel websites. Over time, several interventions have been implemented to improve the visitor experience and heritage value of the Walled City, these include:

- Signage for key heritage assets and locations to visit. This aids with wayfinding and navigating around;
- Segregated general and recyclable waste bins;
- Restricted private vehicle access through the implementation of checkpoints and gates with limited parking availability; and
- Supporting artisan traders and local crafts, such as carpet making and local food and beverage facilities.

Figure 5-8 – Photos from Walled City of



Source: AtkinsRéalis site visit

⁴¹ UNESCO World Heritage Convention, Walled City of Baku with the Shirvanshah’s Palace and Maiden Tower, (2023), Available at: <https://whc.unesco.org/en/list/958/>, (Accessed: 11/08/2023).

Historic areas of Istanbul, Turkey⁴²

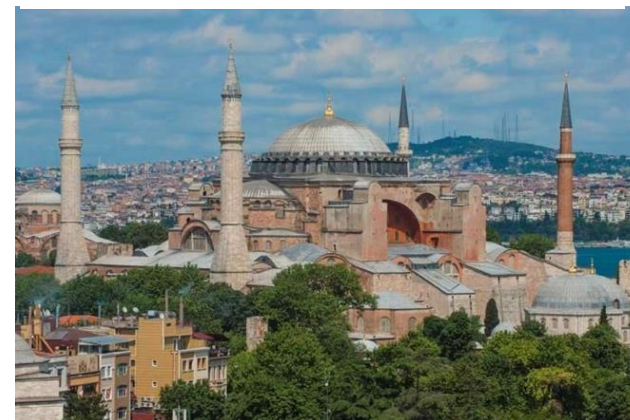
In total, there are four historic zones found in the centre of Istanbul which have been on the UNESCO World Heritage List since 1985. These represent outstanding universal value and include many monuments, places of worship and buildings of architectural value from the 14th to the 17th century. The zones are protected under national legislation and any alterations or changes to registered buildings and conservation sites must be approved by a dedicated Conservation Council.

The first Conservation Plans were approved in the early 1980s and have since evolved to protect additional assets and the skyline as a whole. The latest iteration of the Conservation Plan is currently being prepared with the aim to:

- Reduce traffic across the designated zones;
- Undertake urban regeneration and tourism management activities; and
- Provide a framework to ensure the provision and construction of necessary municipal infrastructure.

The Plan will also include policies and standards for restoring and rehabilitating assets, managing stakeholders and responsibilities, improving accessibility and visitor management, enhancing the quality of life for residents, raising awareness and providing tailored training. The measures put in place have made Istanbul a major tourist destination and showcase the city and its approach to conserving culture and heritage as a best practice example for others.

Figure 5-9 – Historic Mosque in Istanbul



Source: UNESCO World Heritage Convention

⁴² UNESCO World Heritage Convention, Historic Areas of Istanbul, (2023), Available at: <https://whc.unesco.org/en/list/356/>, (Accessed: 11/08/2023).

LU4 Spatial Common Data Environment (sCDE) to enhance GIS collation, monitoring and reporting	Investment
<p>Impact: Improved monitoring of environmental assets. Increased awareness of environmental conditions and empowerment of citizens and local businesses.</p>	
<p>This action aims to enhance Geographic Information System (GIS) data collection and monitoring, develop a spatial common data environment (sCDE) to store GIS data and create a publicly accessible web-map to aid the visualisation and dissemination of geospatial information to local stakeholders. The sCDE will function as a place to store GIS data relating to the City and act as a single database for all geospatial information.</p> <p>A key activity to kickstart the project will be the digitalisation of the tree inventory. Capturing information on the 240 ancient Sycamore trees designated as national monuments should be prioritised and later progress onto other trees across the GC. This will assist with their protection, management and implementation of enforcement measures. Additionally, the inventory will help to inform the public of the co-benefits to the urban environment, such as increased biodiversity, better-quality green spaces, GHG reduction, and monetary value associated to wider eco-system benefits.</p> <p>Currently, GIS data is owned and compiled by SCUPA and other Ministries. This action will enhance collaboration across public stakeholders to exchange geospatial data and better cooperation among institutions to create an integrated database centred on land uses, growth areas, utilities and transport infrastructure, natural environment and historic assets. as well as planning documentation and procedures. The GIS data and web-map should also be used to provide evidence and inform plans, policies, strategies, and investment decisions – taking into account local environmental challenges and climate risks. The sCDE and web-map will require regular updates and maintenance to ensure they display correct and up-to-date information.</p> <p>Components and steps for implementation</p> <ol style="list-style-type: none"> 1. Develop a protocol to share GIS data between stakeholders including the GCEA departments, Ministries and State Agencies, non-government organisations (NGOs) and academic institutions. This should also include developing an Environmental Information Management System to ensure stakeholders are in agreement and understand international best practices for storing and sharing GIS data (including standardisation of metadata, such as naming conventions, geographic projection, and attribute features); 2. The sCDE should be established as a central repository of geospatial data, which will enable continuous monitoring and evaluation of environmental data, land use, utilities and transport infrastructure and encourage intersectoral coordination; 3. Alongside the development of the sCDE, activities relating to enhancing the digitalisation of spatial data and collection of GIS data from different stakeholders should be undertaken and input into the sCDE, this includes transport, utilities, hydrology, contaminated land sites, community and public facilities, environment, green spaces and protected areas, biodiversity, demographics and socioeconomics, land use types and ownership, cadastral information, buildings and historic sites, topography, areas at risk, environmentally sensitive areas, etc.; 4. Once the platform is well developed, the sCDE can be integrated into the GCEA website as a web-map to disseminate geospatial information which can be accessed by stakeholders and the general public to view and utilise when needed; <ul style="list-style-type: none"> • Create new GIS data and uploading it into the sCDE and web-map – including the digitalisation of the trees inventory, as well as digital inventories of flora and fauna, climate risks and other environmental assets. The web-map could have a dedicated section or page to publishing information on environmental rules and regulations, sustainability news, events, etc.; and • Finally, undertake training sessions for GCEA members and Government stakeholders on digital and GIS data and the use of the sCDE and web-map. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • CEG4 – Will automatically feed data into the sCDE. However, Government staff will need to validate and check computer errors; and 	

- Pilot initiative to digitalise the Local Executive Services from the AIDD⁴³. Since the launch of the pilot, approximately 200,000 users and 150,000 applications across several cities have been received, demonstrating its potential to encourage citizens' participation in the provision of public services and improve local governance. Further work is recommended to identify the applicability and usability of the portal and its potential linkages to the sCDE for the dissemination of information to the public.
- Many of the actions will result in data which can be spatial and geolocated, this should be incorporated into the sCDE and web-map, for example, energy audits, green certificates of buildings, information regarding bus lanes and parking, green corridors, etc.

Key stakeholders and responsibilities:

- MENR (including the Geodesy and Cartography Agency)– **Implementation agency** in cooperation with the AIDD from the Ministry of Digital Development Transport (MDDT). MENR is the main environmental authority in GC, hence the main holder of environmental data, and main authority of map development and cartography;
- AIDD – Potential partner in implementing the action. The Agency was created in 2021 with the overall responsibility of organising, coordinating and implementing activities in the field of digital government, digital society, innovation and testing practices of high technology. AIDD provides assistance and funding in the acquisition of state-of-the-art technologies and technological solutions, as well as training;
- GCEA – Main beneficiary and a contributor to data collection and monitoring. The GCEA website could host the web-map;
- Municipalities – Beneficiaries and consultees in collecting environmental data, monitoring and the development of the web-map;
- SCUPA – Currently the main owner of geospatial data in Ganja, the main entity responsible for land use planning and construction;
- State Statistical Committee (SSC) – Owner of socio-demographic, economic and environmental data to be incorporated in the sCDE and web-map;
- SCPI - Owner of relevant data, such as the national cadastre and real estate information; and
- Universities and Academia – Potential owners of data as part of research activities that could inform the sCDE and web-map. Could potentially assist with data collection and undertake surveys.

<p>CAPEX (AZN): 650,000 (338,000 EUR)</p>	<p>OPEX (AZN)⁴⁴: 47,800 (24,850 EUR)</p>	<p>Potential funding sources and revenue generation: State budget. IFI/Donors Agencies. Local businesses and events advertising on web-map.</p>	<p>Timeframe for implementation: 2026-2027 (subject to fibre optic network completion); and Long-term - O&M</p>
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Notes on cost estimate (AZN): 350,000 - developing sCDE and web map including coding. 150,000 - initial data gathering, field surveys, and GIS data digitalisation, 50,000 servers, equipment, PCs. 100,000 - capacity building and training sessions for Government staff on system operation and data uploading,

⁴³ Pilot portal to engage LEA available at <https://rih.gov.az/>.

⁴⁴ Inflation and cost of living is not considered for year calculations / OPEX. This applies to all actions.

approximately 10 sessions for 20 staff for half a day. 20,000 / year - for regular surveys of biodiversity, birds, flora, etc. which could be carried out by universities. 5,000 - for yearly maintenance of web-map and server. 22,800/year – on 2 x full time employees (FTE) to manage and maintain database, upload new info, etc.

Pre-requisite and steps for implementation:

- Undertake a comprehensive investigation into the reliability, accuracy and availability of GIS data held by various stakeholders;
- Understand how data is exchanged across departments at the local level and between State Agencies and Ministries;
- Develop protocols for sharing data if non-existing;
- New data collection and validation process;
- Preparatory work on IT infrastructure including ongoing deployment of fibreoptic internet network (to be finished by 2025);
- Digital capability of personnel including GIS data production, data management and storage, hence capacity building for Government staff and potentially upskilling local citizens on digital technologies are needed; and
- Identify opportunities to expand the scope of services offered by the online portal of Digitalisation of Local Executive Services in line with the sCDE, for example: 1) Submit complaints and suggestions on environmental issues such as air pollution, tree falling, etc., 2) Incorporating digital fee payment services for utilities and local services such as waste collection, 3) Incorporating transport and travel information, e.g., digital bus timetables, live bus locations and travel times based on traffic and demand, and 4) Potentially incorporating the web map developed as part of action.

<p>G&EI considerations and benefits</p> <p>A web-map hosted on the GCEA website would allow for the provision of targeted geospatial information to vulnerable groups, for example, information related to the accessibility of green spaces, location of public toilets or the extent of the bus network and which routes may operate during evening and early morning hours.</p> <p>It is important to note that some vulnerable groups may have challenges in accessing the internet or lack digital literacy, therefore targeted training and support on the use of the web-map should be offered to upskill local citizens where possible. This should also take into account people with different impairments and learning styles, such as</p>	<p>Climate resilience considerations</p> <p>This system will provide the foundations for increased city capacity with regard to climate resilience, for example by enabling the dissemination of climate-related information, such as the location of areas at risk of flooding. This will not only help to inform citizens of potential climate risks but also inform developers and future development plans, policies, strategies and investment decisions in identifying areas not suitable for development, as well as where mitigation measures should be considered.</p> <p>A central repository and monitoring system of biodiversity, protected areas and green public areas in GC will</p>	<p>Potential GHG reduction</p> <p>No direct GHG reduction impact.</p> <p>However, this action will improve the monitoring of carbon emissions to inform policymaking and investment.</p>	<p>Smart City considerations</p> <p>Collecting GIS data, developing an sCDE and creating a web-map is inherently a smart initiative.</p> <p>This system will also enhance and facilitate effective monitoring and evaluation.</p> <p>Development of the fibre-optic internet network across Ganja (to be fully operational in 2025) will be crucial for unlocking the full potential of digitalisation and smart maturity.</p> <p>Targeted training and capacity-building sessions will empower GCEA, Municipalities and other Government stakeholders to use digital initiatives and become part of their day-to-day.</p>
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<p>those with learning difficulties or audio/visual impairments. The sCDE will promote effective communication of geospatial information relating to the City with residents. There is also potential for job creation regarding data collection and server maintenance.</p>	<p>provide information on the status of endemic and endangered species, pressures from human activities and the impacts of urban development on flora and fauna. It will also facilitate integrated planning to enhance biodiversity and environmental protection.</p>		<p>By utilising sCDE to store GIS data, the GCEA will be able to make more effective management decisions. This will also help increase cybersecurity and strengthen the capacity of municipal enterprises to face growing challenges.</p>
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Case Studies

Digital spatial initiatives across London, United Kingdom⁴⁵

The Greater London Authority has conducted a comprehensive digital mapping exercise of key assets, plans and urban challenges across the city. The data gathered has been uploaded onto a publicly accessible website with the aim of helping communities, planners and the Mayor of London’s office to understand the city in a greater level of detail. The open-source data is critical to delivering projections in areas such as economic growth, local labour market, population dynamics and environmental challenges. The source of data assists with developing future policies and plans to manage growth across the city. In recent years, tools have been developed to aid with the identification and implementation of social funds across the city, for example, ‘social impact bonds for children on the edge of care’. Some of the web maps and data services available include:

- Environment challenges including, air quality, flooding and road noise layers;
- Digital and ICT connectivity;
- Green coverage, canopy coverage and green infrastructure;
- Predicted energy use by property;
- Infrastructure development and investment;
- Social infrastructure including schools, markets and open spaces; and
- Planning data.

Figure 5-10 – London Planning Data



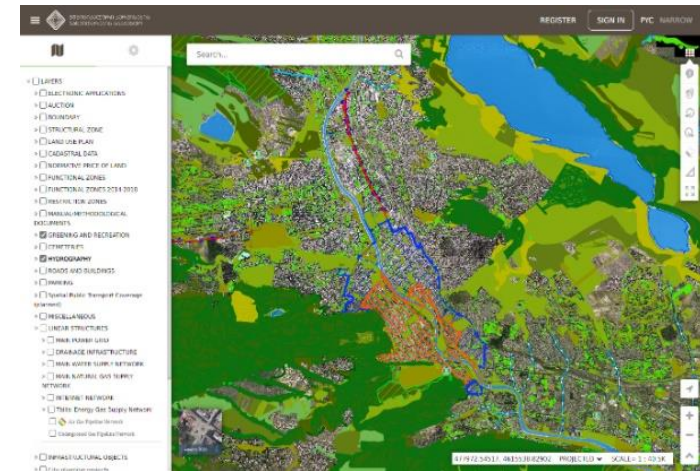
Source: Mayor of London

⁴⁵ Mayor of London, Our Strategy, (2022), Available at: <https://www.london.gov.uk/what-we-do/research-and-analysis/our-strategy>, (Accessed: 11/05/2023). Link to Map - [Planning Data Map \(london.gov.uk\)](#).

Interactive web-map for Tbilisi, Georgia⁴⁶

The Municipal Service Development Agency developed an interactive web-map for Tbilisi which displays a number of key layers including current land use, linear infrastructure (such as roads and power lines), and water and gas networks. In addition, the web-map displays key planning designations, such as the historic centre of Tbilisi, as well as planned projects for the city to inform residents of upcoming changes.

Figure 5-11 – Tbilisi Data Map



Source: Maps.Tbilisi.gov.ge

⁴⁶ Maps.Tbilisi.gov.ge, Interactive web-map for Tbilisi, (2023), Available at: <https://maps.tbilisi.gov.ge/?token=null#/C=44.7807474-41.7138468@Z=14>, (Accessed 22/06/2023).

6. Transport

Sector goals:

Improve the existing public transport network and develop a high-quality pedestrian and cycling environment, capitalising on the City's compact nature to encourage active travel and create a pedestrian-oriented City.

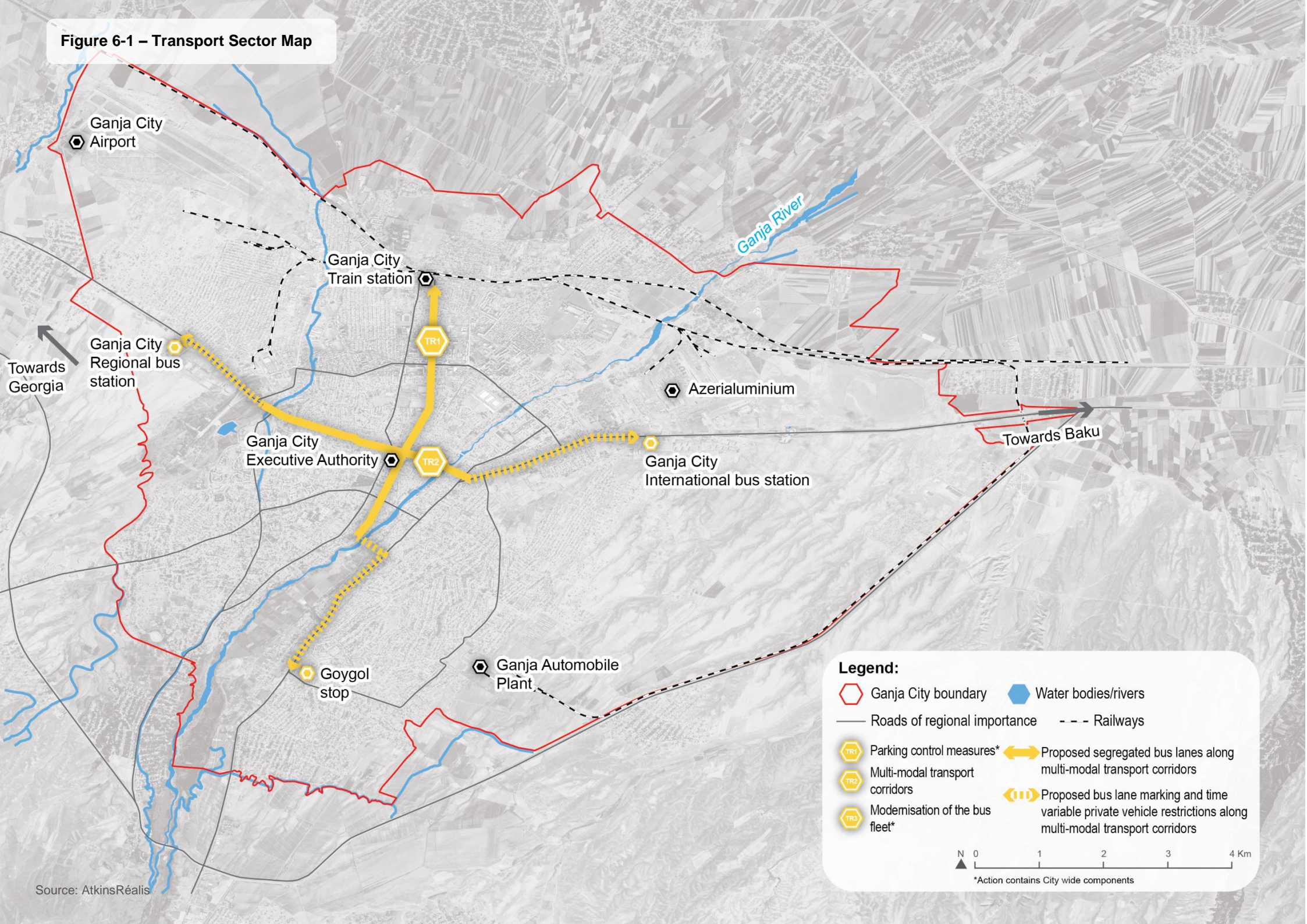
Ensure public transport and active travel network are accessible by all to increase safety and improve mobility.



Mid-term Targets	Current value		Target
Average age of car fleet total and by type (years)	12	↘	10
Transport modal share (% private transport)	25%	-	25%
Kilometres of road dedicated exclusively to public transit per 100000 population (km)	0	↗	10
Kilometres of road dedicated exclusively to cycle paths per 100000 population (km)	0	↗	15

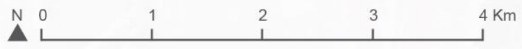
Action Ref.	Action Title	Action Owner	CAPEX (AZN)	OPEX (AZN/Annual)	Linkages
TR1	Parking control measures and implementation	AYNA	2 million (Approx. 1.04 million EUR)	88,400 (45,968 EUR)	LU2 and TR2.
TR2	Integrated multi-modal transport corridors	AYNA/ AARSA	12.68 million (Approx. 6.59 million EUR)	126,865 (65,970 EUR)	TR1, LU1 and 2, WW2, 3 and 4, EB5, and draft GC Master Plan.
TR3	Modernisation and decarbonisation of the bus fleet and Sustainable Urban Mobility Plan (SUMP)	AYNA	42.91 million (Approx. 22.3 million EUR)	4.29 million (Approx. 2.2 million EUR)	TR2, EB5, AYNA upgrade plans and draft GC Master Plan.

Figure 6-1 – Transport Sector Map



Legend:

- ⬡ Ganja City boundary
- ⬢ Water bodies/ivers
- Roads of regional importance
- Railways
- TR1 Parking control measures*
- ➡ Proposed segregated bus lanes along multi-modal transport corridors
- TR2 Multi-modal transport corridors
- ⏸ Proposed bus lane marking and time variable private vehicle restrictions along multi-modal transport corridors
- TR3 Modernisation of the bus fleet*



*Action contains City wide components

6.1. Key Actors and Stakeholders

At the national level, policy and regulation for the transport sector are developed by the MDDT and its agencies – for example, the AYNA deals with regulations relating to roads and road transport and have a remit in maintaining sidewalks and own transport infrastructure across the City. Public transport in GC is provided by several private bus operators who receive licences to operate on different routes through the City. Additional information is provided in Table 6-1.

Table 6-1 – Stakeholders Involved in the Transport Sector

Stakeholder	Role
MDDT	Implements elements of State programmes and works with other relevant State Agencies to deliver plans and projects across the transport sector. The Ministry also works to attract investment in the transport sector.
AYNA	This legal entity regulates road transport to meet the needs for road transport services across Azerbaijan, controls compliance with rules and requirements related to international and domestic passenger and cargo transport, as well as provides regulatory legal acts in this field. Also manages the bus network in Ganja. They are also the owner of transport infrastructure, such as bus stations and stops, and approve and controls parking zones across the City and maintains sidewalks.
Azerbaijan Automobile Road State Agency (AARSA)	Deals with the automobile road industry and all relevant work relating to the construction of bridges, tunnels and highways. The Agency also controls, protects, maintains,

	repairs and upgrades road infrastructure across the country.
Private Bus Operators, e.g., Simurq and Azər Avto Nəqliyyat.	Operate bus fleet and services in Ganja.

Source: AtkinsRéalis analysis

6.2. Supporting Activities and Enabling Policies

- **Promoting EVs and sustainable fuels** - Investment and adoption of EV charging infrastructure across the country, more stringent inspection for emission-quality for private vehicles, enforcement of vehicle and traffic offences (in particular for old and polluting vehicles), implementation of consumer incentives such as purchase grants, registration tax to encourage use of sustainable mobility. Efforts are currently underway to prepare a National Electromobility Plan which will help with identifying necessary actions⁴⁷;
- **Introduce, develop and enforce standards and guidelines for mobility planning, parking and street design** - In support of efforts to build green and inclusive cities and communities, it is necessary to change the focus of the function of streets, with people in mind instead of cars. The development of inclusive design accessibility guidelines and standards will ensure design, construction, adoption and maintenance of streets and the public realm promote inclusivity and safety for all. These guidelines should introduce parking landscaping standards to encourage greening and SuDS. Similarly, pedestrian accessibility within transport hubs (i.e., bus stations) should be in line with work being carried out by AYNA and ensure easy pedestrian movements. Bicycle infrastructure, such as covered and secure bicycle parking, should also form part of the guidelines to encourage people to cycle during commutes and daily life. Obligations for real estate developers regarding solutions for parking, greening and SUDs must be considered as part of the standards and regulations to obtain permits for design and construction;
- **Better services** - More frequent, reliable, comfortable and accessible buses will increase ridership of public buses. This in turn improves the

⁴⁷ This plan was proposed as part of the "Socio-Economic Development Strategy of the Republic of Azerbaijan in 2022-2026" approved by the Decree No. 3378 of the President of the Republic

of Azerbaijan dated July 22, 2022; At the time of writing, a tender for the plan was created and released and a consultant has been appointed to develop the plan.

financial performance of the bus company, allowing sustainable financing of new capital investments. Increased fares (in line with affordability analysis) further enhance revenue but must be implemented alongside better services to attract customers from minibuses;

- **Smart technology** - Private sector participation and innovation using smart apps and real-time information provide opportunities for improved service provision and revenue potential. Recommendations for each action are described below – such as real-time passenger information, electronic boards, card payment, parking apps and smart traffic management systems; and
- **Awareness raising** - Relating to the benefit of public/active transport and reducing the use of private vehicles.

6.3. Best Practice of Financing Modalities

Introduce Infrastructure Design-Build-Operate forms of contracting to facilitate private sector involvement in large infrastructure projects. In this case, the concessionaire is given a long-term contract to design, build and operate a public transport system, and the contractor owns fare revenue. At the end of the contract period, the asset is then transferred to public ownership, while further options for private sector operation remain.

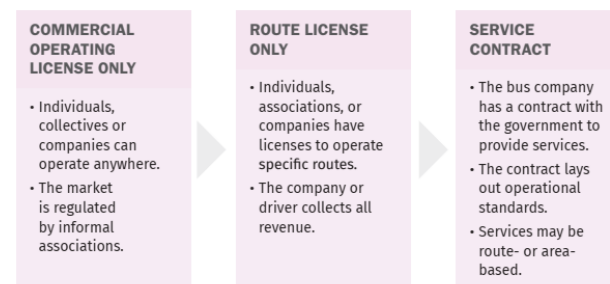
Improvement of planning and management regulations of public transport services to enable PPP and revenue generation – including longer concessions and contracts for public bus operators to ensure financial sustainability, introducing legislation that allows strict parking regulation and management, fare collection and partnership with private sector operators. Both on-street and off-street parking offer revenue generation potential. On-street parking can be regulated by the MDDT and GCEA, with PPP options to include private sector partners in delivery. Off-street parking can be fully private sector-led, depending on the ownership of private lots and land outside of direct control from the GCEA or Municipalities.

Bus reforms are needed to drive change – buses are the dominant public transport system across cities in developing countries, such as Ganja.

Reforms to bus services are urgently needed to provide reliable, safer and high-quality services as well as address environmental pollution. The reform process will impact the institutional, regulatory, and operational structure as well as the planning, procurement, operation, monitoring and evaluation of the bus systems. Reforms may include changes in⁴⁸:

- New roles and responsibilities, contract arrangements for public and private operators;
- Route integration and route optimisation based on travel patterns, congestion levels, availability of infrastructure and distribution of population;
- Financial optimisation including tariff policy, integrated fares, concessions, automated fare collection; and
- New operating model – Public transport services can vary from completely unregulated minibuses to sophisticated government public service contracts with internationally competitive, modern companies. Within service contracts, there are variations in contracting, payment and incentivisation mechanisms to improve service quality, profitability and financial risk sharing between private/public sectors. Figure 6-2 outlines the Institute for Transportation and Development Policy’s (ITDP)⁴⁹ typical forms of regulation of private sector operators.

Figure 6-2 – Typical Forms of Regulation of Private Sector Operations



Source: ITDP

⁴⁸ Adapted from, EBRD, [Driving change: reforming urban bus services](#), (2019).

⁴⁹ ITDP, Quick Guide to Bus Sector Modernisation, (2020), Available at: <https://africa.itdp.org/publication/quick-guide-to-bus-sector-modernisation/>, (Accessed: 16/08/2023).

TR1 Parking control measures and implementation	Pre-investment
<p>Impact: Reduced air pollution and improved air quality. Reduced road congestion. Improved road and public safety. Possibility of revenue generation from parking fees. Possible private sector participation and job creation. Direct GHG emissions reduction (although not quantifiable at this stage).</p>	
<p>Measures to deal with and optimise parking along integrated multi-modal transport corridors (TR2) transecting the City (including Nizami Ganjavi Avenue, Haydar Aliyev Avenue and Nariman Narimanov), with a focus on restricting parking and reducing the availability of long-stay parking in strategic areas of the City centre. Introduction of parking charges and enforcement, dedicated parking facilities for load/unload deliveries, smart parking fees, use of smart apps and controlled parking zones (CPZ).</p> <p>A parking strategy including parking demand surveys and traffic impact studies will be necessary to ensure suitable parking supply remains available to match demand.</p> <p>Component 1 – Restriction of on-street parking at key locations</p> <p>Restriction and removal of on-street parking will allow for the reallocation of road space for use by non-private vehicle modes, with shared spaces, prioritisation and improved public realm, based on a sustainable transport network hierarchy.</p> <p>Clear signage and road markings are needed to inform the public and support enforcement.</p> <p>Component 2 – Creation of off-street alternatives</p> <p>On-street parking restrictions can be offset through the utilisation of undeveloped land plots in the City centre. Aligned to vacant sites identified as part of action LU2 or new development, these off-street sites can either be temporary (using land being earmarked for development) or permanent sites such as commercial buildings where available. These can be managed privately or publicly, offering revenue generation potential.</p> <p>Incorporate a minimum number of EV charging points, both on-street and off-street (both public and private facilities).</p> <p>Removal of parking on main arteries in the City will free up road space for use by sustainable modes. In addition, this will also enhance road safety, reduce congestion, improve movement of public transport and promote non-motorised transport. Regulation of parking offers significant potential for private sector participation and revenue generation.</p> <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • TR2 – This measure is the first stage in road space optimisation and should be implemented in sequence with TR2; and • LU2 – Off-street parking can be provided within vacant sites identified in LU2. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • AYNA – Implementation agency. Authority in controlling and regulating on-street parking; • MDDT – Implementation agency in collaboration with AYNA. Provides advice and guidance for plan, design and implementation of measures; • Private sector landowners and developers – Owner of land suitable for off-street parking facilities, with the potential to charge of parking and collect revenue; and • GCEA and Municipalities – Owner of land with the potential to be used as off-street parking. To be consulted and informed when developing plans and strategies. 	

<p>CAPEX (AZN): 2 million (Approx. 1.04 million EUR)</p>	<p>OPEX (AZN): 88,400 (45,968 EUR)</p>	<p>Potential funding sources and revenue generation GCEA budget. Private sector (off-street lot particularly). PPP model for privately operated, public-determined on-street regulation. Formalised, regulated parking can provide a reliable revenue stream through parking charges.</p>		<p>Timeframe for implementation 2024 - feasibility study including parking demand surveys and traffic impact studies, and approval of legislation where required; and 2025 – implementation.</p>
<p>Notes on cost estimate (AZN): 650,000 – for pre-investment including, parking surveys and master plan; 1,350,000 - for increased road markings, physical signage, safety and security measures and payment infrastructure; 68,400 - for new operators to control and enforce parking regulations based on 6 x FTE; 20,000 - regular maintenance of infrastructure.</p>				
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> Development and implementation of the SUMP. 				
<p>G&EI considerations and benefits Accessibility and inclusivity must be incorporated into any parking solution, e.g.,</p> <ul style="list-style-type: none"> Clear signage and universal usability; Safe, secure and good quality lighting; Parking permits and concessions for vulnerable social groups (elderly, limited mobility, lower income groups, and IDPs); Provision of suitable numbers of disabled bays at all controlled parking sites; and Opportunities to involve vulnerable groups including women and IDPs as parking wardens exist creating job opportunities for those groups. 	<p>Climate resilience considerations Include trees and other NBS to promote shading and permeable paving for urban water management within parking areas (to be linked with LU1). Additionally, potential to incorporate covered shading including solar energy generation.</p>	<p>Potential GHG reduction Direct GHG reduction is possible, although not quantifiable at this stage. However, parking regulation should promote a modal shift to more sustainable modes. Removal of on-street parking will improve traffic flows and reduce emissions from congestion. Potential to reduce emissions further by removing parking spaces, thereby disincentivising car use and promoting public transport use and active travel, reducing emissions.</p>	<p>Smart City considerations There are several opportunities to incorporate smart considerations including public information boards informing availability of parking spaces, a parking app to provide information on available spaces, online payments and smart parking apps, inclusion of EV parking spaces as a minimum standard. CCTV, video and app-based licence plate recognition enforcement of parking violations</p>	
<p>Case Study</p>				
<p>Zonal parking scheme in Kyiv, Ukraine⁵⁰ Uncontrolled on-street parking had plagued the city of Kyiv for a number of years before the City took decisive action to resolve this challenge. A study commissioned for the City was undertaken in 2016 to identify the main causes of the problem, as well as to offer solutions and quick wins which the City could</p>				

⁵⁰ ITDP, Parking recommendations for Kiev Lessons for all (2016), Available at: <https://www.itdp.org/2016/01/28/parking-recommendations-for-kiev-lessons-for-all/>, (Accessed: 16/08/2023).

implement to better manage parking and resolve the identified challenge. Basic improvements in the dissemination of information to the public through awareness campaigns, leaflets and mapping exercises were implemented to inform the public of general parking rules and standards. Furthermore, a zonal parking scheme was introduced – consisting of a tiered parking structure, with higher charges and restrictions on the historic centre (Zone I), with incrementally lower charges in Zones II and III. This change was also accompanied by the provision of off-street paid parking and a digital platform in the form of the ‘Kyiv Digital App’ to help drivers identify where parking spaces are available and allow them to pay the associated charges depending on the zone and duration of their stay. The results associated with the implemented measures have been linked to a better quality of life and improved transport provision for citizens.

Figure 6-3 – Map of Kyiv Parking Restrictions and Kyiv Digital App



Source: Kyiv City, Visit Ukraine and Behance

TR2 | Integrated multi-modal transport corridors Investment

Impact: Reduced air pollution and increased air quality. Improved access to sustainable and safe mobility by enhancing NMT provisions for all and promoting active travel. Reduced congestion. Reduced reliance on private cars. Direct GHG emissions reduction (although not quantifiable at this stage).

This action aims to build, implement and enforce integrated multi-modal transport corridors in order to re-accommodate and prioritise space for sustainable transport modes such as walking, cycling and public transport. Improving road corridor layouts will reduce reliance on private car usage along key corridors in the City. It will also promote connectivity between key transport nodes (bus stations, train station and the historical centre) and enhance road safety, whilst reducing congestion, improving movement of public transport and promoting non-motorised transport.

Component 1 – Iterative pedestrian network enhancements

Provision of good quality connected pedestrian facilities on routes in the City centre and key arteries. Through the SUMP (TR3), identify areas based on traffic volumes, accident rates and connectivity with important economic drivers. Once improvements to the parking network across the City have been made (TR1), identify and implement car-free/limited zones, where the use of cars is restricted and pedestrian movement is prioritised, such as public squares in the City centre. Proposed pedestrian network enhancements cover around 34 km of City centre streets.

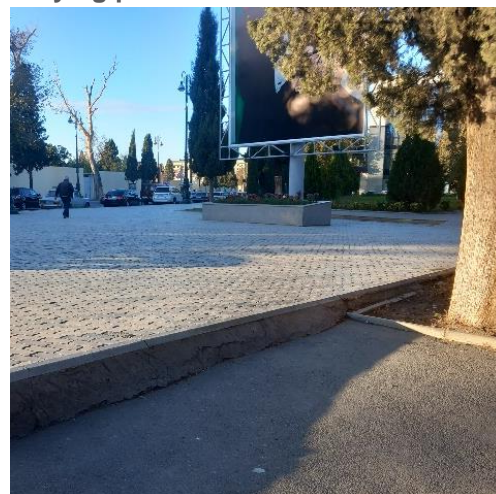
Examples of the poor pedestrian network are presented in Figure 6-4. Pedestrianisation options can range from affordable initiatives like kerbing, tactile pavement, street furniture, and wayfinding and signage; to more permanent options, such as street crossing. The intention is to allow for continuous pedestrian movement and ensure pedestrian routes are accessible by everyone (including PWD, women with children in buggies and the elderly).

Figure 6-4 – Examples of the pedestrian network in GC.

Uneven and elevated paths



Varying pavements



Poor quality access ramps.



Source: AtkinsRéalis site visit

Component 2 – Cycling network investment

Implement cycling infrastructure across the City, connecting key areas and providing cycle parking facilities. Development of a coherent, integrated City-wide cycle network that links residential areas with the City centre and key destinations such as schools, universities, markets, public institutions, parks and public squares, entertainment areas and employment. Installation of new cycle parking facilities including secured/covered cycle parking spaces in parks, public institutions, markets and retail areas which all link with the cycle route network.

Cycle networks can be implemented on high-traffic streets with good segregation to promote the safety of users, but are also equally implementable on streets with low traffic volumes/speeds and designed to give cyclists travel priority. These streets use signs, pavement markings, and speed and volume management measures to discourage car journeys and create an integrated and comprehensive City-wide network with safe, convenient bicycle crossings on major, busy streets.

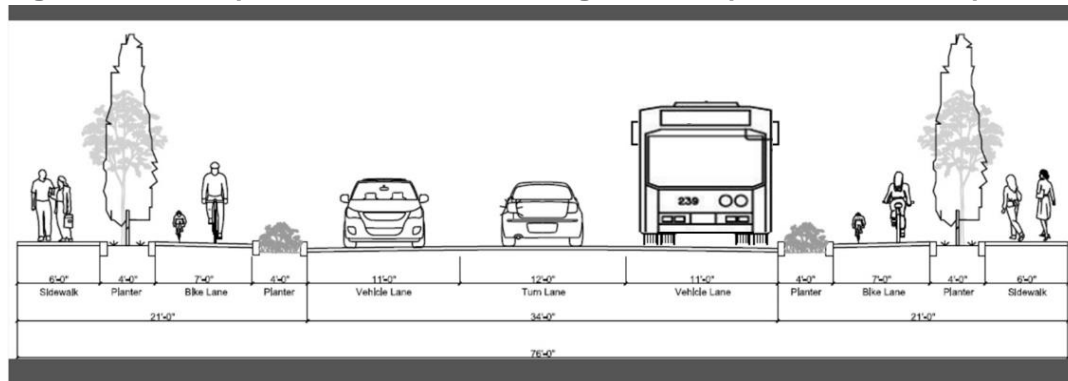
The proposed cycling network investment is around 37.5km (including 34km along main streets/corridors and 3.5 km along the Ganja River linked to LU1).

Component 3 – Bus route prioritisation

This action is aimed at improving the reliability of bus routes, through the development of dedicated bus priority lanes and facilities for buses to improve journey times and service reliability. This includes bus vehicle access at stops across the City (such as bus boarders and Kassel kerbs). Priority for buses can contribute towards reducing urban congestion, especially if supported by traffic control/management measures and parking controls. Options to be considered include bus-only lanes and streets, bus gates which provide short sections protected for bus movement, adaptive traffic light system and bus priority signalling at junctions, and bus stop protection and priority. However, bus priority can be flexible by day or time to target peak hour movements and clear markings/signage is essential to inform road users. Shared lanes could also be an option to include mixed-use with other transport modes, depending on the traffic and street layout. Measures to enhance enforcement to avoid invasion onto bus lanes, parking violations and speed limits should be included, such as, CCTV cameras to monitor drivers and automated sanction, as well as additional resources and training for the road police to undertake physical monitoring and issuing of fines.

The proposed bus-only lanes are about 17.5 km, including 8.5 km of segregated bus route along the central east-west axis running along Nizami Ganjavi Avenue and Haydar Aliyev Avenue; 9 km of road markings for bus routes priorities on the eastern section of Nizami Ganjavi Avenue up to Heydar Alivev Park, and western section of Nariman Narimanov up to the international bus station, and south along Nariman Narimanov towards the Goygol bus station).

Figure 6-5 – Example Street Section with Integrated Multiple Modes of Transport



Source: AtkinsRéalis

<p>Links with other actions and initiatives:</p> <p>Building upon improved road space optimisation (TR1) integration and coordination with utility investments such as water and sewerage (WW2 and WW3), upgrade of the urban drainage system and urban regeneration and brownfield development (LU2) will provide cost and delivery efficiencies. In coordination with other utilities investments where hard infrastructure measures are planned, rehabilitation of the road network offers a unique opportunity to improve urban transport corridor layouts in turn.</p> <ul style="list-style-type: none"> • TR1 – Regulating parking and creating additional road space for improved sidewalks and multi-modal transport corridors; • LU2 – Multi-modal transport corridors linking the proposed sites from brownfield redevelopment; • LU1 – Incorporating NBS and GI into the redevelopment of sidewalks and multi-modal transport corridors, in particular, the proposed corridor along Nizami Ganjavi Avenue; • WW2, WW3 and WW4 – Proposed to undertake work on improving sidewalks and multi-modal transport corridors alongside improvements to the water, sewerage and drainage network to reduce costs and minimise disturbance. SuDS should be incorporated to aid with surface water drainage; • EB5 – Smart street lighting should be implemented alongside; and • Draft GC Master Plan – The action is aligned with and will help to implement the provision of multi-modal transport corridors along key mobility corridors as outlined in the Master Plan. 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • AYNA in coordination with AARSA – Implementation agency for improvements of the sidewalks and pedestrian environment. AARSA is the main authority over road space, with the responsibility to plan, design and undertake implementation of the priority bus routes and cycle lanes; • MDDT – Authority on transport-related matters, who should be consulted when developing and implementing plans; • Other GCEA departments and Municipalities – Stakeholders in developing plans, potential owners of land and responsible for the public realm; • Private landowners and developers – Stakeholders in developing plans and providing further information and data relating to economic and transport activities; and • General public – To be consulted and informed during the development of the plans, design and implementation, in particular, due to the disruption during construction and bus services provision. 			
<p>CAPEX (AZN): 12.68 million (Approx. 6.59 million EUR)⁵¹</p>	<p>OPEX (AZN): 126,865 (65,970 EUR)</p>	<p>Potential funding sources and revenue generation</p> <p>State budget. Existing maintenance budgets. Parking fees. IFIs/Donor Agencies. Establish farebox recovery ratio on bus ticket sales.</p>	<p>Timeframe for implementation</p> <p>2024 - Planning, design and feasibility of corridors; 2025 onwards - Implementation of pedestrian and cycling improvements; and 2025 onwards - Integrated corridor implementation (following completion of the design of associated water, sewerage and drainage schemes as part of WW2, 3 and 4).</p>

⁵¹ Important to note: Costs can be minimised if implemented in an integrated manner, following the investments in water infrastructure – as outlined in the description of the action.

Notes on cost estimate (AZN): Component 1 – 3,298,000 – Pedestrian zone improvement and crossings based on 97,000/km. Pedestrian improvements depend on scale and technical solutions, for example, low capex measures such as those used in Low Traffic Neighbourhoods in the UK. Not essential to fully pave and segregate roads to make them more pedestrian-focused. With strategic planning and consideration of maintenance cycles, some physical measures could be incorporated into existing maintenance budgets.

Component 2 – 1,445,000 – segregated cycle lane, based on 289,000/km. 2,885,000 for improved cycle lane marking, based on 97,000/km. 250 Cycle stands = 49,000 based on 196/unit). CAPEX may vary depending on scale, technical solutions and mode of enforcement. Low CAPEX measures such as improved road markings displaying cycle lane priority will require higher levels of enforcement. Physical infrastructure measures such as lane segregation and cycle-specific signalling have higher upfront costs, but reduce the requirements for enforcement. Some physical measures could be incorporated into existing maintenance budgets, as long as suitable road-space design standards are adopted and followed.

Component 3 – 3,272,500 – For bus route prioritisation and signalling, based on 385,000/km. 1,737,000 to improve bus lane marking, based on 193,000/km. Dependent on the scale, technical solutions and mode of enforcement. Low CAPEX measures can be achieved for example by improved road markings displaying bus priority, which will require higher levels of enforcement but lead to higher OPEX. Physical infrastructure measures such as improved curbing, lane segregation and bus-specific signalling have higher upfront costs, but reduce the requirements for enforcement and thus have a lower OPEX. Some physical measures could be incorporated into existing maintenance budgets, so long as suitable road-space design standards are adopted and followed. OPEX has been estimated at 1% of CAPEX to cover additional maintenance and cleaning. Noteworthy, cleaning and repainting of paths and roadways is already incorporated into the maintenance budget, hence the low level of estimation.

- Pre-requisite and steps for implementation:**
- Parking strategy to identify supply and demand will form the basis of these transport interventions;
 - Feasibility study for the development of dedicated bus priority lanes;
 - Traffic impact assessment to understand the knock-on effect of parking restrictions on the wider network, both to mitigate externalised impacts and also identify key locations for improvement;
 - Traffic and social surveys to understand current and future user demand; and
 - Development and implementation of the SUMP.

<p>G&EI considerations and benefits</p> <p>Dedicated, safe and secure NMT facilities will promote active travel, creating health benefits and improving road safety for all non-motorised users. This will also result in better accessibility for pedestrians, people with prams and those with reduced mobility. Encouraging greater participation of women in the urban transportation labour market, including opportunities</p>	<p>Climate resilience considerations</p> <p>A range of hard and soft infrastructure measures exist that could be integrated into these proposals in order to limit exposure to extreme heat or heavy rainfall. This may include, Permeable payments; Bioswales and</p>	<p>Potential GHG reduction</p> <p>Direct GHG reduction is possible, although not quantifiable at this stage. Viable non-motorised routes and dedicated public transport lanes will reduce traffic congestion by allowing public transport, such as dedicated bus lanes that will reduce journey times. This would therefore incentivise more people to use public transport and reduce private car emissions.</p>	<p>Smart City considerations</p> <p>Possibility to establish an integrated bike-sharing system offers strong private sector potential. This should include the introduction of cycling apps (linked to LU3 and LU4) for navigation around historic sites. Consider integrated ticketing for shared bicycles with overall public transport ticketing. Incorporate advance traffic management systems (ATMS) based on real-time traffic</p>
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<p>within the supply chain workforce of this sector, is a crucial step towards achieving gender equality in this field.</p>	<p>other NBS; and Green roofs and covered bus stops.</p>	<p>Active transport corridors such as cycling and walking routes would allow further emission reductions on top of the public transport benefit.</p>	<p>data, such as adaptive traffic light system and bus priority signalling at junctions to aid with better design, operation and monitoring of the network and alleviate traffic.</p>
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Case Study

Bogota comprehensive urban mobility plan and cycling network, Colombia⁵²

Since 1998, Bogota has been developing the City’s cycling network and renovating sidewalks, streets and public spaces to increase their quality. As of 2022, the cycling network amounted to more than 590 km of permanent cycling paths – including 162 km of dedicated cycle paths along roadways, 299 km integrated into the sidewalk, 124 km of shared cycleways on roadways (shared road spaces between cyclists, buses and cars), and 5 km cycle bridges and tunnels. The efforts of the City to expand the network meant that, in 2019, 6.6% of people chose cycling as their main mode of transport. In general, active modes of transport accounted for around one-quarter of all trips made and public transport (buses) accounted for half, whilst private vehicles, motorcycles and taxis accounted for the other quarter (see Figure 6-6). Bike ridership increased by 40% in the four years leading up to 2020 and has since been estimated to have increased to approximately 8% of the total modal share – this translates to around 900,000 daily trips undertaken by bike.

