VARNA

GREEN CITY ACTION PLAN

Prepared for:

European Bank for Reconstruction and Development

Prepared by:

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1.4 Acronyms List

Acronym	Definition
AGUP	Architecture, Urbanism and Urban Planning Directorate
AR5	Assessment Report 5
BOD	Biochemical Oxygen Demand
CAPEX	Capital Expenditure
CC	Congestion Charge
CFL	Compact Fluorescent Lights
CO_2	Carbon Dioxide
CoM	Covenant of Mayors
DD	Design Development
EBRD	European Bank for Reconstruction and Development
EU	European Union
FiT	Feed in Tariff
GCAP	Green City Action Plan
GHG	Greenhouse Gas
GWh	Giga Watt Hours
IIB	Engineering Infrastructure and Public Works Directorate
IFI	International Financial Institutions
INDC	Intended Nationally Determined Contributions
ICLEI	Local Governments for Sustainability
KOM	Kick-Off Meeting
KwH	Kilo watt Hour
LED	Light-emitting Diode
LEZ	Low Emission Zone
MAFF	Ministry of Agriculture, Food and Forests
MCA	Multi-Criteria Analysis
MOEW	Ministry of Environment and Water

Acronym	Definition
MTT	Medium-term targets
NAP	National Adaptation Plan
NGO	Non-governmental organisation
NRW	Non-Revenue Water
NH_4	Ammonium
N/A	Not Applicable
OECD	Organisation for Economic Cooperation and Development
OPEX	Operational Expenditure
PEC	Priority Environmental Challenge
PPP	Public Private Partnerships
Q&A	Question and Answer
Q1 / Q2 / Q3 / Q4	Quarter 1, 2, 3, or 4 of a calendar year
RIEW	Regional Inspectorate of Environment and Water
SEAP	Sustainable Energy Action Plan
SECAP	Sustainable Energy and Climate Action Plan
SEDA	Sustainable Energy Development Agency
SO	Strategic Objectives
SC	Steering Committee
TAG	Technical Advisory Group
TPO Varna	Territorial design organization - Varna
WSUD	Water Sensitive Urban Design
WWTP	Wastewater Treatment Plant
WWTW	Wastewater Treatment Works
ViK Varna	Water supply and sewerage - Varna Ltd.
VSO	Vision and Strategic Objectives

0. Executive Summary

This Green City Action Plan (GCAP) sets out Varna Municipality's Vision to become a

"Green, clean city that promotes healthy and sustainable living through intelligent and resilient solutions"

With input from 173 unique stakeholders across 15 individual engagement events, our ambitious plan looks to deliver 31 actions actions over the next 5 years across 8 key sectors. Each of the actions specific within this GCAP aims to tackle one or more of the 22 priority environmental challenges (PECs) identified for Varna, as shown in Table 0.1. The I.D for of the Challenges is C – Challenge.

Table 0.1. A summary of the GCAP's priority environmental challenges.

Sector	Priorty Environmental Challenge
Industry 	**C.1**: Lack of comprehensive air quality data to understand the spatial extent and severity of the problem **C.2:** Lack of regular monitoring and reporting of waste streams from industries and associated environmental impact **C.3**: Lack of sewerage and stormwater infrastructure in parts of the Municipality **C.4**: Ageing and/or capacity constrained wastewater treatment plants
Water Cycle Management 	**C.5:** Lack of whole water cycle management **C.6:** Lack of resilience planning for water and wastewater infrastructure **C.7:** Depreciated potable water infrastructure impacting water quality **C.8:** Absence of monitoring and management process of fresh and marine water pollution
Buildings 	**C.9**: Poor energy performance of buildings **C.10:** Lack of rainwater recycling in existing building level design
Energy 	**C.11:** Reliance on fossil fuel electricity generation and low uptake of renewables **C.12:** Reduced public awareness on the opportunity and benefits of renewable energy technologies
	C.13: Absence of incentives for developments to use renewable energy sources
Land-Use 	**C.14:** Lack of holistic strategy for land-use planning **C.15**: The impact of the Urban