This modal shift has also been facilitated by changes to national traffic codes, implementing private vehicle speed management, creating traffic calm zones around schools and swift action by elected officials to improve road safety (in particular for cyclists). Cycle lanes often run parallel to the Bus Rapid Transit system and help to connect cyclists with public transport services. Moreover, in 2022, the City launched its first bike-sharing scheme with over 3,000 bikes and 300 docking stations in the system. Discounted fares for bicycle hire are offered to disadvantaged groups with women accounting for 24% of ridership.

⁵² Mobilize, From Transmilenio to cycle networks – lessons learned from Bogota’s Comprehensive Urban Mobility Planning, (2022), Available at: <https://transformative-mobility.org/wp-content/uploads/2023/06/From-Transmilenio-to-Cycle-Networks-Lessons-Learned-from-Bogotas-Comprehensive-Urban-Mobility-Planning-MAY4.pdf>, (Accessed: 16/08/2023).

Figure 6-6 – Reclaiming Road Space for Public Use and Renovating Sidewalks (left), Example of Temporary Cycle Lane and Shared Road Space (centre), and Modal Split in Bogota in 2019 (right)



Source: Mobilize

<p>TR3 Modernisation and decarbonisation of the bus fleet and Sustainable Urban Mobility Plan (SUMP)</p>	<p>Investment</p>
<p>Impact: Reduced air pollution and improved air quality. Improved access to sustainable and safe mobility. Potential revenue generation through farebox recovery ratio on bus ticket sales. Improved safety, social equity and gender equality. Possible GHG reduction of 3379.96 tCO_{2e} per year.</p>	
<p>Component 1 – Development of a SUMP</p> <p>The SUMP aims to develop a sustainable urban transport system by improving the efficiency and cost-effectiveness of the transport network, reducing the impact of transport on the environment, ensuring accessible transport options for all citizens, ensuring personal safety and security within the transport system, and improving the overall quality of life for the citizens. This will be a holistic plan involving policy, traffic model development software procurement, and measures to address multi-modal transport across the entire urban agglomeration – including public and private operators, passenger and freight, zoning and parking and door-to-door mobility. The SUMP will also enable the implementation of the draft GC Master Plan. The SUMP will ensure the investment is a catalyst for greater coordination in sustainable transport across the city, hence this plan should be the first step to be executed for the rationalisation of the transport system across GC.</p> <p>Component 2 – Modernisation of the bus fleet</p> <p>Undertake a study to optimise bus routes, including testing the feasibility of additional services in the early morning and evenings and expanding the network to cover hard-to-reach areas. Currently the bus fleet in Ganja runs on diesel fuel and does not meet the required EURO standards by law. Therefore, investment in EV bus fleet for two main bus companies to replace a portion of the polluting and outdated vehicles. This will include a feasibility study and procurement planning support for a fleet of up to 50 buses. The new buses should be accessible and inclusive to all. The implementation of a modern bus fleet will enhance public transport provision in the City, promoting additional ridership and mode shift from higher polluting, less efficient modes such as private car or minibus. A decarbonised fleet will further enhance local air quality and GHG emissions profile for the City.</p> <p>Investments should also include improved vehicle and pedestrian accessibility within depot and station/termini design; and improvements to depots and maintenance facilities and other support infrastructure (such as bus stops).</p> <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • Ongoing EBRD bus modernisation project; • TR2 – Several bus routes run along proposed multi-modal transport corridors which will benefit from segregated lanes and road makings with private vehicle restrictions imposed at certain times of day; • EB4 – Ensuring the electricity distribution network is capable of handling additional loads from charging a large quantity of electric buses; and • Improvement to vehicle and pedestrian accessibility of stations and depots aligns with the AYNA Plan and the draft GC Master Plan. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • MDDT – Implementation agency for the development of the SUMP and key stakeholders in delivering the investment project; • Private bus operators (such as Simurqq Open Joint Stock Company (OJSC) and Azeravtoneqliyyat OJSC) – Potential implementation agency for modernisation of bus fleet. Currently in charge of operating buses across the network and maintaining their condition and infrastructure. These companies operate on short-term concessions for main lines/routes in the City; 	

<ul style="list-style-type: none"> • SCUPA – To be consulted in developing SUMP to ensure the plan is aligned with the draft GC Master Plan; • AARSA – To be involved in developing the SUMP as the authority responsible for streets in GC; and • AYNA and Municipalities – To be involved in developing the SUMP and bus modernisation. The entity is responsible for controlling parking measures and sidewalk infrastructure. 			
<p>CAPEX (AZN): 42.91 million (Approx. 22.3 million EUR)</p>	<p>OPEX (AZN): 4.29 million (Approx. 2.2 million EUR)</p>	<p>Potential funding sources and revenue generation Sovereign loan. IFIs/Donor Agencies. Establish farebox recovery ratio on bus ticket sales.</p>	<p>Timeframe for implementation 2024 – SUMP and feasibility study for bus fleet; and 2025-2026 – Procurement of rolling stock and depot rehabilitation for EVs.</p>
<p>Notes on cost estimate (AZN): 424,000 - feasibility study; 34,650,000 - for new buses based on 693,000 per e-bus vehicle. Battery replacement will be needed after 8-10 years is an additional 40%; 2,310,000 - for transformers, based on 770,000/unit, usable for around 20 vehicles; 4,847,000 - for depot rehabilitation to include charging infrastructure; 680,000 – SUMP; O&M costs of new fleet and infrastructure is estimated at 10% of CAPEX.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Feasibility study. 			
<p>G&EI considerations and benefits A modern rolling stock will enhance the quality of the public transport service through improved comfort, safety and satisfaction for all passengers, particularly women and people with prams, IDPs, the elderly and their carers, which in turn will increase the level of use compared to private motorised transport. New buses should be accessible to vulnerable groups (including PWDs, elderly, people with prams and children). This includes providing ramps, disabled bays, audible information announcements, and low floors, amongst other interventions, where conditions allow.</p>	<p>Climate resilience considerations Considering likely increases in extreme weather events, the new rolling stock should be suitably designed to ensure the comfort of passengers and optimum operations. This can include ensuring that bus design accounts for extreme temperatures and placing charging</p>	<p>Potential GHG reduction of 3379.96 tCO₂e. Taking into account several assumptions (see Appendix C), replacing 50 buses with electric vehicles would have a potential GHG reduction of 3379.96 tCO₂e. The emission factor of the Grid published by the International Financial Institutions Technical Working Group on Greenhouse Gas Accounting (IFI TWG) for 2021 was 534 gCO₂/kWh.⁵³ Enhancement/renewal of rolling stock of public transport to new electric fleet vehicles and supporting infrastructure (e.g., charging and incorporation of</p>	<p>Smart City considerations As part of the SUMP, smart measures and initiatives should be explored and deployed where possible, including automated traffic lights, speed control measures, automated congestion charges and smart ticketing, data gathered can be used to inform the design and management of traffic system across GC. Modernisation and improvement of the public transport system has great potential for smart solutions, including smart ticket sales and cashless payments, parking management, traffic</p>

⁵³ UNFCCC, IFI Default Grid Factors 2021 v3.1 (2021), Available at: <https://unfccc.int/documents/437880>, (Accessed: 24/08/2023).

<p>Supporting infrastructure, such as bus stations and stops, should also promote comfort and safety – including covered stops, improved lighting and information displays.</p> <p>Encouraging greater participation of women in the urban transportation labour market, including opportunities within the supply chain workforce of this sector, is a crucial step towards achieving gender equality in this field.</p> <p>There should be a consideration to implement a special reduced fees scheme for particular groups (e.g., students, the elderly, PwD, war veterans, IDPs and underprivileged families receiving government allowance), and for people making different trips over short distances/periods.</p>	<p>infrastructure outside of flood-risk areas to ensure their accessibility at all times.</p> <p>The SUMP should consider the resilience of key transport routes, as well as increased budgets for maintenance, inspection and repair that may be needed to ensure that the Plan can be effectively implemented under conditions favouring increased climate-related damage and disruption.</p>	<p>renewables into the energy mix) will help to significantly reduce emission levels and improve operational efficiency.</p> <p>Switching to electric buses would also be dependent on wider upgrades to the electrical grid network to ensure capacity is available in bus stations and depots to charge buses (linked to EB4). This intervention should be completed alongside the continuation of greening the electricity grid, and where possible providing onsite solar to assist with renewable charging capacity at bus stations and bus depots.</p>	<p>management, information for passengers and more. The fleet upgrade, combined with a new sensor infrastructure and mobile applications for residents (such as real-time traffic) will result in convenience for residents and visitors:</p> <ul style="list-style-type: none"> • Real-time passenger information and online journey planners with the introduction of new routes/timetables; • New bus vehicles will deliver improvements, such as air conditioning/heating and cooling system, Wi-Fi equipment, traffic management system, passenger audio-video information system, passenger counting system, camera video surveillance system and USB sockets for charging various devices; and • Plans exist to expand e-ticketing and equip all bus stops with digital screens displaying information on schedules and routes.
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Case Study

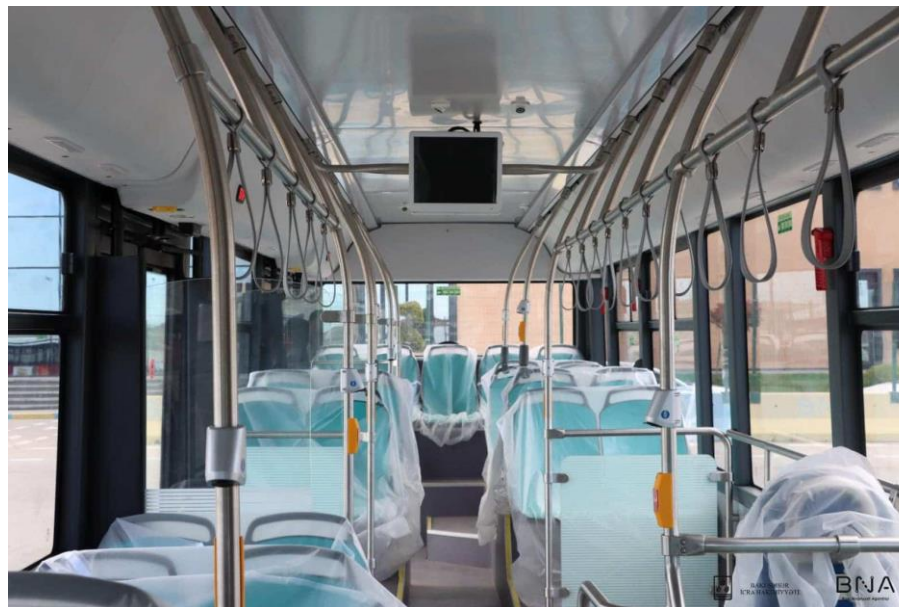
Electric buses deployed in Baku, Azerbaijan^{54, 55}

The first in a new fleet of 100% electric buses from the Chinese company BYD arrived in Baku in early 2023. The bus has a total battery capacity of 383Kw, which allows it to cover 350km on a full charge, with 33 passenger seats and a total passenger capacity of 82. Designed to meet all the requirements of modern passenger transport, the buses are fully accessible to all, with space for disabled passengers or people with buggies, and digital displays for dissemination of route information. Over the past seven years, the Baku Transport Agency stated that in line with the directive from the President, 1,044 modern passenger buses have been purchased and put into operation in Baku.

⁵⁴ Contact, Baku needs 5,000 buses, (2023), Available at: <https://www.turan.az/ext/news/2023/4/free/Social/en/3756.htm>, (Accessed: 24/08/2023).

⁵⁵ ISR Holding, The first 100% electric BYD bus arrives to Baku, (2023), Available at: <https://isrholdingltd.com/the-first-100-electric-byd-bus-arrived-to-baku/>, (Accessed: 24/08/2023).

Figure 6-7 – Electric Bus to be Deployed in Baku



Source: Contact and ISR Holding

Electric “green” buses in Batumi, Georgia⁵⁶

In 2020, Eight fully electric buses for the city of Batumi were financed through a sovereign loan of 5.5 million Euro from the EBRD and a 1.5 million Euro grant from the Eastern European Energy Efficiency and Environmental Partnership with the buses being let to the Batumi Autotransport LLC municipal bus company. These were the first electric busses to be introduced into a public transport network in a city in the South Caucasus region and have played a key role in helping to improve the city’s air quality, reduce GHG emissions and provide high-quality accessible transport options for users of the bus network.

The introduction of the electric buses was facilitated by the development of the Batumi GCAP, which the city council approved in the same year. Optimising the city’s public transport and parking system has been a priority and allowed the new busses to achieve their full potential.



⁵⁶ EBRD, EBRD, EU and multi-donor E5P-Financed electric “green” buses arrive in Batumi, (2020), Available at: <https://www.ebrd.com/news/2020/ebrd-eu-and-multidonor-e5pfinanced-electric-green-buses-arrive-in-batumi.html>, (Accessed: 05/10/2023).

7. Energy and Buildings

Sector goals:

Adopt and implement energy efficient technologies to minimise losses and promote decarbonisation across all types of building stock, industries and energy infrastructure.

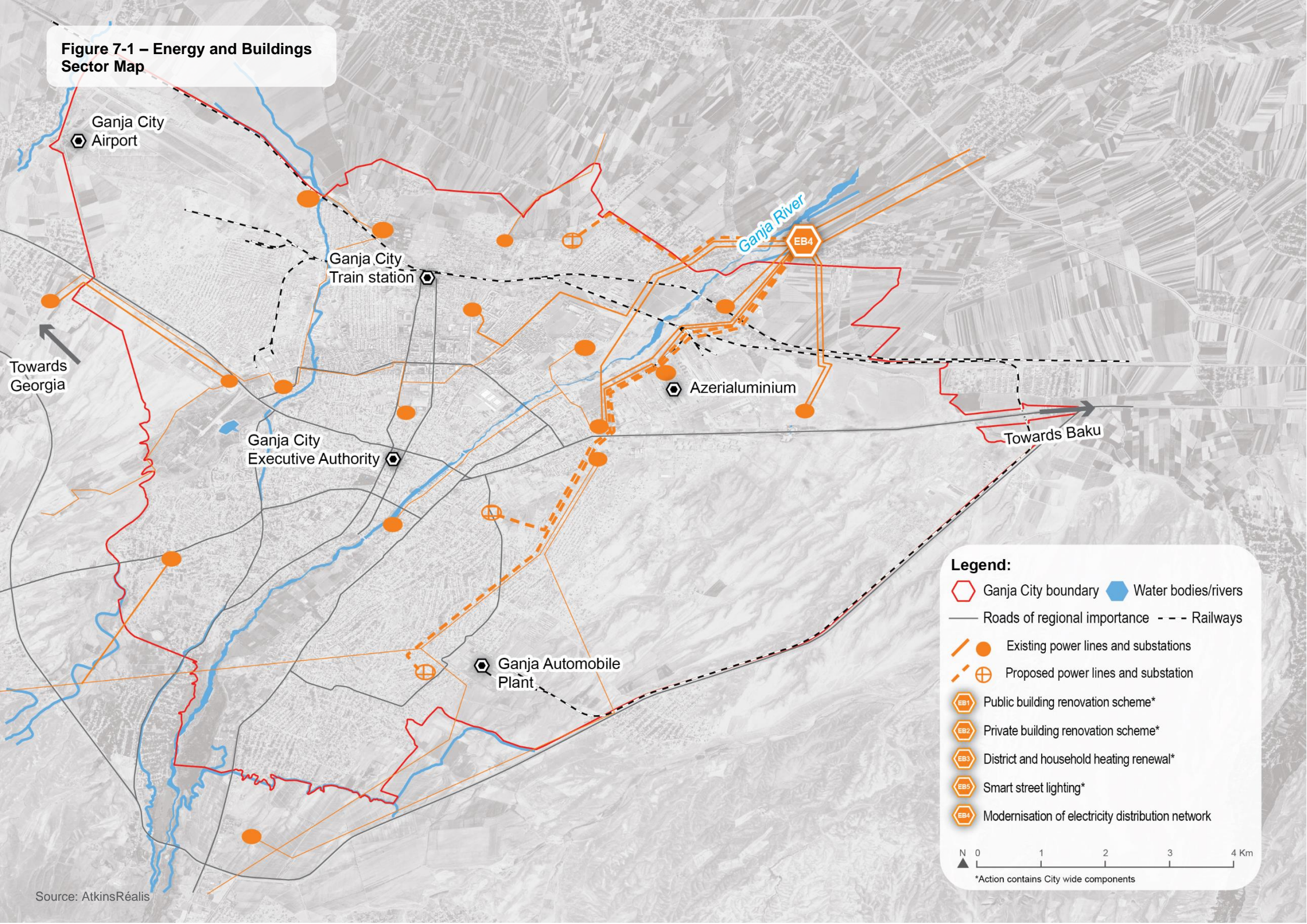
Maximise the use of renewable energy sources.



Mid-term Targets	Current value		Target
Electricity consumption in residential buildings (kWh / m2)	64.3	↘	26
Electricity consumption in public buildings (kWh / m2)	n/a	↘	213
Fossil fuels consumption for heating and cooling (kWh / m2)	n/a	↘	96
Share of new buildings with green certification (%)	0	↗	25%
Share of households connected to district heating (%)	0	↗	25%

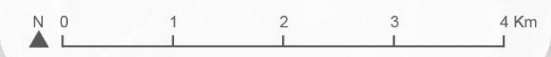
Action Ref.	Action Title	Action Owner	CAPEX (AZN)	OPEX (AZN/Annual)	Linkages
EB1	Public buildings renovation scheme (including renewable energy in buildings)	MENG	Total - 28.65 million (Approx. 14.9 million EUR)	Up to 841,500 per year for scheme administration. (437,580 EUR)	SW3, WW2 and 3, CEG3 and 5.
EB2	Private buildings renovation scheme (including renewable energy in buildings)	MENG	Total - 28.65 million (Approx. 14.9 million EUR)	Up to 841,500 per year for scheme administration. (437,580 EUR)	SW3, WW2 and 3, CEG3 and 5.
EB3	District and household heating renewal and decarbonisation	MENG	Up to 9.35 million (Approx. 4.86 million EUR)	Up to 1.87 million savings per year (Approx. 0.97 million EUR)	EB1 and 2
EB4	Modernisation of electricity distribution network	Azerishiq and Azerienergy OJSC	Up to 18.70 million (Approx. 9.72 million EUR)	Up to 3.74 million savings per year (Approx. 1.94 million EUR)	EB1 and 2, IN3 and draft GC Master Plan.
EB5	Smart street lighting	GCEA (lighting department)	Up to 3.74 million (Approx. 1.94 million EUR)	Up to 470,000 per year for system maintenance. (244,400 EUR)	LU1 and 2, TR2 and WW2, 3 and 4, and EBRD Streetlighting.

Figure 7-1 – Energy and Buildings Sector Map



Legend:

- Ganja City boundary
- Water bodies/ivers
- Roads of regional importance
- Railways
- Existing power lines and substations
- Proposed power lines and substation
- Public building renovation scheme*
- Private building renovation scheme*
- District and household heating renewal*
- Smart street lighting*
- Modernisation of electricity distribution network



*Action contains City wide components

7.1. Key Actors and Stakeholders

The Energy and Buildings sector in GC and across Azerbaijan has several stakeholders. Policy and regulation are developed by the Ministry of Energy (MENG) and various State Agencies, for example, the State Agency on Alternative and Renewable Energy Sources (SAARES). Resources, such as electricity, gas and oil, are then produced and distributed by several OJSCs who also manage, maintain and operate the networks, for example, Azerishiq and Azerienergy deal with electricity production and management of the electricity network across Azerbaijan. The GCEA and Municipalities have little to no influence on the Energy and Building sector, other than being a stakeholder in the development of plans and strategies and being potential owners or occupants of property, which could benefit from the actions. Additional information is provided in Table 7-1.

Table 7-1 – Stakeholders Involved in the Energy and Buildings Sector

Stakeholder	Role
MENG	Ensures the implementation of State programmes, prepares and implements energy security measures and forecasts the production and consumption of energy. The Ministry works with the GCEA, State committees and State-owned companies to maintain and upgrade energy infrastructure, as well as advocate for renewable energy and energy efficiency measures.
Azerbaijan Energy Regulatory Agency (AERA)	Regulates and inspects issues related to electricity, gas and heat supply, as well as carries out regulatory and inspection (supervisory) functions over enterprises operating in the electricity, gas and heat supply industry, as well as over consumers.
SAARES	The State Agency participates in the formulation and implementation of state policy in the field of renewable energy sources and their efficient use, and takes measures to organize, regulate, and coordinate activities in the field of renewable

	energy sources and their efficient use, and at the same time, increase the investment attractiveness of the relevant field.
MES	Issues construction permits for large developments, as well as ensuring the safety of buildings.
Azerishiq and Azerienergy	Coordinate the production and transmission of electrical energy. Operates, maintains and upgrades the national electricity grid, including transmission lines, substations and power plants.
AzeriGas	Operates, maintains and upgrades the national gas supply network.
Azeristiliktehzizat OJSC	Operates, maintains and upgrades the heat supply networks, including boilers and district heating.
SOCAR	State-owned national oil and gas company in charge of production oil and natural gas from onshore and offshore fields and O&M of refineries and processing plants.
SCUPA	Central authority implementing policy and regulations related to urban development, spatial planning and architecture. SCUPA also issues construction permits for large developments.
GCEA and Municipalities	Potential owner and occupier of public land and property, potentially also dedicated to energy infrastructure. Stakeholders in the development of plans and strategies.
Private buildings/landowners and businesses	Owners of property and land. Maintain building condition.
Other Ministries	Potential owner and occupier of property on public land.

Source: AtkinsRéalis analysis

7.2. Supporting Activities and Enabling Policies

- **Improved regulatory environment** – For small to medium-scale solar PV and renewable power generation projects (up to 20MW). This could include improving the planning process by reducing any fees or timescales for approvals, streamlining the process, actively promoting PV or even mandating minimum requirements for renewable energy;
- **Develop an overarching city plan for energy** – In order to fully define the long-term objectives for energy in Ganja, develop a long-term energy plan that sets out targets for various metrics, such as energy usage reduction, numbers of existing homes/buildings improved, numbers of new households/ buildings connected to power/natural gas/district heating schemes, households removed from fuel poverty, percentage of energy provided by renewables, reduction in greenhouse gas emissions etc;
- **Enhanced policy and regulation for building efficiency** – This should include measures to improve green energy certification, including the robustness of Azerbaijan Green Zoom certification system;
- **Legislation to support community heating networks** – Legislation could support the establishment of new community heat networks or the extension of existing networks, and also support the refurbishment of networks by establishing minimum energy efficiency standards for boilers, insulation and minimum requirements for control systems;
- **Awareness raising campaign** – Improved public knowledge relating to the availability and benefits of energy-efficient technologies such as LED lighting and renewable energy technologies such as PV panels, and ways to reduce energy demands, as well as outlining the potential costs and how the planned intervention schemes will operate;
- **Develop easy-to-use tools** – Coupled with the above awareness campaign, easy-to-use accessible tools should be developed so potential scheme participants can understand the tangible details of how the programme will benefit them and what the various steps are. An example of this is to determine the viability of PV panels (both technically and financially), how the funding mechanism would work, and where approved equipment, suppliers, contractors and auditors can be found;
- **Development of capacity building projects** – Capacity building projects to train energy auditors, utilities operators, and installers will be

crucial. These projects need to ensure all parties involved along the process are trained to a recognised standard, and that all equipment also meets recognised standards;

- **Smart technology** – Primary network upgrades should consider advanced smart technology options such as smart metering, energy storage (thermal stores for district heating, battery storage for power); and
- **Health and Safety** – Consider a long-term plan to mitigate and eventually eliminate the safety risks associated with the above-ground natural gas pipelines.

7.3. Best Practice of Financing Modalities for the Energy and Buildings Sector

Financing infrastructure delivery and improvements in GC is restrained due to the centralisation of finance via the Government. It is also further constrained in the power and gas sector due to Azerishiq, Azerienergy and AzeriGas being the only suppliers and operators of the transmission and distribution networks. This minimises the opportunities for external investment (for example from the private sector) into any upgrades and extensions of energy infrastructure. District heating and buildings (concerning their energy usage) are not subject to similar monopolies, therefore there are more opportunities for energy projects in these areas. Nonetheless, power projects are more difficult to undertake and will require concerted effort from all parties.

There are numerous financial mechanisms that can be used to successfully deliver energy improvements and upgrades. Particularly effective is the **energy services companies (ESCO) model**. ESCOs are used to undertake energy audits of a facility, propose solutions, and then finance, implement, operate and maintain them, all without the client having to invest their own capital. The ESCO contract guarantees certain energy (and therefore financial) savings to the client. The ESCO takes a proportion of the savings to recoup its outlay and generate a profit.

Public-private partnerships are also very effective in delivering infrastructure. Different types of PPPs can be used. The Build-Own-Operate and Build-Operate-Transfer forms of PPP are particularly popular for energy sector projects.

Another alternative that is already proven in Azerbaijan is financed credit lines linked specifically to sustainable activities. The EBRD’s Caucasus Energy Efficiency Programme (CEEP) has been active in Azerbaijan and since 2014 has supported four local financial institutions (FI) and banks (Demirbank, Muganbank, FINCA and Unibank) with credit lines totalling USD 16.5 million, see. In addition, the Green for Growth Fund (GGF) has concluded credit lines with two further banks (Accessbank and Muganbank). These credit lines help local companies and households to buy and install more energy-efficient equipment, appliances and materials, together with small-scale renewable technologies. These include modern production

facilities, double-glazed windows, insulation, gas boilers, solar water heaters and rooftop solar panels. Credit lines come with technical assistance support where necessary to help design and appraise projects.

Table 7-2 – Summary of IFI Funding Environmental Credit Lines to Local FIs in Azerbaijan

Year	Donor	Recipient FI	Value (million USD)	Target
2015	EBRD CEEP	Unibank	1.5	Retail, corporate
2014	GGF	Muganbank	5.0	Residential, MSME
2014	EBRD CEEP	Demirbank	5.0	Retail, corporate
2014	EBRD CEEP	Muganbank	3.0	Retail, corporate
2014	EBRD CEEP	FINCA	6.0	Micro, SME (MSME)
2014	GGF	Accessbank	15.0	MSME
2013	IFC	Bank Respublica	15.0	SME
2013	EBRD	Accessbank	4.2	Direct investment

Source: United Nations Environment Programme

EB1 Public buildings renovation scheme	Investment
<p>Impact: Increased resource efficiency including energy savings. Improved energy resiliency. GHG emissions reduction.</p>	
<p>Component 1 – Energy Performance and Retrofitting Develop an energy performance programme using public funds to finance and support the implementation of retrofit improvements to existing public buildings (such as government offices, schools and hospitals), including measures to improve thermal efficiency, use of low-carbon and locally available materials, retrofit efficient lighting and equipment. The programme should also target the integration of climate resilience measures for overheating and surface water flooding.</p> <ul style="list-style-type: none"> • Complete an energy audit on a sample of buildings to determine the worst performing buildings, this could focus on type of buildings, or specific buildings and should be standardised, for example, schools, hospitals or government offices. The intention of the survey is to verify which buildings are worst performing and understanding the primary reasons for their poor performance. It should be noted that there may be limited scope to work on some buildings, such as buildings of heritage value, where appropriate alternative solutions may be needed in line with the heritage management plan (LU3); • Undertake a technical study to determine the most effective interventions in improving or correcting these deficiencies, and a commercial study to understand the availability of suitable equipment and labour skills; • Complete energy audits on all public buildings, and develop a priority list to tackle the worst-performing buildings⁵⁷; • Develop a suite of interventions such as insulation and improve thermal efficiency, secondary glazing, LED lighting, automated heat control systems, etc., as well as water-efficient devices and rainwater harvesting, develop a database of standard interventions (e.g., replacement of lighting), costs per intervention, and likely benefits for each, such as cost savings and emissions reduction; and • Develop the outline costs and programme, engage with funders, apportion costs and engage with suitable contractors and end-users to deliver the programme (part of this scheme may be needed to improve the capacity of local contractors). <p>Similar energy performance measures should also be implemented in any new public building.</p> <p>Component 2 – Renewable Energy Develop a programme to finance, incentivise and support the installation of solar PV and/or solar hot water on public buildings. The programme should include training and assisting manufacturers to ensure local content in new installations.</p> <ul style="list-style-type: none"> • Develop a suite of standard interventions such as roof-mounted PV and Solar Hot Water Heating, costs per intervention, and likely benefits for each, such as annual cost savings and emissions reduction; • Undertake an assessment to identify suitable rooftops to install solar PV, this could utilise satellite imagery if available and feasible; • Determine the availability of suitable equipment and qualified installers. Develop approved lists of equipment (and suppliers) and installers; • Set upper boundaries for the number of interventions, determine total costs and engage with suitable funders; and • Develop a public awareness campaign. Administer campaigns and deliver projects. 	

⁵⁷ As prescribed by the decision of the National Council of Ministers dated 17.08.2022 No. 309 "On the approval of the criteria for determining economic entities and non-residential buildings that must be conducted a mandatory energy audit".

<p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> Planned initiative identified as part of the ‘Socio-economic Development Strategy of the Republic of Azerbaijan 2022-2026’ to prepare and implemented a national renovation programme for residential, commercial and office and public buildings; LU3 – Consider any changes and alterations to improve the energy efficiency of buildings with a high heritage value in line with the heritage management plan; SW3 – Considerations to implement circular economy measures to reduce resource and waste; WW2 and WW3 – This should also include water resource efficiency measures at the building level, for example, rainwater harvesting; CEG3 – Helping to decarbonise building stock and provide climate mitigation and adaptation options at the building scale; and CEG5 – Awareness campaigns. 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> MENG – Implementation agency as the authority on creating and implementing plans and strategies in the energy sector; SAARES – Main authority in the renewable energy sector, they will be consulted and informed in retrofitting public buildings; GCEA and Municipalities – Potential owners of public buildings that could undergo retrofitting and implementation of renewable energy schemes; SCUPA – Main authority in urban development plans to ensure sustainable practices and issuing of building permits for large development; Ministry of Education (MEDU), Ministry of Health (MH) or MC – To be consulted as main users of public buildings, that could undergo retrofitting and implementation of renewable energy schemes; and SCPI – Management of State property and buildings that need to be retrofitted as part of this action. 			
<p>CAPEX (AZN): Total - 28.65 million (Approx. 14.9 million EUR) Component 1- 9.35 million (Approx. 4.86 million EUR) Component 2 - 18.70 million (Approx. 9.72 million EUR)</p>	<p>OPEX (AZN): 841,500 (437,580 EUR)</p>	<p>Potential funding sources and revenue generation State budget. IFIs/Donor Agencies. Increased electricity sales. Reduced electricity losses. Sale of renewable energy back to the electricity grid (need to implement energy purchase regulatory framework).</p>	<p>Timeframe for implementation 2024 - Energy audits, technical studies, cost and investment plan; and 2025 - Implementation programme to begin, depending on equipment availability and labour force readiness.</p>
<p>Notes on cost estimate (AZN): 9.35m AZN for the renovations and retrofitting in up to 100 public buildings depending on the specific works carried out. 18.7m AZN for solar potential assessment, installing about 50 to 80 solar PV installations, 50 to 80 solar hot water installations.. This budget would provide a good starting level to develop and deploy some key interventions on a number of pilot buildings (as proof of concept) that could then be expanded to other buildings and then to private buildings once the scheme is mature enough. 600,000 for the installation of water tanks and devices. The CAPEX budget will provide for a certain number of schemes to be delivered, however, if the programme proves successful, the budget could be extended. OPEX costs are estimated at 3% of CAPEX, and 12 x FTE for scheme administration</p>			

<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Set up a specific department within GCEA to develop and administer the scheme; • Review renewable energy resources in Ganja and determine which types of renewable energy should be selected for project development and create detailed mapping data (ideally on a GIS platform, to be linked with the sCDE described in LU4); • Determine availability of suitable equipment i.e. pumps, motors and drives and qualified installers. Develop approved lists of equipment, approved suppliers, installers and auditors which will be regularly maintained. There might be a need to develop a suitable approval process for each category; • Feasibility study to determine viable energy efficiency and energy renewable energy schemes (technical, cost, benefits); • Development of suitable tools to assist in the project selection process; • Develop a suite of interventions to address key issues, including build-up of costs, ease of delivery, benefits etc. Check interventions can be delivered (equipment, labour availability); • Develop detailed overall cost and delivery plan; and • Development and distribution of marketing materials. 			
<p>G&EI considerations and benefits</p> <p>This programme should reduce the cost of energy for all consumers, but will considerably assist those more vulnerable, including low-income households, single-headed female households and the elderly. These groups should also be represented in the decision-making process to ensure their voices are heard.</p> <p>Seek opportunities to offer skill development programmes and job opportunities for women and disadvantaged groups. Support local women, IDPs and PWD-owned businesses, particularly in the supply chain for renovation materials and energy technologies.</p> <p>Create and launch gender-sensitive public awareness campaigns on energy efficiency technologies and practices.</p>	<p>Climate resilience considerations</p> <p>The renovation programme should also identify opportunities to introduce cooling and insulation measures where possible. Meanwhile renewable energy sources i.e solar PV systems could be further explored.</p> <p>The water efficiency measures should reduce water demand and increase city resilience to drought and dry spells if there is sufficient uptake in the scheme.</p>	<p>Potential GHG reduction</p> <p>Direct GHG reduction is possible, although not quantifiable at this stage. There is currently no available data for public buildings. However, similar assumptions of energy consumption savings can be used from the private building action (EB2).</p> <p>Importantly, the emissions from public buildings are expected to be far greater than private domestic properties, with more roof space for the utilisation of PV arrays. It can be assumed that PV installations and the insulation improvements outlined will reduce building emissions by at least one third. The structural integrity of buildings will need to be taken into account when installing PV.</p>	<p>Smart City considerations</p> <p>The action proposes a number of smart initiatives such as solar PV and solar water heaters.</p> <p>The latest technology in lighting, pumps and equipment should be used when retrofitting buildings.</p> <p>Energy audit performance certificates should be digitalised and potentially presented on the sCDE (linked to LU4). The audit could be undertaken by drone-based thermal imagery to identify poor-performing buildings, depending on the availability and reliability of the technology. Similarly, assessment to identify suitable rooftops to mount solar PV could be done using satellite imagery and the results could be linked with the sCDE (LU4). Public awareness could be undertaken using an online platform where residents can learn how to reduce their impact on the climate.</p>

Case Study

EU Concerto Initiative – Stengårds School refurbishment, Copenhagen, Denmark⁵⁸

Stengårds School is located in the Municipality of Egedal in Copenhagen. The school was constructed in 1978 and consists of a main single-floor building (7,000m²) with a central yard and a 1,300m² underground basement. The main building was extended to a second building of 750m². The building was constructed according to 1977 regulations, and therefore the building envelope had very poor thermal characteristics.

The refurbishment project comprised a new façade with improved insulation and new windows, insulation of the hot water tank, hot water pipework and other items such as the pump, insulation of the heating pipework and valves, a new CO₂-controlled ventilation system with heat recovery, new low energy motors for the hall ventilation system and optimised lighting systems including controls. Additionally, PV panels were installed on the roof of the main building which had a total peak capacity of 220kW.

The total cost for energy and non-energy related items was EUR 2.4m, funded mainly by the Municipality's funds, loans obtained at favourable rates and support from the EU Concerto initiative. Once the measures were completed, the annual cost for heating was reduced from EUR 128,755 to EUR 85,405, giving an annual saving of EUR 43,350. For electricity, the original annual cost was EUR 72,295, but because of the improvements and the PV array being able to sell power back to the grid, the school had an annual income of EUR 105,905. The overall saving was EUR 221,540, giving a payback period of 11 years. Based on the planned improvements, the predicted energy saving was 56%. Moreover, the school building was compliant with the 2010 Danish Building Regulations, in line with the national target of 71.5kWh/m² energy consumption in schools.

⁵⁸ IEA-EBC, Deep Energy Retrofit Case Studies, (2027), Available at: https://iea-ebc.org/Data/publications/EBC_Annex%2061_Subtask_A_Case_Studies.pdf, (Accessed 14/08/2023).

EB2 Private buildings renovation scheme	Investment
<p>Impact: Increased resource efficiency including energy savings. Improved energy resiliency. Increased access to sustainable housing. GHG reduction potential of 670 tCO₂e per year.</p>	
<p>Component 1 – Energy performance and retrofitting</p> <p>Develop an energy performance programme based on small grants or loans to finance, incentivise and support the implementation of retrofit improvements to private buildings (such as residential, commercial, offices and industry), including improved thermal performance and insulation, use of low-carbon and locally available materials, and retrofit efficient lighting and equipment. The programme should target the integration of climate resilience measures for overheating and surface water flooding.</p> <ul style="list-style-type: none"> • Complete an energy audit on a sample of buildings to determine the worst performing buildings (this could be types of buildings or specific buildings and should be standardised, for example, post-soviet multifamily housing), to verify which buildings are worst performing and understand the primary reasons for their poor performance; • Undertake a technical study to determine the most effective interventions in improving or correcting these deficiencies, and a commercial study to understand the availability of suitable equipment and labour skills; • Develop a programme where applicants can complete energy audits by using an approved auditor; • Develop a suite of interventions such as insulation, secondary glazing, LED lighting, automated heat control systems, etc., as well as water-efficient devices and rainwater harvesting, and develop a database of standard interventions (e.g., replacement of lighting), costs per intervention, and likely benefits for each, such as cost savings and emissions reduction; • Determine the availability of suitable equipment and qualified installers. Develop approved lists of equipment, suppliers and installers; • Set upper boundaries for the number of interventions, determine total costs, and engage with suitable funders to secure funding; and • Develop a public awareness campaign. Administer campaigns and deliver projects. <p>Component 2 – Renewable energy</p> <p>Develop a programme to finance, incentivise and support the installation of solar PV and/or solar hot water in residential, commercial, offices and industries. The programme should include training installers and assisting manufacturers to ensure local content in new installations.</p> <ul style="list-style-type: none"> • Develop a suite of interventions such as roof-mounted PV or Solar Hot Water Heating etc., develop a database of standard interventions (e.g. a 2kW array for domestic properties), costs per intervention, and likely benefits for each, such as annual cost savings and emissions reduction; • Undertake an assessment to identify suitable rooftops to install solar PV, this could utilise satellite data and imagery if available; • Determine the availability of suitable equipment and qualified installers. Develop approved lists of equipment, suppliers and installers; • Set upper boundaries for the number of interventions, determine total costs and engage with suitable funders; and • Develop a public awareness campaign. Administer campaigns and deliver projects. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • Planned initiative identified as part of the ‘Socio-economic Development Strategy of the Republic of Azerbaijan 2022-2026’ to prepare and implement a national renovation programme for residential, commercial and office and public buildings; • SW3 - Considerations to implement circular economy measures to reduce resource and waste; • WW2 and WW3 – This should also include water resource efficiency measures at the building level, for example, rainwater harvesting; 	

<ul style="list-style-type: none"> • CEG3 – Helping to decarbonise building stock and provide climate mitigation and adaptation; and • CEG5 – Awareness campaigns; 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • MENG – Implementation agency in cooperation with private building owners, as the authority in creating and implementing plans and strategies in the energy sector; • SAARES - the main authority on developing plans and strategies in the renewable energy sector; • SCUPA – Main authority in urban development plans to ensure sustainable practices and issuing of building permits for large development; • GCEA and Municipalities – To help in identifying areas and buildings which should be retrofitted; and • Private businesses, SMEs, industries - Potential owners of buildings to benefit from the action. 			
<p>CAPEX (AZN): Total - 28.65 million (Approx. 14.9 million EUR) Component 1 - Up to 9.35 million (Approx. 4.86 million EUR) Component 2 - Up to 18.70 million (Approx. 9.72 million EUR)</p>	<p>OPEX (AZN): Up to 841,500 per year for scheme administration. (437,580 EUR)</p>	<p>Potential funding sources and revenue generation IFIs/Donor Agencies. Increased electricity sales. Reduced electricity losses. Sale of renewable energy back to the electricity grid (need to implement energy purchase regulatory framework).</p>	<p>Timeframe for implementation 2024 - Energy audits, technical studies, cost and investment plan; and 2025 - Implementation programme to begin, depending on equipment availability and labour force readiness.</p>
<p>Notes on cost estimate (AZN): 9.35m AZN for the renovations and retrofitting for 400 to 1,000 residential buildings or 50 to 100 non-residential buildings depending on the specific works carried out. 18.7m AZN solar potential assessment, installing about 650 residential solar PV installations, 650 residential solar hot water installations and 150 commercial PV installations. 600,000 for the installation of water tanks and devices. This budget would provide a good budget to develop and deploy renovation projects to private buildings, once the public building scheme is mature enough and knowledge, skills etc. can be effectively transferred to this action. This CAPEX budget will provide for a certain number of schemes to be delivered, however, if the program proves successful budget could be extended. OPEX costs are estimated at 3% of CAPEX and are based on 12 x FTE for scheme administration.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Set up a specific department within GCEA to develop and administer the scheme; • Review renewable energy resources in Ganja and determine which types of renewable energy should be selected for project development and create detailed mapping data (ideally on a GIS platform); • Determine availability of suitable equipment i.e., pumps, motors and drives and qualified installers. Develop approved lists of equipment, approved suppliers, installers and auditors which will be regularly maintained. There might be a need to develop a suitable approval process for each category; • Feasibility study to determine viable energy efficiency and energy renewable energy schemes (technical, cost, benefits); • Development of suitable tools to assist in project selection process; • Develop a suite of interventions to address key issues, including build-up of costs, ease of delivery, benefits etc. Check interventions can be delivered (equipment, labour availability); • Develop detailed overall cost and delivery plan; and • Development and distribution of marketing materials. 			

<p>G&EI considerations and benefits</p> <p>This programme should reduce the cost of energy for all consumers, but will considerably assist those more vulnerable, including low-income households, single-headed female households and the elderly. These groups should also be represented in the decision-making process to ensure their voices are heard.</p> <p>Ensure that women and other vulnerable groups participate in energy efficiency and renewable energy initiatives through the provision of information, training, and financial incentives.</p> <p>Provide targeted small grants or loans to women and low-income households for obtaining energy-efficient materials and equipment.</p> <p>Create and launch gender-sensitive public awareness campaigns on energy efficiency technologies, and practices.</p>	<p>Climate resilience considerations</p> <p>The loan programme will also target the integration of climate resilience measures for overheating and surface water flooding.</p> <p>The water efficiency measures should reduce domestic water demand and increase city resilience to drought and dry spells if there is sufficient uptake in the scheme.</p> <p>The specification of solar energy systems needs to account for operation in higher temperatures.</p>	<p>Potential GHG reduction of:</p> <p>Component 1: 20 tCO₂e/ annum estimated for 1000 homes.</p> <p>Component 2: 650 tCO₂e/annum estimated for 1000 homes (based on 2kw solar arrays)⁵⁹.</p> <p>Taking into account several assumptions (see Appendix C), in total applying the action to 1000 homes and 650 residential solar PV installations has the potential to result in a reduction of 670 tCO₂e per annum.</p> <p>Insulation improvements through cavity wall insulation and double glazing have the potential to reduce energy consumption by 33% in homes.</p> <p>Solar PV should help to reduce electricity consumption from the national grid and result in lower emissions from the electricity used for everyday household activities.</p>	<p>Smart City considerations</p> <p>The action proposes a number of smart initiatives such as solar PV and solar water heaters.</p> <p>The latest technology in lighting, pumps and equipment should be used when retrofitting buildings.</p> <p>Energy audits and performance certificates should be digitalised and potentially presented on the web-map (linked to LU4). The audit could be undertaken by drone-based thermal imagery to identify poor-performing buildings. Similarly, assessment to identify suitable rooftops to mount solar PV could be done using satellite imagery and the results could be linked with the sCDE (LU4). Public awareness could be undertaken using an online platform where residents can learn how to reduce their impact on the climate.</p>
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Case Studies

Renovate Europe⁶⁰

Renovate Europe was launched in 2011 as an initiative of the European Alliance of Companies for Energy Efficiency in Buildings (EuroACE) which includes 18 national partners and 47 partners from industry and civil society. The Renovate Europe campaign aims to reduce the energy demand of the building stock in the EU by 80% by 2050, in order to reach nearly Zero Energy Buildings (nZEB) standard by mid-century.

It is the only EU-wide campaign that focuses exclusively on the ambitious renovation of the building stock in the EU, taking a technology-neutral, integrated and holistic approach to energy-efficient renovations. The programme focuses on eight different types of technology; roof insulation, dry lining walls, window restoration, external insulation systems, heat pumps, solar panels, control systems and solar panels.

At present, 29 different projects across 20 different countries are underway or have been completed. One specific case study in Tampere, Finland, concerned a 20-apartment building in the Tammela built in the 1960s that had a G energy rating (the lowest rating). It is an area with a huge need for energy renovation, so a key driver for this project was to develop a replicable methodology that could inform district-level regeneration.

Typically, privately-owned housing companies are often reluctant to undertake big renovations because of a lack of tenant interest, and a lack of available funding. It took some time to secure agreement among the occupants, however, the result was a reduction of 69% in energy usage (against an anticipated 50%

⁵⁹ Likely this is an underestimation of emission savings currently due to a lack of data.

⁶⁰ Renovate Europe, Tampere, Finland Case Study, (2023) Available at: <https://www.renovate-europe.eu/reday/reday-2019/online-resources/tampere-finland/>, (Accessed 11/08/2023).

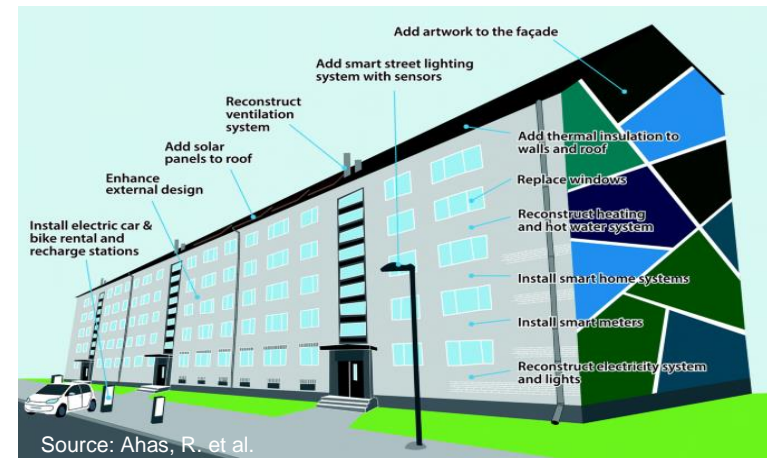
saving) for an outlay of EUR 705k (EUR 360/m²). The interventions that were completed included over cladding of the structure with insulated panels, replacement of windows and doors, installation of ground source heat pumps with new heat recovery ventilation, a building management system, and renewal of the entire electrical installation. Post-completion, all tenants agreed that the results of the project made it worthwhile.

The H2020 SmartEnCity Project in Tartu, Estonia⁶¹

The SmartEnCity project renovated and retrofitted 22 buildings of approximately 800 flats within a pilot area of 0.39 km² in the city centre of Tartu. The retrofitting efforts directly impacted 2,100 inhabitants in the area and aimed at achieving a nearly zero-energy level, increasing life quality and encouraging more sustainable consumer behaviour among residents. In 2016, energy consumption in the buildings to be retrofitted was estimated at 270 KWh/m²/y, with the aim of the project to reduce this to 90 KWh/m²/y by implementing measures set out in Figure 7-2. These include installing solar PV, retrofitting ventilation, electric and district heating systems, improving insulation, replacing old windows and installing EV charging points. A district cooling system was implemented, whereby residual heat was returned from the cooling system into the heating network, to contribute additional GHG savings and reduce the amount of energy needed for heating.

The estimated cost for the retrofit undertaken was around EUR 400 per m². The project was financed with around EUR 4 million by the city using EU H2020 funding, national government support for renovation activities (KredEX), where apartment owners could apply for financial grants of up to 40% of the total cost of renovation, and loans taken out by individual apartment owners who sought to improve their homes energy efficiency.

Figure 7-2 – H2020 SmartEnCity Project Proposed



Source: Ahas, R. et al.

⁶¹ Ahas, R. et al. (2019) 'Retrofitting Soviet-era apartment buildings with "smart city" features: The H2020 smartcity project in Tartu, Estonia', The Urban Book Series, pp. 357–375.

EB3 District and household heating renewal and decarbonisation			Investment
Impact: Reduced energy bills and cost savings. Improved reliability for heat network customers. Direct GHG emissions reduction.			
<p>Undertake a programme to rehabilitate, extend and decarbonise the district heating networks in Ganja. This involves upgrading the pipe network – including insulation, leak detection and installation of smart metering systems. The program should also look at extending the network to serve new users and use low or zero-carbon fuels. The action entails:</p> <ul style="list-style-type: none"> Engage with district heating operators to i) review current plans of district heating network including the extent of the network, consumer base, fuels used, and current state of each network, ii) determine efficiency/cost to consumers of district heating, iii) determine any plans for expansion of network already developed; Undertake a study to document areas in district heating systems that are in the poorest state and would offer the most benefits if refurbished; Carry out a study to compare district heating costs to individual boiler costs to determine if district heating is beneficial for different types of end-users; Undertake a study to investigate the potential for low carbon fuels, looking at availability, costs, supply chain, emissions reduction potential etc. and develop a low carbon conversion plan; Investigate proximity of unserved developments to district heating network, categorise best opportunities (based on most new customers reached, closeness to network etc.); and Complete a detailed study that pulls together the conclusions of all the above studies, develop the outline costs, delivery plan and programme, apportion costs, and engage with potential funders, with suitable contractors and end-users to deliver the programme. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> EB1 and 2 – In terms of helping to decarbonise building stock. 			
Key stakeholders and responsibilities:			
<ul style="list-style-type: none"> Azeristiliktihazat OJSC - Implementation agency main authority on operating and maintaining heat supply networks; MENG – Implementation partner alongside Azeristiliktihazat OJSC as the authority on creating and implementing plans and strategies in the energy sector; SAARES – Main authority in the renewable energy sector, should be consulted when identifying alternative low-carbon fuels; GCEA and Municipalities – Potential owners and/or users of those buildings with existing district heating systems; AERA – Regulates the energy sector in the country, hence should be consulted and informed; MEDU, MH or MC – To be consulted as potential users of buildings that rely on district heating systems and will need upgrading; and SCPI – Manages State property and buildings which may have existing district heating systems that need to be upgraded. 			
CAPEX (AZN): Up to 9.35 million (Approx. 4.86 million EUR)	OPEX (AZN): 1.87 million savings per year (based on best-case payback period) (Approx. 0.97 million EUR)	Potential funding sources and revenue generation IFIs/Donor Agencies. Increased sales. Reduced heat losses.	Timeframe for implementation 2024 - 2025 - feasibility and necessary studies; and 2026 onwards - The Programme could begin depending on the completion of pre-requisite steps.
Notes on cost estimate (AZN): CAPEX depends on the state of the network and extent of what needs to be replaced/upgraded (for district heating) and the number of poor-quality boilers that need to be replaced.			

<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Coordination with District Heating Providers to review any current or proposed upgrade projects to the district heating network; • Agreement with providers to explore the development of projects; • Survey of nearby communities to feed into the study to determine network expansion potential; • Feasibility study to determine viable upgrades and network expansion and detailed cost and delivery plan. 			
<p>G&EI considerations and benefits</p> <p>This programme should reduce the cost of energy for all consumers but will considerably assist those who spend a disproportionate amount on their energy bills (those who are experiencing energy poverty, for example, single-headed female households and the elderly).</p> <p>Incorporate women's perspectives in designing heating solutions, as they often have unique energy needs and consumption patterns. Promote women's involvement in technical and decision-making roles related to heating systems.</p> <p>Ensure that the transition to new heating systems creates local job opportunities for women, IDPs, and PwD in installation, maintenance, and operation.</p>	<p>Climate resilience considerations</p> <p>Rehabilitation of the networks should also include an assessment of climate risks, and opportunities to climate-proof the network.</p> <p>The roll-out of smart metering has the potential to reduce energy demand and could reduce strain on the city's supply and distribution systems during extreme events.</p>	<p>GHG reduction</p> <p>Direct GHG reduction is possible, although not quantifiable at this stage.</p> <p>Carbon reductions could be achieved by optimising or expanding any current district heating networks. However, the largest benefits would come from connecting newly built housing estates with district networks, as existing properties are not easily reconfigured to district heating networks. Further investigation through the collation of primary data on district heating networks would be needed to draw up further calculations.</p>	<p>Smart City considerations</p> <p>Including smart metering on district heating systems at household level (revenue metering) and network level (check metering) could provide useful data to assist with delivering impactful policy, programmes and other interventions.</p> <p>For example, smart revenue meters can allow dynamic tariffs to help reduce peak demands or alleviate costs for poorer users, whereas check metering can immediately identify any leakages from the system.</p> <p>Heat loss-thermal imagery, thermos-hydraulic modelling of the existing district heating networks and heat mapping can be used initially to identify the poorest performing parts of the system, to pinpoint specific leakage points and to optimise performance.</p>
<p>Case Study</p> <p>District heating expansion in Heidelberg, Germany⁶²</p> <p>Heidelberg, Germany has a district heating system that covers 47% of the City's heating needs. It used to run on coal plants that resulted in 40% of the City's energy-related greenhouse gas emissions. To cut emissions by 95% by 2050, the City replaced them with combined heat and power plants using renewable fuels. One of these burns sustainable wood chips from the region. Six others use natural gas, four of which run on biomethane from agricultural waste derived from the local area. Implementing such changes resulted in an increase in renewable energy use for district heating by 20%. The City also plans to add solar thermal power and a storage tank for excess renewable electricity from the grid to further decarbonise its operations.</p>			

⁶² C40 Knowledge Hub, How to decarbonise your city's heating and cooling systems, (2023), Available at: https://www.c40knowledgehub.org/s/article/How-to-decarbonise-your-city-s-heating-and-cooling-systems?language=en_US, (Accessed: 11/08/2023).

EB4 Modernisation of electricity distribution network	Investment
<p>Impact: Improved climate resilience of the network. Improved reliability for electricity network for customers. Cost savings on electricity bills. Possible GHG reduction of 201,620 tCO₂e per year.</p>	
<p>Carry out a comprehensive audit of the electricity distribution network conditions and power infrastructure in Ganja. This will inform any improvements or upgrades needed in the distribution network and the potential need for new energy facilities to increase resilience to climate change, extreme weather events and natural disasters, and to adapt to future developments such as the electrification of transport i.e., provision of electric vehicles and charging points.</p> <p>Components:</p> <ul style="list-style-type: none"> Engage with the network operator to i) review record drawings of the power network, ii) complete a survey to verify/complete drawings and understand the state of the network, iii) determine the full extent of the network (substations, connections, areas above and below ground); Undertake a study to document areas in the distribution system that are in the poorest state and would offer the most benefits if refurbished. This should consider the pressure on the network due to future energy supply from renewable sources and demand from the growing popularity of EV vehicles; Undertake a study to investigate smart grid options such as metering, energy storage, and electric vehicles, looking at technology options, and their effect on power demands, costs and benefits; Complete a survey to determine any unserved properties and proportion of the population subject to fuel poverty; Develop programmes to extend electricity to unserved properties, and work with network operators to develop affordable tariffs to assist consumers currently in fuel poverty; and Develop an outline cost for social tariffs, engage with funders, apportion costs and engage with network operators, suitable contractors and end-users. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> EB1 and EB2 – Ensuring the electricity distribution network is capable of supporting additional small-scale renewable energy infrastructure; IN3 – Ensuring the electricity distribution network is capable of supporting large-scale solar PV integration; and Draft GC Master Plan – This action is aligned with and will help to expand and modernise the electricity distribution network as outlined in the Master Plan. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> Azerishiq and Azerienergy OJSC – Implementation agency. Owns and operates the energy distribution network across Azerbaijan and therefore should take ownership in developing plans and implementing the necessary upgrades; GCEA and Municipalities – To be consulted and informed to identify the current and future energy needs and where upgrades to the network are most needed; MENG – To be consulted and informed as the main entity responsible for planning, designing, and implementing energy production and consumption measures; SAARES – To advise on the integration and upgrades needed to support renewable energy potential; and AERA – Regulates the energy sector in the country and, therefore, should be consulted and informed. 	

<p>CAPEX (AZN): 18.70 million (Approx. 9.72 million EUR)</p>	<p>OPEX (AZN): 3.74 million savings per year (Approx. 1.94 million EUR)</p>	<p>Potential funding sources and revenue generation State budget. IFIs/Donor Agencies. Increased electricity sales and reduced losses.</p>	<p>Timeframe for implementation 2024 - 2025 - feasibility and necessary studies; and 2026 onwards - The Programme could begin depending on the completion of pre-requisite steps.</p>
<p>Notes on cost estimate (AZN): CAPEX depends on the state of the network and the extent of it that needs to be replaced/ upgraded, plus how much can be covered in other budgets already set aside for upgrades.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Coordination with Azerishiq to review the existing network and any current or proposed upgrade projects to the electrical network and agreement with Azerishiq to develop refurbishment/upgrade/extension/smart grid projects; • Data collection including a survey of nearby communities to feed into study to determine network expansion and feasibility study to determine viable upgrades/network expansion. 			
<p>G&EI considerations and benefits This programme should reduce the cost of energy for all but will considerably assist those who spend a disproportionate amount on their energy bills (those who are experiencing energy poverty, e.g., single-headed female households). Collaborate with CBOs to identify economically disadvantaged areas and marginalised communities for network modernisation projects. Ensure that training programmes and job opportunities are accessible to women, PwD, and IDPs.</p>	<p>Climate resilience considerations The audit should include a specific assessment of the resilience of the network to climate impacts. Electricity infrastructure is sensitive to climate risks, including flooding of substations, overheating, storm damage to overhead lines, and potential subsequent fire risks. The plan should include equipment that can cater for the effects of climate change including higher temperatures and identify measures to address key network vulnerabilities. The roll-out of smart metering has the potential to reduce energy demand and could reduce strain on the supply and distribution systems during extreme events.</p>	<p>Potential GHG reduction of 201,620 tCO₂e per year. Taking into account several assumptions (see Appendix C), reducing transmission losses as a result of upgrading the network across Ganja has the potential to save 201,620 tCO₂e per annum. Potential further reductions are possible as additional emissions released as a result of the extraction and transportation of fossil fuels (Well-to tank) have not been considered.</p>	<p>Smart City considerations Smart metering at the household level (revenue metering) could provide useful data to improve the network and assist with delivering impactful policies, programmes and other interventions. For example, smart revenue meters can allow dynamic tariffs to help reduce peak demands or alleviate costs for poorer users and immediately identify any abnormal usage, such as fraudulent activities. Automated metering/ monitoring at the substation level can immediately identify any faults. The action will also help to determine the feasibility of other smart initiatives such as energy storage and network support for EV charging.</p>

EB5 Smart Street lighting			Investment
<p>Impact: Improved public safety. Improved resource efficiency and reduced operating costs. Improved maintenance regimes. Possible GHG reduction of 228 tCO₂e per year.</p>			
<p>Expand the existing EBRD programme on solar smart street lighting and upgrade along streets and public squares including conversion to LED luminaires, solar PV, automated lighting control and monitoring systems, and pole and power cable replacement.</p> <p>Components:</p> <ul style="list-style-type: none"> Survey and map all streets, public areas etc., that have smart streetlights and areas where street lighting is not currently present, or where it needs upgrading; and Categorise best opportunities, develop the outline costs, delivery plan and programme, engage with funders, apportion costs, and engage with suitable contractors to deliver the programme. 			
<p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> Ongoing EBRD street lighting initiative; LU1, LU2 and IN2 – Implementing smart solar street lighting in brownfield redevelopment, green corridors and rehabilitated bear earth surfaces, and at the green industrial park; TR2 – Implementing smart street lighting along multi-modal transport corridors and redeveloped sidewalks; and WW2, WW3 and WW4 – Upgrading streetlights alongside work completed to implement new water, sewerage and drainage infrastructure. 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> GCEA House-Community Production Union (Lighting Department) – The implementation agency, in charge of operating and maintaining street lighting in GC, should identify areas using outdated lighting or having poor quality lighting to be upgraded, and to maintain future installations; GCEA and Municipalities – Stakeholder and consultee in identifying areas to have street lighting upgraded; MENG – To be consulted and informed as the main entity responsible for planning, designing, and implementing energy production and consumption measures; SCUPA – Main authority in urban development plans, for existing and new developments including their streets and roads, to ensure sustainable practices; and Azerishiq – Energy supplier and operator, should facilitate connections and implement any necessary upgrades to the network to support the additional load. 			
<p>CAPEX (AZN): 3.74 million (Approx. 1.94 million EUR)</p>	<p>OPEX (AZN): 470,000 per year for system maintenance. (244,400 EUR)</p>	<p>Potential funding sources and revenue generation</p>	<p>Timeframe for implementation 2024 onwards- As the EBRD already has a programme similar to this running, this programme could use</p>

		<p>State budget. IFI/Donor Agencies. PPP. Energy savings.</p>	<p>the same framework, systems and key personnel.</p>
<p>Notes on cost estimate (AZN): Depends on the amount of streets that need streetlighting. It is estimated that 3.74 million could fund street lighting for between 60 and 80km of streets, based on a cost of between 62,300 to 46,750/km.</p>			
<p>Pre-requisite and steps for Implementation:</p> <ul style="list-style-type: none"> • Coordinate with ongoing streetlight upgrade projects (funded by the EBRD); and • Survey other roads in Ganja, and compile a list of priority roads to add to the new plan. 			
<p>G&EI considerations and benefits Additional streetlighting in unlit areas will improve the safety of pedestrians, particularly for women. Involve women in the planning of smart lighting installation to ensure their needs are addressed. Offer contracts and subcontracting opportunities to local businesses, particularly those owned by women for manufacturing, installing, and maintaining smart lighting infrastructure. Where possible, ensure that the benefits of cost savings from energy-efficient lighting are shared with the local community.</p>	<p>Climate resilience considerations No direct climate resilience benefits but systems will be specified to ensure performance under higher temperatures.</p>	<p>Potential GHG reduction of 228 tCO₂e per year. Taking into account several assumptions (see Appendix C), upgrading streetlighting to LED along 80 km of street should improve the efficiency of the streetlighting network by increasing its energy efficiency. Further reductions can be achieved by utilising solar energy produced as part of the accompanying installations.</p>	<p>Smart City considerations Inherently this is a smart action with the street lighting being LED, using solar energy and capable of turning on and off based on natural light conditions. Moreover, the operator of the street lights will be able to manage lighting, detect issues and monitor energy consumption. Lighting columns can potentially implement EV charging points (depending on the outcomes of EB4 and the capacity of the network to support the additional loads) and integrate environmental sensors and monitoring equipment (CEG4), CCTV, parking and traffic information (TR1).</p>

8. Industry

Sector goals:

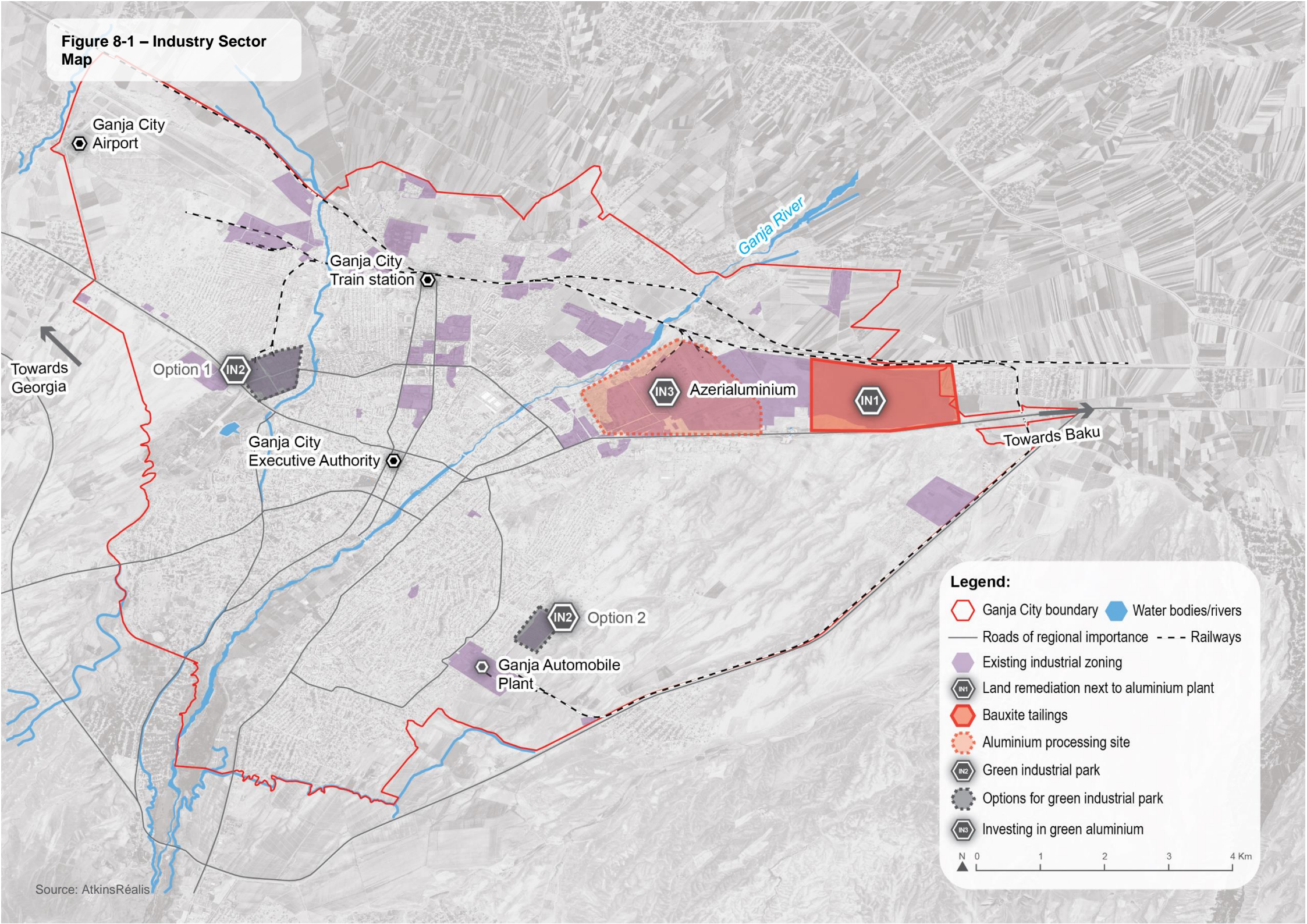
Develop a green industrial sector in the City that fosters economic growth, while minimising environmental degradation by promoting green technology and cleaner production.



Mid-term targets	Current value		Target
Heat consumption in industries per unit of industrial GDP (MJ / 2010 USD)	n/a	↘	0.25
Fossil fuel combustion in industrial processes per unit of industrial GDP (MJ / USD)	n/a	↘	2.2
Share of industrial energy consumption from renewable energy (%)	n/a	↗	10%
Number of contaminated sites (CSS / km ²)	n/a	↘	10-20

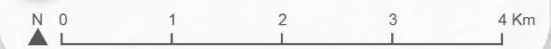
Action Ref.	Action Title	Action Owner	CAPEX(AZN)	OPEX (AZN/Annual)	Linkages
IN1	Remediation of contaminated land next to aluminium plant	Azerialuminium	174 million (Approx. 90.5 million EUR)	N/A	CEG1 and 4, WW1 and 2, and draft GC Master Plan.
IN2	Green industrial park	MECON	760,000 (395,200 EUR)	N/A	LU2, WW2 and 3, and draft GC Master Plan.
IN3	Investing in green aluminium	Azerialuminium	735.4 million (Approx. 382.4 million EUR)	36.7 million (Approx. 19.1 million EUR)	SW2.

Figure 8-1 – Industry Sector Map



Legend:

- Ganja City boundary
- Water bodies/ivers
- Roads of regional importance
- Railways
- Existing industrial zoning
- Land remediation next to aluminium plant
- Bauxite tailings
- Aluminium processing site
- Green industrial park
- Options for green industrial park
- Investing in green aluminium



Source: AtkinsRéalis

8.1. Key Actors and Stakeholders

The industries sector has various types of stakeholders involved, including both Ministries and State-owned enterprises (such as Azerialuminium), private companies and SMEs. The development of plans and expansion of industries is undertaken by the Ministry of Economy (MECON). The MES and MENR play a key role in ensuring health and safety risk standards and the environmental performance of industries are fully met. The GCEA and Municipalities have little to no influence on the industries sector. Additional information is provided in Table 8-1.

UNIDO, in partnership with the EU4Environment Programme, have established RECP in Ganja State University. The aim is to help SMEs and industries in GC to identify how their industrial and manufacturing processes could become more resource-efficient.

Table 8-1 – Stakeholders Involved in the Industries Sector

Stakeholder	Role
MECON	Implements elements of State programmes and works with other relevant State Agencies to deliver plans and projects to improve economic outlook and employment prospects for citizens.
Azeraluminium OJSC	Own and operate the aluminium plant in Ganja. The OJSC is the largest employer in the City and occupies land which could have a high level of soil pollution.
Azerbaijan Industrial Corporation OJSC (AIC)	Own and operate industrial and manufacturing enterprises. Key stakeholder, and potential implementation agency, in developing plans and strategies to promote economic growth (in particular in non-oil sectors), achieving favourable cooperative relationships between other OJSCs, and eliminating unemployment.
MES	Issue construction permits for large developments and ensure technical safety standards across the industrial sector.
MENR	Manages environmental audits of industries, issues permits for the discharge of pollutants into the

	environment and fines those who breach these permits.
Small and Medium Business Development Agency (SMBDA)	The agency was established under the MECON to support the development of SMEs, regulate services, ensure coordination between SMEs, provide training and facilitate access to finance and trade networks.
SMEs and Private Industries	Own, manage and operate businesses, industries and manufacturing enterprises. About 20 SMEs and industries from food and agriculture, textiles, cement and metallurgy are part of the RECP Ganja.
GCEA and Municipalities	Potential owner of public land, also potentially designated for industrial use. Stakeholders in the development of plans and strategies.

Source: AtkinsRéalis analysis

8.2. Supporting Activities and Enabling Policies

- **Environmental auditing should be reinstated across the country** - Environmental auditing and reporting from industries and businesses should be a priority to ensure industrial pollution is avoided, minimised, and appropriately mitigated. Environmental audits were compulsory until 2015 and conducted annually, biannually or every three years depending on the company's size and environmental risks. The reinstatement of the environment audits should be recommended promptly by order of the head of State environmental audits;
- **Permitting and licensing should be streamlined** - MENR has recently enabled an electronic application process for environmental licenses and permits. However, the portal needs improvement as the system is still complicated to use. In addition, many requirements and types of licenses and permits could be merged or reduced as some are unnecessary; and
- **“Polluters pay” system to be improved** - Enforce the fines and punishment mechanisms for polluting industries. The “Polluter Pays” system was established in 1992, however, it was recently updated with a list of pollutants and fees/charges per pollutant. However, there is no mechanism for calculation, reporting or fines for non-compliance due to the lack of clarity in the regulations.

8.3. Best Practice of Financing Modalities for the Industry Sector

- **Expand fiscal incentives** - including, tax breaks, import duty exemptions on equipment or tax credits for green industries and smart technologies that will help to minimise pollution.
- **Better access to finance** - for green industries and green industrial hubs including the establishment of dedicated funds, loan guarantees, or low-interest loans for green industries should be promoted.
- **Green SME clusters (or industrial hubs) to be established in Ganja** - Clusters of SMEs are already promoted across the country, and tax

exemption for SME clusters is already established by the Azerbaijan Tax Code: “*Within a period of seven years from the date of registration in the SME Cluster Register, an SME shall be exempt from the following taxes: income tax; land tax; property tax; while the imported technical/technological manufacturing and/or processing equipment and units shall be exempt from VAT*”⁶³. This needs to be enforced and encouraged across Ganja to ensure SMEs are clustered together within the identified industrial zones, such as the site identified in IN2 – green industrial park.

⁶³ SMBDA, SME Clusters, (2023). Available at:- <https://smb.gov.az/en/nav/sme-cluster>, (Accessed: 21/08/2023).

IN1 Remediation of contaminated land next to aluminium plant	Investment
<p>Impact: Reduced pollution and improvement of soil quality. Reduced risk to water quality. Improvement of public health and safety. Potential for GHG emissions reduction.</p>	
<p>Establish a programme for remediating contaminated land affected by the industrial legacy around the Azeraluminium plant and red mud caustic (bauxite) tailings area that represents an unacceptable risk to health, surface/groundwater quality and the general environment. The remediation options will need to consider the proposed land use master plan, the vicinity of sensitive receptors, sustainability, and cost-benefit. Future remediation of areas that may be regenerated for commercial, residential and mixed uses needs to be to a sufficient standard to attract investment from multinational organisations.</p> <p>The bauxite tailings in the east of the Azeraluminium plant are likely to represent the primary source of metal contamination in soil and groundwater (250 Ha). However, the aluminium plant in the west of the site (about 200 Ha), which likely adopted the Bayer Process, also has a high likelihood of soil and groundwater impact from various refining and smelting activities using caustic liquors and the likelihood of asbestos-containing materials in the structures and soils. The processing plant is also closest to the Ganja River and a possible risk to surface water quality.</p> <p>Component 1: Desk-based data collation and preliminary risk assessment</p> <p>Complete a detailed desk-based assessment of the current environmental condition of the land and construct a conceptual site model (CSM). The model should evaluate the possible sources of contamination, receptors to the contamination and the pathways between them (pollutant linkages). The assessment of the sources of contamination will require a detailed inspection of the aluminium plant complex, including the general processing plant in the west and the bauxite tailings in the east.</p> <p>Component 2: Intrusive investigation and detailed risk assessment</p> <p>The CSM should be used to determine the most advantageous positions for intrusive site investigation. The investigations will need to evaluate soil quality from sampling and laboratory testing and comparison with internationally accepted guidance criteria for health, based on the proposed end use and the potential for leachability and impact on groundwater/surface water quality.</p> <p>The investigations should also evaluate the geological sequence, surface water quality, and the presence of aquifers and include groundwater sampling to assess groundwater quality, depth and flow direction. The assessment of groundwater quality and flow will assist in future consideration of groundwater resources. In addition, the assessment should determine whether the migration of potentially contaminated groundwater represents a risk to the quality of the Ganja River located in close proximity to the northwest of the Azeraluminium plant. The results of the ground investigation will be used to update the CSM, refine the pollutant linkage assessment and identify priority risks that may require intervention to remediate unacceptable risks and improve environmental conditions.</p> <p>Component 3: Remediation options appraisal</p> <p>Develop a preliminary options appraisal to evaluate and consider possible remediation strategies to mitigate unacceptable risk. The remediation strategy should consider the proposed land uses, technical approach, cost/benefit, sustainability and overall environmental improvement. This will enable the remediation funding to be targeted at the most pertinent risk items. The remediation options appraisal should also include an appraisal of the remediation activities at other aluminium refineries around the world, of which there are approximately 80. In particular, new remediation technology for bauxite tailings is being developed in Australia and may be applicable.</p> <p>Component 4: Remediation and verification</p> <p>Implementation and verification of chosen remediation.</p>	

<p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • WW1, WW2 and CEG1 – To inform and understand how Ganja River and groundwater have been polluted by legacy industrial activities; • CEG4 – Regarding regular soil and water monitoring; and • Draft GC Master Plan – This action is aligned with and will help to implement the ambition to rehabilitate the land currently used for bauxite tailings and repurpose it for future use. 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • Azeraluminium – Implementation agency. Currently occupies public land used as bauxite tailings, operational and old aluminium processing plant. In collaboration with MENR, carry out risk assessment, ground intrusive investigations, appraisal options and implement remediation measures of land polluted by legacy activities as part of the aluminium processing; • MENR – Coordinate remediation efforts with Azeraluminium and across other contaminated sites; • AIC – Entity responsible for several State-owned industries across the country and potentially in developing plans for the future use of the site and its occupation; • GCEA and Municipalities – Main beneficiary and consultee in remediating the land and developing plans for its future use; • SCUPA – To be consulted when undertaking appraisal options when considering future land uses; and • MES – To be consulted in terms of H&S risks from the operation of the aluminium processing plant, as well as H&S issues from the contaminated site and its potential future uses. 			
<p>CAPEX (AZN): 174 million (Approx. 90.5 million EUR)</p>	<p>OPEX (AZN): N/A – O&M cost to be provided by remediation options appraisal.</p>	<p>Potential funding sources and revenue generation State budget. Sovereign loan. Sale of the red mud, particularly in cement, iron, steel and brick manufacturing.</p>	<p>Timeframe for implementation 2025 onwards - Risk assessment, ground investigation and appraisal of options should commence after approval of the Master Plan. However, remediation measures could take a few years due to the extension of the contaminated areas.</p>
<p>Notes on cost estimate (AZN): 962,000 - desk-based study, site investigation and remediation options appraisal, this is due to the significant size of the Azeraluminium plant and bauxite tailings area; Approx. 96 million - remediation of bauxite tailings; Approx. 77 million - remediation of the old aluminium plant west to the current plant closer to the Ganja River. Remediation costs are excluded, future remediation costs are dependent on the levels of contamination detected and the proposed future end uses. However, the remediation costs could be 400,000/ha (not including above-ground structure demolition and removal). Remediation of bauxite tailings is notoriously difficult and therefore options for reuse of the tailings may be limited.</p>			

<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> Detailed site assessment and study to understand the extent of pollution on the site as well as around it, including groundwater contamination and impact on the river Ganja; and Define who will be paying for the remediation. Under the principles of “Polluter Pays”, the aluminium plant should pay for the remediation with financial support from the State budget due to the plant being publicly operated by the State. 			
<p>G&EI considerations and benefits</p> <p>The remediation of contaminated land next to the aluminium plant can have a significant impact on people's health and safety, in particular on those communities who live close to the contaminated land and aluminium plant. It is important to use a CSM to assess the risks and take all necessary measures, in accordance with the selected remediation options, to minimise the exposure of people to contaminated materials (especially women and children, who are more vulnerable to the effects of pollution).</p> <p>Depending on the duration of the remediation programme and the number of trucks and earth movement equipment, it is likely that in the order of 50-200 temporary jobs could be created.</p> <p>Opportunities should be sought to increase the participation of IDPs in the remediation and further down the supply chain, for example in the logistics and reuse of the bauxite deposits.</p>	<p>Climate resilience considerations</p> <p>Remediating the land could allow it to be used as a green space with wider heat reduction and environmental benefits. Potential future uses of the site should consider the contribution to urban cooling, drainage and biodiversity.</p>	<p>Potential GHG reduction</p> <p>There is evidence that the bauxite tailings can be neutralised by the capture and storage of carbon dioxide. This not only assists in lowering the pH of the wastes but also reduces greenhouse gas emissions and maybe a possible option for GHG reduction and management at the site.</p> <p>There could be significant GHG sequestration potential by remediation of contaminated land, i.e., increasing/enhancing biodiversity and plant matter. However, a land assessment would need to be undertaken to determine sequestration potential and the form of remediation required to ensure it is effective. There would also need to be a maintenance plan in place to ensure that habitat is maintained to ensure benefits are realised.</p>	<p>Smart City considerations</p> <p>The use of new and emerging technologies should be explored to remediate the bauxite tailings and aluminium processing plant.</p>
<p>Case Study</p> <p>St Modwen Park, the former Etruria iron and steelworks plant⁶⁴</p> <p>St Modwen Park is part of a wider 300-acre Festival Park development to redevelop the former Shelton Iron and Steelworks in Etruria Valley, UK. Steel production ended in 1978 and by 2002 the Rolling Mill also closed, signalling the end of Shelton Works which employed more than 3,000 people and produced over 400,000 tonnes of steel each year. As part of the redevelopment of the area, approximately 1,400,000 sq ft of commercial space has been developed with the potential to accommodate a further 600,000 sq ft if remediated. AtkinsRéalis was the lead engineer for the design phase which included: earthworks and remediation; the design of transport infrastructure, drainage and utility provision to serviced plots and structural landscaping.</p>			

⁶⁴ AtkinsRéalis project library.

Following demolition, successful remediation and reclamation of the former iron and steelworks were undertaken, involving the removal of belowground obstructions and contamination hotspots. Earthworks were also undertaken to provide an appropriate development plateau to render each plot suitable for commercial uses. The analysis of slag (iron and steelworks bi-product), which was prevalent across the site indicated that the slag was of low expansion.

Figure 8-2 – St Modwen Park and Master Plan



Source: AtkinsRéalis project library

IN2 Green Industrial Park	Pre-investment
<p>Impact: Circular economy and clean production. Increased resource efficiency. Reduced environmental risk. Avoid urban sprawl. Possible job creation. Stimulation of local businesses and economic growth.</p>	
<p>This aims to establish a green industrial park in an appropriate location within Ganja, incorporating eco-industrial, clean production and circular economy principles. The park should focus on clustering industries and SMEs within a suitable site with fully equipped facilities. The green industrial park should build upon the lessons learned from the ongoing Resource Efficiency and Clean Production Clubs established by UNIDO and the EU4 Environment Programme. A green industrial park will help to foster economic opportunities for industries by increasing their competitiveness, reducing exposure to resource and licensing risk, promoting business development and building a firm reputation among stakeholders for their commitment to sustainable practices. At the same time, adverse environmental impacts will be managed by focusing on mitigation solutions and sharing resources based on circular economy principles. The first step is to identify an appropriate site and the development of a business case and feasibility study. Once this is completed, a detailed design should be undertaken to determine the number of units to be provided and ancillary infrastructure alongside an environmental and social impact assessment to minimise the impacts on the local environment.</p> <p>Components:</p> <ul style="list-style-type: none"> • Develop a business case and feasibility study for the creation of a green industrial park in Ganja. This should include site selection and preparation, infrastructure and accessibility assessment, site investigations, clearance and potential remediation once the site is selected; and detail pre-requisite measures to unlock the site for redevelopment as an industrial park; • Supply and demand study to determine the type of industries / SMEs to be located on the site and opportunities to share resources, i.e., waste exchange platform; • Undertake detailed master planning and design of utility infrastructure – including to determine the number and size of SME units, warehouses and production/industrial units to be provided; detailed design of ancillary infrastructure on-site i.e. internal roads, utilities and green infrastructure such as shared district heating system using excess heat from production lines to heat other buildings; energy and water smart meters; efficient and modern equipment such as pumps, motors and drives; grey water harvesting and reuse for flushing toilets; industrial effluent treatment and waste management; • Undertake an Environmental and Social Impact Assessment (ESIA) and a Resettlement Action Plan if needed; • Identify the necessary consenting permits for the park to be built and fully operational as well as identify potential access to green credentials and certificates; • A long-term investment plan should also be created to detail investment attraction and value propositions for industries and businesses to move to the green industrial park. This should include tax exemption and incentives as per the Tax Code, flexible rental agreements and access to unique services; • Identify the operational model of the park including options as a Special Economic Zone (SEZ), a concession to the private operator who will maintain the common facilities and offer of joint infrastructure provision for the companies located inside the park; and • Determine the procurement route for the construction and operation of the park and prepare the tender documentation. <p>Options: Both sites identified below are within public land/State-owned land.</p>	

- Site Option 1 – Located within an old industrial zoning closer to the Heydar Aliyev Park (around 15ha), where transport infrastructure such as accessibility to main roads and proximity to railway are beneficial, but water, sewerage and power are lacking, see Figure 8-3. Its proximity to the city centre, residential neighbourhoods and green park will make the site more suitable for SMEs and light industry; and
- Site Option 2 – Located within the proposed industrial area in the east of the City, with the potential to be co-located with the existing car assembly plant and former poultry industry (around 23ha), found along the E60 highway. This area also has relatively good access to the road network and an existing railway track to the automobile assembly plant; however, it is in the outskirts of the City and therefore more suitable for heavy industries to minimise disturbance.

Figure 8-3 – Site option 1 photos.



Source: AtkinsRéalis site visit

Links with other actions and initiatives:

- Ongoing work by UNIDO relating to Resource Efficiency and Clean Production Clubs;
- LU2 – Depending on the type of industries i.e., light industries and SMEs, the park could be located within the sites identified for brownfield mixed-use development;
- WW2 and WW3 – All sites should be connected to the water supply and wastewater network; and
- Draft GC Master Plan – This action is aligned with and will help to re-establish a strong industrial presence in the City and implement the Master Plan proposed for future industrial zones and science park.

<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • MECON – Implementation agency. The main body in charge of developing plans relating to the economy of the country, including any special zones for industry; • AIC – National agency promoting Azerbaijan industry and helping to develop the industrial sector. It could be a potential implementation partner and closely collaborate with MECON; • SMBDA - Promotes and coordinates interaction between SMEs, entrepreneurs, industrial parks, SEZ and industrial neighbourhoods. Also supports in obtaining licenses and permissions; provides financial support including loans, investments, grants and venture capital, and provides support to industrial parks and business incubators. They could also be a potential implementation partner; • SCUPA – To assist and develop a detailed master plan for the selected site; • GCEA and Municipalities – Could be the owners of land to host the industrial hub. Potential to get revenue for leasing the land, buildings, SME units and warehouses; • SMEs and Private Sector – Future occupiers of the industrial park who will benefit from reducing their pollution and operational carbon footprint; • SCPI – Manages the State property; and • Other industrial park operators in the country e.g., Balakhanya Industrial Park operated by Tamiz Shahar – Potential stakeholder and consultee as a partner to gather input and lessons learnt from their operations. 			
<p>CAPEX (AZN): 760,000 (395,200 EUR)</p>	<p>OPEX (AZN) TBC by operational model. O&M costs will be high and can be managed by a third party i.e., a park operator. High potential for job creation.</p>	<p>Potential funding sources and revenue generation Sovereign loan. State budget. IFI/Donor Agencies. Leasing of land. Leasing of industrial buildings, SME units and warehouses.</p>	<p>Timeframe for implementation 2024 - 2025 - Pre-investment components and described in the proforma and pre-request steps. 2025 – onwards – investment and build out of the green industrial park.</p>
<p>Notes on cost estimate (AZN): 150,000 - feasibility study and business case; 30,000 - demand and supply study; 200,000 - ESIA and Resettlement Action Plan (RAP); 350,000 - detailed master plan; 30,000 - long-term investment and model of operation.</p> <p>The studies will provide better information about CAPEX, the need for land to be developed, enabling infrastructure and construction of industries/SME units, warehouses, etc. O&M costs will be high and can be managed by a third party i.e., the park operator. Potential for high numbers of jobs to be created.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Lessons learned from ongoing RECP Club; • Agreement and consensus from Government and stakeholders to release sites for industrial purposes within public land; • Options for establishing a SEZ in Ganja; and • Raise awareness of the benefits of an industrial cluster to leverage change. 			

<p>G&EI considerations and benefits</p> <p>Assess potential economic benefits for the local community – including job creation, skill development and increased business opportunities.</p> <p>Include women in the planning and decision-making process for the industrial park's location and design to ensure their voices are heard.</p> <p>Consider the safety and accessibility of the site for women, IDP and PwD workers – including well-lit pathways, CCTV and safe and secure transportation options.</p> <p>Identify women-owned businesses in the local area to participate in the park's development and operations.</p> <p>Overall, there is a big potential for job creation and economic activity as a result of implementing a green industrial park in the City.</p>	<p>Climate resilience considerations</p> <p>The site selection process should include a climate risk assessment to inform appropriate drainage and site layout and ensure that flood risk is limited.</p> <p>Detailed design and master planning for the site should:</p> <ul style="list-style-type: none"> • Incorporate heat resilience measures into building design; • Ensure drainage systems are sized appropriately for increases in heavy rainfall, and incorporate SuDS approaches where possible; and • Include the development of flood risk and heat management plans to ensure a safe working environment. 	<p>Potential GHG reduction</p> <p>No direct carbon reduction saving.</p> <p>Indirect carbon savings are possible, although these cannot be quantified until a detailed master plan is created, and a clear understanding of which industries/SMEs are brought forward.</p> <p>Nonetheless, it is clear there would be a GHG reduction potential by having an industrial estate on a shared district heating system, or by utilising on-site solar to power the industrial park. Moreover, the latest technology in building efficiency should be utilised to further reduce the energy intensity of the site and therefore GHG emissions.</p>	<p>Smart City considerations</p> <p>The action will include Smart City technologies in line with other actions proposed, for example:</p> <p>Integrating smart solar street lighting (linked to EB5): The green industrial park should include solar-powered lighting where economically viable, to reduce carbon emissions;</p> <p>Smart utility sensors and energy efficiency in buildings (linked to EB2): New industrial and office buildings should be of high energy efficiency and employ the latest technology to monitor resources, this could also include awareness raising and an online platform regarding energy efficiency measures for future tenants and industries building upon the UNIDO work);</p> <p>Sustainable Materials: The action will prioritise the use of sustainable, locally sourced materials in the construction which will reduce its environmental impact;</p> <p>Other technologies could be solar PV and solar water heaters, CCTV surveillance, EV charging points for the employees, carpooling schemes for the employees, and cycling and pedestrian-friendly streets within the development.</p>
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Case Study

Estonian Industrial Symbiosis Agro-Park (EISAP), Estonia ^{65,66}

The development of the EISAP has been led by the Ida-Virumma Industrial Areas (IVIA) public organisation, founded by the Estonian Ministry of Economic Affairs and Communications and several city governments in the region to develop five industrial parks to attract investment. The IVIA are also the owner of land, property and associated infrastructure in each park and helps link businesses with incubator services and support services – such as assisting with tax administration, recruitment and offering legal, business and financial advice. One of the planned industrial parks, the EISAP, involves regenerating some 1500ha of land in the eastern region of Estonia into an agro-park designed to host sustainable-minded businesses, manufacturing and logistics companies

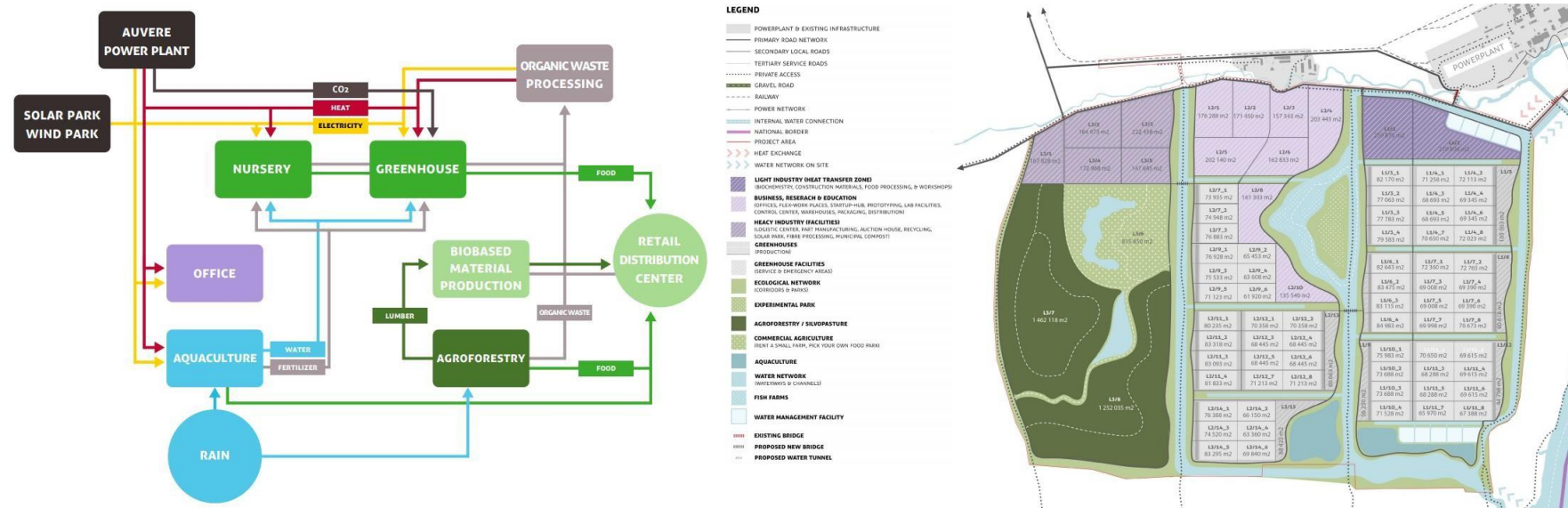
⁶⁵ Except, Estonian Industrial Symbiosis Agro-Park, (2023), Available at: <https://except.eco/projects/estonian-industrial-symbiosis-agro-park-eisap/>, (Accessed: 18/08/2023).

⁶⁶ Interreg Baltic Sea Region, Pilot 3-Best use of land and resources for a fully circular Agro-industrial park with RAS, (2023), Available at: <https://interreg-baltic.eu/project-pilots/pilot-3-best-use-of-land-and-resources-for-a-fully-circular-agro-industrial-park-with-ras/>, (Accessed: 18/08/2023).

while operating as a closed-loop system where resources and waste products across the site are interlinked. This design will help EISAP achieve its aims of:

- Reducing industrial contributions to emissions and helping to meet EU climate targets for 2030 and Estonia's goal of 80% CO₂ reduction by installing solar PV to supply energy for the site and reuse CO₂ emissions from a nearby power plant;
- Minimising resource use through implementing rainwater capture and grey water recycling measures, as well as using excess steam and heat from the nearby power plant to heat industrial buildings and offices;
- Implementing large-scale water attenuation, NBS, and capitalising upon its location close to a wetland to manage surface water and enhance local biodiversity;
- Drive regional job growth and minimise the migration of the local workforce by providing green jobs across the site; and
- Increase and diversify local food production through implementing innovative technologies, such as aquaculture.

Figure 8-4 – EISAP Resources Flow Chart and Master Plan



Source: Except

IN3 Investing in green aluminium	Investment
<p>Impact: Clean production and circular economy. Increased resource efficiency. Reduced GHG and environmental impact. Reduced disposal and increased reuse of used aluminium, such as beverage cans. Possible revenue generation through the sale of green aluminium and excess energy from solar PV. Permanent job creation as part of the new production line. Training/education opportunities for vulnerable groups.</p>	
<p>The Azerialuminium processing plant is one of the largest employers in Ganja, and its activities account for a high proportion of the City's GDP. However, aluminium processing is a carbon and resource-intensive activity. Currently, the plant has an annual capacity of producing 50,000 tonnes of primary aluminium. It draws the electricity needed for the aluminium smelting and processing activities from the national grid, and although some of the energy produced at the national level is derived from hydro and renewable energy (9% hydro in 2021), the remaining is generated by gas-powered thermal plants. This means that the energy drawn from the national grid already has a carbon footprint associated with it.</p> <p>The action aims to support and invest in the aluminium processing plant to accelerate its efforts in decarbonising its operations and becoming a greener industry. Potential investments should include solar PV power generation, recycled aluminium processing and resource efficiency measures, among other possible investment opportunities. These would help the plant decarbonise its operations, and reduce its impact on the local environment and resource demand.</p> <p>Components:</p> <ul style="list-style-type: none"> Invest in on-site solar PV renewable energy to power the aluminium smelting process - a solar PV power plant with a potential total capacity of 400 MW (as per the presentation given by Azerialuminium), potentially in phases to accommodate additional energy demand once new aluminium production lines are established. Phase 1 - 200 MW (for current energy demand), Phase 2 - 100 MW, Phase 3 - 100 MW); Invest in modern aluminium recycling facility to reuse used beverage cans (UBCs) in the smelting process to recycle used aluminium into new aluminium products, therefore saving energy and reducing GHG emissions. Estimated annual production volume of 40,000 tons (as per presentation given by Azerialuminium); and Implement energy and water efficiency measures in the office buildings, including LED lighting, smart meters for water and electricity and grey water reuse. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> SW2 – Possibility for recycled aluminium from the proposed action to be used in the aluminium processing plant. Options for segregation of aluminium cans in the MRF and reuse of used beverage cans (UBCs) in the smelting process. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> Azerialuminium – Implementation agency. Responsible for the O&M of the aluminium processing plant and other office buildings on the site; MES – Oversee health and safety at the plant and issue safety building permits; MENR – Environmental authority for controlling and monitoring the environment and issuing fines if needed; MENG – Stakeholder, in particular relating to the solar PV renewable power potential on the site; and OJSC (utility companies) – Stakeholders, in charge of O&M of networks and connections as well as partners in implementing any necessary network upgrades to support the action. 	

<p>CAPEX (AZN): 735.4 million (Approx. 382.4 million EUR)</p>	<p>OPEX (AZN): 36.7 million (Approx. 19.1 million EUR)</p>	<p>Potential funding sources and revenue generation Sovereign loan. IFI/Donor Agencies. (Private-led investment). Sale of recycled aluminium, potentially at a better price due to green credentials. Sale of renewable energy back to the electricity grid (need to implement energy purchase regulatory framework).</p>	<p>Timeframe for implementation 2024 - planning and feasibility studies; and 2025 – 2028 – implementation.</p>
<p>Notes on cost estimate (AZN): CAPEX is based on the initial project estimate provided by the Azerialuminium Investment Plan. 680 million - solar PV power plant; 54.5 million - aluminium recycling; 1 million - resource efficiency measures. OPEX is estimated at 5% of CAPEX, 20 x FTE for maintenance and expansion of the production line including operators, managers, supervisors, fitters, etc.</p>			
<p>Pre-requisite and steps for Implementation:</p> <ul style="list-style-type: none"> • Each component will need to undergo a feasibility assessment; • Environmental and social impact assessment; and • Memorandum of understanding with technical advisor. 			
<p>G&EI considerations and benefits Consider the potential economic advantages of creating sustainable green aluminium that can attract eco-conscious consumers and investors helping to increase the economic output of the processing plant. Collaboration with local educational institutions to provide training programmes that equip the local workforce with the necessary skills for using the latest technologies. Ensure gender diversity in the workforce operating the new aluminium production lines, encouraging women's participation in technical and operational roles in recycling facilities and the green aluminium production line. Offer training opportunities to women, PwD and IDPs, both in technical and leadership capacities, to bridge the gender gap in skilled positions within the industry and offer disadvantaged groups enhanced opportunities to obtain skilled jobs.</p>	<p>Climate resilience considerations Consider the development of operational guidelines for working in high temperatures, including more regular breaks and access to cool rooms. Assess whether factory cooling systems are adequate under heatwave conditions and whether there is a need for additional cooling.</p>	<p>Potential GHG reduction of 218,800 tCO₂e. Taking into account several assumptions (see Appendix C), GHG reductions are achieved through the implementation of the 400 MW solar PV installation which would allow the aluminium plant to reduce its reliance on the national grid for processing of aluminium. This should result in approximate savings of 328,800 tCO₂e per annum once fully operational. However, solar energy output may not be at 100% all the time and would not produce energy at night, therefore it is reasonable to assume that at times the GHG emission savings from installing solar PV may be lowered than calculated. Although implementing a new recycled/green aluminium processing line with a capacity of 40,000 tonnes per annum would result in additional GHG emissions, a saving of 504,000 tCO₂e could be possible when compared to implementing a primary alumina processing line. Further GHG reductions of the plant could be possible through implementing other energy savings across the plant.</p>	<p>Smart City considerations The latest technologies should be used to establish the recycled aluminium production line. Any building resilience measures should utilise LEDs, smart energy and water meters to maximise resource efficiency.</p>

Case Studies

Hydro zero-emission aluminium production, Norway⁶⁷
 Since 1990, Hydro has cut its GHG emissions by 55% and the CO₂ footprint of its produced aluminium products by 70%. More recently, they have identified that the fastest way to deliver zero-carbon aluminium within their production chain is by recycling post-consumer scrap. Hydro is currently marketing Hydro CIRCAL extrusion ingot, which consists of 75% post-consumer scrap and has a product footprint of 2.3 kg CO₂ /kg aluminium. Hydro’s recycling system delivers near-zero⁶⁸ carbon aluminium based on 100% recycled post-consumer aluminium scrap. This has been achieved through three key routes to producing their green aluminium:
 1. Recycling of post-consumer scrap with decarbonised operations; 2. Implementing carbon capture and storage for existing smelters (CCS); and 3. Development of bespoke high-efficiency smelters named ‘HalZero’ technology. Specifically relating to CCS, Hydro has evaluated 50 CCS technologies which aim to help make their existing aluminium smelters fit for the future, Hydro has also developed CCS solutions that can be retrofitted into aluminium plants that are in operation today. Implementing CCS by 2030 is one of the main goals of the company to help decarbonise its operations.

Emirates Global Aluminium (EGA), aluminium produced using solar energy, UAE⁶⁹
 EGA is the first company in the world to produce aluminium commercially using solar energy (a product which they have named CelestiAl), to reduce GHG emissions associated with their aluminium production. Solar power used in the smelting process is derived from the nearby Mohammed bin Rashid Al Maktoum Solar Park in the desert outside Dubai and from Noor Abu Dhabi at Sweihan. The energy is transmitted through the grid to the plant and is tracked and traced through the use of the International Renewable Energy Certification system, which ensures the energy supplied is derived from the solar fields. EGA and its green aluminium product have already attracted attention from large corporations such as Mercedes-Benz, Nissan and the Mohammed Bin Rashid Space Centre for use in MBZ-SAT a high-resolution imagery satellite due to launch in 2024.

Figure 8-5 – EGA CelestiAl Aluminium Product (left) and the Mohammed bin Rashid Al Maktoum Solar Park (right)



Source: EGA

⁶⁷ Hydro, Hydros roadmap to zero emission aluminium production, (2023), Available at: <https://www.hydro.com/en/media/on-the-agenda/hydros-roadmap-to-zero-emission-aluminium-production/>, (Accessed: 18/08/2023).

⁶⁸ Defined as aluminium with a footprint of 0.5-1 kg CO₂ /kg aluminium, throughout the value chain.

⁶⁹ EGA, CelestiAL solar aluminium, (2023), Available at: <https://www.ega.ae/en/products/celestial>, (Accessed: 18/08/2023).

9. Water and Wastewater

Sector goals:

Ensure the 24/7 provision of potable water for all.
 Ensure the protection of key water resources and the efficient use of these resources.
 Implement and maintain functioning wastewater treatment plant and network.

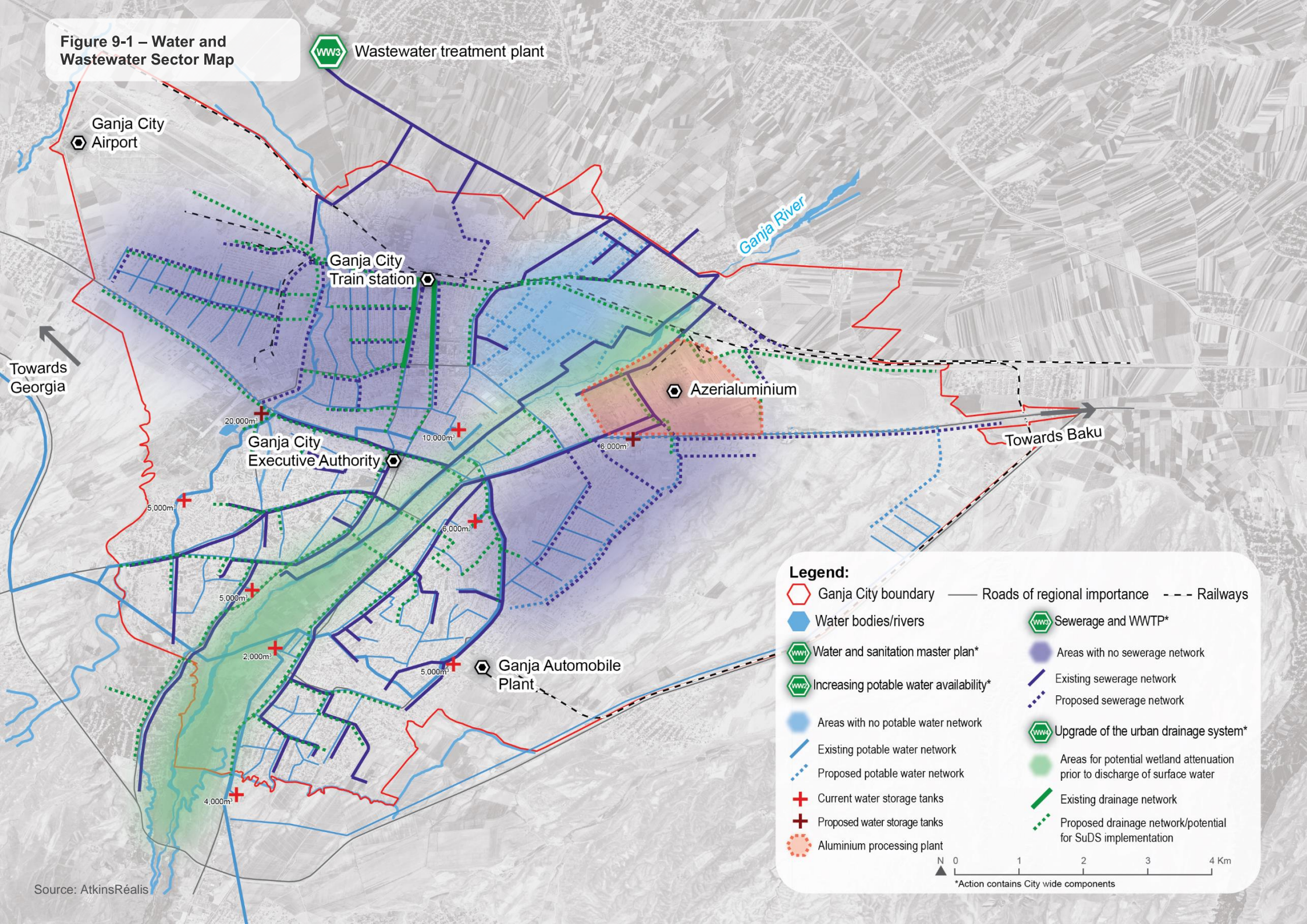


Mid-term Targets	Current value		Target
Water consumption per capita (L/day/capita)	4 ⁷⁰	↗	between 80-200
Water Exploitation Index (%)	72%	↘	<40%
Non-revenue water (NRW) (%)	Up to 60%	↘	45%
Wastewater treated according to applicable national standards (%)	0%	↗	40%

Action Ref.	Action Title	Action Owner	CAPEX (AZN)	OPEX (AZN/Annual)	Linkages
WW1	Water and sanitation Master Plan	AzerSu (or WRA)	3 million (Approx. 1.56 million EUR)	N/A	LU4, CEG1 and 4, WW2 and draft GC Master Plan.
WW2	Increasing potable water availability	AzerSu (or WRA)	250 million (Approx. 130 million EUR)	5 million (Approx. 2.6 million EUR)	WW1, TR2, EB5, LU4, CEG4 and draft GC Master Plan.
WW3	Sewerage and wastewater treatment plant	AzerSu (or WRA)	500 million (Approx. 260 million EUR)	10 million (Approx. 5.2 million EUR)	WW1, TR2, EB5, LU4, CEG4 and draft GC Master Plan.
WW4	Upgrade of the urban drainage system	AzerSu (or WRA)/ AYNA	600,000 (312,000 EUR)	N/A	WW1, TR2, EB5, CEG1, LU1 and 2, and draft GC Master Plan.

⁷⁰ Total water consumption in Ganja is approximately 850,000 m³/year, of which 50% was assumed to be used by industries based on anecdotal evidence. Therefore, 425,000 m³/year divided by the official total population of 335,800 is equal to less than 4L/day/capita.

Figure 9-1 – Water and Wastewater Sector Map



WW3 Wastewater treatment plant

Ganja City
Airport

Ganja City
Train station

Ganja River

Azerialuminium

Ganja City
Executive Authority

Ganja Automobile
Plant

Legend:

- ⬡ Ganja City boundary
- ⬡ Water bodies/ rivers
- ⬡ Water and sanitation master plan*
- ⬡ Increasing potable water availability*
- ⬡ Areas with no potable water network
- ⬡ Existing potable water network
- ⬡ Proposed potable water network
- + Current water storage tanks
- + Proposed water storage tanks
- ⬡ Aluminium processing plant
- Roads of regional importance
- - - Railways
- ⬡ Sewerage and WWTP*
- ⬡ Areas with no sewerage network
- ⬡ Existing sewerage network
- ⬡ Proposed sewerage network
- ⬡ Upgrade of the urban drainage system*
- ⬡ Areas for potential wetland attenuation prior to discharge of surface water
- ⬡ Existing drainage network
- ⬡ Proposed drainage network/potential for SuDS implementation

N 0 1 2 3 4 Km

*Action contains City wide components

9.1. Key Actors and Stakeholders

The water and wastewater sector in GC and across Azerbaijan is mainly managed and operated by AzerSu, with the regional branch being Ganja Sukanal. In addition, Azerbaijan Water Amelioration and Management (AWAM) are involved in distributing water resources for irrigation purposes. The MENR have a role in ensuring the quality of water, and issuing discharge permits and fines for polluters who have an adverse impact on water resources. The GCEA and Municipalities have little to no influence on the water sector, other than acting as stakeholders in the development of plans.

Currently, work is underway to establish a new Water Resource Agency (WRA). Once established, the new WRA would take over the role of managing and operating the water and wastewater sector across Azerbaijan and the current institutions will be dismantled. Additional information is provided in Table 9-1.

Table 9-1 – Stakeholders Involved in the Water and Wastewater Sector

Stakeholder	Role
MENR	Responsible for monitoring water quality and a key stakeholder in the development of strategies and policies relating to the water and wastewater sector.
AzerSu (Under reform to be taken over by the WRA)	In charge of policy and strategy development for the water supply and wastewater (including sanitation) sector in Azerbaijan. Implements elements of State programmes and works with other relevant State Agencies to deliver plans and projects to improve water supply and wastewater. Operate, maintain and upgrade water supply and sanitation networks.
Ganja Sukanal (Under reform to be taken over by the WRA)	The regional department of AzerSu is tasked with undertaking activities in the Ganja-Dashkasan region.
AWAM (Under reform to be taken over by the WRA)	Responsible for the distribution of water for irrigation purposes.

GCEA	Potential owner of public land designated for water utility use. Ensure limited interruptions to water supply, wastewater collection and treatment, as well as resolving issues relating to connecting residential areas to the network.
Municipalities	Potential owner of public land designated for water utility use. Key stakeholders in developing plans and projects.

Source: AtkinsRéalis analysis

9.2. Supporting Activities and Enabling Policies

Ongoing institutional reform is essential to ensure a sustainable and climate-proofed future - The Water Sector is currently undergoing institutional reform and new responsibilities and policies have not been finalised. It will include a review and update of the 1997 Water Code in line with modern standards and international best practices, such as the inclusion of options for NBS and the impact of climate change. It must also consider:

- Enhanced policy and regulation for fee collection;
- Enhanced regulation regarding water quality and protection of water resources;
- Enhanced regulation of extraction;
- Enhanced regulation of wastewater disposal and safe sludge management from wastewater treatment plans; and
- Awareness raising relating to efficient use of water and correct disposal of wastewater.

Developing a holistic approach to water and wastewater management is key to an efficient and effective sector. The outcome of the reform process must ensure clear and delineated responsibilities between agencies, with a strong mandate for collaboration to ensure an integrated holistic approach to water management at a catchment scale – including water resources, drainage, environmental monitoring, resilient communities and other water users such as the irrigation sector. While strengthened policy will be a useful tool, it must be backed up by improved regulatory enforcement for non-compliance in areas such as abstraction permitting. Better coordination

between institutions on investment measures is needed to promote water efficiency and avoid pollution.

Tariff reform is required to improve the financial sustainability of the utility and ensure that funds are available for O&M of the system. Tariffs must balance social objectives such as affordability with cost recovery and encourage resource conservation.

9.3. Best Practice of Financing Modalities for the Water and Wastewater Sector

A variety of financing mechanisms exist in the water sector, ranging from tariffs and taxes to transfers such as aid flows and cross-subsidies and loans which ultimately must be repaid from tariffs and taxes.

Government budgetary funding and international loans and grants are likely to be the key sources of funding for capital investment and studies in the sector. Current revenues from water sales are not adequate to cover operations and maintenance costs, therefore tariff reform needs to be considered.

The current centralised institutional setup, poor water availability and the need for significant upfront investment are unlikely to attract large-scale PPP investors. However, there may be opportunities for small-scale private operators to take on management contracts for services such as tariff collections. The case studies below in Senegal and Moldova showcase best practices of management to achieve financial sustainability.

Public-Private Partnership (PPP) in Urban Water Supply in Senegal⁷¹

The private firm Sénégalaise des Eaux (SDE), owned by the French group SAUR took on a management contract from the Société Nationale des Eaux du Sénégal (Sones), the public water company in Senegal. SDE was responsible for the operations and maintenance, billing and collection. The PPP aimed to upgrade the network to enable increased water consumption and higher profits. They achieved a 69% increase in customers in ten years, increased their volume production/sale ratio to 81% from 68% and became financially sustainable with a 98% bill collection rate. The success of this PPP

has been attributed to good management of a strong and incentive-based contract. Contracts were reviewed every six months by a committee that monitors SDE's performance. The review is based on 18 criteria spelled out in the contract between SDE and its public counterpart. Achievement of each of the main targets is rewarded and failure incurs fines. The Government has played a strong regulatory and coordination role and has kept its promises, notably by paying its own bills. The necessary tariff increases have also been made.

Another type of PPP is a performance-based contract (PBC), which are used increasing for non-revenue water (NRW) improvements. In the PBC model, the contractor takes on the risk and is paid on the achieved outcome but has the flexibility to use any methods to achieve the agreed outcomes. The utilities company minimises the risk of not achieving the NRW targets while also retaining control of operations and assets. One challenge with this model, in a context such as GC, is the lack of monitoring equipment in place to measure accurately the baseline NRW and track any progress. It may also be a challenge to find supply chain with the required technical skills and risk appetite.

Tariffs are a key financing instrument for the sector. Changes to tariffs are most effective when supported by a clear and robust institutional and legal framework. In Moldova, customer water metering was introduced in the late 1990s as a tariff policy tool to link water consumption directly to use and to incentivise consumers to use water efficiently. In Chisinau, this resulted in a reduction of water consumption of around 35%. However, water losses increased due to discrepancies in meter readings at apartment block and individual household levels, as well as water meter tampering, situations that were not considering in regulations and water meter selection and thus creating a financial burden on the water company⁷². After significant sector reform programmes in 2014, the Moldovan National Agency for Energy Regulation (ANRE) introduced a new tariff methodology. The new methodology included a clear formula for calculating water tariffs based on

⁷¹ OECD, Stocktaking of the water and sanitation sector and private sector investment in selected African Countries, (2007), Available at: <https://www.oecd.org/development/investmentfordevelopment/39679099.pdf>, (Accessed: 16/08/2023).

⁷² OECD, S. Drozdov, Use of Water Consumption Metering as a Tariff Policy Tool: Moldova's Experience (2002), Available at [2403012.pdf \(oecd.org\)](#) (Accessed at 16/08/2023).

actual costs, which ensured that water utilities were adequately compensated for their services and improving the financial stability of water utilities⁷³.

Chisinau River Bic rehabilitation and flood protection as best practice for addressing water quality, availability and drainage challenges⁷⁴:

As part of its GCAP, Chisinau, Moldova, identified GBI and rehabilitation of the River Bic as a priority project to help the City improve its water quality, reduce surface water flooding as a result of increasing intense precipitation events and adapt to climate change, see Figure 9-2.

An investment package developed by the EBRD to rehabilitate the river and improve flood protection for local residents also included:

- Restoration of current storm drainage;
- A pilot project consisting of several SuDS across the city to increase natural infiltration of rainwater and aid with improving water quality;
- Installation of flap valves to control stormwater overflow events and excess silt entering the river; and
- Re-grade the River along some of its sections to increase its capacity.

Another aim of the project was to improve the quality of public spaces and the River itself so that it becomes an asset for all residents to enjoy.

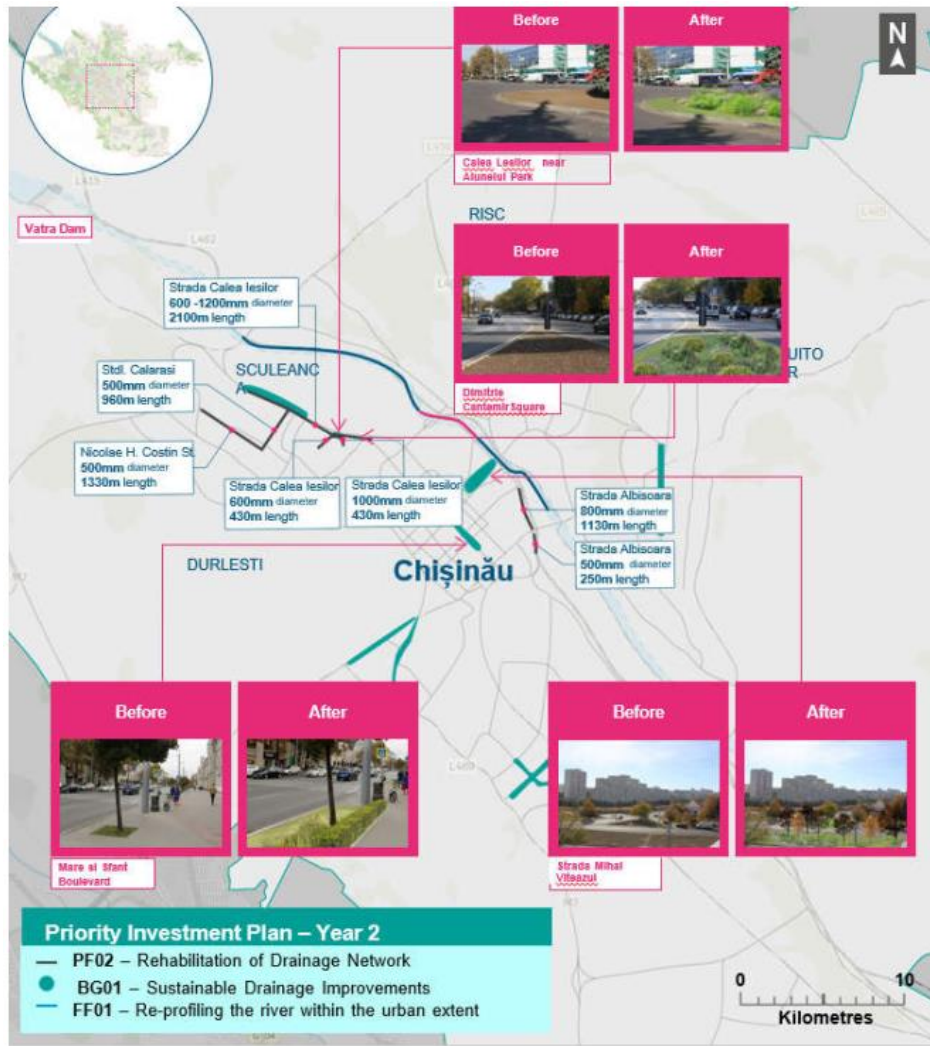
Implementation of the rehabilitation project is expected to reduce damage and costs associated with the increased probability of flood events due to climate change directly to around 2,100 people and a further 100,000 people who live, work and visit the City. The project will also have several other benefits, including improving local biodiversity, positive impacts on health and wellbeing by providing improved access to nature for all, increased carbon sequestration as a result of additional trees and planting, and helping to reduce the urban heat island effect by providing natural shading and increased green spaces across the City.

Opportunities for PPP were identified, in particular, to undertake the implementation of measures on rainwater retention at the residential level, permeable landscaping, permeable paving of highways, rainwater harvesting in private areas, provision of rain gardens and swales and developing alternative surface water reduction facilities. Moreover, it was identified that private investors could be involved in the design, revitalisation and periodic maintenance of the GBI in the City and its open spaces, especially those linked to tourism.

⁷³ Wareg, ANRE Approves Amendments to Water Tariff Methodology to Address Challenges in Moldovan Water Sector, (2023), Available at: <https://www.wareg.org/articles/anre-approves-amendments-to-water-tariff-methodology-to-address-challenges-in-moldovan-water-sector/>, (Accessed: 16/08/2023).

⁷⁴ EBRD, GrCF2 W1-Chisinau River Bic Rehab. & Flood Protection, (2023), Available at: <https://www.ebrd.com/work-with-us/projects/psd/52754.html>, (Accessed: 17/08/2023). And AtkinsRéalis project library.

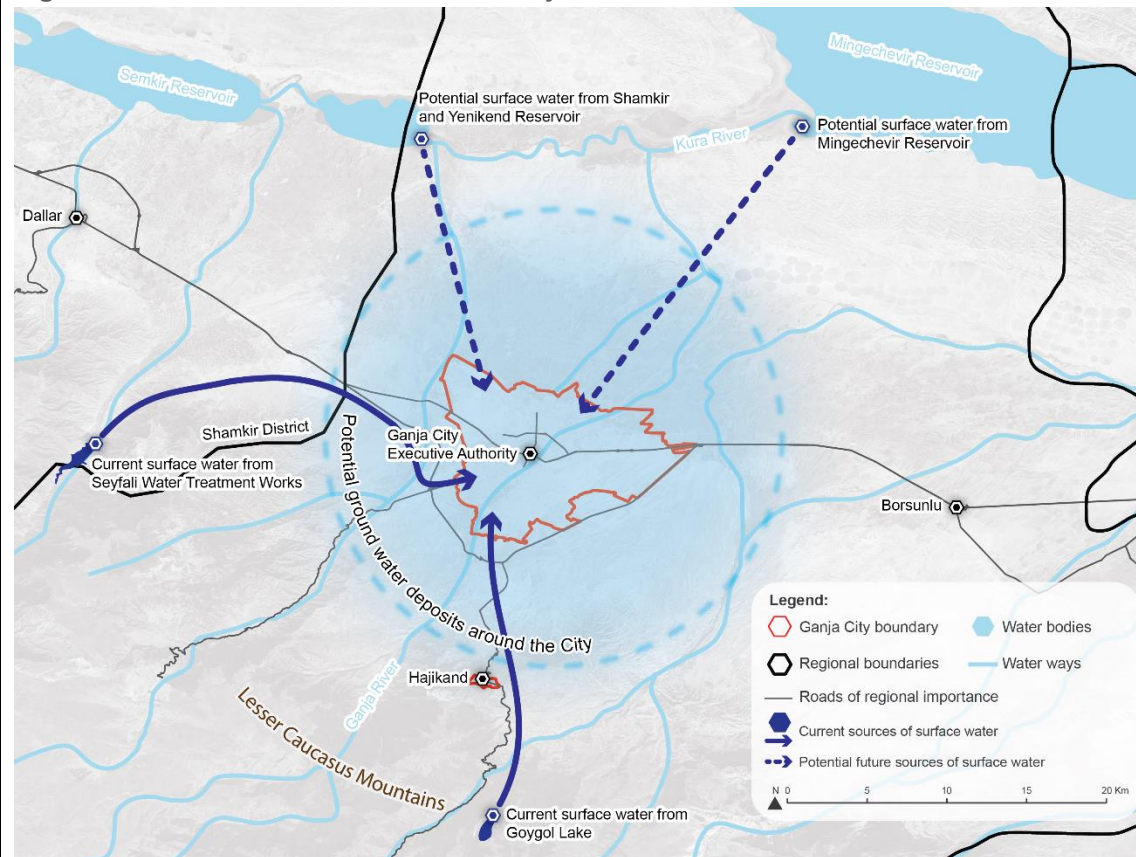
Figure 9-2 – Chisinau River Bic Priority Investment Plan (left) and River Bic Before and After (right)



Source: AtkinsRéalis project library

WW1 Water and Sanitation Master Plan	Policy
<p>Impact: Integrated approach to water and wastewater management. Improved water and sanitation service provision. Increased water resources.</p>	
<p>This action aims to develop a water and sanitation master plan for 100% effective coverage services across Ganja to bring together water resources, water supply and wastewater systems in a holistic manner to define priorities for investment.</p> <p>Components:</p> <p>The Master Plan should include a supply and demand assessment for water and sanitation services and options study for future investment and the development of a fully costed priority investment plan. It should consider the quality, availability, and sustainability of water resources, the impacts of climate change scenarios and future population growth on the availability of water resources. It should consider options for:</p> <ul style="list-style-type: none"> • Increasing water quantity in the system including surface options such as the two reservoirs that are fed from the Kura River (Figure 9-3) and groundwater resource options. • The protection of water resources from contamination; • The integration of NBS; • Energy efficiency measures such as installation of variable speed pumps and more efficient process equipment • Improving capacity and condition of Water treatment for water supply; • Increasing the coverage and condition of the water supply network; • Non-revenue water reduction options, including a business case for smart meters at household level; • Upgrade and development of the sewage network, wastewater treatment and sludge management infrastructure; and • Institutional and capacity building needs assessment including operations and maintenance, cost recovery, billing and collection; <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • CEG1 – In terms of aligning work with the Ganja River catchment management plan to evaluate, redistribute and protect water resources; • LU4 and CEG4 – Regarding the monitoring of water quality and feeding data into the web-map; • WW2 – To ensure there is an adequate supply of potable water for drinking and household use; and • Draft GC Master Plan – The water and sanitation master plan should be aligned with the water supply and sewerage network proposals in the Master Plan. 	

Figure 9-3 – Water Resources around Ganja



Source: AtkinsRéalis analysis

Key stakeholders and responsibilities:

- AzerSu (or the WRA) – **Implementation agency**, responsible for ensuring adequate water supplies as well as managing and maintaining the water and wastewater network and implementing major projects in GC and across the country;
- Ganja Sukanal – Regional branch of AzerSu, responsible for minor projects across GC and maintenance of the network;
- GCEA – Has a remit of maintaining the network and stability of water supply and wastewater treatment across GC;
- MES – Responsible for maintaining health and safety and issuing permits;

<ul style="list-style-type: none"> MENR – Responsible for monitoring water quality and issuing abstraction and discharge permits and fines to polluters; and Azerbaijan Water Amelioration and Management OJSC (AWAM) – Stakeholder in developing plans and implementing action in relation to the use of water for irrigation. 			
CAPEX (AZN): 3 million (Approx. 1.56 million EUR)	OPEX (AZN): N/A	Potential funding sources and revenue generation State budget. IFI/Donor Agencies.	Timeframe for implementation 2024 – this plan is a pre-requisite for the water infrastructure investments.
Notes on cost estimate (AZN): Cost based on the World Bank’s Moldova Water Security and Sanitation Project: National WSS Development Plan for Moldova (P173076) ⁷⁵ .			
Pre-requisite and steps for implementation: <ul style="list-style-type: none"> GCEA and Ganja Sukanal to identify areas which need potable water network expansion and help to identify current network issues, as well as the areas not intervened by KfW project; and Ongoing water sector reform is described in Section 9.2. should be taken into account in the development of this plan. 			
G&EI considerations and benefits Affordability and tariff reform must ensure to engage with woman and vulnerable groups to understand their needs. Involve local communities, businesses and other stakeholders (such as women, PwD, IDPs and the elderly) in the master planning process to understand their needs and preferences regarding water and sanitation services. Ensure that the master plan aligns with their aspirations for improved services. Analyse the social and economic benefits of improved water and sanitation services, including potential job creation and reduced healthcare costs due to improved public health. Consider the equitable distribution of services across different neighbourhoods (settlements), particularly areas with limited access to water and sanitation facilities and prioritise investments in these areas to bridge deficiencies in water supply.	Climate resilience considerations The master plan will provide the guiding framework for enhancing the resilience of the water sector in Ganja. Climate change and its impact both on water resources, as well as water and wastewater infrastructure, will be specifically included in the master plan and baseline assessments. The master plan will explore the viability of several measures which increase the resilience of the system, including NRW reduction, integration of NBS where possible, and enhancing understanding of surface and groundwater reserves. Climate change impacts on water resource options must be considered when assessing the viability of additional water resources.	Potential GHG reduction No direct GHG reduction impact. However, the master plan considers renewable energy options and NBS. NBS can offer win-win solutions, as plants and trees remove CO ₂ from the atmosphere and NBS frequently use less power when compared to more traditional grey solutions.	Smart City considerations There is a limited possibility for smart interventions due to the nature of the action. However, any data gathered should feed into the web-map (LU4).

⁷⁵ The World Bank, Procurement Plan – Project information: P173076 – Moldova Water Security and Sanitation Project, (2020), Available at: <https://documents1.worldbank.org/curated/en/099080823000535312/pdf/P1730760ea7d890d2095dd013100b4b7717.pdf>, (Accessed: 15/08/2023).

WW2 | Increasing potable water availability

Investment

Impact: Improved access to good quality and reliable potable water services. Increase coverage of the population served, including barrier-free access to vulnerable groups. Potential cost savings through the implementation of smart meters and leak detection.

Development of new water resources to meet the demand for 100% access and 24-hour supply in Ganja, including any necessary upgrade of the Seyfali Water Treatment Works, and continuing the upgrade and expansion programme for the water supply network to ensure all homes and businesses have a connection to potable water. This action is building upon the KfW water project, which is currently about 50% complete. This project should identify the areas in need of further expansion and funding, implement leak detection for those that need immediate attention and reduce the amount of non-revenue water, as well as strengthening the capacity within the organisation to effectively manage capital programmes, operations and maintenance, billing and collection.

Component 1 - Design and development of water source projects:

- Design and development of water source projects and associated infrastructure i.e., treatment and pipelines to increase water availability in the system;
- Implementation of energy efficiency measures such as variable speed pumps, more efficient treatment process, and improvements in maintenance routines. There may be an opportunity for energy efficiency activities to be carried out under a saving based financing mechanism;
- Stakeholder engagement, ESIA and land acquisition for projects; and
- Construction of water supply projects.

Component 2 - Expansion of potable water network (potential to include expansion of potable water treatment plant if necessary):

- Stakeholder engagement, feasibility and business case for expansion;
- Design for expansion and environmental scoping report;
- Construction and implementation of expansion; and
- 500km of pipeline expansion and renewal (800km of pipeline renewal and expansion planned as part of KfW project, only around 300 km complete to date. This project will review work done by KfW and update the business case, and design and complete the estimated 500km outstanding).

Component 3 - Non-revenue water reduction programme:

- Development of leak detection and repair reduction strategy and programme;
- Procurement of smart leak detection equipment;
- Capacity building and development of performance monitoring and preventive maintenance strategy;
- Purchase and installation of smart meters (at the household level); and
- Installation of flow monitoring to provide data on leakage - Permanent flow meter, pressure devices, chambers, pressure logger, smart meter, SCADA and software. Detection of leaks and renewal of pipes to bring leakage to <45% (approx. 10 - 15% reduction). This should be carried out in tandem with component 1 to reduce leakage of water resources entering the network.

Component 4 - Institutional capacity building:

- A programme of training for management, financial management, customer service, and procurement;

<ul style="list-style-type: none"> • Development of performance monitoring, and capacity building on preventive maintenance and leak detection and repair; design and technical support for construction; and • Capacity building on management, including procurement support and contract supervision for the investments. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • WW1 – Regarding the adequate supply of potable water; • TR2 – Excavation and implementation of new/rehabilitated water supply network to be coordinated with the implementation of improved sidewalks, drainage and the proposed multi-modal transport corridors; • EB5 – To upgrade street lighting alongside the works to upgrade the water supply network; • CEG4 – Automated monitoring stations and digital reporting; and • Draft GC Master Plan – This action will help to implement the expansion of the potable water supply network to under-served areas, and ensure accessibility to basic needs for all, as outlined in the Master Plan. 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • AzerSu (or the WRA) – Implementation agency, responsible for ensuring adequate water supplies, as well as managing and maintaining the water and wastewater network and implementing major projects in GC and across the country; • Ganja Sukanal – Regional branch of AzerSu, responsible for minor projects across GC and maintenance of the network; • GCEA – Also has a remit of maintaining the network and stability of water supply and wastewater treatment across GC; • SCUPA – To be consulted as it is the entity responsible for developing the draft GC Master Plan; and • MES – Responsible for maintaining health and safety and issuing permits. 			
<p>CAPEX (AZN): 250 million (Approx. 130 million EUR)</p>	<p>OPEX (AZN): 5 million (Approx. 2.6 million EUR)</p>	<p>Potential funding sources and revenue generation State budget. IFI/Donor Agencies. Potable water connection fees. Water sale and water savings (reduced NRW).</p>	<p>Timeframe for implementation 2024 – completion of studies and pre-request steps; and 2025 - 2028 (onwards) - subject to completion of master plan WW1 and understanding of KfW project.</p>
<p>Notes on cost estimate (AZN): The water and wastewater master plan will provide a better understanding of areas to be served, services, pipelines to be replaced, smart meters and monitoring devices to be installed, etc. OPEX is estimated at 2% capital investment. Energy costs are current highly volatile and change in the price of energy will have a significant impact on O&M cost, particularly for the water and wastewater treatment plants.</p>			
<p>Pre-requisite and steps for Implementation:</p> <ul style="list-style-type: none"> • Development and implementation of the Water and Sanitation Master Plan (WW1). 			

<p>G&EI considerations and benefits</p> <p>Improved water infrastructure will enhance water availability, quality, access, and efficiency, benefiting communities and businesses. The needs of women, vulnerable groups and those who have different patterns of water use should be considered when developing plans to rehabilitate and extend the network.</p> <p>Undertake high-quality stakeholder engagement and ensure any land acquisition is carried out fairly, this is crucial to avoid any disputes or conflicts.</p> <p>Training and employment opportunities in traditionally male-dominated areas, such as construction and procurement, should be inclusive and accessible to all, particularly for local women, PwD and IDPs.</p>	<p>Climate resilience considerations</p> <p>The design of the infrastructure components will specifically include climate risk assessments to ensure that climate resilience is integrated into the design.</p> <p>The institutional capacity-building programme should include training on climate resilience principles for the water sector and the operation of climate-resilient water services.</p> <p>NRW activities will improve water use efficiency, and act as an adaptation to changing rainfall patterns.</p>	<p>Potential GHG reduction</p> <p>No direct GHG reduction impact.</p> <p>However, indirect savings could be achieved through reducing leakage and wastage of water and upgrading infrastructure.</p>	<p>Smart City considerations</p> <p>Smart monitoring equipment, for example, flow, pressure and leak detection, should be fitted across the network to enhance the amount of data available to run and maintain the network, identify leaks early on and prompt repair and maintenance.</p> <p>Smart meters at the household level could also help facilitate data gathering and analysis of water consumption and expenditure (linked to LU4 and CEG4).</p> <p>The smart card initiative that currently exists in the City should be expanded to benefit more residents and businesses.</p>
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Case Study

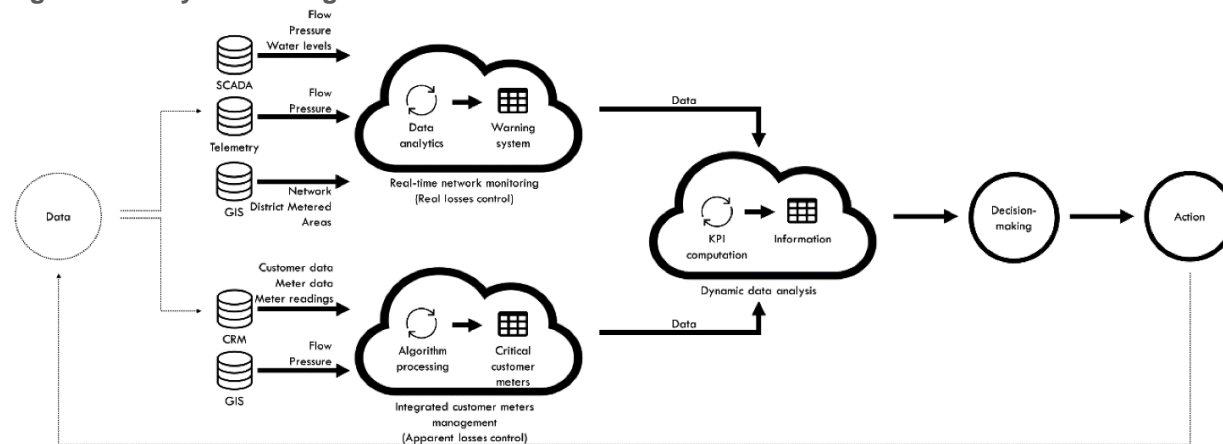
Smart tools to reduce NRW in Chilean Water Utilities⁷⁶

The utilities parent company AGS developed a real-time digital network monitoring system called ‘Flowise’ to support the reduction of NRW water. Flowise was based on district metered areas (DMA), enabling the company to analyse the mass balance over smaller defined areas, which resulted in better leakage detection, location isolation and thus reduced detection time.

The system (as shown in Figure 9-4) was designed to securely collect vast amounts of information from multiple sources and formats, providing insight and helping decision-making and prioritisation. To assist in managing water loss reduction, both utilities installed flow and pressure meters strategically placed in the network which communicate with Flowise in real time. In addition to differences in flow data, Flowise detects differences in pressure data from pressure reduction valves or pressure critical points. These differences can indicate and pinpoint the occurrence of bursts when a significant pressure reduction is detected.

⁷⁶ Cassidy, J. et al. (2021) Taking water efficiency to the next level: Digital Tools to reduce non-revenue water, Journal of Hydroinformatics. Available at: <https://doi.org/10.2166/hydro.2020.072> (Accessed: 15/08/23).

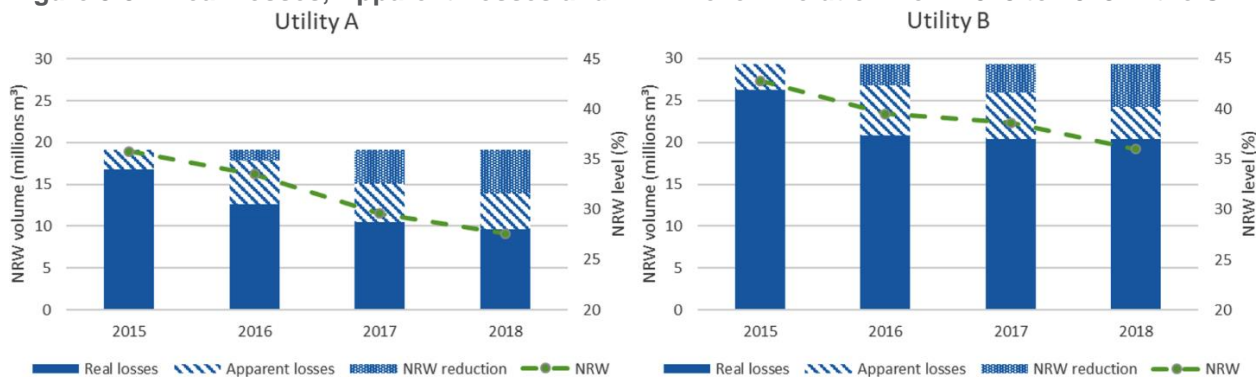
Figure 9-4 – System Design for Flowise



Source: Cassidy, J. et al. (2021)

At the start of the project, records of daily operations were made on paper and were not analysed unless a major problem occurred assessing performance either at the DMA level or utility level was a lengthy process and made targeting NRW a challenge. Smart water solutions enabled the company to collect and analyse data more efficiently, coherently and rapidly analyse data. This enabled them to better understand their system and ultimately improve asset management, and workforce transformation and reduce NRW in a prompter manner which will improve customer service and reduce financial losses. Over 4 years, the project resulted in reducing NRW levels by 8% as shown in Figure 9-5. This is equivalent of 13 million m³/year of water loss and savings of 5.8 million Euros.

Figure 9-5 – Real Losses, Apparent Losses and NRW Level Evolution from 2015 to 2018 in the Chilian Utilities



Source: Cassidy, J. et al. (2021)

WW3 Sewerage and wastewater treatment plant	Investment
<p>Impact: Improved access to water and sanitation services. Improved public health. Pollution reduction and improved water quality. Job creation. Possible revenue generation from the sale of sludge.</p>	
<p>This project entails the development of a WWTP, upgrades to the sewerage network and expansion of the system to serve the 30% population who are not connected to the sewerage network. A review of the proposed treatment should be undertaken including the use of NBS options as an alternative to increase resilience. Develop a sludge management facility, alongside the functioning WWTP, to manage residue sludge from the treatment process and look at options for the reuse of waste such as fuel briquets or fertiliser which can be used by local farms. Preparation of a (national) strategy for sustainable sludge management, including recommendations for safe and sustainable use of sludge in agriculture as an organic alternative rather than raw sewerage or any other uses.</p> <p>The proposed location of the WWTP is shown in Figure 9-1, which is surrounded by agricultural land and therefore has the potential to use a natural base wastewater treatment system.</p> <p>The reuse of sludge should be investigated along with on-site renewable energy sources to power the plant. The effluent should be monitored to ensure it meets national water quality standards before it is discharged.</p> <p>The planned WWTP has a capacity of 110,000 m3 per day, which would be sufficient for the current and future wastewater treatment demand.</p> <p>Component 1 includes:</p> <ul style="list-style-type: none"> • Study of WWTP to understand limited functionality and options appraisal of new systems, including the use of NBS and for reuse of sludge; • Design of priority investments identified as part of WW1; • ESIA and land acquisition; and • Design of the sludge management plant. <p>Component 2:</p> <ul style="list-style-type: none"> • Design of sewerage expansion; • ESIA and land acquisition; and • Construction of the sewage expansion. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • WW1 – The master plan will inform this action; • TR2 – Excavation and implementation of new/rehabilitated sewerage network to be coordinated with the implementation of improved sidewalks and the proposed multi-modal transport corridors; • EB5 – To upgrade street lighting alongside the sewage expansion and upgrades; • LU4 and CEG4 – Automated monitoring stations and digital reporting to feed into the developed web-map and environmental data monitoring; and • Draft GC Master Plan – This action will help to implement the expansion of the sewerage network to underserved areas and develop a functioning WWTP, as outlined in the Master Plan. 	

<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> AzerSu (or the WRA) – Implementation agency, responsible for ensuring adequate water supplies as well as managing and maintaining the water and wastewater network and implementing major projects in GC and across the country; Ganja Sukanal – Regional branch of AzerSu, responsible for minor projects across GC and maintenance of the network; GCEA – Also has a remit of maintaining the network and stability of water supply and wastewater treatment across GC; SCUPA – To be consulted as it is the entity responsible for developing the draft GC Master Plan; MENR – Responsible for maintaining high water quality and issuing discharge permits and fines for polluters; and MES – Responsible for maintaining health and safety and issuing permits. 			
<p>CAPEX (AZN): 500 million (Approx. 260 million EUR)</p>	<p>OPEX (AZN): 10 million (Approx. 5.2 million EUR)</p>	<p>Potential funding sources and revenue generation State budget. IFI/Donor Agencies. Sanitation fees. Wastewater collection and network maintenance fees. Sludge to organic compost sales.</p>	<p>Timeframe for implementation 2024 - completion of studies and pre-request steps; and 2025 - 2028 (onwards) - subject to completion of master plan WW1 and understanding of KfW project.</p>
<p>Notes on cost estimate (AZN): Cost based on similar World Bank projects in neighbouring countries where a WWTP servicing 350k people had a budget of 408 million USD. OPEX is estimated at 2% of CAPEX. Energy costs are current highly volatile and change in the price of energy will have a significant impact on O&M cost, particularly for the water and wastewater treatment plants.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> Development and implementation of Water and Sanitation Master Plan (Action WW1). 			
<p>G&EI considerations and benefits Upgrading wastewater treatment infrastructure and expanding the sewerage network will reduce waterborne diseases, leading to improved public health and the potential to reduce healthcare costs. The action will create jobs in a variety of fields (including engineering, construction, maintenance, and management). NBS and resilient infrastructure will help the community and local farmers, who sometimes use wastewater for irrigation, to adapt to the challenges posed by climate change (e.g., shortage of water for</p>	<p>Climate resilience considerations A climate risk assessment for the WWTP and sewer upgrade will be carried out to ensure that the design is resilient to higher temperatures, low flow, and increased intensity of rainfall.</p>	<p>Potential GHG reduction Direct GHG reduction is possible, although not quantifiable at this stage. Using NBS can reduce the electricity required to power more traditional technological WWTP solutions and can also act as a carbon sink, removing GHG gases from the atmosphere. Creating sewage and wastewater facilities would save a considerable quantity of methane and carbon emissions, compared to uncontrolled sewage releases. However,</p>	<p>Smart City considerations The WWTP should utilise the latest cutting-edge technology, as well as combine with appropriate NBS to ensure a better outcome for the local environment and have a lower OPEX in the long-term. Automated water quality monitoring equipment should be included to ensure</p>

<p>crop yields) and ensure healthy and safe agriculture methods are adhered to. The project should promote gender diversity in the workforce.</p>	<p>Nature-based treatment options will be explored.</p>	<p>without current waste and sewage volumes and information on current sewage conditions, it is not possible to quantify this.</p>	<p>compliance with international national standards (linked to LU4 and CEG4).</p>
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Case Study

French vertical-flow treatment wetland in Orhei, Moldova⁷⁷

The city of Orhei, Moldova replaced their old wastewater treatment plant (WWTP), which used a high-rate percolating filter and was expensive to run with a French vertical-flow treatment wetland (French VFTW). A comparison with other technologies, such as activated sludge, sequencing batch reactors, and percolating filters was undertaken, and a French VFTW was chosen to minimise the operational costs and protect the affordability of water tariff. The Orhei TW (Figure 9-6) occupies a gross area of 50,000 m² and is designed for a population of 33,000 people and some small industries.

The system is composed of two stages: a first stage with French reed beds (FRBs) fed with raw wastewater, designed for high removal of total suspended solids, chemical oxygen demand and ammonia; and a second stage with VFTW, to refine the treatment and to complete the nitrification. Four two-stage treatment lines working in parallel are present, with an FRB and vertical-flow area for each line equal to 4,489 m² and 4,248 m² respectively. The only pre-treatment is a grit removal stage, a classic primary treatment such as septic or Imhoff tanks has been avoided in accordance with the ‘French system’ guidelines.

The NBS adopted by WWTP in Orhei was able to meet the effluent water quality standards even under very low temperatures (the minimum registered air temperature during the monitoring campaign was -27°C), showing constant efficient removal of total suspended sediments, chemical oxygen demand, and Biochemical Oxygen Demand (BOD) independent of the different seasons and only a partly inhibited nitrification in winter. This system was introduced to reduce operational costs, however, there were a number of co-benefits, for example, the discharged effluent had a high nutrient content which was a useful fertigation (combining fertilisation and irrigation) source, and the reeds could be harvested and used as a biomass source for the production of biogas.

TYPE OF NATURE-BASED SOLUTION (NBS)
French vertical-flow treatment wetlands (French VFTWs)

LOCATION
Orhei, Moldova

TREATMENT TYPE
Primary and secondary treatment using French reed beds (FRBs) and VFTWs

COST
€3.4 million (2013)

DATES OF OPERATION
2013 to the present

AREA/SCALE
5 hectares (gross)

⁷⁷ Nature-Based Solutions for Wastewater Treatment: A Series of Factsheets and Case Studies, Edited by: Katharine Cross, Katharina Tondera, Anacleto Rizzo, Lisa Andrews, Bernhard Pucher, Darja Istenič, Nathan Karres, Robert McDonald, <https://doi.org/10.2166/9781789062266>. ISBN (electronic): 9781789062267. Publisher: IWA Publishing. Published: 2021.

Figure 9-6 – Pictures from the Orhei WWTP



Source: Nature-Based Solutions for Wastewater Treatment

WW4 Upgrade of the urban drainage system	Pre-investment
<p>Impact: Improved climate resilience and reduced risk of flooding. Increase in green space and capitalising on ecosystem services. Pollution reduction and improved water quality.</p>	
<p>There is no integrated overall drainage plan and the system is insufficient when experiencing storm weather leading to localised flooding. This action is mainly to develop a feasibility study regarding drainage across the City and an investment plan to increase the resilience of the drainage network. The action includes updating drainage standards to accommodate more intense rainfall events, identifying areas of poor drainage and developing potential SuDS, particularly linked to channel options and attenuating drainage water for reuse, as well as options for greywater reuse and recycling. This will increase the capacity of the existing drainage network to accommodate for erratic rainfall, especially across the areas prone to flooding. The planned drainage network is shown in Figure 9-1 and should be reviewed to look for opportunities to incorporate SuDS. SuDS schemes may be particularly useful alongside the river running through the town where drainage flows could be directed. A constructed wetland or bioswales running alongside the river would act as a barrier removing pollutants before the water is discharged into the river, improving river water quality.</p> <p>Components:</p> <ul style="list-style-type: none"> • Development of urban drainage master plan and priority investment plan; • Design of drainage upgrade (including hydraulic modelling of SuDS and drainage network design); • ESIA and land acquisition if necessary; • Outline of construction of drainage upgrade; and • Capacity building on maintenance and repair of drainage. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • WW1 and CEG1 – In terms of utilising SuDS to help with water attenuation mitigate surface water flood management while improving water quality; • LU1 and LU2 – Integrating SuDS and proper drainage across redevelopment sites, proposed green corridors and rehabilitated bare earth surfaces; • TR2 – Integrating SuDS as part of the multi-modal transport corridors, as well as coordinating any excavation and upgrade of the drainage network with the improvement of sidewalks and implementation of the transport corridors; • EB5 – To upgrade street lighting alongside the works undertaken to upgrade the drainage network; and • Draft GC Master Plan – This action will help to implement a functioning drainage network as outlined in the Master Plan. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • AzerSu (or the WRA) – Implementation agency, responsible for ensuring adequate drainage capacity across the City; • GCEA and the AYNA– Potential implementation partner to aid with the construction of drainage network and SuDS which run along roads maintained by the Department; • Ganja Sukanal – Regional branch of AzerSu, responsible for minor projects across GC and maintenance of the network. • SCUPA – To be consulted as it is the entity responsible for developing the draft GC Master Plan; • MNER – To be consulted based on responsibility for ensuring high water quality and controlling surface water flooding from a climate resilience perspective; and 	

<ul style="list-style-type: none"> MES – To be consulted based on responsibility for maintaining health and safety across the City. 			
<p>CAPEX (AZN): 600,000 (312,000 EUR)</p>	<p>OPEX (AZN): N/A – To be confirmed by the feasibility study.</p>	<p>Potential funding sources and revenue generation State budget. IFI/Donor Agencies.</p>	<p>Timeframe for implementation 2024 – creation of plan, feasibility study and fulfilling pre-requests; and 2025 (onwards) - ideally to run in parallel with TR2, WW2 and 3 to avoid chaos and duplication of efforts when excavating water pipelines, sewage and redeveloping roads.</p>
<p>Notes on cost estimate (AZN): CAPEX is only for feasibility and impact study. Capex of implementation will be based on the feasibility study findings.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> Feasibility study across the City to identify areas to be improved; and Drainage feasibility study should be followed after WW1. Hydraulic model should be developed to facilitate SuDS and drainage network design. 			
<p>G&EI considerations and benefits Enhanced urban drainage and SuDS will surface water drainage and reduce flood risk, contributing to sustainable development in the City. Woman and vulnerable groups should be consulted when creating the plans ensuring that their voices are heard to understand how they are impacted by surface water flooding. Any capacity building programmes should be targeted to all making sure these are available and accessible to everyone, regardless of gender or physical capabilities. In delivering the drainage there is an opportunity for job creation, woman should be encouraged to take on leadership roles in drainage upgrade projects. Moreover, women's participation in maintenance and construction training programmes and jobs should be supported where possible.</p>	<p>Climate resilience considerations A combination of green and grey infrastructure will be used to upgrade the drainage system. The drainage system itself will be designed to accommodate increases in heavy rainfall and specific climate change allowances will be incorporated into the update of design standards. The feasibility study will also identify where SuDS solutions can reduce localised flooding and contribute to the overall resilience of the city to surface water flooding. Reduced surface water flooding will also reduce pollutant flushes into the river and watercourses, and as such improve water quality and reduce treatment needs, while improving ecosystem health.</p>	<p>Potential GHG reduction No direct GHG reduction impact. However, indirect carbon saving by reducing leaks and upgrading infrastructure, as well as through CO₂ sequestration of planting and trees which form the SuDS used to aid with drainage of surface water.</p>	<p>Smart City considerations Limited possibility for smart interventions due to the nature of the action.</p>

Case Study

How Bioswales Are Helping to Clean Brooklyn’s Gowanus Canal, USA^{78, 79}

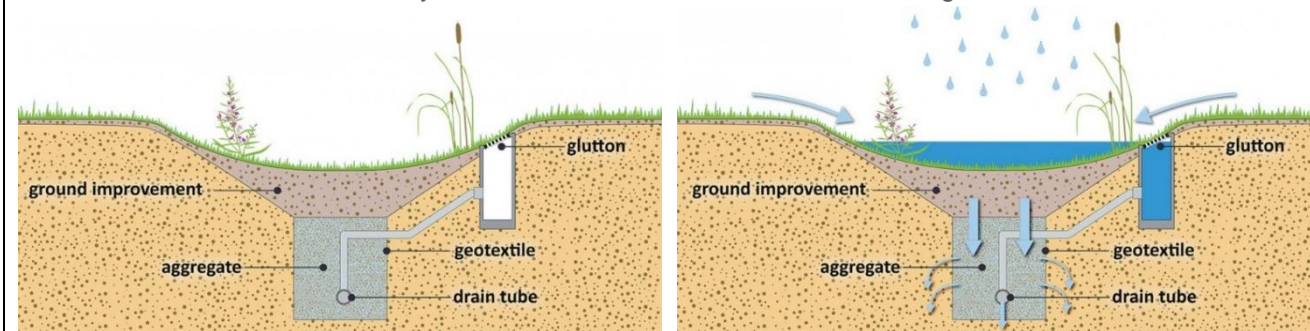
The post-industrial neighbourhood of Gowanus in Brooklyn, New York has implemented a programme of introducing bioswales instead of more traditional drainage systems such as Combined Sewage Overflows (CSOs) which currently discharge into the canal during intense rainfall events. The area was historically home to tanneries, coaling stations, paint, ink, and chemical manufacturers causing high pollution in the Canal. The Canal is considered one of the most polluted waterways in the USA. The Department of Environmental Protection has introduced over 100 bioswales, which are estimated to reduce the amount of water entering the CSO system by eight million gallons a year.

Bioswales (sloping drainage filled with vegetation) collect surface water runoff from roads, remove pollutants and are often 50% cheaper to construct than traditional combined sewerage systems. Bioswales absorb CO₂ and reduce urban heat island effects, which lower the need for energy-intensive air-conditioning, provide habitats for pollinators and other beneficial insects and improve the aesthetics of the area. In addition to bioswales, other green infrastructure features (such as rain barrels, rain gardens and tree boxes) are all effective and relatively low-cost methods, which cities and private individuals can employ to help mitigate the effect of storm run-off into CSOs.

Figure 9-7 – Section and Photo of Bioswale

Section of a bioswale when it is dry:

Section of Bioswale during rainfall:



Source: Urban Green-Blue Grids

⁷⁸ New Jersey Future, Case study: How bioswales are helping to clean Brooklyn’s Gowanus Canal, (2016), Available at: <https://www.nifuture.org/2016/04/11/gowanus-canal-bioswales/> (Accessed: 15/08/2023).

⁷⁹ Urban Green-Blue Grids, Bioswales, (2023), Available at: <https://www.urbangreenbluegrids.com/measures/bioswales/>, (Accessed:15/08/2023).

10. Solid Waste Management

Sector goals:

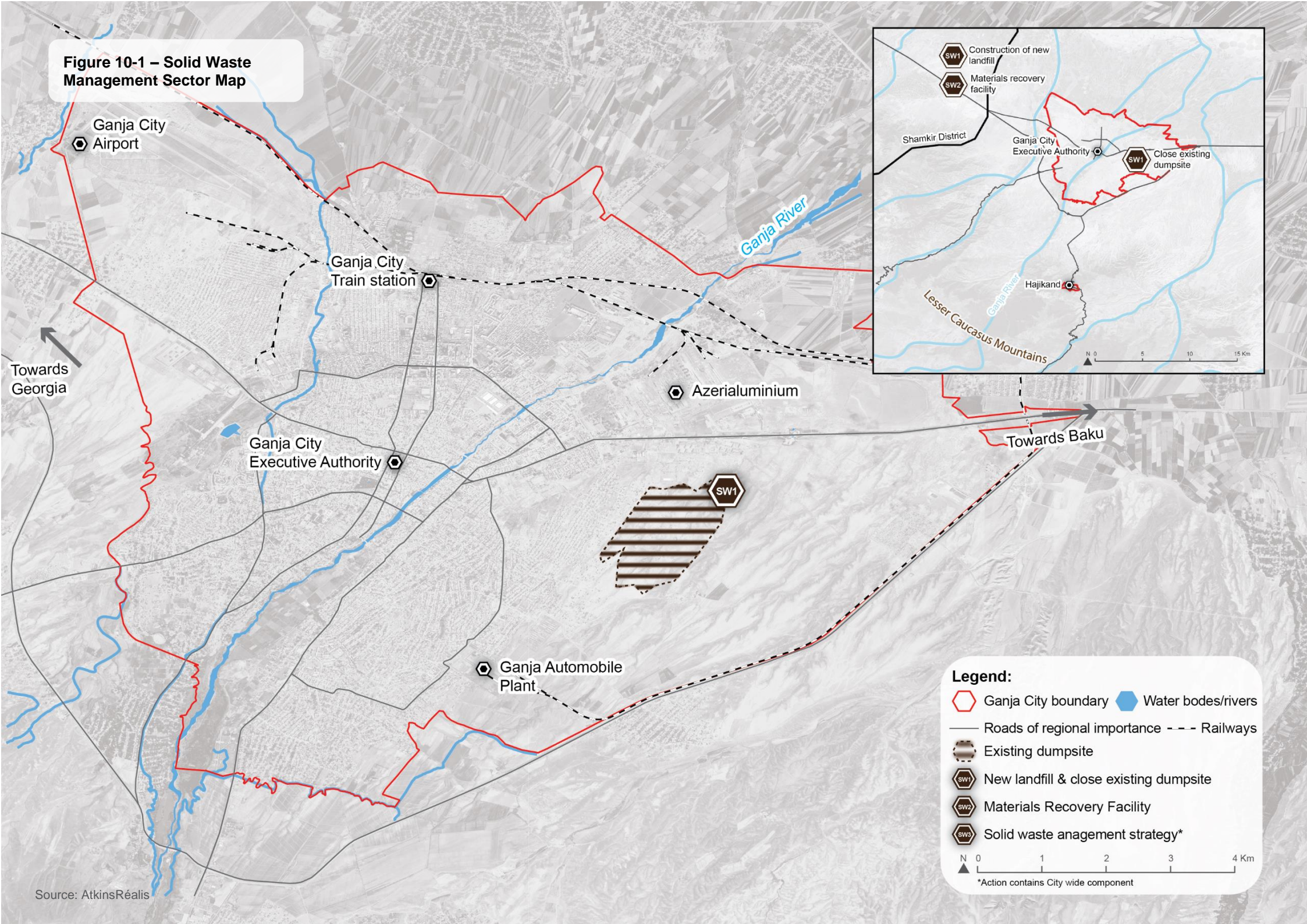
Adopt a circular economy approach by prioritising the 4Rs principles: Reduce, Reuse, Recycling, Recover, while minimising disposal.



Mid-term Targets	Current value		Target
Total solid waste generation per capita (kg/years/capita)	450	↘	300
Proportion of dry recyclables (%)	28%	↗	35%
Municipal solid waste treated in sorting, processing and treatment plants (%)	n/a	↗	25%
Municipal solid waste landfilled disposed of in EU-compliant sanitary landfills (%)	0%	↗	80%
Share of industrial waste recycled as a share of total industrial waste produced (%)	n/a	↗	80%

Action Ref.	Action Title	Action Owner	CAPEX (AZN)	OPEX (AZN/Annual)	Linkages
SW1	Build new EU compliant landfill and close down existing dumpsite	GCEA CUSPU	106 million (Approx. 55 million EUR)	1.59 million per year (Approx 0.83 million EUR)	SW2, draft GC Master Plan, and EBRD SWM Phase 1 & 2.
SW2	Combined Materials Recovery Facility and Mechanical Biological Treatment (MBT) Facility	GCEA CUSPU	50 million (Approx. 26 million EUR)	2.5 million (Approx. 1.3 million EUR)	SW1 and EBRD SWM Phase 2.
SW3	Solid waste management strategy	GCEA CUSPU	185,000 (96,200 EUR)	N/A	SW1 and 2, LU1 and 2, and TR2, and EBRD SWM Phase 1.

Figure 10-1 – Solid Waste Management Sector Map



Ganja City
 ○ Airport

Ganja City
 Train station ○

○ Azerialuminium

Ganja City
 Executive Authority ○

○ Ganja Automobile
 Plant

SW1

Legend:

- Ganja City boundary
- Water bodies/ rivers
- Roads of regional importance
- - - Railways
- Existing dumpsite
- SW1 New landfill & close existing dumpsite
- SW2 Materials Recovery Facility
- SW3 Solid waste anagement strategy*

N 0 1 2 3 4 Km

*Action contains City wide component

10.1. Key Actors and Stakeholders

SWM is one of the sectors where the GCEA have a stronger influence and can make direct decisions, as it is within their jurisdiction as devolved powers to Local Executive Authorities. The GCEA Communal Utility Service Production Unit (CUSPU) oversees the planning for, O&M of SWM activities across GC. Another key stakeholder is Tamiz Shahar OJSC who are the national SWM company, however, their remit is restricted to the regions of Baku, Shusha and the recently liberalised regions of Nagorno-Karabakh. Although Tamiz Shahar is not operating in GC, they should be considered as a potential operator of the landfill and when implementing actions identified in the SWM sector. Additional information is provided in Table 10-1.

Table 10-1 – Stakeholders Involved in the Solid Waste Sector

Stakeholder	Role
CUSPU	Undertakes solid waste collection and management in Ganja, as well as street and public space cleaning. The unit also manages and maintains the current dumpsite and its facilities.
Municipalities	Endowed with powers to undertake SWM – including collection, disposal and street cleaning, however low resources and capacity mean that the majority of tasks are undertaken by the GCEA.
MENR	Responsible for monitoring waste and being a key stakeholder in the development of strategies and policies relating to the SWM sector. The Ministry also provides the classification of waste according to its effects on the environment and human health and determines appropriate procedures for waste disposal, as well as promoting waste-free and low-waste products. It also approves the allocation of land for SWM sites and has the power to request polluters pay fees for the collection and disposal of certain types of waste.
Tamiz Shahar OJSC	National company responsible for sorting, incineration and disposal of waste in Baku/Shusha.

Source: AtkinsRéalis analysis

10.2. Supporting Activities and Enabling Policies

- **Appropriate waste disposal and management depending on the waste streams** - It is evident that current waste management practices are not sufficient to manage the needs for household waste. This problem is exacerbated by the fact that industries and hospitals often dispose of their wastes (including radioactive wastes) in the current dumpsite causing pollution, and health and hygiene risks to both the environment and humans. As such, there is a need for enforcement to ensure that medical and industrial waste is properly managed by the producer and that it is their responsibility to ensure it is managed appropriately and in a manner that reduces environmental impacts. Medical and industrial waste should not be managed with household or municipal waste streams;
- **Installation of radioactive detection equipment** - To prevent radioactive waste from being disposed of in landfills, it is necessary to install radioactive detection equipment at the entrance to waste management facilities, such as the engineered sanitary landfill and/or materials recycling facilities to prevent unauthorised disposal. If radioactive waste is detected it should be handled using appropriate protocols;
- **Create a circular economy market and mindset** - Increasing producer and consumer awareness and education campaigns will stimulate the recycling markets and create opportunities for the circular economy. This in turn will increase the value of waste and recycling materials, as these markets become better established and awareness continues to grow. This ultimately will lead to reductions in the amount of waste being disposed of and will move waste material up the waste hierarchy; and
- **Smart technology to regulate fees** - Through the use of smart technologies such as onboard vehicle weighing and container chips, it will be possible to more accurately allocate and regulate fees for waste collection services based on, for example, a pay-as-you-throw principle.

10.3. Best Practice of Financing Modalities for the Solid Waste Sector

The country’s centralised approach to financing limits the opportunities for external investment in the delivery and operation of infrastructure. Financing infrastructure improvements in Azerbaijan is somewhat limited by the centralisation of funding and allocation of budgets all residing with the Ministry of Finance. SWM, however, is one of the few municipal functions that are decentralised and undertaken by the GCEA, with budgets for SWM allocated to the GCEA by the Ministry of Finance on an annual basis.

The SWM sector commonly adopts PPP to assist in the financing, delivery and operation of major infrastructure such as integrated waste management facilities, treatment facilities and collection contracts.

PPP integrated solid waste management project in Belgrade⁸⁰ - The IFC (a member of the World Bank Group) supported a 25-year PPP project in Belgrade to deliver an integrated project that included the remediation of the existing landfill and construction of a new engineered sanitary landfill, a plant for processing construction and demolition waste, a plant for leachate treatment and landfill gas management and a large-scale waste to energy plant to treat municipal solid waste. This was the first PPP project undertaken in the region and began in 2015.

Utilising competitive dialogue with pre-qualified bidders, the City of Belgrade could offer a bankable design-build-finance-operate (DBFO) contract, bundling the landfill remediation with the development of new revenue-generating assets. The IFC supported the process by acting as a PPP advisor. The total funding received for the project was USD 350 million, with the IFC contribution including: a) a loan of USD 84 million, b) a loan of USD 41 million, and c) a concessional loan of USD 24 million from the Canada-IFC Blended Climate Finance Program.

It is acknowledged that PPP is currently in its infancy in Azerbaijan and may be premature as a funding mechanism for Ganja. However, a summary of the pros and cons with regards to delivering waste management infrastructure projects are summarised below:

Pros:

- Private sector finances all (or most) of the infrastructure;
- Could take advantage of private sector experience and efficiency in operation;
- Private sector remains committed due to financial investment;
- Financial risk usually borne by private sector;
- Reduced upfront / capital strain on municipality budget;
- Less susceptible to political interference

Cons:

- Complex contracts requiring significant management effort and meticulously developed and refined specifications;
- Environmental risk usually shared between private and public parties;
- City / Municipality may not own facility or equipment after debt is paid or may inherit old equipment;
- Public sector committed to long-term financing of project costs through gate fees, etc which can result in higher costs than publicly operated service.

Formalisation of the informal sector as an alternative financing mechanism

- Globally there is a large research and policy gap on the informal waste management sector. It is thought that in 2016 there were as many as one million active informal waste re-users and recyclers in Europe alone⁸¹. These informal recyclers have kept many tonnes of waste out of landfills and have played an active role in helping close the circularity gap.

Informal waste collection is often illegal and competition over ‘ownership’ of the material can arise between the formal and informal waste management systems. As such, mechanisms to formalise the informal sector, for instance by creating cooperatives that provide salaries and improved working conditions and equipment/facilities, can help to bridge the gap between the informal and formal and provide necessary infrastructure and support the waste management system. These methods of formalisation are less complex and risky than large integrated PPP projects and require less capital cost and involvement from the public sector.

⁸⁰ Global Infrastructure Hub, Belgrade Waste-to-Energy PPP, (2021), Available at: [Belgrade Waste-to-Energy PPP \(qihub.org\)](#), (Accessed: 15/08/2023)

⁸¹ European Public Service Union, Waste Management in Europe, (2023), Available at: [Waste Management in Europe_EN.pdf \(epsu.org\)](#), (Accessed: 15/08/2023)

SW1 | Build new EU compliant landfill and close existing dumpsite Investment

Impact: Improved soil and water quality. Improved public health. Direct reduction of GHG emissions. Job creation.

Stop operation and close the current dumpsite, identify options for remediation and undertake a feasibility study for the potential future uses of the site.

Following the land acquisition and appropriate resettlement measures, construction of an EU-compliant sanitary landfill including baselining systems, collection and treatment of leachate, and capture and treatment of gas in Shamkir District. The project should include a full ESIA study with recommendations to minimise, avoid and manage environmental (including climate) and socio-economic impacts and risks.

Component 1 – Existing dumpsite

- Undertake site investigation works to determine the level of remedial works required at the existing dumpsite;
- Remediate and close existing dumpsite; and
- Formalise the informal waste sector.

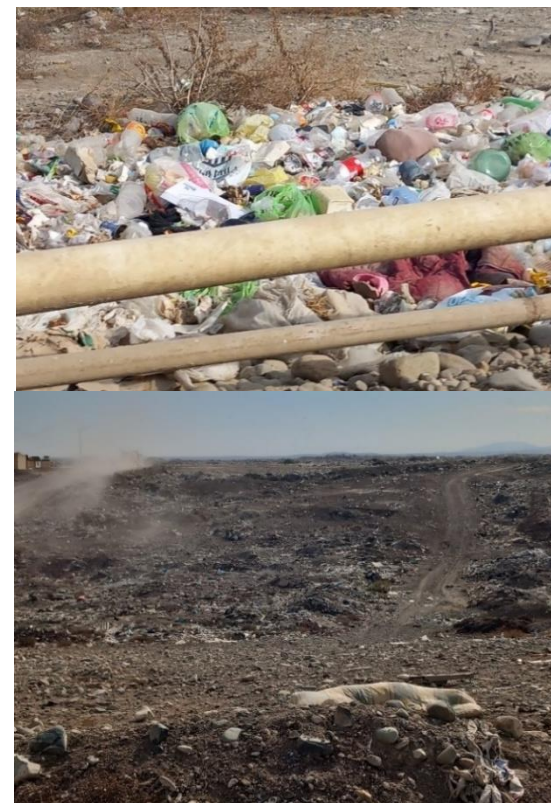
Component 2 – Construction of new EU-compliant landfill

- Complete land acquisition and resettlement measures as necessary;
- Undertake feasibility study to determine size, capacity and engineering requirements for new landfill site;
- Undertake detailed ESIA;
- Tender/construction of new landfill to meet EU requirements with regards to lining, leachate and gas capture/ treatment;
- Strengthen/increase regulatory capacity to prevent wild dumping of waste; and
- 150ktpa waste per year. 15 years lifetime and approx. 2.3 million tonnes design capacity. Cells developed in line with the fill rate of the landfill, but likely that one to two cells were constructed initially with a third constructed perhaps 8-10 years later to prevent degradation of liners and other infrastructure.

Links with other actions and initiatives:

- Ongoing EBRD GrCF2 W2 Ganja Solid Waste Phase 1 and 2 –in particular, Phase 2 which seeks to close down the current dumpsite and construct a new EU-compliant landfill in Shamkir District;
- SW2 – Potential to co-locate the new landfill with the MRF facility; and
- Draft GC Master Plan – This action is aligned with and will help to implement projects which are designated for land on the current dumpsite, it will facilitate the rehabilitation of land unlocking it for future sustainable development.

Figure 10-2 – Solid waste around the City (top) and current dumpsite (bottom)



Source: AtkinsRéalis site visit

<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • GCEA CUSPU – Implementation agency. Currently responsible for all aspects of SWM in GC; • Tamiz Shahar – Potential implementation agency if the operation is extended to Ganja to carry out similar work as in Baku and liberalised regions. They will also contribute to insights and lessons learned from their ongoing operations and practices; • GCEA and Municipalities (other departments) – To coordinate efforts and plans for solid waste collection and cleaning; • MENR – Responsible for issuing fines for polluters including fly-tipping, • MH – Responsible for safe waste disposal of medical equipment; and • Ministry of Agriculture (MA) – Authority responsible for appropriate disposal of hazardous from agriculture SWM. 			
<p>CAPEX (AZN): 106 million (Approx. 55 million EUR)</p>	<p>OPEX (AZN): 1.59 million per year (Approx 0.83 million EUR)</p>	<p>Potential funding sources and revenue generation State Budget. IFI/Donor Agencies. Waste collection fees. A potential revenue stream from the sale of electricity produced from landfill gas.</p>	<p>Timeframe for implementation 2024 - 2025 - Short-term remediation of existing dumpsite; and 2025 (onwards) - construction and O&M of new engineered landfill into the medium and long-term.</p>
<p>Notes on cost estimate (AZN): 19 million - estimated for remediation cost; 87 million - estimated landfill engineering and construction, based on 150ktpa waste per year, 15 years lifetime and around 2.3 million tonnes design capacity. Cost of land, design and supporting studies are not included in the CAPEX. The landfill cells will not all be constructed at the same time. It is likely that the first stage will include the construction of 1 or 2 cells and stage 2 will include the construction of a third cell. 106 million is an estimate for the full build-out and remediation of the current dump site. OPEX is calculated at approximately 1.5% of CAPEX.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Secure land/complete acquisition; undertake ESIA and approve resettlement plan. 			
<p>G&EI considerations and benefits This action will result in improved access for residents to basic services by improving waste management. A new landfill site designed and operated in compliance with EU environmental standards will have a beneficial impact on local environmental quality, as waste will be managed in an appropriate manner. This will reduce the health risks associated with pollutants from waste entering groundwater and the local environment. As a result of the new landfill</p>	<p>Climate resilience considerations An engineered landfill can help to reduce environmental pollution and therefore help to promote healthy ecosystems, enhancing urban resilience. In</p>	<p>Potential GHG reduction Direct GHG reduction is possible, although not quantifiable at this stage. Closing the dumpsite and implementing a controlled landfill would save a considerable quantity of carbon emissions in comparison to an open dumpsite. Moreover, capture and appropriate management of landfill gas</p>	<p>Smart City considerations Smart technology options will include truck weighing mechanisms at the landfill, radio frequency identification tags and potentially</p>

<p>opening (and the closure/remediation of the old dumpsite), there will be beneficial health, safety and security impacts for informal waste pickers currently operating at the dumpsite, however, this may signify a loss of income for them.</p> <p>Without due consideration in the new landfill design and construction, livelihoods and incomes will be lost for the informal sector which pick waste on the existing dumpsite. Therefore, measures should be taken to ensure that informal waste pickers are not left behind and have an opportunity to secure future employment in the waste management sector.</p> <p>A low level of job creation may be possible through this action during operation (estimated <20 jobs).</p> <p>Ensure that capacity-building programs and jobs are accessible to everyone, regardless of gender or physical capabilities.</p>	<p>particular, it is likely to reduce leaching during heavy rainfall events, and bad odours during hot weather.</p> <p>Reducing wild dumping of waste can reduce littering and prevent material from entering water courses, therefore reducing blockages which lead to flooding.</p>	<p>has the potential to reduce emissions of GHG gases from landfill operations. Several modern landfills capture and burn methane from the landfill to create electricity rather than allowing it to be released uncontrolled.</p> <p>Therefore, there is a potential to investigate emission reductions further as the project develops.</p> <p>However, considerable methane emissions would remain from directing waste to landfills, in comparison to recycled and closed-loop systems.</p>	<p>smart sensors on waste containers to monitor their location and capacity (linked with the ongoing EBRD SW collection project as a first phase).</p> <p>There is also a potential to link tonnage data to fee tariffs based on how much waste is generated (pay as you throw principle).</p>
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Case Study

Integrated SWM in Baku, Azerbaijan^{82, 83, 84}

The World Bank supported Greater Baku in improving its poorly managed waste disposal operations by transforming the main city dumpsite, Balakhani, into a 120 ha engineered sanitary landfill – the first engineered sanitary landfill in the Country. The engineering of the landfill created an additional 9.7 million tonnes of additional capacity and incorporated the installation of leachate and gas collection and management systems. The World Bank project for the rehabilitation of the Balakhani landfill included:

1. Full remediation and closure of the old dumpsite;
2. Installation of leachate controls;
3. Development and construction of new waste cells at the existing site; and
4. Installation of methane gas (landfill gas) capture system.

As a result of the Balakhani landfill upgrade, informal waste pickers were incorporated into the formal economy – providing safer and more reliable working conditions. A wider benefit of the project was the closure of 132 informal dump sites (totalling around 199 ha) to minimise the negative environmental effects associated with uncontrolled waste disposal. 40 dump sites were closed under the World Bank project (around 143 ha), and 92 were closed by the Government (around 56 ha). The World Bank also fund additional waste infrastructure in Baku including an eco-industrial park to facilitate recycling and reuse of waste materials.

⁸² Tamiz Shahar, The Integrated Solid Waste Management Project, (2023), Available at: <https://tamizshahar.az/en/projects/5>, (Accessed: 14/08/2023).
⁸³ World Bank, ARP II Integrated Solid Waste Management Project, (2021), Available at: https://ieg.worldbankgroup.org/sites/default/files/Data/reports/ppar_azerbaijanarp2.pdf, (Accessed: 14/08/2023).
⁸⁴ Trend news agency, Service life of Balakhani solid waste landfill increases (PHOTO), (2022), Available at: <https://en.trend.az/business/3540486.html>, (Accessed: 14/08/2023).

Figure 10-3 – Photos of Integrated SWM in Baku



Source: Tamiz Shahr

SW2 Combined Materials Recovery Facility (MRF) and Mechanical Biological Treatment (MBT)			Investment
<p>Impact: Improved circularity of waste materials. Reduced environmental impact of product creation. Job creation. Potential for revenue generation through the sale of recyclables and increased local business opportunities.</p>			
<p>Undertake a feasibility study for the construction of a combined MRF that manually and/ or automatically sorts, separates and prepares source segregated dry mixed recyclable materials and MBT facility that mechanically separates, prepares and stabilises residual waste prior to disposal at the new sanitary landfill. Identify a suitable location within, or near, the City and carry out an ESIA to ensure minimum disturbance to the environment and the local community.</p> <p>Components:</p> <ul style="list-style-type: none"> Undertake a stakeholder engagement exercise to determine the extent of informal recycling activities and the needs of existing recycling businesses; Undertake a feasibility study to identify target source segregated waste streams, collection systems and requirements (i.e., type, number, size and location of containers and need for additional vehicles) and develop an implementation schedule. This should include a market study relating to the specific recyclable waste streams to define potential offtake agreements, demand and price/revenue, and development of an outline business case; Appropriate public awareness and education campaigns to educate the public to segregate waste; Confirm the MRF and MBT site and undertake detailed ESIA and confirm land acquisition/ownership and resettlement as necessary (if possible, co-located on the same land as the new EU-compliant landfill (SW1)); and Tender construction and operation of the new MRF and MBT. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> SW1 – Potential for the MRF and MBT to be co-located with the new landfill capitalising on their close proximity. 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> GCEA CUSPU – Implementation agency Currently responsible for all aspects of SWM in GC; Tamiz Shahr – Potential implementation agency if the operation is extended to Ganja in order to carry out similar work as in Baku and liberalised regions. They will also contribute to insights and lessons learned from their ongoing operations and practices; GCEA and Municipalities (other departments) – To coordinate efforts and plans for solid waste collection and recycling; and Private sector and individuals working on collecting and commercialising recyclables. 			
<p>CAPEX (AZN): 50 million (Approx. 26 million EUR)</p>	<p>OPEX (AZN): 2.5 million (Approx. 1.3 million EUR)</p>	<p>Potential funding sources and revenue generation State Budget. IFI/Donor Agencies. PPP (potentially bundled with SW1 and SW3). A potential revenue stream from the sale of recycled material - is linked to global commodity prices which can fluctuate. Reduction in waste requiring landfill disposal thus reducing operational costs, extending the life of landfill, and reducing O&M investment requirements.</p>	<p>Timeframe for implementation 2024 - Planning and feasibility study: and 2025- 2026 - Construction to be undertaken medium-term, with ongoing O&M into the medium and long-term.</p>

Notes on cost estimate (AZN): CAPEX and OPEX are dependent on the level of automation and sorting technology installed in the facilities. OPEX is estimated at 5% of CAPEX, however, costs depend on the level of automation and technical complexity - i.e., the number of source segregated material streams to sort. Cost of land, design and supporting studies are not included.

- Pre-requisite and steps for implementation:**
- Determine feasibility, and market demands and outline business case;
 - Secure land and complete acquisition;
 - Undertake ESIA and execute resettlement plan;
 - Establishment of an active recycling programme across Ganja City; and
 - Characterisation of waste streams in Ganja (Part of SW3).

<p>G&EI considerations and benefits</p> <p>Improves residents’ access to basic services by improving waste management.</p> <p>Improved waste separation and processing reduces the exposure of informal waste pickers, often from marginalised groups to poor sanitation and hazardous materials.</p> <p>There is also a potential for the action to stimulate the local markets to encourage investors to start recycling businesses.</p> <p>A moderate level of job creation may be possible through this action during operation (estimated <40 jobs).</p>	<p>Climate resilience considerations</p> <p>Enhanced collection of segregated waste can reduce littering and subsequent blockages in drainage systems therefore potentially reducing flood risk.</p>	<p>Potential GHG reduction</p> <p>Direct GHG reduction is possible, although not quantifiable at this stage.</p> <p>Reduction and stabilisation of waste going to landfill reduces emissions of GHG from landfilling of wastes.</p> <p>The processing of waste enables the reuse and extension of product and material lifespan, reducing production-related emissions.</p>	<p>Smart City considerations</p> <p>Source segregated waste collection systems facilitate the implementation of a smart waste monitoring and tracking system to assist with waste tariffs.</p> <p>There is also potential to deploy automated sorting as part of the MRF and MBT utilising a range of sensors and cameras to sort materials.</p>
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Case Study

Balakhany sorting facility, Baku, Azerbaijan⁸⁵

Tamiz Shahar OJSC identified a need to sort household recyclable waste to facilitate the emergence of a recycling market in Azerbaijan, produce cheaper raw materials to expand recycling in the country, save natural resources and energy, and reduce the environmental impacts associated with waste disposal. As such, they developed Azerbaijan’s first MRF, which began operation in 2012.

⁸⁵ Tamiz Shahar, Balakhany sorting facility, (2023), Available at: <https://tamizshahar.az/en/projects/1>, (Accessed: 14/08/2023).

The facility is designed to process around 200,000 tonnes of mixed household waste per year and to segregate paper, glass, plastic, non-ferrous and ferrous metals, reducing the overall volume of waste that requires landfilling.

The facility also segregates some waste electronic and electrical equipment (WEEE) such as batteries, accumulators and other electronic waste – diverting them from landfill to specialist reprocessing and recycling companies. Whilst the quantity of WEEE segregated is relatively small, it reduces the quantity of these often hazardous materials being disposed to landfill or combusted in the waste-to-energy facility also operated by Tamiz Shahaar.

The benefits of the MRF are:

- Stimulation of the recycling industry in Baku and country-wide;
- Generation of recyclable raw materials to encourage the recycling market and stimulate the circular economy;
- Saving natural resources and energy;
- Reducing negative impacts on the environment and human health by diverting waste from landfill;
- Reducing the amount of waste sent to landfill; and
- Creation of both skilled and unskilled employment opportunities.

Figure 10-4 – Photos of the Balakhany Sorting Facility in Baku



Source: Tamiz Shahaar

SW3 Solid waste management strategy	Policy
<p>Impact: Improved access to SWM services. Job stabilisation through the creation of co-operatives for informal waste pickers.</p>	
<p>Following the development of the National Solid Waste Management Strategy (NSWMS), develop a solid waste management strategy for GC to enable the implementation of NSWMS at the local level. This strategy aims to provide a strategic direction for GC to implement the NSWMS Strategy. This could include improved waste collection services, safe and efficient disposal, increased recycling and resource recovery, as well as segregation of potentially hazardous waste and organic waste. This should encompass a study to identify waste streams in GC including source, volume and current disposal methods; for example, waste associated with construction and demolition (such as asbestos and lead), WEEE (electronics), hazardous waste (including batteries, paints, used oils and mercury), organic and biological waste. The strategy should also include appropriate solutions to deal with, manage and appropriately dispose of all waste streams, rather than disposing of them in the new landfill.</p> <p>Waste pickers collect and operate at an informal level in the City. They can be organised into cooperatives with full employment benefits and organised in teams to pick up different types of recyclables.</p> <p>Development and conducting awareness campaigns among households, school children and students on good practices relating to solid waste management, including, recycling and reuse at home/school, zero littering and circular economy principles.</p> <p>Components:</p> <ul style="list-style-type: none"> • Establish a cooperative to formalise the informal waste pickers and stimulate the recycling market; • Develop targeted knowledge and capacity building campaigns focusing on youth, women and the informal sector – potentially providing training on areas such as resource efficiency and the circular economy, and facilitating with developing the necessary skills to enter the workforce and promote the green economy; • Develop the GC waste management strategy. This could be developed in-house by the GCEA CUSPU or by an appointed external consultant if further resources and capacity are required; • Knowledge and capacity building for GCEA officials and employees to facilitate the implementation of strategic actions; and • Development of public awareness campaigns with a targeted focus on schools and children/students. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • SW1 and SW2 – Regarding developing a well-integrated SWM strategy for the City; and • LU1, LU2, and TR2 – Ensuring the integration of good solid waste management practices when redeveloping brownfield sites, providing new open green spaces and upgrading transit corridors. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • GCEA CUSPU – Implementation agency. Currently responsible for all aspects of SWM in GC; • Tamiz Shahar – Potential implementation agency if the operation is extended to Ganja in order to carry out similar work as in Baku and liberalised regions. They will also contribute to insights and lessons learned from their ongoing operations and practices; • GCEA and Municipalities (other departments) – To coordinate efforts and plans for solid waste collection and cleaning; 	

<ul style="list-style-type: none"> • MENR – Responsible for issuing fines for polluters including fly-tipping; • MH – Responsible for safe waste disposal of medical equipment; and • Ministry of Agriculture (MA) – Authority responsible for appropriate disposal of hazardous from agriculture SWM. 			
<p>CAPEX (AZN): 185,000 (96,200 EUR)</p>	<p>OPEX (AZN): N/A</p>	<p>Potential funding sources and revenue generation State budget. IFI/Donor Agencies. Waste collection fees. GCEA street cleaning fees. Cooperative for waste pickers and sorting recyclable material. Reduction in waste requiring landfill disposal thus reducing operational costs, extending the life of the landfill and reducing O&M investment requirements.</p>	<p>Timeframe for Implementation 2024 - Short-term development of strategy, however, ongoing implementation into the medium and long-term.</p>
<p>Notes on cost estimate (AZN): CAPEX assumes an external provider to develop the Strategy. These could be reduced if developed in-house by the GCEA CUSPU.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Provision of resources to facilitate delivery and support of the action. 			
<p>G&EI considerations and benefits The implementation of a solid waste management strategy (along with actions SW1 and 2) will improve residents’ access to basic services and improve the local environment by improving waste management. Informal waste pickers could be organised into cooperatives to formalise the sector, facilitate waste collection and improve working conditions. Targeted education and awareness campaigns will improve resident’s access to basic waste management services.</p>	<p>Climate resilience considerations The strategy will create conditions for more coordinated SWM in the city and is expected to reduce both littering and the blockage of drains and watercourses, as well as reduce the amount of unmanaged waste therefore reducing problems associated with odour during hot weather.</p>	<p>Potential GHG reduction No direct GHG reduction impact. However, improved resident awareness will reduce littering and promote better waste management reducing wild dumping of waste and associated generation of GHG emissions.</p>	<p>Smart City considerations This action should include digital initiatives, such as providing apps and online tools to promote awareness and education regarding circular economy principles and the 4Rs, helping to facilitate a digital transformation of the sector. This could also include a targeted social media campaign.</p>

Case Study

Recycling Initiative of Karak Municipality, Jordan⁸⁶

The City of Karak in Jordan has a very significant strategic location and covers an area of 3,495 km². The population of Karak Governorate is approximately 280,000, with about 112,000 people living within the Karak Municipality district. The Greater Karak Municipality is the focal point of all development efforts of the City and is responsible for many public services, including solid waste collection for houses and public places. The Municipality collect around 120 tonnes of solid waste a day and transfers it to the landfill site located around 35 km from the City. The annually increasing quantity of waste collected and the distance driven for disposal puts pressure on Municipality staff, as well as on infrastructure and financial resources, therefore budgets are becoming increasingly stretched. Syrian refugees have fled to Karak, adding additional challenges to the authorities in providing appropriate services.

In September 2015, the German Association for Adults Education, German Cooperation Council, Karak Municipality and Jordan Hashemite Fund for Human Development established a recycling facility that collected cardboard, paper and plastic.

The project aimed to reduce the burden of waste collection on staff and collection vehicles alike by reducing the amount of waste disposed at landfill. Increased collection of segregated materials led to a decrease in waste volume for the collection vehicles and subsequently a reduction in fuel consumption helping to mitigate negative impacts on the environment. Additionally, recycling is an important step in preserving natural resources and adopting the principles of the circular economy to help reduce GHG emissions.

The recycling facility was implemented in a number of stages and, most importantly, in close cooperation with all actors involved in the process. The first step was to agree on the establishment of a project steering committee, comprised of representatives from across all partner organisations. The committee held regular meetings to define and agree on the suitable working mechanisms of the project and to discuss legal, administrative and technical concerns, as well as to identify and define roles for all partner organisations in line with their respective areas of expertise.

Karak Municipality provided land within the vocational zone, equipment and offices for staff to implement the project, and the necessary containers to collect cardboard from the marketplaces.

The project outcomes were:

- Significant reduction in the workload of waste collection vehicles and labourer staff, by reducing the quantity of waste transported to the landfill by around 730 tonnes per year and saving two daily trips for four-tonne trucks to the landfill site. This has helped to reduce operational costs for both staff and vehicles, improved efficiencies in collection routing and reduced environmental impacts associated with transportation;
- Improvements in waste awareness within the local community, with increasing users' usage of the recycling containers;
- Revenues from the sale of collected recyclable material have ensured that the facility covers its operational costs; and
- A local entrepreneur set up a facility for both the recycling and reuse of cardboard and consequently created job opportunities within the waste and recycling market sector.

⁸⁶ Connected Cities, Recycling initiatives of Karak Municipality, Jordan, (2023), Available at: <https://www.connective-cities.net/en/good-practice-details/gutepraktik/recycling-initiative-of-karak-municipality-jordan>, (Accessed: 14/08/2023).

Figure 10-5 – Images of SWM in Karak Municipality



Source: Connected Cities

11. Climate and Environmental Governance

Sector goals:

Enhance the environmental governance system by improving, modernising and automating the environmental monitoring system and implementing and enforcing policies to protect the local environment.

Reduce environmental pollution by strengthening environmental governance systems, enforcing environmental auditing and reporting, increasing technical capacity, and deploying green technology and green infrastructure projects.

Improve resilience to climate change, particularly water scarcity, through coordinated and effective land planning and delivery of infrastructure.



Mid-term Targets	Current value		Targets
Average annual concentration of PM2.5 (mkg/m3)	28	↘	10-20
Average daily concentration of SO2 (mkg/m3)	35	↘	20-50
Average daily concentration of NOx (mkg/m3)	115	↘	40-80
Biochemical Oxygen Demand (BOD) in rivers and lakes (mg/L)	3.2	↘	2
Phenol concentration in rivers and lakes (mg/L)	2	↘	<2
Estimated economic damage from natural disasters floods droughts earthquakes etc. as a share of GDP (%)	n/a	↘	1%
Annual CO ₂ equivalent emissions per capita (Tonne/year/capita)	5.3	↘	5
Annual CO ₂ emissions per unit of GDP (Tonne/m. USD of GDP)	0.4	↘	0.35
GHG emissions reduction	n/a	↘	35%

Action Ref.	Action Title	Action Owner	CAPEX (AZN)	OPEX (AZN/Annual)	Linkages
CEG1	Ganja River management plan	MENR	8.65 million (4.5 million EUR)	22,800 (11,856 EUR)	LU4, WW1 and 2, CEG1 and 3.
CEG2	Disaster Risk Management and Emergency Plans	MENR/MES	140,000 (72,800 EUR)	N/A	CEG3 and 4, linked with all other actions and sectors.
CEG3	Climate Change Action Plan	MENR	250,000 (130,000 EUR)	N/A	CEG1, 2 and 4, linked with all other actions and sectors.
CEG4	Enhanced environmental monitoring	MENR	2.37 million (Approx. 1.23 million EUR)	23,600 (12,270 EUR)	LU4, CEG1, 2 and 3.

11.1. Key Actors and Stakeholders

At the national level, the MENR is responsible for environmental policy formulation, safeguarding the county, and for certain project implementation responsibilities. MENR is the main authority responsible for implementing programmes and policies in relation to the environment and managing, monitoring and safeguarding all aspects of the environment – including hydrometeorology, climate and GHG emissions, water, air and soil quality and biodiversity. The Ministry also carries out State regulation and coordination of activities in the environmental field, issuing permits to regulate potential polluting activities and working with relevant State institutions and stakeholders to take measures to attract investment. There are several other Ministries and State Agencies that are responsible for environmental indicators, with these presented in Table 11-1 and their responsibilities discussed throughout Chapters 5 to 11.

Table 11-1 – Stakeholders Involved in the Climate and Environmental Governance Sector, Based on Environmental Indicators

Environmental Theme	Stakeholder with Responsibilities
Air quality	MENR, MH, and MTDD
Biodiversity, forestry, and fisheries	MENR
Land and soils	MENR, SLCC, and MA
Water	MENR, MH, MA, AzerSU, and AWAM (soon to include the new WRA)
Oil pollution	SOCAR and MENR
Hazardous waste	MES, MENR, and MH
Waste	MECON, MENR, GCEA and Municipalities
Mineral resources	MENR
Sustainable development	MECON, MENR, and SCUPA
Climate change	MENR and MENG
Natural and man-made disasters	MES, MENR and SCUPA.

Source: AtkinsRéalis analysis and adapted from UNECE⁸⁷

At the local level, as set out by part four of the Constitution of Azerbaijan and the Law “On the status of Municipalities”⁸⁸, individual Municipalities have the

remit to manage open green spaces, develop local environmental programmes to maintain and oversee the ecological balance in the local area, maintain and improve municipal areas, alongside implementing other environmental measures in conjunction with neighbouring Municipalities. However, a lack of capacity, resources and financing available to the Municipalities in Ganja means that many duties regarding environmental protection are performed by the GCEA at the local level, whose budget is subsidised by the Government. This mainly includes undertaking the management and maintenance of open green spaces across Ganja, street cleaning and solid waste management (as discussed in Chapter 10).

11.2. Supporting Activities and Enabling Policies

- Initiate/complete the preparation of new and revised environmental laws as well as their subsequent adoption and implementation** - Finalise the review of stringent laws on climate change, atmospheric pollution, fauna and flora, chemicals and subsoil, and develop low-carbon strategies with strong consideration of environmental protection. Draft amendments to environmental legislation to determine that the scope is consistent with the mandatory thresholds; issuance of integrated permitting for larger industries; enhance opportunities for public participation in the integrated permitting procedure. Update the methodological documents on air emission and wastewater discharge limits alongside updates to environmental quality standards;
- Publicly accessible environmental legislation and documentation** - This should also ensure that evaluation reports on environment-related laws and legal documentation are publicly available on the relevant Government department websites, which could be hosted on the MENR website;
- Prioritisation of GC for installation of monitoring equipment and awareness-raising campaigns** - Activity 5.1.2. of “2022-2026 Socio-economic Development Strategy of Azerbaijan Republic” aims to improve the weather forecasting and environmental monitoring system, including early warning systems and automated environmental monitoring equipment. Environmental awareness and capacity building are also key

⁸⁷ UNECE, Azerbaijan 2nd Environmental performance review, (2011), Available at: https://unece.org/DAM/env/epr/epr_studies/azerbaijan%20II.pdf, (Accessed: 09/09/2022).

⁸⁸ Law CR3 of the Republic of Azerbaijan, On the Status of Municipalities, (2009), Available at: <https://cis-legislation.com/document.fwx?rgn=2667>, (Accessed: 09/09/2022).

considerations within the strategy. Although indicators for the implementation of activities are in place at a national level, it is not clear which regions or cities will be prioritised. Therefore, the action should be developed to include specific geographic locations of monitoring equipment and GC should be a priority city to receive future funding for the implementation of the action;

- **Ratified and abide by international environmental conventions** - Including protocols and standards on impact assessment, pollution, hazardous chemicals, heavy metals (such as ESPOO Convention on ESIA, the Minamata Convention on Mercury, depletion of the Ozone Layer, sustainable agriculture, amongst others) to implement procedures and best practices that will help to preserve the natural environment;
- **Training and skills development** – Establish tailored vocational courses in partnership with academia, industries and businesses to upskill employees on how to reduce and minimise the environmental footprint, and implement resource efficiency and cleaner production measures. Increase and improve the number of higher education courses specialising in climate change, as well as introducing new topics related to climate change in the curriculum. Further information on training and capacity building is provided in Section 12.4
- **Strengthening international cooperation** - Ganja could join international initiatives to raise the City profile and show its commitment to the green agenda. These initiatives could include the EU Covenant Mayors, C40 or ICLEI;
- **Local representation is needed in the decision-making** – Climate change risk is affecting GC and other localities in several different and unique ways. Local Governments are not currently represented in the State Commission on Climate Change, which means the challenges the City faces and voices from the citizens and vulnerable groups are not heard or fully considered when developing adaptation and mitigation measures which tackle climate change at the City level; and

11.3. Best Practice of Financing Modalities for the Climate and Environmental Governance Sector

- **Provide import duty exemptions for imported equipment** – It is important to note that most environmental investments are unprofitable; procurement, installation and operation of monitoring equipment is not an exception. There is no production entity in Azerbaijan for such equipment, hence all need to be imported. Import fees mainly include VAT – 18% and import duty - 15%. Accounting for other relatively small expenses, the total import fee could reach up to 40%. In this context, import duty exemptions should be provided for imported monitoring equipment in order to reduce costs;
- **Engagement with donor organisations** - Azerbaijan is party to several multilateral environmental agreements – including the UN Framework Convention on Climate Change, the UN Convention on Biological Diversity, the UN Convention to Combat Desertification and the Convention on Long-Range Transboundary Air Pollution. Although Azerbaijan is an upper-middle-income country, it is still developing. Therefore, to implement obligations and commitments under these conventions, Azerbaijan has a right to apply to international donors funding and/or technical assistance, which should be capitalised upon;
- **Climate Finance** - Taking steps to strengthen the capacity of banks, for example, the International Bank of Azerbaijan, so that they can become a Green Climate Fund (GCF) accredited implementing entity. This could facilitate access to a mobilisation of GCF funding to support both adaptation and mitigation activities. Further information on climate financing can be found under Section 0;
- **Revise the current legislative framework regarding Public-Private Partnerships** - To clarify ownership rules and therefore increase the attractiveness of such investments from the private sector perspective;
- **Continue attracting investments in non-oil sectors** - To promote green activities and gradually impose environmental performance targets on firms benefiting from favourable taxation; and
- **Develop legislation on green public procurement** - To ensure that national guidelines for such procedures are developed and disseminated across all public authorities, and their implementation monitored.

CEG1 | Ganja River Management Plan and Urban Green Corridor Investment

Impact: Improved climate resilience. Increased access to water. Improved management of water resources

Develop an investment plan for the Ganja River basin to rationalise water resources – including undertaking a comprehensive hydrological assessment and developing management options for the sustainable use of water for irrigation of agricultural land and sustainable extraction of water resources for potable water use, recharging of groundwater reservoirs and protection of water bodies from pollution and degradation, river restoration options. The plan should also consider options for drought management, river and surface water flooding, the use of NBS (as described in LU1) and incorporate climate resilience measures. The plan should include a monitoring system for water bodies (rivers, lakes, streams) and groundwater to provide early warning of drought conditions, and trigger actions as part of a drought management plan, for example, restricting the use of water for washing cars or watering lawns. The monitoring system should include some of the elements outlined in CEG4.

Components:

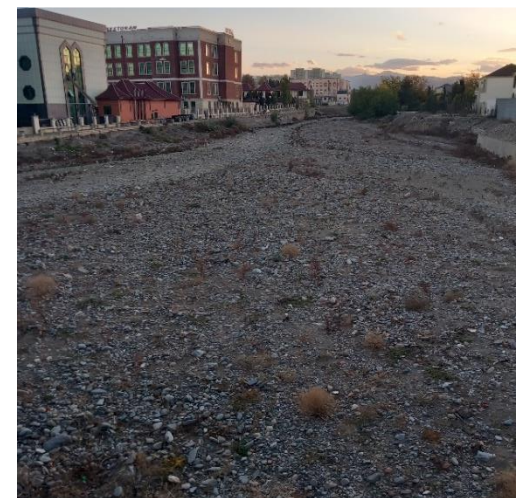
- A comprehensive study into the current water balance for the catchment, including a hydrological assessment and an assessment of future changes in flow regime driven by climate change major water users, identifying major water users, and assessing the amount of water needed for environmental flow requirements;
- Stakeholder identification and engagement phase to build partnerships and develop a shared vision for the management of the River;
- Identify investment opportunities, including areas for river restoration (similar to the pilot scheme identified below), investment in improved drainage and water-efficient agricultural programmes;
- Collaborative development of catchment management plan, including prioritisation of key management interventions and trade-offs; and
- Develop a funding strategy for the interventions identified in the plan, including exploring models of payment for NBS, SuDS and payment for ecosystem services.

Pilot scheme for river restoration using NBS:

This action also entails the detailed design and implementation of a green corridor along Ganja River, running through the centre of the City from the bridge along Ali Mammadov Street to the bridge along Haydar Aliyev Avenue (approximately 3.5 km). The land along the Ganja River within this section is mainly state-owned. This green corridor should be informed by the wider hydrologic assessment of the river to understand potential risks and opportunities for improvement associated with river flow and drought, implementation of river restoration measures i.e., rewilding with native species, and inclusion of SuDS, NBS and grey infrastructure where necessary to increase greening in the area. The project should take a multi-benefits approach as part of the feasibility study as it has the potential to assist with water retention and infiltration to improve water flow, soil stabilisation to decrease risk to landslide, improvement of biodiversity, better air quality, and provision of recreational area. Please refer to Chisinau river restoration project in Section 9.3 and Figure 9-2.

Links with other actions and initiatives:

Figure 11-1 – Ganja Riverbed at the bridge along Haydar Aliyev Avenue



Source: AtkinsRéalis site visit

<ul style="list-style-type: none"> • LU1 – introduction of NBS to river restoration • WW1 and WW2 – Relating to the redistribution and protection of water resources to ensure there is enough potable water for residents • CEG4 – The monitoring system proposed will be linked with the wider monitoring systems of environmental assets to improve water availability and quality; and • CEG2 – Help to inform the disaster risk management plan. 			
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • MENR – Implementation agency, responsible for management and overseeing water quality and resources in GC; • GCEA and Municipalities – Stakeholders and consultees when developing the plan; • AzerSu and Ganja Sukanal (future WAR) – Stakeholder and consultee when developing the plan, responsible for supplying and maintaining enough water resources for household use; • AWAM – Stakeholder and consultee in developing the plan, responsible for managing water use for irrigation; and • Universities and Academia – Stakeholder and potential data owner and user as part of research activities undertaken by students and faculty. 			
<p>CAPEX (AZN): 8.65 million (4.5 million EUR)</p>	<p>OPEX (AZN): 22,800 (11,856 EUR)</p>	<p>Potential funding sources and revenue generation State budget, water utilities and IFI/Donor agencies.</p>	<p>Timeframe for implementation 2024 - development of management and Investment plan.</p>
<p>Notes on cost estimate (AZN): 200,000 - catchment plan, 450,000 - hydrology assessment. 8 million - associated with Green Corridor along Ganja River (3.5km), including rewilding / native trees and SuDS. This is based 8.5 km urban stretch in Chisinau was estimated at 11 million Euros, OPEX includes staff costs at 2 x FTE for maintenance of urban stretch and replanting where necessary.</p>			
<p>Pre-requisites and steps for implementation:</p> <ul style="list-style-type: none"> • Clear identification of relevant stakeholders. 			
<p>G&EI considerations and benefits Ensure the involvement of local communities, farmers and other stakeholders, including women and vulnerable groups, in the planning process to understand their needs and preferences regarding water use and ecosystem services.</p>	<p>Climate resilience considerations The investment programme developed will significantly contribute to increased</p>	<p>Potential GHG reduction No direct GHG reduction impact. However, investments included in the plan may provide opportunities for emissions reductions (for example, upstream agricultural investments).</p>	<p>Smart City considerations The monitoring of water resources within the catchment, including waters bodies (rivers, streams, lakes) and groundwater could utilise real-time automated monitoring equipment and smart sensors (linked</p>

<p>The plan will help to protect the river and local water resources to ensure there is an adequate level of resources to meet the needs of residents and businesses within the Ganja River catchment.</p>	<p>resilience to droughts and floods in particular.</p>		<p>to CEG4). Parameters to be measured include water quality (pH, temperature, turbidity, toxicology, etc), availability and water levels, etc and should be linked with early Warning Systems for droughts or floods in order to anticipate to potential restrictions or warnings to be disseminated using mass notification systems.</p>
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Case Study

Investment requirements for England’s catchment management plans⁸⁹⁹⁰
 This study was prepared alongside the 2022 river basin management plans and outlines the evidence for making the investments that are needed to improve the water environment in the country. It provides the information needed to make cost-effective investments in environmental outcomes, including the costs and benefits of various river restoration and catchment-wide investments. The overall analysis allows for the most cost-effective package of measures to be identified.

⁸⁹GOV.UK, Guidance – Investment requirements for England’s river basin management plans, (2023), Available at: <https://www.gov.uk/government/publications/investment-requirements-for-englands-river-basin-management-plans>, (Accessed: 04/09/2023).

⁹⁰ Ibid

CEG2 Disaster Risk Management and Emergency Plans	Policy
<p>Impact: Improved disaster response capacity across the City.</p>	
<p>Azerbaijan is a party to the Sendai Framework for Disaster Risk Reduction which provided the country with a focus to adopt measures to address risk, hazards and vulnerability, in order to increase resilience⁹¹.</p> <p>In line with the Sendai Framework, this action aims to carry out a climate and disaster risk, vulnerability and opportunity assessment for GC – including risk to droughts, flooding, heat and other disasters pertinent in Ganja. Mapping and identifying the most vulnerable areas and critical infrastructure at risk, including energy, transport, water and telecommunications infrastructure, natural environment and assets, communities, households businesses and industries. The study should also identify key opportunities to build resilience and attract investment.</p> <p>Following the identification of areas and infrastructure at risk, develop, approve, implement and enforce contingency and emergency plans in case of disasters and extreme weather.</p> <p>Components:</p> <ul style="list-style-type: none"> • Climate Risk and Opportunity Assessment for the City to build the evidence base for strategy development and understand disaster risk. This includes identifying key hotspots in the City where there are particular risks from overheating and flooding, identifying key sectors at risk, engaging with key stakeholders across the City (public and private sector), and identifying and prioritising a set of actions to make the City more resilient; • Institutional mapping of responsibility for different types of disasters, and inventory of existing disaster management plans in the City to strengthen disaster risk governance to manage disaster risk; • Identify and outline early warning systems (EWS) to be further developed and implemented in line with the risk and opportunities, • Enhance disaster preparedness by developing specific emergency response plans, with clearly identified lead agencies, the ability to enforce the recommendations and actions in the different plans ensuring effective response, and to ‘Build Back Better’ in recovery, rehabilitation and reconstruction. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • LU4 – Integrating disaster risk information and the developed plan into the sCDE and webmap; • CEG4 – Regarding the collection of data and information which could contribute to the creation of the plans; • CEG3 – Regarding the assessment of climate risks and feeding into the climate change action plan; and • Strongly linked to the other actions proposing improvements to the municipal infrastructure in helping to identify potential assets at risk and developing measures to future-proof them against disasters. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • MENR – Implementation agency (in cooperation with the MES), managing disaster risk and creating emergency plans for GC; • MES – Potential implementation partner and a key stakeholder in developing plans relating to (natural and man-made) emergencies; 	

⁹¹ UNDRR, Implementing the Sendai Framework, (2023), Available at: <https://www.undrr.org/implementing-sendai-framework/what-sendai-framework#:~:text=The%20Sendai%20Framework%20focuses%20on,existing%20risk%20and%20increase%20resilience.>, (Accessed: 25/09/2023).

<ul style="list-style-type: none"> • GCEA and Municipalities – Stakeholders and consultees when developing the plan; • MENG – Stakeholder in developing plans, in particular relating to disaster readiness and management of the energy network; • MDDT – Stakeholder in developing the plans, in particular relating to disaster readiness and management on the transport network and infrastructure; and • Universities and Academia – Stakeholder and potential data owner and user as part of research activities undertaken by students and faculty. 			
CAPEX (AZN): 140,000 (72,800 EUR)	OPEX (AZN): N/A	Potential funding sources and revenue generation State budget and IFI/Donor agencies.	Timeframe for implementation 2024 - collecting of data and development of the plan.
Notes on cost estimate (AZN): N/A			
Pre-requisite and steps for implementation: N/A			
G&EI considerations and benefits When developing the plan, ensure to identify and consider different ways that local communities, different genders, PwD, IDPs, the youth and the elderly, are affected by disasters. Moreover, consider the different socio-economic factors that can make people more vulnerable to disasters. Women and vulnerable groups should be involved in all stages of disaster risk management and emergency planning. Ensure that the plan and any designed disaster risk reduction measures consider G&EI, making sure to be gender-sensitive and meet the needs of all people.	Climate resilience considerations Direct resilience benefits, and the pre-requisite for the development of a resilience investment plan in CEG3.	Potential GHG reduction No direct GHG reduction impact.	Smart City considerations Smart City initiatives in the form of data management and developing/deploying an app to help citizens understand the risks and procedures to undertake in the event of a disaster. There is also potential to integrate EWS identified in the plan, to forecast, communicate, and prepare of potential risks using mass communication systems. Integrating the disaster risk information and the plan developed into the sCDE and webmap to ,disseminate the information among the population (LU4).

CEG3 Climate Change Action Plan	Policy
<p>Impact: Improved climate resilience. Greater capacity for climate change governance in the GCEA.</p>	
<p>Develop a Climate Change Strategy and Action Plan for the City, including both climate resilience and climate mitigation, and setting out specific actions to ensure that Ganja develops on a resilient, low-carbon pathway while enhancing the City as a place to live, work and visit. As far as possible, the strategy should be developed with input from a range of stakeholder groups across the City.</p> <p>The City does not have specific strategies or policies for climate change (mitigation and adaptation), however, targets and priorities set out in national plans influence activities in GC. Specific national mitigation and adaptation plans or strategies are not deployed at the local scale, nor are climate change considerations integrated into territorial and sectoral planning. The GCEA or the MENR do not maintain an emissions inventory, or climate risk assessment at the City level. This poses a challenge when developing plans, as direct sources of GHG emissions in GC are unknown and therefore measures to mitigate these cannot be tailored;</p> <p>Components:</p> <ul style="list-style-type: none"> • Develop emissions inventory for the City to understand the current baseline situation. Identify opportunities for short and medium-term reductions in emissions, including making the case for emissions reductions as a business opportunity; • Drawing on the results of the climate and disaster risk and opportunity assessment in CEG4, summarise key hotspots in the city where there are particular risks from overheating and flooding, engage with key stakeholders across the City (public and private sector), and develop an investment plan for the City's climate resilience; and • Strategy development - Multi-stakeholder process to bring together the evidence gathered in components 1 and 2, and agree on priority actions and timings. The action plan should include potential funding sources for the interventions identified. <p>Links with other actions and initiatives:</p> <ul style="list-style-type: none"> • CEG4 – Regarding the collection of data and information which would be useful for the creation of the climate action plan; • CEG3 – Linked with the creation of the Ganja River management plan to help redistribute and protect water resources with climate change in mind; • CEG4 – In terms of developing climate and disaster risk management measures to feed into the climate action plan; and • Strongly linked with several other actions, including, LU1 and 2, TR2 and 3, EB1, 2, 3, 4, 5, IN3, WW1 and 4, and SW1 and 2, in terms of helping to mitigate and adapt to climate change and increase climate resilience. 	
<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • MENR – Implementation agency, oversees climate mitigation and adaptation activities across the country and would be responsible for creating the climate action plan for GC; • GCEA and Municipalities – Stakeholders and consultees when developing the plan in particular how they manage their estate in light of climate change; • MES – Stakeholder in developing plans relating to emergencies; • MENG – Stakeholder in developing plans, in particular relating to climate mitigation and adaptation of the energy sector and network in GC; • MDDT – Stakeholder in developing the plans, in particular relating to climate mitigation and adaptation of the transport network and infrastructure; 	

<ul style="list-style-type: none"> • SCPI – Stakeholder and consultee relating to the management of State property and their impacts and links to climate change; and • Universities and Academia – Stakeholder and potential data owner and user as part of research activities undertaken by students and faculty. 			
CAPEX (AZN): 250,000 (130,000 EUR)	OPEX (AZN): N/A	Potential funding sources and revenue generation State budget. IFIs/Donor Agencies. The action plan could be developed in part using funding from the EBRD’s CCG facility. The action plan will proactively identify sources of funding for the interventions identified.	Timeframe for implementation 2024 - 2025 - collecting of data and development of plan.
Notes on cost estimate (AZN): 130,000 - emissions inventory; 70,000 - climate resilience assessment; 50,000 - strategy development.			
Pre-requisite and steps for implementation: <ul style="list-style-type: none"> • Actions taken in CEG4. 			
G&EI considerations and benefits Stakeholder engagement will include representatives from different socio-economic groups, and be carried out in a gender-sensitive way. Prioritisation of actions will specifically include the impact on disadvantaged groups and the differential impact on women and men.	Climate resilience considerations Priority set of costed adaptation measures developed.	Potential GHG reduction No direct GHG reduction impact. However, an inventory of GHG emissions will serve as baseline information to move further with mitigation actions. Moreover, the strategy to be prepared will also include mitigation actions. Implementation of the action will directly lead to a reduction of GHG emissions.	Smart City considerations There are several opportunities to implement Smart City initiatives as part of the action, for example, the potential to develop/deploy the use of an app to help residents understand their contribution and potential mitigation measures they can implement in the face of climate change.
Case Study			
Istanbul Climate Action Plan ⁹² The Istanbul Climate Action Plan sets out how the City will meet its emissions reduction targets, while simultaneously enhancing the resilience of the City. Incorporating an emissions inventory, climate risk assessment and action plan, the plan lays out key actions for adaptation and mitigation and a roadmap for their implementation. The development of the plan included an inclusive multi-stakeholder process that allowed the development of a coherent vision and strategy for the City.			

⁹²Istanbul Metropolitan Municipality, Istanbul Climate Change Action Plan, (2021), Available at: https://cevre.ibb.istanbul/wp-content/uploads/2023/05/istanbul_climate_change_action_plan_v03.pdf, (Accessed: 04/09/2023).

Figure 11-2 – Istanbul Climate Change Action Plan



Source: Istanbul Metropolitan Municipality

CEG4 | Enhanced environmental monitoring

Investment

Impact: Enhanced air, water and soil quality, and biodiversity abundance monitoring, alongside streamlined data-sharing protocols.

The impacts on local environmental quality in GC are difficult to assess, mainly due to the lack of data collection at the local level. Current environmental quality monitoring is limited to a single automated air quality station found in Heydar Aliyev Park in the west of Ganja and limited water quality monitoring upstream of Ganja along the Ganja River, and there is no regular soil quality or biodiversity monitoring at the local level. Furthermore, data collected is often not easily accessible to the public due to non-functioning and outdated reporting mechanisms.

Therefore, this action aims to improve the quantity and quality of environmental data at the local level through the investment in automated and modern monitoring equipment. Moreover, the action looks to develop a comprehensive dataset and storage mechanism, linked with LU4, to report and publicise the data collected in a user-friendly web platform where residents, businesses and academic institutions can freely access the data and gain insight into real-time local environmental quality. This dataset will also enhance the information available for evidence-based decision-making and investment for City resilience; for example, clearly identifying exposure to air pollution and heat stress, and providing the basis for drought and flood monitoring.

The data gathered should also be available to policymakers and stakeholders to inform plans and proposals for the City. As part of this, data-sharing protocols between the GCEA, relevant Ministries and State Agencies, stakeholders and other interested parties should be streamlined and enhanced to support greater transparency and encourage data sharing.

Components:

Invest in and develop a comprehensive network of environmental monitoring devices across GC, including:

- 3-4 Automated air quality monitoring equipment across the City, in locations with high levels of anthropogenic activity, such as the City centre and industrial areas, to monitor the effects of human activity on local air quality. Monitoring should focus on CO₂, PM_{2.5}, PM₁₀, NO_x, SO₂, etc;
- 2-3 hydrological and 2 groundwater smart real-time monitoring stations along the Ganja River to monitor water quality and quantity. Monitoring should focus on NH₄, Phenols, Biological Oxygen Demand and radioactivity as a priority. An automatic groundwater monitoring station should be installed close to key industrial activities and the dump site, in particular where groundwater is abstracted for use in everyday life;
- Regular soil quality monitoring in locations with identified poor soil quality, for example, the existing dump site and land near the aluminium plant. Monitoring should focus on pollutants and hazardous mercury, zinc and cadmium, as well as other heavy metals, oils and radioactivity (i.e., radon gas); and
- Regular biodiversity monitoring in the City, to understand trends in biodiversity and abundance of flora and fauna and their changes over time.
- Development of data storage and web-based platform to provide and inform citizens about real-time local environmental quality information (linked to LU4); and
- Enhancing data sharing protocols between interested parties.

Links with other actions and initiatives:

- LU4 – integrate with gathered environmental data into the sCDE and web-map; and
- CEG1, 2 and 3 – Provide data to support the creation of various plans and climate policies.

<p>Key stakeholders and responsibilities:</p> <ul style="list-style-type: none"> • MENR – Implementation agency, responsible for implementing equipment and monitoring environmental quality in GC; • GCEA and Municipalities – Stakeholder in identifying the most appropriate locations for monitoring stations; • Universities and Academia – Stakeholder and potential environmental data owners and users as part of research activities undertaken by students and faculty; • Other relevant Ministries and State Agencies – Potential holders or users of environmental data; • SSC – Potential holders or users of environmental and other sector data; • NGOs – Potential holders or users of environmental and other sector data; • Private sector (companies) – Potential suppliers/importers of equipment and providers of maintenance; and • Private sector (farmers) – Potential data users in farming planning. 			
<p>CAPEX (AZN): 2.37 million (Approx. 1.23 million EUR)</p>	<p>OPEX (AZN): 23,600 (12,270 EUR)</p>	<p>Potential funding sources and revenue generation State budget. IFI/Donor Agencies.</p>	<p>Timeframe for implementation 2024 - development of plans and locations for monitoring equipment alongside CEG1, 2 and 3; and 2025 - 2026 - installation of monitoring equipment (with monitoring continuously undertaken).</p>
<p>Notes on cost estimate (AZN): 500,000 - per unit of automated air quality and meteorological monitoring system; 120,000 - per unit of automated surface water monitoring station; purchased monitoring equipment will be warranted by the supplier, all costs related to possible eventual breaks, including service and spare parts will be covered by the supplier itself; 10,000 - capacity building session relating to the monitoring of environmental data. Moreover, if equipment is using solar energy, no energy cost will appear. OPEX is calculated at 1% of CPAEX based on costs associated with data storage, server maintenance on costs and data/information exchange with the servers, replacement of batteries and physical cleaning, only. Costs associated with other environmental monitoring, namely automated equipment for groundwater quality monitoring are not included; there is no such experience in the country. It is not clear which parameters and standards will be prioritised by the Government for such equipment, consequently, it's not possible to estimate its cost.</p>			
<p>Pre-requisite and steps for implementation:</p> <ul style="list-style-type: none"> • Identifying the specific locations for monitoring equipment and determining the need to acquire land; • Identifying the appropriate technology to use; and • Enhancing cooperation between the GCEA, Ministries and relevant stakeholders regarding data sharing. 			
<p>G&EI considerations and benefits Environmental monitoring will increase the environmental consciousness of society and help to develop measures to</p>	<p>Climate resilience considerations</p>	<p>Potential GHG reduction No direct GHG reduction impact.</p>	<p>Smart City considerations Inherently this action is a smart initiative. Where possible,</p>

<p>protect the public against hazardous air quality, as well as hazardous meteorological events. It will also guide the relevant departments to better control air pollution and avoid negative social, economic and environmental impacts – in particular on women, the youth and the elderly.</p> <p>Farmers and villagers will use data and information from monitoring to select more appropriate crop varieties, and/or consider their water needs for irrigation. This information will also enable them to be prepared in advance for the protection of their properties from hazardous meteorological events.</p>	<p>Climate and natural hazards are increasing in intensity, frequency and complexity. Monitoring will enable early warning and dissemination of climate-related information, for example with regards to heat waves and floods, and help to build the evidence base for climate-informed investments and planning.</p>	<p>However, monitoring of GHG emissions will be undertaken as part of this action and therefore contribute to the understanding of the situation and potential solutions that should be implemented to reduce emissions.</p>	<p>automated monitoring stations should be prioritised to monitor local environmental quality. The data will feed into the sCDE and web-map as part of LU4 to disseminate environmental data collected to the public.</p>
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Case Study

Smart City Monitoring in Baku, Azerbaijan^{93, 94}

Increased vehicle traffic and street-level pollution as a result of a growing population is a significant concern for Baku. In 2019, the ‘Smart City’ initiative was launched, in partnership with the MDDT and High Technologies AR alongside CISCO, to execute a plan to install a variety of smart initiatives and meters and monitors across the City. This includes smart street lighting, smart parking, automated environmental monitoring sensors and public Wi-Fi, amongst other measures. Installed onto streetlights, the Oizom Internet of Things automated air pollution monitors (or ‘Polludrone’) monitors air quality and the abundance and impact of several pollutants – such as PM2.5, PM10, CO₂, SO₂, NO₂ and O₃ – on local air quality in Baku. In addition, the monitoring stations can monitor local weather, including temperature, humidity and pressure. The monitoring station collects real-time data and sends it directly to a control and command centre where it can be analysed. Installing the monitoring equipment has helped the City Authority undertake detailed environmental assessments and make informed decisions to minimise environmental pollutants as a result of vehicle emissions through the implementation of traffic management measures.

⁹³ Oizom, Baku Smart City Case Study, (2019), Available at: <https://oizom.com/wp-content/uploads/2021/11/Baku-Smart-City-Case-Study.pdf>, (Accessed: 24/08/2023).

⁹⁴ Oizom, Air quality monitoring systems, (2023), Available at: <https://oizom.com/product/polludrone-air-pollution-monitoring/>, (Accessed: 24/08/2023).

Figure 11-3 – Automated Air Quality Monitors in Baku



Source: Oizom



Polludrone Pro

PM1, PM2.5, PM10, PM100, CO2, CO, SO2, NO, NO2,
O3, H2S, Noise, Light, UV-Radiation, Temperature,
Humidity

12. Implementation Plan

12.1. Investment Plan

12.1.1. GCAP Costing Estimates

All CAPEX and OPEX figures are preliminary indicative estimates at this stage. These are not detailed cost estimates, owing to the need for actions to Table 12-1. The proformas for each GCAP action, presented in Chapters 5 to 11, contain notes that indicate how CAPEX⁹⁵ and OPEX estimates were derived and how the costs have been divided into individual activities and

Table 12-1 – Approximate Cost Estimate by Sector⁹⁶

Sector	Total CAPEX (AZN)	Total CAPEX (EUR)	Total OPEX (AZN)	Total OPEX (EUR)
Land Use/Planning	10.84 million	5.64 million	126,200	65,624
Transport	57.60 million	29.95 million	4.50 million	2.34 million
Energy and Buildings	89.10 million	46.33 million	7.80 million	4.05 million
Industry	910.20 million	473.30 million	36.77 million	19.12 million
Water and Wastewater	753.60 million	391.87 million	15 million	7.8 million
Solid Waste	156.18 million	81.22 million	4.09 million	2.13 million
Climate and Environmental Governance	11.41 million	5.93 million	46,400	24,100
Total	1,988.93 million	1,034.24 million	68.34 million	35.53 million

Source: AtkinsRéalis

be further developed and the legal and regulatory investment framework reviewed in more depth before detailed financial estimates can be generated.

The cost estimates have been determined by drawing on knowledge of similar domestic projects if available, international projects, the professional judgement of technical experts, and local expertise/knowledge of appropriate adjustments that need to be made.

The CAPEX and OPEX estimates by sector are presented in

components. All estimates were also subject to plausibility checks that involved consulting literature, commercial project developers and financial specialists.

⁹⁵ The CAPEX cost estimates are exclusive to delivery risk, optimism bias and climate change adaptation costs. OPEX do not consider inflation and cost of living for year calculations.

⁹⁶ AZN to EUR costs were calculated based on a conversion rate of 1AZN to 0.52EUR.

12.2. Alternative Funding Options

The most common source of financing infrastructure projects in Azerbaijan is based on targeted State budget allocations, determined on a project-by-project basis as part of the annual budget review undertaken by the Ministry of Finance and approved by the Parliament. Approval of capital expenditure is based on a rigorous allocation approach. However, funds allocated from the State budget could be unstable due to the long-term nature of municipal infrastructure projects. Moreover, financing arrangements for some specific projects – such as public transport provision and operation, remediation of contaminated land or implementation of building efficiency measures – can be difficult to establish due to institutional setting and the nature of municipal infrastructure projects.

Apart from the transport sector, there is limited private sector involvement in delivering and managing municipal infrastructure in GC. Those private companies that do operate in the transport sector often have weak economic performance and are faced with unstable economic fundamentals and an absence of clear stimulating measures for growth and improvement.

Therefore, it is advised that the GCEA, Ministries and State Agencies, as well as the Government of the Republic of Azerbaijan as a whole, look to consider and explore the use of alternative long-term financing arrangements to allow them to invest in green and resilient infrastructure interventions, such as:

- **International Finance Institutions and development partners** (including multilateral development banks) can support infrastructure investment in developing economies through a variety of financing mechanisms and options. They can offer their project equity finance (such as multilateral finance, infrastructure and other funds) and/or mobilise private capital investments. Loans are typically offered at below market rate, and thereby offer cities lower financing costs for long-term infrastructure needs. Additional instruments include credit guarantees which are offered to protect private lenders from a government's failure to make payments;

- **Green and Climate Funds** are part of the international agenda for sustainable development and climate change. Various global funds have been established that provide loans and technical assistance grants to infrastructure projects that fulfil a specific set of eligibility criteria. Such funding is provided to public and private sector entities, as well as civil society organisations and research institutes. Some green and climate funds include the GCF, the Special Climate Change Fund (SCCF) and the Adaptation Fund⁹⁷.

Climate finance flows for the Central Asian region are low relative to other Asian regions, accounting for just 2.5% of the total finance for Asia⁹⁸. At the sectoral level, these funds have been focused on renewable energy and transport. At the national level, there have been relatively few investments from climate funds so far, apart from some renewable energy projects, and projects aimed at building readiness.

There are several barriers to be addressed if Azerbaijan is planning to fully access potential international funding for mitigation and adaptation, primarily related to the lack of institutional capacity and lack of a coordinated policy and regulatory framework. Strengthening the capacity of the International Bank of Azerbaijan so that it can become a GCF-accredited implementing entity would facilitate access to GCF funding to support both adaptation and mitigation activities.

A few commercial banks in the country have benefitted from international lines of credit designed to support domestic investment in renewable energy and energy efficiency. Several resilience-focused lending programmes have also been established to support resilience in the region. For example, EBRD and partners including the Climate Investment Funds (CIF) provided \$10m for climate resilience investments in Tajikistan through the CLIMADAPT programme, and the World Bank and others also provide similar facilities. Exploring access to these facilities could provide important additional funds for adaptation in Azerbaijan and Ganja;

- **The Azerbaijan State Oil Fund** has invested in transport, irrigation and water supply projects. Opportunities to use the fund to support municipal mitigation and adaptation investments should be explored, and would

⁹⁷ Further information relating to the availability of green and climate funds can be found at: NDC partnership, Climate funds explorer, (2023), Available at: <https://ndcpartnership.org/climate-finance-explorer>, (Accessed: 06/07/2023).

⁹⁸ ADB, Climate finance landscape of Asia and the Pacific, (2023), Available at: <https://www.adb.org/sites/default/files/publication/901611/climate-finance-landscape-asia-pacific.pdf>, (Accessed: 06/07/2023).

provide a strong domestic source of capital for financing low carbon, climate resilient development;

- **Carbon financing and Emissions Trading** (equity) is an opportunity for national and city governments to avail of the additional source of grant finance for their infrastructure project if these lead to quantifiable greenhouse gas emissions reduction; and
- **Green Bonds** are income securities issued to raise the necessary capital for a project that contributes to a low-carbon, climate-resilient economy and have been designed to attract capital from institutional investors, or as a means for the government to direct funding to climate change mitigation.




It is noted that wider economic and financial reform across the country will need to be undertaken to support the adoption and use of alternative financing mechanisms discussed above.

Under international best practice conditions, national and local governments can choose the optimal method of funding municipal infrastructure based on the city's financing capacity, its relevant experience in design, building, finance and operation functions for specific projects, and both its risk management capabilities and desire for innovation. The government may choose to transfer risk to the private sector where the private sector has specific expertise to achieve more innovation through private-sector procurement models, such as PPP. Although implementing such financial mechanisms is supported through the Law of the Republic of Azerbaijan – *“On the implementation of special financing for investment projects related to construction and infrastructure facilities”* (2016) – there is a lack of secondary legislation providing clarity on standards for PPP to be adopted and how it can be implemented. To date, there have been no examples of PPP projects in the country.

12.3. Implementation Programme

Table 12-2 provides an indicative implementation programme for the GCAP actions. Actions have been organised and scheduled to complement each other while taking into account stakeholder prioritisation and ensuring the maximisation of co-benefits.

Table 12-2 – Ganja GCAP Implementation Programme

sector	#	Action	Timeframe (2024 - 2028)					Funding options	CAPEX (AZN)	OPEX (AZN)
			2024	2025	2026	2027	2028			
	LU1	Improvement of green spaces and network of green-blue infrastructure	■	■	■	■	■	State budget. IFI/Donor Agencies. Climate funds.	9.15million	78,400
	LU2	Urban regeneration and brownfield development	■	■	■	■	■	State budget. IFI/Donor Agencies.	820,000	N/A
	LU3	Heritage Protection and Management Plan			■			State budget. IFI/Donor Agencies.	220,000	N/A
	LU4	sCDE to enhance GIS data collation and reporting			■	■		State budget. IFI/Donors Agencies.	650,000	47,800
	TR1	Parking control measures and implementation	■	■				GCEA budget. Private sector. PPP	2 million	88,400
	TR2	Multi-modal transport corridors	■	■	■	■	■	State budget. Existing maintenance budgets. Parking fees. IFIs/Donor Agencies.	12.68 million	126,865
	TR3	Modernisation and decarbonisation of the bus fleet and SUMP	■	■	■			Sovereign loan. IFIs/Donor Agencies.	42.91 million	4.29 million
	EB1	Public buildings renovation scheme (including Renewable energy in buildings)	■	■	■	■	■	State budget. IFIs/Donor Agencies.	28.65 million	841,500
	EB2	Private buildings renovation scheme (including Renewable energy in buildings)	■	■	■	■	■	IFIs/Donor Agencies.	28.65 million	841,500
	EB3	District and household heating renewal and decarbonisation	■	■	■	■	■	IFIs/Donor Agencies.	9.35 million	1.87 million
	EB4	Modernisation of electricity distribution network	■	■	■	■	■	State budget. IFIs/Donor Agencies.	18.70 million	3.74 million
	EB5	Smart street lighting	■					State budget. IFIs/Donor Agencies. PPP.	3.74 million	470,000

sector	#	Action	Timeframe (2024 - 2028)					Funding options	CAPEX (AZN)	OPEX (AZN)
			2024	2025	2026	2027	2028			
	IN1	Remediation of contaminated land next to aluminium plant						State budget. IFIs/Donor Agencies.	174 million	N/A
	IN2	Green industrial park						Sovereign loan. State budget. IFI/Donor Agencies.	760,000	N/A
	IN3	Investing in green aluminium						Sovereign loan. IFI/Donor Agencies. Private led investment	735.4 million	36.7 million
	WW1	Water and Sanitation Master plan						State budget. IFIs/Donor Agencies.	3 million	N/A
	WW2	Increasing potable water availability						State budget. IFIs/Donor Agencies.	250 million	2.5 million
	WW3	Sewerage and wastewater treatment plant						State budget. IFIs/Donor Agencies.	500 million	5 million
	WW4	Upgrade of the urban drainage system						State budget. IFIs/Donor Agencies.	600,000	N/A
	SW1	Build new EU compliant landfill and close down existing dumpsite						State budget. IFIs/Donor Agencies.	106 million	1.59 million
	SW2	Materials Recovery Facility						State budget. IFIs/Donor Agencies. PPP.	50 million	2.5 million
	SW3	Solid waste management strategy						State budget. IFIs/Donor Agencies.	135,000	N/A
	CEG1	Ganja River management plan						State budget, water utilities and IFI/Donor agencies.	8.65 million	22,800
	CEG2	Disaster Risk Management and Emergency Plans						State budget. IFIs/Donor Agencies.	140,000	N/A
	CEG3	Climate Change Action Plan						State budget. IFIs/Donor Agencies.	250,000	N/A
	CEG4	Enhanced environmental monitoring						State budget. IFIs/Donor Agencies.	2.37 million	23,600

Implementation of action as per description
 Preparation of actions

12.4. Capacity Building and Training

Awareness of environmental and climate-related issues in GC, and Azerbaijan in general, is relatively low among the general public and government officials. Improved climate and environmental governance at the local level is increasingly seen as a key part of enabling cities to pursue low-carbon, climate-resilient development pathways. This section aims to enhance the dissemination of environmental and climate-related information among residents, GCEA and government officials to raise awareness of environmental issues and risks associated with climate change.

Improving the capacity of government officials to better understand the implications of climate change and environmental degradation should be a key focus, in order to help them develop better-informed plans for the City and implement the GCA.

In addition, targeted training for students and school children would help to inform the next generation about the importance of maintaining a high-quality local environment. The Ganja State University as partners of the GCAP play a key role in mainstreaming environmental and climate related information in the curriculum. Similarly, targeted training for IDPs, the youth and women could support upskilling and provision of knowledge with regard to specific green sectors and topics. This would potentially unlock a new sub-sector of the workforce, which could assist with filling in the employment gaps needed to support the implementation of GCAP actions and activities from the green urban agenda.

Several areas and activities are recommended for capacity building for the GCAP implementation, with a focus of upskilling GCEA and the Ministries personnel as well as awareness raising. These would support the effective and integrated approach to sustainable urban development; infrastructure delivery, operation, and maintenance; and climate resilience future-proofing development. Suggested capacity-building and awareness-raising topics, could include:

- Enhancing local biodiversity through targeted soft interventions, such as installing bird baths and boxes, as well as bee and insect hotels, and sowing wild native flowers;
- Benefits of renewable energy and installation of solar PV panels and other technology;

- Green building certificates;
- Sustainable use of water, and best practices in wastewater disposal;
- Importance of responsible consumption (including energy, water, food products, equipment and clothes); and
- Promotion of sustainable mobility (such as walking, cycling and public transport).
- Knowledge and capacity building for GCEA officials and employees, as well as representatives of other governmental authorities in GC;
- Adoption of sustainable farming methods, including composting and organic farming, to minimise the use of chemical fertiliser and reduce food waste going to landfill;
- Public awareness campaigns on water shortage or intense droughts, importance of renewable energy, sustainable water and energy consumption,
- Targeted knowledge-building and awareness campaigns, focusing on children and students;
- Targeted knowledge-building and capacity-building campaigns focusing on IDPs, the youth and women – potentially providing training relating to topics such as solar panel installation and renewable energy, green building certificates, resource efficiency and the circular economy, in order to provide them with skills to enter the workforce and participate in the green economy; and
- Implementation of curriculum on environmental topics for universities in GC.
- M&E sessions to demonstrate how to collect data for IDB, monitoring impacts and reporting.

The awareness raising campaigns should ensure to reach diverse groups within the community, including women, PwD, IDPs, youth, and the elderly. Moreover, different learning styles and information sharing should be taken into account through the production of different audio, visual and written content to cater to different learning needs.

Local NGOs could be involved in conducting awareness raising, capacity building and public events. This can also mean they provide alternative and additional funding for such activities, such as through charity fundraising.

12.5. Monitoring and Evaluation

The GCEA will be the main entity responsible for the monitoring and evaluation (M&E) of the GCAP, which will involve monitoring the implementation of actions, as well as the impact of the GCAP actions on environmental indicators. M&E is an ongoing process to ensure the GCAP actions are being pursued in the right direction and in line with the agreed scope, identifying emerging issues and addressing these early. M&E is not just a data exercise based on collecting and analysing quantitative data. A strong monitoring process is essential to ensure the success of the GCAP programme, therefore the EBRD has established M&E requirements that apply to all GCAPs, as a minimum these require the submission of two reports:

- **Progress Monitoring Plan (PMP)** - aims to have an updated understanding of the status of action implementation over time, including budget spent alignment with deadlines and achievements of key milestones. 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; and
- **Impact Monitoring Plan (IMP)** - aims to assess the effective impact of actions against the strategic goals and mid-term targets that were established, for instance, reducing air pollution or increasing the share of green space. 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 environmental, social and economic impact of the GCAP. The IMP should be populated by drawing on the relevant indicators from the Indicators Database.

Table 12-3 – PMP Reporting Template

To be inserted

Source: EBRD

Table 12-4 – IMP Reporting Template

To be inserted

Source: EBRD

12.5.1. Key Roles and Responsibilities

To ensure the M&E process is carried out effectively, the following key roles are proposed, with their responsibilities summarised in Table 12-5.

Table 12-5 – Key Roles and Responsibilities for M&E

Role	Key Responsibilities
PSC and PWG	The PSC and PWG should continue to have a key role in the implementation of the GCAP. The PSC will approve the PMP and IMP and will have overall responsibility for the successful implementation of the GCAP and its actions.
GCAP Co-ordinator	<p>It is recommended that a single designated GCEA official be responsible for ensuring the timely monitoring of the GCAP and submission of related reports. This co-ordination role could continue to be adopted by the First Deputy Mayor. The GCAP co-ordinator will have overall responsibility for monitoring and supervising the GCAP implementation and report to PSC.</p> <p>The main tasks are:</p> <ul style="list-style-type: none"> • Delegate the required data collection, collation, analysis and reporting tasks to the PSC and senior-level officials from across the GCEA; • Liaise with the M&E Co-ordinator; • Submit the PMP and IMP reports to PSC and PWG and circulate them internally (once approved by PSC) to inform internal decision-making, and communicate them with other stakeholders as appropriate; • Submit the PMP and IMP reports to EBRD once approved by PSC; and • Establish any additional M&E requirements when needed.
GCAP M&E Co-ordinator	<p>It is recommended that someone with a close working relationship with the GCAP Co-ordinator takes on the role of M&E Co-ordinator. The M&E Co-ordinator will be responsible for identifying and assigning officials within each GCEA Division, Ministry and State Agency responsible for the data collection to monitor the GCAP progress and impacts. The main tasks are:</p> <ul style="list-style-type: none"> • Set and enforce deadlines for regular reports relating to each GCAP action and indicator being monitored; • Report back frequently to the GCAP Co-ordinator on the process of actions and issues and discuss potential solutions; • The M&E co-ordinator ensures that the monitoring process is conducted effectively. If monitoring issues have been identified, s/he helps them to find adequate solutions, so that actions can be pursued in line with the implementation programme; • Report specific issues arising from the implementation of actions to the GCAP Co-ordinator, based on information they receive from other stakeholders and data collected as part of the monitoring activities; • Understand the mid-term targets and indicators relevant to the GCAP sectors and actions and how the data to inform each sector is derived and validated; and • Compile relevant data and populate the monitoring plan in collaboration with each assigned official.

13. Next Steps

The Ganja GCAP is a strategic document plan that will be used by GC to communicate its Green City Vision and as a roadmap for realising its ambitions. It presents long-term aspirations and priority actions for GC in the short and medium 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.

13.1. GCAP Approval

The GCAP will enter the approval stage where it will be reviewed by the PWG and GCEA Council, PSC, and the Administrative Office of the President of the Republic of Azerbaijan before it is formally approved. Approval of the Ganja GCAP is expected to be undertaken by the GCEA Council in accordance with Decree No.648 of the President of the Republic of Azerbaijan (dated 6th June 2012) on the regulation of Local Executive Authorities.

Once the GCAP is approved, it will serve as the basis for capital investment programmes. It will be crucial to continue to build political support for the GCAP and its actions over the coming years.

13.2. GCAP Implementation

A concerted effort should be made to ensure the GCAP implementation period begins in 2024 as planned. This will mark the start of 5 years implementation period, 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.

The GCEA will need to decide which of the GCAP actions to implement. This will require further analysis of each proposal, including with regard to 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 have been identified 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, and 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.

13.3. GCAP Monitoring

Ganja GCAP Monitoring is the final stage of the GCAP process which aims to identify what has been achieved, how, and what the opportunities are for future improvement. Chapter 12 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 Ganja GCAP.

The GCAP process is iterative, therefore 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 the GCEA.

A series of next steps, in the form of activities and suggested timelines, is outlined in Table 13-1.

Table 13-1 – Ganja GCAP Implementation Programme

	Activity	Year					
		2023	2024	2025	2026	2027	2028
	Approve the GCAP						
GCAP Implementation	Confirm GCAP Co-ordinator for implementation phase						
	Engage politicians, PSC, other decision-makers and their bodies						
	Include the GCAP actions in the annual budget and mid/long-term development plans						
	Review and mitigate GCAP implementation risk						
	Commission feasibility studies for GCAP actions						
	Pursue sources of funding						
	Select key GCAP measures and prepare a detailed implementation plan						
	Establish and formalise implementation partnerships						
	Implement GCAP actions						
GCAP Monitoring	Agree and refine the monitoring process						
	Monitoring GCAP implementation						
	Monitor the contribution of GCAP towards goals and mid-term targets						
	Report GCAP implementation progress and plan and implement any necessary corrective measures						
	Report the contribution of GCAP actions towards targets and plan and implement any necessary corrective measures						
	Identify and report on changes in environmental indicators						
	Prepare for the next GCAP cycle						

Appendices



Appendix A. Summary of Stakeholder Engagement

Appendix B. Gender and Economic Inclusion Assessment

Appendix C. Explanatory Note on Carbon Savings potential and EBRD tool

Appendix D. Monitoring and Evaluation Plan (Excel)

The M&E plan is presented in a separate appended spreadsheet file.

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Ganja Green City Action Plan – Appendix

European Bank for Reconstruction and Development

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EBRD GREEN
CITIES

Ganja - Azerbaijan

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Appendices



Appendix A. Gender and Economic Inclusion Assessment

Glossary

Gender	Gender refers to social, behavioural, and cultural attributes, expectations, and norms associated with being male or female (WB, 2021).	Gender-inclusive	precondition for, and indicator of, sustainable and people-centered development (WB, 2021). An approach that takes an inclusive view of gender, considering people of all genders and sexualities as well as intersections with factors such as race, ethnicity, income, class, age, and ability, to ensure the voices of people of all genders are heard and integral to project design, delivery, and evaluation, with the goal of promoting gender equity (WB, 2021).
GBVH	Gender-based violence and harassment (GBVH) is an umbrella term and can take many forms including physical, psychological, sexual or economic harm. It is directed at a person because of their sex or gender, or by disproportionately affecting persons of a particular sex or gender. While GBVH can affect anyone, it is predominantly perpetrated by men against women and girls: an estimated one in three women worldwide has experienced some form of physical or sexual violence (CDC, n/d).	PWD	People who have mental or physical impairments that adversely affect their ability to carry out everyday activities on a substantial, long-term basis. These impairments can be visible or invisible. Disabilities can affect a person’s mobility, manual dexterity, physical coordination, continence, ability to lift or carry objects, speech, hearing, eyesight, memory, and ability to concentrate, learn, or understand. Around 15% of the global population has some sort of disability, and prevalence is higher in developing countries (WHO, 2011; WB 2021).
Gender equity	Equal outcomes for people of all genders. Where gender equality implies people of all genders should have the same starting point of equal rights, responsibilities, and opportunities, gender equity implies that they should be enabled to reach an equal endpoint through the provision of benefits, resources, and opportunities that meet their specific needs. These benefits, resources, and opportunities may be the same or different depending on the specific needs and challenges faced by people of a certain gender, especially when also taking into account other factors such as race, ethnicity, age, ability, income, and class (WB, 2021).	Sex	The biological categories of male, female, and intersex to which humans belong, based on sex characteristics and chromosomes (WB, 2021).
Gender equality	Equal rights, responsibilities, and opportunities for people of all genders. Equality between women and men is seen both as a human rights issue and as a	Vulnerable groups	People or groups of people who may be more adversely affected by project impacts than others by virtue of characteristics such as their gender, gender identity, sexual orientation, religion, ethnicity, indigenous status, age (including children, youths and the elderly), physical or mental disability, literacy, political views, or social status (EBRD, 2022).

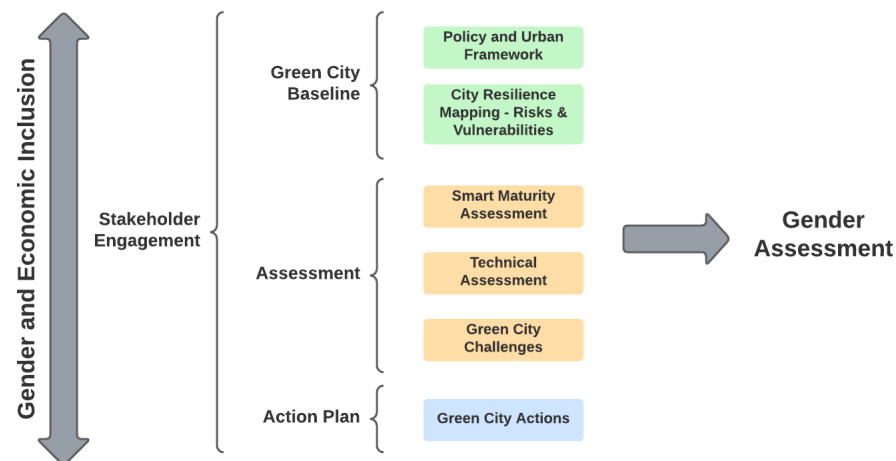
1. Introduction

1.1. Objectives and Scope

The European Bank for Reconstruction and Development (EBRD) believes that economic inclusion, that is, making economic opportunities accessible and available to under-served social groups (including women), is integral to achieving a transition towards sustainable market economies. Green City Action Plans (GCAPs) must then ensure that all genders are included in their development, implementation and monitoring, as well as disadvantaged groups (which may be, depending on the context, elderly persons, migrants, minorities, internally displaced population (IDPs), refugees, children, youth, the LGBTQ+ community, low-income communities, remote communities, etc). This process should pay particular attention to challenges and obstacles faced by these groups, who may face disproportionate barriers to economic opportunities, and develop specific measures to address these situations.

For this reason, the EBRD requires the development of a Gender and Economic Inclusion Assessment (G&EI) to promote gender equality and opportunities for disadvantaged populations throughout the GCAP methodology. This exercise involves, at minimum, an early assessment of gender and vulnerable population involvement in city decision-making, gender considerations in review of all municipal infrastructure sectors, analysis and development of gender-disaggregated data. Gender considerations are expected to be included in several deliverables of the GCAP, but it is also expected to produce a self-contained deliverable that aggregates the analysis and information gathered throughout the development of the GCAP. These exercises will inform a subset of green city actions with gender and economic inclusion components and indicate the gender equality and economic inclusion co-benefits derived from those actions.

Figure 1-1 – G&EI in GCAPs



Source: AtkinsRéalis, based on EBRD (2021)

1.2. EBRD Priority Areas 2021-2025

This guidance document draws on the EBRD Gender Strategy for the Promotion of Gender Equality 2021-2025, which has identified cross-cutting priorities to their operations. These have been divided in megatrends and persistent challenges:

- Megatrends:
 - The Green Economy → reflecting the opportunities and challenges from climate change and the green economy; and
 - The Digital Economy → reflecting the opportunities and challenges from the proliferation of digital technology and economic activity.
- Persistent challenges:
 - The Care Economy → reflecting the opportunities and challenges from increased demand for care provision, and the importance of addressing women’s unpaid care burden; and

- Voice, Agency and Addressing GBV → reflecting the importance of ensuring women’s ability to participate in decision-making across economic and public life, as well as tackling gender-based violence and harassment in all forms.

Considering these themes, the EBRD has three key focus areas:

- 1) Building inclusive and gender-responsive financial systems and business environments to promote access to finance and entrepreneurship and promote financial inclusion and the establishment of an inclusive, and gender-equal financial system;
- 2) Broadening access to skills, employment, and sustainable livelihoods to enhance access to skills and employment as well as livelihoods to reflect also on non-standard forms of employment; and
- 3) Creating inclusive and gender-responsive services and public goods recognising the importance of access to public realm as it shapes women’s ability to participate fully in economic and public life. The main aim behind these three points is women’s economic empowerment and equality of opportunity increased as a result of EBRD’s investments, technical support, and policy dialogue.

1.3. G&EI Methodology

According to the GCAP methodology, the Gender Analysis is the combination of multiple steps of the GCAP Methodology. The Consultant should describe the steps taken to analyse gender and economic inclusion conditions in the City during the Baseline, and outline the information collected as a part of these steps. Specifically, the Gender Analysis should include the following items:

1. Stakeholder Engagement

A summary of considerations for gender and economic inclusion adopted in the GCAP development process to ensure balance participation and gender equality in all aspects of the GCAP development.

2. Baseline

Policy and Urban Framework: assessment of social and economic conditions, which are relevant to gender, and gender and vulnerable population representation and participation in city development.

Map city resilience: based on risks and vulnerabilities, with particular attention to vulnerable communities and persons.

3. Assessment:

Smart Maturity Assessment: gender disaggregated data collected as part of the Smart Maturity Assessment.

Technical Assessment: the Gender Analysis should also outline information collected and conclusions drawn with respect to gender equality and economic inclusion as part of the Technical Assessment. Within the Technical Assessment, the Consultant should address gender considerations for each sector (gaps, needs, status), following the questions below, covering both:

Access to urban infrastructure, as well as needs and the gender gaps in terms of use of urban infrastructure. This analysis will include the dimensions of access to, safety and affordability of services.

Women’s Skills and Employment in the urban infrastructure sectors.

4. Gender Recommendations

Gender and economic inclusion considerations to be embedded within actions.

Green City actions should support the City to address its identified challenges, while ensuring co-benefits in gender equality and economic inclusion.

1.4. G&EI Assessment Approach & Limitations

This G&EI Assessment has been developed reviewing relevant available reports, legislation, and public documents. It also includes gender-disaggregated data available in documents such as national/municipal census, international/national poverty and household databases, municipal transportation data, etc. This analysis also incorporates findings from different stakeholder engagement and consultation stages.

It is notes, the availability of data was the main concern and limitation to this study. There was a low level of data and official statistics for the City. To complement the lack of available gender-disaggregated data, the consultant team conducted a study visit to Ganja City (GC) (29 September – 1 October 2022) and collected data for the baseline assessment. Data was collected via

focus group discussions (FGDs) and semi-structured in-depth key informant interviews (KIIs).

The Consultant Team conducted three FGDs with individuals from the following target groups:

- Mix-gender focus group with youth, ages 19-24 (7 girls – 4 boys).
- Focus group with women, ages 26-50 (6 women).
- Focus group with IDPs (3 women – 7 men).

The Consultant Team conducted four KIIs with experts and representatives from various target groups:

- Elshad Asgarov, Chief of Ganja Automobile Transportation Department under the GCEA.
- Nurahmad Ahmadov, Chief of GC Housing and Communal Services Production Union.
- Huseynkhan Hajizade, Chairperson of the “Bridge to the Future” Youth Public Union.
- Kubra Alakbrova, Chairperson of the “TAMAS” Regional Development Public Union.

2. Stakeholder Engagement

A Stakeholder Engagement Plan (SEP) was developed to help GC communicate with all stakeholders and ensure that the GCAP process is inclusive. The SEP aims at ensuring the participation of both women and men throughout the development of the GCAP, and equal treatment of all vulnerable/disadvantaged groups.

In GC, the early assessment identified that the elderly, youth, women, IDPs, persons with disabilities (PWD), veterans from the first and second Karabakh war and their families, persons with low-literacy levels, low-income families including single mothers/female-headed households, persons with no digital

¹ Turan, Amnesty International reports on violation of rights of elderly people in Nagorno-Karabakh, (2022), Available at: https://www.turan.az/ext/news/2022/5/free/politics_news/en/4960.htm, (Accessed: 26/09/2022).

literacy or access to digital tools, and generally people who may have difficulties accessing information about the GCAP could be considered as vulnerable groups. These groups may be more adversely affected by project impacts than others, and have less access to the project’s benefits, by virtue of characteristics such as their social status, gender, ethnicity, age, disability, literacy, etc. For this reason, there should be special efforts to ensure their inclusion in the GCAP development process.

It needs to be noted that:

- The Karabakh wars have had a profound effect on GC, as it hosts many IDPs as well as a significant number of war veterans, PWDs and their families. The recent UN assessments show that these groups need psycho-social support as well as economic opportunities. Amnesty International (2022) report¹ also highlighted the impact of war and displacement on elderly people;
- GC experiences high numbers of feminicides and GC hosts one of the three shelters (nationwide) for the victims of gender-based violence and harassment (GBVH). The city shelter serves the broader Ganja - Dashkasan region of Azerbaijan; and
- GC, due to its academic offer, also hosts many young people from different regions of Azerbaijan.

3. Gender and Economic Inclusion Baseline

3.1. Legal and institutional framework

International instruments

Azerbaijan ratified the UN Convention on the Elimination of All Forms of Discrimination against Women (CEDAW) on the June 30, 1995, and Optional Protocol on June 1, 20012. Azerbaijan is also a member of the Council of

² United Nations, Consideration of reports submitted by States parties under article 18 of the Convention on the Elimination of All Forms of Discrimination against Women, (2008), available at: <https://www2.ohchr.org/english/bodies/cedaw/docs/AdvanceVersions/CEDAW-C-AZE-4.pdf>, (Accessed: 11/10/2022).

Europe and has signed the European Convention on Human Rights (1950) on 25 January 2001, and ratified the Convention on 15 April 2002.³

National and regional regulations

Significant efforts have been made to advance gender equality in Azerbaijan within the past several decades. The country's Constitution (1995) guarantees full gender equality between men and women and prohibits discrimination based on sex (Article 25), provides the equal status of men and women within marriage (Art.34), reflects the requirements of all international treaties (Art.12)⁴. The Criminal Code (2000) (Article 154) also prohibits any discrimination, including gender-based discrimination.⁵ The Labour Code (1999) sets the provisions to prohibit discrimination in career development (recruitment, job promotion, vocational training, retraining and skills development)⁶.

The Law on State Guarantees of Equal Rights for Women and Men (2006)⁷ defines concepts and terms related to gender equality, sexual harassment and ensures equal opportunities for women in the enjoyment of all rights, including political, economic, social, cultural rights. The Law provides equal pay for equal work between men and women and prohibits discriminatory hiring practices.

A key legal document on domestic violence is the Law of Azerbaijan on the Prevention of Domestic Violence⁸, which was adopted in 2010. The Law regulates measures aimed at the prevention of violence, including legal measures, such as the criminal prosecution of cases, accountability for perpetrators and the executions of court decisions, and social measures, including the provision of shelter, legal, and medical assistance for victims, as well as continuing education and assistance in finding employment.

³ Council of Europe, Chart of signatures and ratifications of Treaty 005, (2022), Available at: http://www.coe.int/en/web/conventions/full-list/-/conventions/treaty/005/signatures?p_auth=s9uNDfa4, (Accessed: 11/20/2022).

⁴ The Constitution of the republic of Azerbaijan (1995), Available at: https://stat.gov.az/menu/3/Legislation/constitution_en.pdf, (Accessed: 06/09/2022).

⁵ Criminal Code of the Republic of Azerbaijan, (2000), Available at: <http://www.e-ganun.az/code/11>, (Accessed: 12/10/2022).

⁶ Labour Code of the Republic of Azerbaijan, (1999), Available at: <http://www.e-ganun.az/code/7>, (Accessed: 12/10/2022).

There are no policies or regulations at the City level to promote gender equality and social inclusion.

Institutional framework

The State Committee for Family, Women and Children Affairs (SCFWCA) (established in 1998) is national machinery responsible for formulating and pursuing State policy on all aspects of child rights and women's rights and women empowerment, along with the implementation of CEDAW. According to a Charter of the SCFWCA approved by the Decree of the President of the Republic of Azerbaijan in 2006, the Committee is a central executive power body implementing and regulating the state policy on family, women and children's issues.

Azerbaijan has made progress in ensuring equal status for women and men under the national legislation. Led by the State Committee for Family, Women, and Children Affairs, Azerbaijan's government has demonstrated efforts to establish a more gender-sensitive mechanism to address gender-related challenges. There are, however, insufficient mechanisms for implementing legal and policy acts, and adequate financial support/budget. There is also a need for better articulation of the government's gender policy and rigorous implementation of gender-related action plans via meaningful engagement with civil society actors.

3.2. Social and economic conditions at a city level

Due to the gender-biased sex selection in Azerbaijan, there are more boys than girls in the 0-24 age group. According to the World Economic Forum's Global Gender Gap Index⁹, Azerbaijan is the lowest-ranked country, before the People's Republic of China, in terms of failing the gender parity on sex

⁷ Law on State Guarantees of Equal Rights for Women and Men of the Republic of Azerbaijan, (2006), Available at: https://www.ilo.org/wcmsp5/groups/public/---ed_protect/---protrav/---ilo_aids/documents/legaldocument/wcms_127414.pdf, (Accessed: 12/10/2022).

⁸ Law of the Republic of Azerbaijan on the Prevention of Domestic Violence, (2010), Available at: <http://www.e-ganun.az/framework/20131>. <https://president.az/articles/47971>, (Accessed: 12/10/2022).

⁹ World Economic Forum, Global Gender Gap Report 2022, (2022), Available at: https://www3.weforum.org/docs/WEF_GGGR_2022.pdf, (Accessed: 14/10/2022).

ratio at birth, which ranks 146 in 2022. However, the higher death rate among men in their late ages causes the increasing number of women against men, which deserves particular consideration.

Table 3-1 – Azerbaijani population distribution by gender and age groups in 2021

Age groups	Numbers		By gender - %	
	Women	Men	Women	Men
0	59,2	67,4	46,8	53,2
1–4	270,2	307,0	46,8	53,2
5–9	394,7	454,1	46,5	53,5
10–14	328,3	379,9	46,4	53,6
15–19	291,5	333,0	46,7	53,3
20–24	327,6	362,8	47,5	52,5
25–29	421,8	447,7	48,5	51,5
30–34	473,9	465,5	50,4	49,6
35–39	424,3	411,6	50,8	49,2
40–44	355,0	349,2	50,4	49,6
45–49	314,5	292,1	51,8	48,2
50–54	338,5	304,7	52,6	47,4
55–59	339,8	299,1	53,2	46,8
60–64	292,5	256,8	53,2	46,8
65–69	175,2	143,5	55,0	45,0
70–74	109,4	82,1	57,1	42,9
75–79	49,9	33,5	59,8	40,2
80+	99,0	63,8	60,8	39,2
Grand total	5065,3	5053,8	50,1	49,9

Source: Azerbaijan State Statistics Committee, “Women and Men in Azerbaijan”.
<https://stat.gov.az/source/gender/>

There are more than half a million IDPs in Azerbaijan as a result of the first and second Karabakh wars. Azerbaijan is home to one of the largest per capita displaced populations in the world and dealing with the issue remains a challenge.

GC is most affected by the second Karabakh War (September-November 2020), besides the City harbours sizeable IDP communities from the first Karabakh War. The CEDAW Committee raised its concern about large number of IDPs affected by the three decades long conflict situation, especially about IDP women and girls, who have limited access to education, employment, health and housing and protection from gender-based violence. Recommend, also to Azerbaijani Government taking actions to ensure the meaningful and inclusive participation of women at all stages of peace and reconstruction processes, to ensure that women’s priorities and experiences of the conflict are fully integrated.

Education

Azerbaijan is the first-ranked country in terms of enrolment of girls in primary and tertiary education¹⁰. However, the concentration of women and girls in traditionally female-dominated fields of study (i.e., pedagogy, natural science, culture and art) and their underrepresentation in the areas of science, technology, engineering and mathematics (STEM) as well as in information and communications technology (ICT), which reduces their employment prospects and cause horizontal and vertical discrimination in career development.

Furthermore, limited use of gender-sensitive language in textbooks and education materials at all levels of education promotes traditional gender roles and career choices exacerbate the problem.

Employment and gender pay gap

According to official statistics (2020)¹¹, men are more economically active and employed than women in the country. Women comprised 48.2% of the

¹⁰ World Economic Forum, Global Gender Gap Report 2022, (2022), Available at: https://www3.weforum.org/docs/WEF_GGGR_2022.pdf, (Accessed: 14/10/2022).

¹¹ State Statistical Committee of the Republic of Azerbaijan, Employment and unemployment in 2020, (2020), Available at: <https://www.stat.gov.az/source/gender/>, (Accessed: 13/10/2022).

employed population, while men constituted 51.8%. Unemployment rates are higher among women (57.5% versus 42.5%).

Gender difference in the career path resulted in the disproportionate representation of women and men in certain areas of work. Women in Azerbaijan are mostly represented in public services, health, education, culture and the arts. In contrast, men are more represented in the management and technical fields.

According to the 2020 economic indicators, 87.3% of mining industrial, 88.8% of electricity, gas and steam production and supply, and 83.8% of transportation and logistics employees are men, and their average monthly salary is around 712.2 to 3455.8 manats. Women work in three main sectors - health and social services (77.6%), education (73.1%), recreation, entertainment and the arts (62%). Their average monthly salary ranges from 454.9 to 552.1 manat¹². The existence of a significant difference in these indicators is a manifestation of horizontal and vertical segregation in the occupational and labour market.

Household economic data

The findings also highlight that gender inequality is still among the factors that continue to affect both the formation of and relationships within families, as well as society at large. Despite the existing legal provisions on equal rights, women have limited access to economic resources as compared to men¹³.

Participation in city decision-making

Women's representation in the national parliament is gradually increased from 16% to 17.6% between 2015 and 2020 and women candidates have been increasingly successful in municipal elections (from 35% to 38,81)¹⁴. However,

¹² State Statistical Committee of the Republic of Azerbaijan, Economic activity and average monthly nominal salary in 2020, (2020), Available at: <https://www.stat.gov.az/source/gender/>, (Accessed: 13/10/2022)

¹³ UNFPA/SCFWCA, Gender equality and gender relations in Azerbaijan: current trends and opportunities. Findings from the Men and Gender Equality Survey (IMAGES), (2018), Available at: <https://azerbaijan.unfpa.org/sites/default/files/pub-pdf/gender%20equality-en.pdf>, (Accessed: 13/10/2022).

women are present in the civil service but are underrepresented at all levels, especially senior levels.

Table 3-2 – Women’s representation in government (2022)

	Women
Prime Minister/Deputy PM	0 out of 4
Deputy Minister	5 out of 68
Minister/Head of Committees	1 out of 24
Civil service employees	28.6%
Civil service managers	9.8%
Head, government divisions	5.0%
District/city deputy heads	79 out of 352 positions
District/city executive heads (Mayors)	0 out of 88 positions

Source: Cabinet of Ministers of the Republic of Azerbaijan, 2022

A similar trend is observed with the major stakeholders of the GCAP: GCEA and subsequent municipalities in the City where the majority of leadership positions are taken by men (Head/Deputy Heads of GCEA, chairperson/deputy of municipalities are men)¹⁵.

Social norms and time use

A complex interplay of different factors including interlinkages between gender and societal norms and institutions continues to confine women to the household where they are valued only for their reproductive capacity¹⁶.

The situation is further exacerbated by the unequal distribution of household responsibilities that many women must shoulder in addition to earning an

¹⁴ SCFWCA, Municipal elections were held in Azerbaijan on Dec. 23, 2019, (2019), Available at: <http://scfwca.gov.az/en/post/1879/belediyeye-uzvu-secilen-qadinlarin-sayi-artib>, (Accessed: 16/10/2022).

¹⁵ Official webpage of GCEA, (2022), Available at: <http://ganja-ih.gov.az/az/aparatin-strukturunu.html>, (Accessed: 16/10/2022).

¹⁶ UNFPA/SCFWCA, Gender equality and gender relations in Azerbaijan: current trends and opportunities. Findings from the Men and Gender Equality Survey (IMAGES), (2018), Available at: <https://azerbaijan.unfpa.org/sites/default/files/pub-pdf/gender%20equality-en.pdf>, (Accessed: 13/10/2022).

income to support the family. Men have more disposable income, spend more time engaged in leisure pursuits, and own/ use electronic appliances more than women in Azerbaijan. Gender-based differences in time use significantly disproportionately affect women. 92.7 % of unpaid household works, such as doing the laundry, cleaning the house, cooking is on the shoulders of women. Moreover, women spend more than 6 hours per-day for taking care of children which are primarily "women's job", where men spend only 2 hours for household work¹⁷. Significant shifts in both personal and social norms are necessary to address these inequalities.

Gender-based violence

Women experiencing GBVH continue to face multiple obstacles to accessing mechanisms of support and protection in Azerbaijan. The Law on the Prevention of Domestic Violence (2010)¹⁸ refers to the establishment of public support centres for victims of domestic violence to provide them with legal and medical assistance, psychological rehabilitation, social protection, and emergency shelter, among others, on a no-cost basis. However, the number

of support and referral centres is limited, and these are mainly run by NGOs reliant on donor funding (one of the centres that continue to support victims of gender-based violence is the TAMAS Regional Development Public Union which located in GC).

4. G&EI Assessment

4.1. Technical Assessment

Both FGDs and in-depth interviews focused on address gender and economic inclusion considerations for each sector (gaps, needs, status), covering questions related to: (i) access to urban infrastructure; (ii) access to, safety, and affordability of services; (iii) women's skills and employment in the urban infrastructure sectors.

¹⁷ State Statistical Committee of the Republic of Azerbaijan, Average time use for activities, (2020), Available at: <https://www.stat.gov.az/source/gender/?lang=en>, (Accessed: 16/10/2022).

¹⁸ Law on the Prevention of Domestic Violence (2010), Available at: <http://www.e-qanun.az/framework/20131>, (Accessed: 16/10/2022).

Table 4-1 – G&EI sectoral findings

Sectors	Findings
Transport	<p>Mobility patterns</p> <p>Mobility patterns are highly gendered in GC. Among the means of transport, men mostly use private means of transportation (i.e.: cars and taxis), while women mainly use public transportation (buses). There is a strong cultural bias against women owning cars and taking taxis due to local social norms.</p> <p>Apart from traditional social norms, financial aspects also contribute to this situation. Women prefer to use public transport to save money mostly since they earn lower salaries.</p> <p>In most cases, women use public transportation with children or family members.</p> <p>Accessibility</p> <p>The only public transportation mean in GC is buses. While publicly available, most buses are in poor condition (old and small-sized). There are no special fares for people taking different buses in short distances or for PWD. Similarly, there is no specific infrastructure for PWD, the elderly or persons with prams.</p> <p>Moreover, some areas in the outskirts of the city lack public transportation services and infrastructure. This is relevant since its population may be working in the city. For example, the Sevinj settlement is 2 km distance from the city and has no asphalt, so drivers avoid that area all along.</p> <p>Time restriction also needs to be noted. After 7 pm almost all buses don't work in the city. These aspects can restrict travel and contribute to the risk of perception of fear of different areas or even GBVH. In the same line of thought, the frequency and punctuality of public transport is considered a particular challenge.</p> <p>Affordability</p> <p>Buses cost a flat fee of 0.30 manat. There are no fee reductions in place for vulnerable groups or for people making different trips in short distances/periods of time. Unemployment and low-income levels create challenges for certain groups such as students, persons with disabilities, and other low-income groups using public transportation.</p> <p>Moreover, there is no card system to improve efficiency.</p> <p>Safety</p> <p>There are no interventions to improve the safety and perception of safety of bus stations/stops. Lighting is limited and there are no security cameras. Since most buses are old, they also have sanitation issues. Bus seating is in a really poor state.</p> <p>Gender-based violence and harassment has been reported, mainly among students and the younger girls. There is, however, no grievance mechanism or reporting system to prevent and mitigate GBVH in public transportation.</p> <p>Labour market</p> <p>Labour market in urban transport is mostly occupied by men. There are not many women directly participating in the city transport labour market, nor in the supply chain workforce for this sector.</p>

<p>Buildings</p>	<p><i>Buildings</i></p> <p>According to the Article 57 (Requirements for the construction object) of the Urban Planning and Construction Code of the Republic of Azerbaijan (June 29, 2012, No. 392-IVQ) reasonable adaptation must be provided for the free use of infrastructure by persons with disabilities and other persons with limited mobility (especially public facilities).</p> <p>Since most public buildings (schools, universities, administration offices, services providers) and 3 or 5-floor apartment buildings in GC have been built decades ago, these are not adapted to the needs of persons with limited mobility.</p> <p>GC Housing and Communal Services Production Union does not provide or cover the costs of lighting apartment building entrances. Women and young girls expressed concern about feeling unsafe at these entrances that are not lightened.</p> <p><i>Labour market</i></p> <p>Labour market in construction and maintaining/repairing buildings is mostly occupied by men. Women are not directly participating in the supply chain workforce for this sector.</p>
<p>Water and Wastewater</p>	<p><i>WASH infrastructure and management</i></p> <p>There are public toilets available for girls and women in the city. There is, however, a problem with their cleanliness.</p> <p>FGDs participants also emphasized that while the quality of the water is very poor, prices for water are extremely high. Moreover, there are no concessions (e.g.: female-headed households or low-income groups); the water tariff is the same for everyone (0.60 manats per cubic meter).</p> <p><i>Labour market</i></p> <p>According to official statistics (2021), men are more economically active and employed than women in the water supply, wastewater, and solid waste collection sector in the country. Women comprised 35.8% of the employed population (mainly as a cleaner of solid waste), while men constituted 64.2%¹⁹.</p> <p>The existence of workplaces where the use of women's labour is prohibited (see examples in footnote²⁰) and deeply rooted gender stereotypes is one of the factors leading to horizontal and vertical discrimination in career development in Azerbaijan.</p> <p>According to official statistics (2021), men tend to participate more (74.3%) in technical and technological professions and metiers than women (25.7%) at the state and non-state higher education institutions in 2021/2022 academic year.</p>
<p>Energy</p>	<p><i>Energy provision</i></p> <p>In the city, light hours in public spaces (street, parks) starts 7 pm and turn off at 8 am morning. The city street lighting is well organised in the main streets. However, lighting in side streets are poor lighting, for example in areas were universities are located. This could represent risk of violence/crime and perception of fear in these areas, particularly affecting youths.</p>

¹⁹ State Statistical Committee of the Republic of Azerbaijan, Employees by types of economic activity in 2021, (2021), Available at: <https://www.stat.gov.az/source/gender/?lang=en>, (Accessed: 20/10/2022).

²⁰ According to the Cabinet of Ministers' Decree on Occupations, professions (positions) where the use of women's labour is prohibited list, the use of female labour is not permitted in the following areas of production: metalworking, construction and repair, production of construction materials, mining, oil and gas production, operation of power plant equipment and repair of network equipment, electrical engineering, shipbuilding and repair, chemical production, processing of synthetic oil products, wood supply, furniture production, production of reinforced concrete and structures, glass products, railway, sea and road transport, operation of civil aviation, etc.

	<p>In terms of energy consumption, it is also evident that women and men have different patterns. In Azerbaijan, women spend more than 6 hours per day for doing unpaid household work, where men spend only 2 hours²¹. The types of household chores, including taking care of children, cooking, laundry, and cleaning are primarily "women's job" in Azerbaijan, one can predict that the energy footprint of Azerbaijani women would be larger than women in more equal societies where both genders take responsibility for domestic work. Hence, this has a severe impact in the costs of female-headed households, often with lower-incomes.</p> <p>Moreover, women are believed to make the majority of household consumption decisions and are more likely than men to make decisions for pro-social and pro-environmental reasons.</p> <p><i>“Energy efficiency equipment is very expensive, households [particularly women and single-headed households] cannot afford to purchase these”. “Moreover, there is a lack of awareness and practices about how the use of energy efficiently”, Kubra Alakbarova, chairperson of the “TAMAS” RD PU</i></p> <p>There are no campaigns or programs are available in the city to promote energy efficiency solutions among women consumers.</p> <p>As it happens with the other sectors mentioned above, women are invisible in the energy sector and supply chain workplaces.</p>
<p>Solid waste</p>	<p>Solid waste</p> <p>Since women are disproportionately in charge of unpaid work (e.g., cleaning, cooking, taking care of children, etc.), women play a key role in solid waste management at the household level.</p> <p>There is currently a lack of separation and recycling system of solid waste at the household level.</p> <p>Solid waste collection, including cleaning streets is the responsibility of GC Housing and Communal Services Production Union. The city Housing and Communal Services cleans collects waste 3 times a day (morning before 8 am, afternoon, and evening).</p> <p>Often, the condition of the wastewater system in buildings is out of shape:</p> <p>“TAMAS” Regional Development Public Union is continuing to support victims of domestic violence but has significant financial constraints in maintaining the shelter (with a capacity of 20-25 women), as well as poor condition sanitation and water facility (it has one washroom for 20-25 women and their child).</p> <p><i>Quote: “Our shelter is located in an old building near the mayor’s office. There is a very poor state of the water and sanitation system, which often breaks down. We are trying to fix it, but it isn’t lasting. I would appreciate the support of the city mayor or another institution in this regard.”, Kubra Alakbarova, chairperson of the “TAMAS” RD PU</i></p> <p>GC also hosts a large number of internally displaced people. One of the IDP settlements (1500 IDP families) is located nearby the city waste polygon and the Ganja Aluminum Plant. During the FGD, IDPs complained about poor solid waste and air pollution management in the city.</p> <p><i>Quote: “IDP settlement is surrounded by two sides: the city solid waste polygon on one side and the aluminium plant on the other. Alongside the stench and impossible to breathe, smoke from both sides is poisoning the IDPs here”, A participant of the mix-gender focus group with IDPs.</i></p> <p>Labour market</p>

²¹ State Statistical Committee of the Republic of Azerbaijan, Average time use for activities, (2020), Available at: <https://www.stat.gov.az/source/gender/?lang=en>, (Accessed: 16/10/2022).

	<p>Workplaces and supply chains of this sector are also dominated by men. However, because city streets are cleaned by hand rather than by machines, 80% of the street cleaners (sweepers) are women.</p>
<p>Land Use (including Public Spaces)</p>	<p>Public spaces</p> <p>Women and young girls are traditionally discouraged to go out alone after 8-9 pm due to gender stereotypes and the risk of GBVH. Public spaces and parks often lack CCTV which creates further safety concerns for woman and young girls during hours of darkness. Women and men use public spaces differently in the city. Women usually take their children to parks/playgrounds, while the men usually meet their friends at the chaykhanas (tea/coffee cafes) to play different games or do sports.</p> <p>There are toilet facilities in parks, but with limited accessible (for persons with disabilities and other persons with limited mobility) and often in poor state.</p> <p>There are no mechanisms/interventions in place that prevent, mitigate and report GBVH in public spaces. Moreover, there women tend to avoid reporting cases due to retaliation, high social stigma, biases, reluctant police officers, etc).</p> <p>The city’s streets are usually not walking friendly. Most streets in the city are not adapted to pedestrians, especially for persons with disabilities and other persons with limited mobility, and persons with prams.</p> <p>There are certain areas of the city where the proportion of single-headed households is higher. For instance, Turkler, Avtozavod, and Sevinj settlements have lower rental fees than the city, so their residents tend to be low-income households, particularly female headed households, divorced or widowed women, or whose husbands are in prison, or those who have lost their homes because of debts.</p> <p>Labour market</p> <p>Likewise other sectors mentioned above, women are invisible in this sector and supply chain workplaces.</p>

4.2. Key G&EI Challenges

Transport

Access to urban infrastructure and services: women use public transportation more than men due to cultural bias and financial constraints. Public buses are the only public transportation available in GC, and they are in poor condition and lack specific infrastructure for PWD, the elderly, and people with prams. Some areas (e.g., Sevinj settlement) lack public transportation services and infrastructure. Buses stop running after 7pm, and the frequency and punctuality of public transport is a challenge. There is no fee reduction scheme for vulnerable groups (e.g., for PWD, the elderly, students).

Buses and bus stations/stops are poorly lit and have no security cameras. GBVH has been reported, mainly among students and younger girls. There is

no grievance mechanism or reporting system to prevent and mitigate GBVH in public transportation.

Women’s Skills and Employment in the urban transport infrastructure: training and vocational education opportunities within the transportation sector have traditionally been dominated by males and lack inclusivity and accessibility for all, especially local women and PWD. Therefore, the urban transport labour market is mostly occupied by men. Not many women directly participate in the city transport labour market, nor in the supply chain workforce for this sector.

Land Use and Public Spaces

Access to public spaces and services: public spaces in Ganja are not safe and inclusive for women and girls. Women and young girls are discouraged from going out alone after 8-9 pm due to gender stereotypes and the risk of GBVH. Public spaces and parks often lack CCTV cameras and good quality lighting during evening hours to help address safety concerns for woman and

girls. There are no mechanisms or interventions in place to prevent, mitigate, and report GBVH in public spaces. Moreover, women tend to avoid reporting cases due to retaliation, high levels of social stigma, biases, and reluctant police officers.

Women and men use public spaces differently in the City. Women usually take their children to parks and playgrounds, while men usually meet their friends at teahouses to play table and board games. Public spaces and parks often lack safe playgrounds for children, and equipment for sport activities.

Community-based organizations (CBO) and vulnerable groups (such as IDPs, women, PWD) and youth, are not adequately engaged in the design, maintenance and surveillance of green spaces, nor protect, and manage the city heritage assets. As a result, these groups do not actively participate in the creation of development plans, heritage management plans or directly benefiting from their implementation, for example, through future jobs (e.g., tour operators) and other social and economic opportunities.

Women's Skills and Employment in the Land Use, and Public Spaces

Services: Women are underrepresented in this sector and its supply chain workplaces. As a result, the labour market is not inclusive or equitable for women and PWD. Certain areas of the City, such as Turkler, Avtozavod, and Sevinj settlements, have a higher proportion of single-headed households, which are often low-income households headed by females, divorced or widowed women, or women whose husbands are in prison or who have lost their homes due to debt. These women need skills development and employment opportunities.

Energy and Buildings

Access to urban infrastructure and services: most public buildings and apartment buildings in GC have not been adapted to the needs of PWD and persons with limited mobility. Apartment building entrances are often not lit, which makes women and young girls feel unsafe.

There is a lack of awareness and practices about energy-efficient materials and equipment, and how to use energy efficiently to reduce the cost of energy.

There are no campaigns or programs available in GC to promote energy efficiency solutions among women consumers.

There is no targeted programme that support low-income households, particularly women, the elderly, and single-headed households for obtaining energy-efficient materials and equipment to reduce the cost of energy who

spend a disproportionate amount on their energy bills (those who are experiencing energy poverty).

Women's Skills and Employment in the Energy and Buildings

infrastructure and services: the energy, construction and maintaining/repairing of buildings labour market is mostly occupied by men. Women do not participate in the supply chain workforce for these sectors.

Water, Wastewater and Solid Waste

Access to urban infrastructure and services: the quality of the water is poor, and the price is high, with no concessions for low-income households, particularly women, PWD, the elderly, and single-headed households.

The condition of the water and wastewater system in public and private buildings is poor. The local NGO supporting victims of domestic violence is facing substantial financial challenges to pay utility bills and maintaining poor water and sanitation system of the shelter's, which breaks down frequently.

Neither households nor public and private entities are aware of the importance of separating and recycling, and there are no incentives to do so.

GC is home to a large number of IDPs, one of whose settlements is located in the southeast of GC, near the dumpsite and the aluminium processing plant. IDPs in the settlement are experiencing significant hardships due to inadequate waste and air pollution management.

Women's Skills and Employment in the Water, Wastewater and Solid

Waste infrastructure and services: men are more economically active and employed than women in the water supply, wastewater, and solid waste collection sector GC. Women who are employed are often in low-paying, low-skill jobs; because City streets are cleaned by hand rather than by machines, 80% of the street cleaners (sweepers) are women. The existence of workplaces where the use of women's labour is prohibited, and deeply rooted gender stereotypes is one of the factors leading to horizontal and vertical discrimination in career development in these sectors.

5. G&EI Recommendations

G&EI considerations and recommendations have been provided as part of each action proforma in the Ganja GCAP. The below presents a summary of the recommendations per sector and interrelation of G&EI with the other co-benefits offered as part of the GCAP and its proposed actions.

5.1. Land Use and Public Spaces

- Design and adapt open green spaces to be accessible to all, including those with mobility, visual, and hearing impairments;
- Consider the needs of different vulnerable groups (such as girls and PWD) when designing and implementing open green spaces projects;
- Providing safe and secure spaces for all users (e.g., installing CCTV cameras and good quality lighting);
- Develop interventions to prevent, mitigate, raise awareness and report GBVH which can occur in public spaces;
- Increase employment opportunities for women, IDPs, and PWD by creating jobs in the green spaces sector, such as gardening, maintenance, security and the supply chain of this sector;
- Promote training and certification programs to help people from vulnerable groups qualify for jobs in the green spaces sector and remove any barriers that prevent these groups from getting jobs;
- Work with employers to promote equal opportunity hiring practices;
- Develop a gender-specific policy to increase employment opportunities, including entrepreneurship for women from low-income households, particularly targeting residents of Turkler, Avtozavod, and Sevinj settlements;
- To increase awareness and build the capacity of government officials/decision-makers to ensure that the design and adaptation/construction of public spaces are accessible and walking-friendly;
- Ensure that the design and construction of buildings are PWD friendly and for other persons with limited mobility/needs;
- Hold community events and festivals in open green spaces, support vulnerable groups' businesses that take place in open green spaces;
- Engage local communities and businesses to ensure that the regeneration of brownfield areas plan meets their needs and aspirations;
- Engage the local community in the design, maintenance and surveillance of green spaces;

- Engage CBOs and vulnerable groups in heritage asset management planning and support advancing social and economic opportunities for those who are most vulnerable; and
- Address digital accessibility challenges, and provide tailored training and support for local citizens to enhance their digital literacy and use of the GCEA web-map, including those with impairments and learning styles.

5.2. Transport

- Ensure that all parking spaces are signposted and accessible to PWD;
- Provide safe and secure parking areas, with good-quality lighting;
- Offer parking permits and concessions to vulnerable social groups, such as the elderly, PWD, low-income groups, and IDPs;
- Design safe, and secure non-motorized transport (NMT) facilities, such as bike lanes and pedestrian walkways to be accessible to all users, including PWD, people with prams, and the elderly;
- Introduce investment program to purchase new buses that are accessible to vulnerable groups, including PWD, the elderly, people with prams, and children;
- Implement a special reduced fare scheme for vulnerable groups, such as students, the elderly, PWD, war veterans, IDPs, and underprivileged families receiving government allowance, this could also be linked with the introduction of a card payment system;
- Encourage greater participation of women in the urban transportation labor market, including in the supply chain workforce; and
- Development of a programme to prevent GBVH in public transportation.

5.3. Energy and Buildings

- Support reducing the cost of energy, with a focus on those who spend a disproportionate amount on their energy bills, such as single-headed female households and the elderly;
- Promote women's involvement in planning, technical and decision-making processes related to any changes to energy tariffs, heating systems, and smart lighting installation;

- Provide targeted financial incentives and support to women and low-income households for obtaining energy-efficient materials and equipment;
- Collaborate with CBOs to identify poor areas and marginalized communities for network modernisation projects;
- Create and launch gender-sensitive public awareness campaigns on energy efficiency technologies and practices;
- Undertake gender-disaggregated data collection to understand the patterns in connection with energy and water efficiency and consumption in public and private buildings;
- Ensure that the transition to new energy efficiency technology, including smart lighting, and heating systems creates local job opportunities for women, IDPs, and PWD in installation, maintenance, and operation; and
- Offer contracts and subcontracting opportunities to local businesses, particularly those owned by women, for manufacturing, installing, and maintaining energy-efficient heating systems and smart lighting infrastructure.

5.4. Industries

- Use a conceptual site model to assess the contaminated land risks and take all necessary measures to minimize the exposure of people to contaminated materials, especially women and children;
- Increase the participation of IDPs in the remediation and further down the supply chain, for example, in the logistics and reuse of the bauxite deposits;
- Assess potential economic benefits for the local community, including job creation, skill development, and increased business opportunities in Ganja Green Industrial Park;
- Include women in the planning and decision-making process for the industrial park's location and design to ensure their voices are heard; and
- Consider the safety and accessibility of the site for women, IDP and PWD workers – including well-lit pathways, CCTV and safe and secure transportation options.

5.5. Water and Wastewater

- Involve local communities, businesses, and other stakeholders (such as women, PWD, IDPs, and the elderly) in the planning process to understand their needs and preferences regarding water and sanitation services;
- Invest in upgrading the urban drainage system and implementing sustainable urban drainage systems to aid with increasing water resources in the local area;
- Ensure that training and employment opportunities in traditionally male-dominated areas, such as water and wastewater infrastructure construction and procurement, are inclusive and accessible to all, particularly for local women, PWD, and IDPs;
- Ensure high levels of cleanliness and sanitation among public restrooms and access to potable water;
- Introduce/promote special low tariffs for low-income or women-headed households; and
- promote gender-specific policy and regulatory amendments to increase employment opportunities for women in water management and decision-making areas.

5.6. Solid waste

- Develop and implement a city solid waste management strategy to encourage households and businesses to recycle (financial incentives, or non-financial incentives, such as public recognition or awards);
- Conduct targeted education and awareness-raising campaigns to educate households, public and private entities on the importance of waste separating and recycling, understanding of waste management services;
- develop policies to incentives household waste separation and recycling;
- To ensure that waste and air pollution are prevented by enforcing policies;
- To promote gender-specific policy to increase employment opportunities for women in wastewater and solid waste management; and
- Recognition and formalisation of women's current roles as sweepers.

5.7. Environmental and Climate Governance

- Involve local communities, farmers, and other stakeholders, including women and vulnerable groups, in the Ganjachev River Management planning process;
- Identify and consider different ways that local communities, different genders, PwD, IDPs, the youth, and the elderly are affected by disasters;
- Consider the different socio-economic factors that can make people more vulnerable to disasters;
- Involve women and vulnerable groups in all stages of disaster risk management and emergency planning;
- Ensure that the plan and any designed disaster risk reduction measures consider G&EI, ensuring these are gender sensitive and meet the needs of all people
- Prioritize climate change actions that specifically consider the impact on disadvantaged groups and the differential impact on women and men;
- Increase environmental awareness among inhabitants and help to develop measures to protect the public against hazardous air, water and soil quality and meteorological events;
- Guide the relevant departments to better control environmental pollution and avoid negative social, economic, and environmental impacts, particularly on women, IDPs, youth and the elderly;
- Ensure that knowledge and capacity-building initiatives reach diverse groups within the community, including women, PWD, IDPs, youth and the elderly;
- Consider different learning styles and information sharing through the production of different audio, visual, and written content;
- Provide specialized training programs for women, youth, and IDPs in areas, such as solar panel installation, renewable energy technologies, and green building practices; and
- Involve local NGOs from Ganja to conduct awareness raising, capacity building, and public events.

5.8. Summary of co-benefits

The overlapping interactions between G&EI and the co-benefits offered as part of the GCAP and the proposed actions are provided below. Details of action impacts on the co-benefits are discussed in further detail as part of each action proforma in the main GCAP.

Climate resilience

- Actions have been developed to help the City become more sustainable and better equipped to face climate change impacts, for example, drought or surface water flooding and the urban heat island effect, these will have a beneficial outcome for vulnerable communities who often experience climate impacts at a disproportionate level compared to others;
- Enhance the City's green spaces, through the creation of multiple green corridors and enhancing bare earth surfaces, will contribute to climate resilience and provide multiple ecosystem benefits while providing additional recreational space and opportunities for all;
- Expanding green infrastructure can help mitigate air pollution, which not only improves overall public health;
- NBS not only support climate adaptation but also benefits both the community and local farmers by addressing challenges (e.g., water shortages for crops or drinking water) and promoting improved health and sanitation, safe agricultural practices and enhancing overall sustainability; and
- Promoting and facilitating a modal shift towards walking, cycling and increased use of public transport, will have a beneficial impact on climate resilience and reducing GHG emissions while improving NMT facilities for all including vulnerable groups.

Circular economy and pollution reduction

- promoting and undertaking recycling and separation of solid waste and reducing pollution will benefit all residents of GC and surrounding regions, but especially the IDP community, which is more likely to be exposed to pollution due to their current living quarters being located near the dumpsite and aluminium processing plant in the southeast of the City; and

- Influencing a modal shift through improved NMT infrastructure and increasing the use of public transport will reduce traffic congestion, air pollution, and greenhouse gas emissions which will have a beneficial outcome for residents of GC.

Resource efficiency and savings

- Implementing resource efficiency presents an opportunity to reduce the cost of resources (such as electricity and water) for all consumers, especially those who are experiencing energy poverty. A public and private building renovation scheme will reduce the cost of energy for all consumers but will considerably assist those who spend a disproportionate amount on their energy bills (e.g., single-headed female households and the elderly); and
- Actions will also help to conserve and promote the sustainable use of resources to ensure there is an adequate supply to current demand without compromising the ability to meet future demands.

Improvement of public health and wellbeing

- Prioritizing equitable distribution of services, especially in underserved neighbourhoods with limited access to water and sanitation facilities, will simultaneously address two critical needs:
 - Improved access to essential services - enhancing access to clean water and sanitation facilities for communities that need it the most, directly improving their quality of life and public health; and
 - Bridging infrastructure gaps - investing in these underserved neighbourhoods will bridge deficiencies in water supply infrastructure, thereby strengthening the overall resilience of the City's water systems and reducing vulnerability to water-related challenges, such as shortages and contamination.
- Increased employment opportunities for women, IDPs, and PWDs through creating jobs in the targeted sectors and improved existing green spaces can help livelihood and foster social interaction, and mental and physical health, especially for vulnerable groups;
- Public health and well-being will also benefit from the increased provision of green spaces across the City which will potentially result in positive physical and mental health benefits as people have greater access to green space; and

- The actions will also have a benefit to the local environmental quality through increased air, water and soil quality, this will also potentially benefit public health by reducing the exposure to pollutants and subsequently resulting in better health outcomes for all.

Safety

- High-quality, dedicated, safe, and secure NMT facilities will promote active travel, creating health benefits and improving road safety for all non-motorised users, including women and girls. This will also result in better accessibility for pedestrians, people with prams, and those with reduced mobility;
- Accessible pathways, seating, and amenities will make public spaces more welcoming and inclusive for women and girls, and PWDs;
- CCTV cameras and good quality lighting during evening hours will help to address safety concerns for women and girls and deter crime in public spaces;
- Implementing modern electric busses which take into account accessibility and safety components, such as ramps for the mount and dismount of people with prams and reduced mobility, electronic display boards and CCTV cameras, will help to increase people's feeling of safety when using public transport around the City;
- Street lighting will increase safety for pedestrians walking along streets in evening hours, particularly for women and young girls; and
- Utilizing a conceptual site model to assess and mitigate risks while implementing chosen remediation strategies at the aluminium plant and dumpsite will not only minimize exposure to contaminated materials near the aluminium plant but also significantly enhance the health and safety of affected communities, particularly those residing in proximity to the contaminated site and the aluminium facility i.e., the IDP settlements nearby aluminium plant and dumpsite.

Job creation and stimulating the local economy

- Implementation of the green industrial park will boost potential economic benefits for the local community, including job creation, skill development, and increased business opportunities;

- Investing in green aluminium will have potential economic advantages of creating sustainable green aluminium that can attract eco-conscious consumers and investors, helping to increase the economic output of the processing plant;
- Collaboration with local educational institutions will support the provision of training programmes that equip the local workforce, including vulnerable groups, with the necessary skills for using the latest technologies;
- In addition, attracting new businesses and investments will help create economic opportunities and jobs for all, G&EI considerations as set out in the GCAP, and recommendations should be taken into account to ensure these benefits reach all vulnerable groups; and
- Increasing the participation of women and other vulnerable groups in energy and building, water and wastewater, solid waste and transport infrastructure designing and decision-making processes, and providing them with skills and employment opportunities, will help to achieve social

inclusion and gender equality in these traditionally male-dominated sectors.

Smart technology opportunities

- Incorporating smart technology solutions to improve the efficiency and effectiveness of essential services, such as transportation, energy, water, and waste management, will benefit all residents of Ganja, but especially low-income households, who are often more burdened by high costs for essential services;
- Targeted awareness-raising and capacity building relating to digital skills, linked to the work underway to develop a fibre optic internet network, will help to improve digital literacy among residents of GC, in particular those in vulnerable groups; and
- Implementing digital initiatives, such as CCTV and enhanced lighting in parks and public spaces, will aid in helping to improve perceived safety among women and other vulnerable groups.

Appendix B. Summary of Stakeholder Engagement

The Ganja GCAP has been developed undertaking a wider range of consultation with the GCEA, PWG, PSC and a group of wider stakeholders, including, representatives of regional and state departments of Ministries and State Agencies, utility companies, local academia, and those representing disadvantaged groups and local citizens.

A summary of the stakeholder engagement and consultation undertaken is provided hereafter.

Stakeholder workshops

Three stakeholder workshops, involving the wider stakeholder group, were conducted in Ganja at key milestones during the development of the GCAP. These workshops were typically attended by Deputy Mayors and Heads of Departments, the members of the PWG, representatives of local NGOs, as well as interested parties representing environmental and climate change indicators and sectors (transport, buildings, industry, energy, water, wastewater and drainage, solid waste and land use), representatives of vulnerable groups, local academia and business. Each workshop was inaugurated by the Deputy Mayor, a member of EBRD and the Consultant team. A plenary session was held to provide the stakeholders with an overview of the GCAP development process. Round table discussions were held, and attendees were asked to fill out a survey providing their feedback and comments on the content presented and discussed. Photos of the workshop events are found in the figure below. The stakeholder workshops were as follows:

- **July 2022** – Launch event and first stakeholder workshop, held in person in Ganja, was attended by a total of 72 stakeholders (excluding EBRD and the Consultant Team). The event was inaugurated by the head of the GCEA, Mr. Niyazi Bayramov, and also attended by. As part of the

workshop, attendees were presented with a quick overview of research into the key challenges in Ganja and asked to prioritise these based on their experience of living, working and visiting the City;

- **November 2022** – The second stakeholder workshop, held in person in Ganja, was attended by a total of 47 stakeholders (excluding EBRD and the Consultant Team). The workshop was inaugurated by the GCEA First Deputy Mayor, Mr. Samad Tomuyev. A plenary session was held to present the detailed findings from the BAR to the stakeholders. The workshop commenced thereafter and included a number of round table discussions focused on the challenges and GCAP sectors in order to validate the findings. Attendees were asked to fill out a survey where they prioritised the challenges and provided the consultant team with a set of vision statements and sector goals; these were later used to develop the GCAP vision and sector goals; and
- **March 2023** – The third stakeholder workshop, held in person in Ganja, was attended by a total of 68 stakeholders (excluding EBRD and the Consultant Team). The workshop was inaugurated by the GCEA First Deputy Mayor, Mr. Samad Tomuyev. A plenary session was delivered by the Consultant Team providing the stakeholders with an update on the development of the GCAP since the last workshop and setting out a long list of actions developed for the GCAP. The workshop commenced thereafter in the form of round table discussions focusing on the long list of actions per sector. Attendees were asked to fill out a survey in which they were asked for their feedback and comments on the presented long list of actions and prioritised each one based on the need to address the previously identified green city challenges. The Consultant team took this feedback and prioritisation and developed a short list of actions which were later expanded upon in the draft GCAP.

Figure – Photos from the Launch/first stakeholder workshop in July 2022 (left) and photo from the third stakeholder workshop in March 2023 (right)



Source: AtkinsRéalis

PWG and PSC meeting and consultation

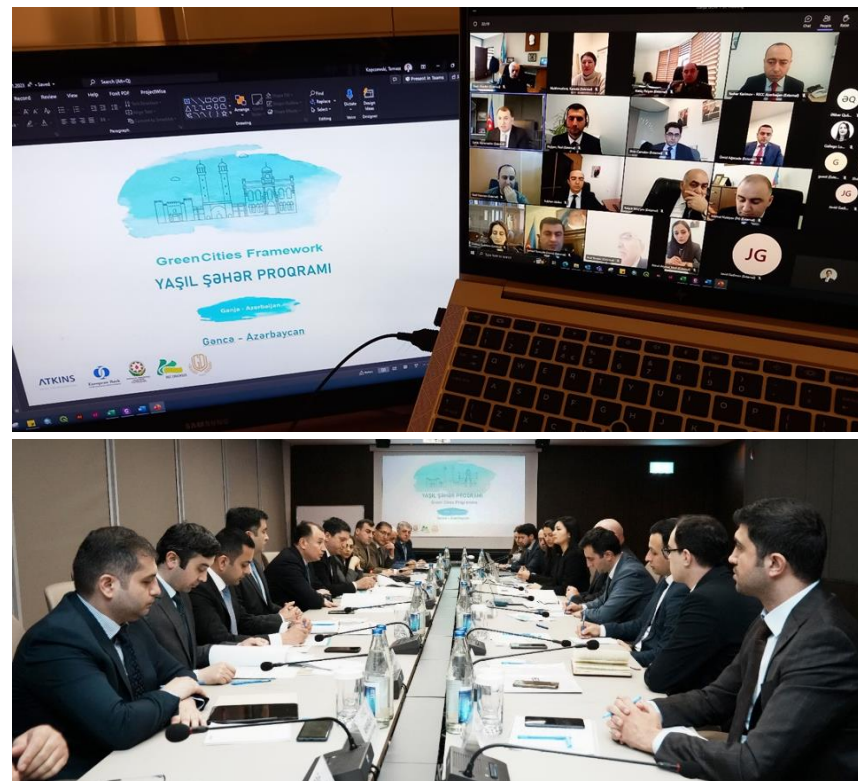
The PWG and PSC were two groups set up to ensure the overall coordination of the process, gain technical and political support as well as contribute to the project stages and milestones. The focus of the PWG was to be at the operational level of coordination between the Consultant Team, the representatives from the GCEA and regional branches of the ministries in Ganja and provide technical guidance when and if required. The PSC, which was formed by most of the decision-makers on infrastructure, planning and environmental matters, endorsed results and exchanged feedback on the state of play of the Project.

Several PWG and PSC meetings were held during the development of the GCAP, these were conducted at key milestones and were as follows:

- **September 2022** – First PWG meeting, held online via Microsoft Teams, where the Consultant Team provided an overview of the GCAP purpose and methodology, and the GCAP approval process and facilitated a discussion about the role of PWG members in the project.
- **December 2022 and January 2023** – PWG and PSC meeting, held online via Microsoft Teams, where they provide the two groups with an overview of the key findings of the Baseline Assessment Report and Green City Challenges and present the overarching GCAP Visions and Strategic Goals developed after the second stakeholder workshop. A survey was conducted, using Microsoft Forms, to prioritise the key challenges and chose a Vision for the Ganja GCAP.
- **March 2023** – PSC meeting, held in person in Baku, where the Consultant Team presented an overview of the GCAP development and in particular the long list of actions developed. The presentation was shared with both PWG and PSC members who provided comments on the long list of actions in the penultimate weeks;
- **August 2023** – Based on the previously received feedback on the long list from the PWG, PSC and wider stakeholder group, the Consultant team developed a short list of actions and shared this with the PWG and PSC members via email. Further comments on the short list of actions were provided in the penultimate weeks and incorporated into the draft GCAP; and
- **November 2023** – The Consultant Team presented the draft GCAP to the PWG and PSC. The draft GCAP was later shared with the PWG and

PSC for their final comments and approval before it was submitted to the GCEA for approval.

Figure – Virtual PSC meeting held in January 2023 (top) and in-person PSC meeting held in March 2023 (bottom)



Source: AtkinsRéalis and Azentag

Other stakeholder engagement

The GCAP Consultant Team utilised several other forms of stakeholder engagement with the wider stakeholder group to gather relevant information which was used to developing the GCAP and its various supporting documents. These included:

- One-to-one meetings between the Consultants team and key stakeholders;
- Focus group discussions (FGDs) with disadvantaged groups;
- Key informal Interviews (KIIs) with target groups; and
- Meetings with other consultants delivering projects in GC.

The key findings, comments and suggestions received during these consultations have been incorporated into the final GCAP.

One-to-one meetings

The one-to-one meetings were crucial in identifying and assessing key challenges due to limitations with the quantitative data gathered for the IDB, as discussed in the BAR. These meetings formed the basis of the qualitative assessment of the Baseline. The meetings also allowed the Consultant Team to understand the political drive and desired outcomes of the GCAP and its actions as many of the one-to-one meetings were held with key members of state and regional branches of Ministries and state agencies.

Focus group discussions

FGDs were held with representatives from vulnerable groups including mixed-gender groups with youth, women ages between 26 and 50 and IDP from the 29th of September to the 1st of October 2022, as well as key informal interviews with the representatives of local NGOs.

The Consultant Team conducted FGDs with individuals from the following target groups:

- Mix-gender focus group with youth, aged between 19 to 24. This group discussion was facilitated by our local partner, the Ganja State University;
- Women, aged between 26 to 50; and
- IDPs of different ages who have migrated to Ganja to seek better opportunities.

Key informal interviews

In addition, the Consultant Team conducted KIIs with various targeted groups to understand affordability and economic inclusion issues:

- Elshad Asgarov, Chief of Ganja Automobile Transportation Department under the GCEA;
- Nurahmad Ahmadov, Chief of GC Housing and Communal Services Production Union;
- Huseynkhan Hajizade, Chairperson of the “Bridge to the Future” Youth Public Union; and
- Kubra Alakabrova, Chairperson of the “TAMAS” Regional Development Public Union.

The detailed findings of the FGDs and KIIs are included as part of the G&EI assessment in Appendix A.

Meetings with other consultants delivering projects in the GC

During this process the GCAP Consultant Team also gathered information from other consultants who are currently working on major projects in Ganja, these included, Vasconi Architects who are developing the draft Master Plan, UNECE working on the Strategic Environmental Assessment for the draft Master Plan, Belarusian Institute of Regional and Urban Planning (IRUP) who are working on a transport plan for the City. These meetings took place from September 2022 to March 2023 via Microsoft Teams. These consultations were valuable in order to share experiences of working in the City as well as gather information on the challenges that the City is facing and current initiatives underway.

Other Communication

The engagement events undertaken during the development of the GCAP were highlighted and communicated to the general public using several communication channels, such as the GCEA website²² and Facebook page, news articles and broadcasts from local and national media outlets²³, and on the EBRD Green Cities Programme website²⁴.

Moreover, the Consultant team were reachable to answer any questions and comments through the local project coordinators and a dedicated email address set up for the project, which was monitored on a regular basis.

²² <http://ganja-ih.gov.az/az/news.html>

²³ https://azertag.az/xeber/Yasil_seher_layihesi_uzre_Gencede_gorulecek_isler_muzakire_edilib-2551313

²⁴ <https://www.ebrdgreencities.com/news-and-events/news/>

Appendix C. Explanatory Note on Carbon Savings potential and EBRD tool

C.1. EBRD City Emissions Trajectory Tool results

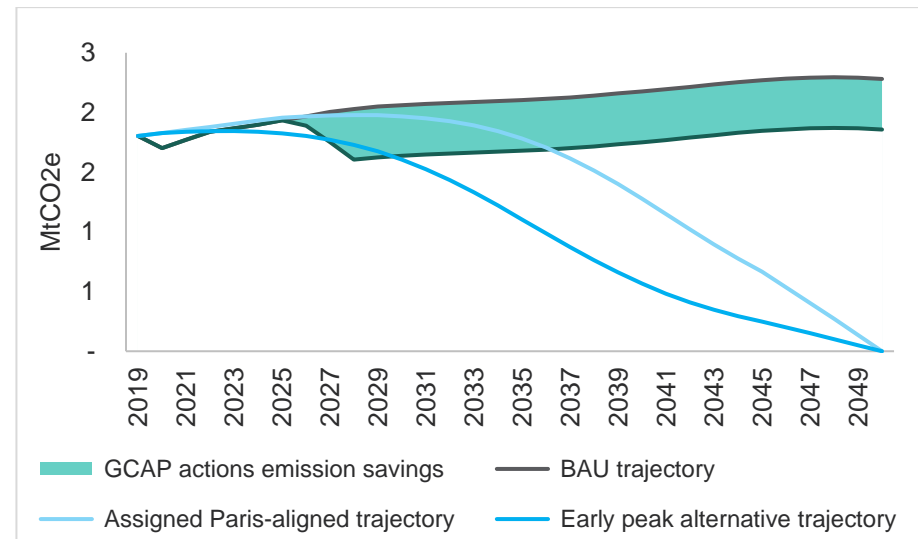
Ganja City at a glance

GCAPs represent an important opportunity for cities to consider how they can decarbonise their infrastructure and urban systems in line with the goals of the Paris Agreement. This appendix presents a business-as-usual and 'Paris aligned' emissions trajectory between 2019 and 2050 for GC, alongside the contribution from the City's GCAP climate actions that aim to reduce GHG emissions. The purpose of these results is to emphasise the level of ambition required to keep within the global 1.5°C temperature rise above pre-industrial levels. The assigned Paris-aligned trajectory for Ganja is based on an assessment of the fair share contribution that Ganja should aim to make towards long-term emissions reduction. Given the urgency of climate change, it is also important to consider whether Ganja can go beyond the assigned trajectory in deriving emissions reductions sooner.

Ganja key results	
Assigned Paris-aligned trajectory typology	Late peak
City emissions in 2019	5.4 tCO ₂ e/Capita
Business-as-usual emissions in 2050	4.9 tCO ₂ e/Capita
Annual emissions reduction against BAU in 2030 required according to the assigned Paris-aligned trajectory	5%
The proportion of assigned Paris-aligned cumulative emissions reduction delivered by GCAP	48%
GCAP actions savings against BAU in 2050	19%

Impact on results from testing alternative decarbonisation trajectory	
Annual emissions reduction against BAU in 2030 required according to the Early peak trajectory	22%
The proportion of Early peak trajectory cumulative emissions reduction delivered by GCAP	31%

Figure – Summary trajectories



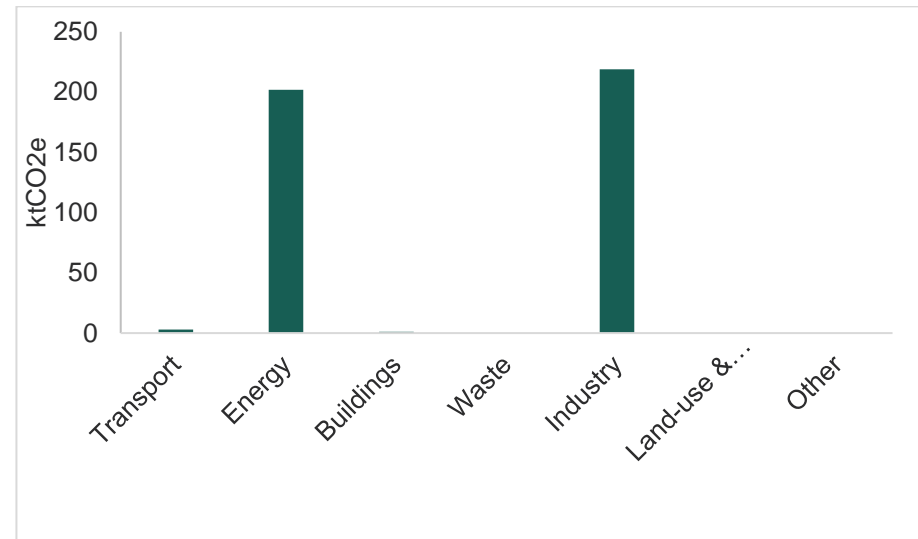
City summary

Emissions in GC are projected to decrease from 5.4 MtCO₂e per capita in 2019 to 4.9 MtCO₂e per capita in 2050 under a BAU emissions scenario. Due to the City’s GHG emissions in 2019 and national income status, it was assigned a Late peak Paris-aligned trajectory, associated with a reduction by 5% on baseline emissions by 2030, before fully decarbonising in 2050.

GCAP actions are expected to save 0.42 MtCO₂e per annum assuming they are all implemented fill, which represents 48% of the required emissions reduction between BAU and the Paris-aligned trajectory.

GCAP actions summary

Figure – GCAP action carbon saving by sector



GCAP actions within the industries sector contribute the largest overall carbon savings, with an aggregated value of 219 ktCO₂e per year, this is followed by the energy and building sector, transport and land-use and planning.

C.2. CO₂ assumptions, sources

#	Action	GHG reduction (tCO ₂ e/year)	Assumptions made	Data sources
LU1	Improvement of green open spaces and network of green-blue infrastructure	5.20	Considering the sycamore trees to be planted, the average estimated biomass growth rate based on FAO global forest resource assessment in Azerbaijan is approximately 1.8 tonnes per ha. Considering the average estimated carbon content in biomass at the level of 40%, based on USDA forest service forest inventory and analysis program, the carbon sequestration potential of trees, based on the amount of carbon in CO ₂ , is approximately 0.7 tonnes of carbon per ha per year, which corresponds to sequestration of about 2.6 tCO ₂ e per ha per year.	https://www.fao.org/3/ca9969en/ca9969en.pdf https://www.fs.usda.gov/nrs/highlights/2256 https://ecometrica.com/assets/GHGs-CO2-CO2e-and-Carbon-What-Do-These-Mean-v2.1.pdf
TR3	Modernisation and decarbonisation of the bus fleet and Sustainable Urban Mobility Plan (SUMP)	3400.20	<p>Calculated difference in tCO₂e/year between diesel engine and electric motor bus:</p> <p>The average distance travelled by a bus in Ganja is assumed to be 62,412 km per year.</p> <p>Diesel engine:</p> <ul style="list-style-type: none"> • Energy consumption of 4.13 kWh/km; • Total energy consumption of 257.76 MWh/km per bus; • Emissions factor of diesel at 0.264 tCO₂e/MWh; and • Total emissions for one diesel bus of around 68.05 tCO₂e/year. <p>Electric motor:</p> <ul style="list-style-type: none"> • Electricity consumption of around 1.35 kWh/km; • Total electricity consumption of 84.26 MWh/bus; • The emission factor of the electricity from the national grid for 2021 was 0.000534 tCO₂e/MWh; and • Total emissions for one electric bus of around 0.045 tCO₂e/year. 	<p>EBRD – Azerbaijan: Green Economy Project Preparation and Implementation Framework – E5P Sustainable Energy Project Assessment Study – Phase 2-Ganja Public Transport prefeasibility study (2021).</p> <p>https://unfccc.int/documents/437880</p> <p>https://rb.gy/xmpn5</p> <p>Graurs, I., Laizans, A., Rajeckis, P., Rubenis, A., (2015) ‘Public bus energy consumption investigation for transition to electric power and semi-dynamic charging’, Engineering for Rural Development January 2015, 14, pp. 366-371.</p>
EB2	Private buildings renovation scheme	670.00	In Ganja, average home consumed 3,005kWh of energy in 2019. An average of one third energy reduction through the implementation of cavity wall insulation and double glazing could be possible.	<p>UNDP, Efficient use of energy and minimising energy loss in residential buildings in the Cities of Ganja and Barda, (no date).</p> <p>https://rb.gy/hm7vp</p>

			<p>Assumed reduction of natural gas equivalent to 991.65KWh/year using an emission factor of 0.20196 kgCO₂e/KWh.</p> <p>Potential reduction per home of 0.2 tCO₂e for insulation improvements.</p> <p>Solar PV with a capacity of 2kw has the potential to save 1 tCO₂e of carbon (assuming a grid factor of 0.00534 tCO₂e/kWh).</p>	https://unfccc.int/documents/437880
EB4	Modernisation of electricity distribution network	201,620.00	<p>The current transmission and distribution loss is at 9.7% of all electricity output.</p> <p>In 2017 the electricity demand in the City was 22,209.8 million kWh.</p> <p>Upgrading infrastructure to limit losses to the global average of 8% (a decrease of 1.7%) would save 377.566 million kWh of electricity, using the grid factor of 0.00534 tCO₂e/kWh this would save 201,620 tCO₂e.</p>	<p>OECD Green Finance and Investment, 2021, 'Sustainable infrastructure for low-carbon development in the EU Eastern Partnership'</p> <p>https://unfccc.int/documents/437880</p>
EB5	Smart street lighting	228.00	<p>Power consumption of a sodium light bulb – 90W with equivalent LED replacement 54W.</p> <p>Assumed 33 streetlights per km.</p> <p>Based on 50% running time for the year – 4380 hours.</p> <p>Emissions grid factor of 0.00534 tCO₂e/kWh.</p>	<p>https://www.scottishfuturetrust.org.uk/publications/documents/street-lighting-toolkit</p> <p>https://unfccc.int/documents/437880</p>
IN3	Investing in green aluminium	218,800.00	<p>Recycled/green aluminium production line:</p> <ul style="list-style-type: none"> Proposed 40,000 tonnes per annum capacity of recycled/green aluminium processing; Emission factor of 16 tCO₂e per tonne of primary alumina processing; and Emissions factor of 4 tCO₂e per tonne of recycled/green aluminium processing. <p>Solar PV instillation:</p> <ul style="list-style-type: none"> Current 50,000 tonnes per annum capacity of primary alumina processing; Electricity use of 15.37 MWh per tonne of alumina smelting; Emissions grid factor of 0.00534 tCO₂e/kWh; and Emissions factor for solar energy 0.00041 tCO₂e/KWh. 	<p>https://rb.gy/d0vop</p> <p>https://rb.gy/wmtzv</p> <p>https://www.solar.com/learn/what-is-the-carbon-footprint-of-solar-panels/</p> <p>https://unfccc.int/documents/437880</p>

C.3. Constraints and recommendations for better GHG reduction calculations

Calculating the GHG reduction potential for the majority of the proposed actions was constrained and limited due to the current lack of GHG reporting at the city level and data limitations on an action-by-action level. The below sets some of the constraints and requirements which would allow for improved GHG reduction calculations for several actions.

LU1 – Improving green spaces and network of green-blue infrastructure

A detailed master plan for the different components proposed as part of the action should be developed to provide details of planting, species and densities. With this detailed carbon calculations could be undertaken.

LU2 – Urban regeneration and brownfield development

A detailed master plan and assessments of the current option sites are needed to be able to understand the types of development, their uses and floor area among other data to be able to undertake detailed GHG reduction calculations. Once these are developed, the types of technologies and materials to be used should be understood to gain a detailed understanding of GHG emissions relating to the operation of future development. There is a potential to reuse structures on the site and recycle materials which would reduce the embodied carbon of any new development and therefore reduce the amount of GHG emissions associated with the demolition and removal of existing buildings.

Transport actions TR1 and 2

There is a large potential for GHG reduction as part of the transport sector's actions by facilitating a modal shift in travel across the City. GC is a relatively walkable and compact City which would benefit from the actions in this sector in facilitating a modal shift to active travel modes such as walking and cycling. The potential GHG emissions reception could not be calculated at this stage due to a lack of granular data relating to the current modal split, however, if this data were to be collected some further assumptions could be made to calculate the GHG reductions as a result of this modal shift.

EB1 – Public building renovation scheme

There is a lack of information on public buildings in GC including their build year and technology, surface area and type of heating and cooling provision.

Although the actions provide an estimate of the number of buildings to be renovated, due to the lack of this aforementioned data further action details could not be provided.

To provide greater clarity and accuracy in GHG reduction potential a building assessment and further granular detail on the current condition of the building, any insulation and glazing which currently exists and the energy performance and requirements of the building and/or type of roofing would be required. This would enable the action to target specific buildings and allow for detailed GHG reduction calculations to be undertaken.

EB2 - Private buildings renovation scheme

This currently assumes that a renovated private building which is well insulated, and has a repurposed and insulated roof and glazing installed would save a third of its energy consumption. This is a commonly used assumption across the world and is a 'blanket' assumption. A bespoke calculation to be created using average floor spaces and property sizes would provide more detailed GHG reduction savings, however, this would require a greater level of detail on the type, age and condition of buildings. This information would also aid in developing further details regarding the placement of solar PV on private buildings, which could further reduce emissions by providing additional rooftop protection and insulation from solar rays (this also applies to public buildings).

EB3 – District and household heating renewal and decarbonisation

It is not currently understood how much district heating is used in Ganja and to what capacity, it is understood that there are a handful of district heating systems supplying heat to hospitals and schools there is no data on these that could be used to calculate GHG reduction. Information on the size of district heating systems, their technology and how many are in place would be essential, alongside their current and potential capacity as a result of action. The current energy requirements of any district heating systems currently in operation and the type of fuel source they use are also important. District heating systems often work better in purposely built estates and it is difficult and expensive to renovate existing estates for a district heating system.

EB4 – Modernisation of electricity distribution network

The current electricity network and its transmission currently use World Bank data for transmission and distribution losses for the country as a whole. To provide a better quantification for the GHG reduction potential of the

modernisation of the electricity grid would require more accurate data on the current state of the power stations and the electricity distribution network, their location and the distance of electricity transmitted.

EB5 – Smart street lighting

The GHG reduction potential calculation for this action was possible due to the ongoing work in the City relating to streetlighting and the overall simplicity of the action. The action assumes that the replacement bulbs will be LED which are currently the most energy-efficient type – this can be considered correct, and the emissions of street lighting will be further reduced as the grid decarbonises.

IN1 – Remediation of contaminated land next to aluminium plant

There is a very limited level of understanding and data available to be able to calculate the GHG reduction potential associated with the remediation of the land next to the aluminium plant. There is potential that the land, if appropriately used, could be used to sequester carbon emissions and this could be explored as part of the further development of the action.

IN2 – Green Industrial Park

A detailed master plan for the site and development of a business case would provide the information needed to be able to undertake detailed GHG reduction calculations, this would provide information on the target businesses to be located in the park, types of buildings to be developed and their surface area, and the potential demand for energy and other natural resources among other information. The design would also determine whether onsite solar and renewable energy could be provided to support electricity demand.

IN3 – Investing in Green Aluminium

The GHG reduction calculation uses reasonable sources for aluminium carbon emissions worldwide and for the production of recycled/green aluminium. However, it is noted that solar will not produce energy overnight and therefore to realise all these emission savings battery storage solutions should be explored on the site to store additional capacity. It should be noted

that solar does not work at 100% capacity at various points in the year and can also overheat, this has not been included in the GHG reduction calculations.

WW3 - Sewage and wastewater treatment plant

It is not currently possible to model and quantify the emissions associated with the sewage and wastewater system as not enough information is currently available and the treatment types are not known. The capacity of the facility and the processes of treating and storing waste should be understood, alongside the site power requirements which would allow for a GHG reduction calculation to be undertaken. As opposed to uncontrolled release and use of wastewater into the landscape, it is expected that the reduction in methane as a result of the controlled wastewater and sewage facility, utilising the latest technology in wastewater treatment, would result in a large GHG reduction.

SW1 - Building a compliant landfill and existing dumpsite

There is a lack of data and detailed understanding relating to the current conditions of the dumpsite and therefore potential GHG emissions as a result. There is also not sufficient detail currently available plans for the EU-compliant landfill which could be used to calculate GHG reduction possibilities, for example, a detailed understanding of the waste streams, the type of technology utilised or distances from the City which would lead to carbon emissions from the transport of waste.

There is expected to be a sizeable GHG emission reduction from dealing with waste at an EU-complaint landfill as opposed to the current dumpsite. Although not considered as part of the GCAP and solid waste management projects, in many cases energy for waste incineration has a lower carbon footprint and could feed into the local energy network and will have much lower methane emissions. Gathering information relating to waste streams in tonnage and the capacity of the landfill and plans would enable the calculation of more granular and accurate GHG reduction potential.

Appendix D. Monitoring and Evaluation Plan (Excel)

The M&E plan is presented in a separate appended spreadsheet file.

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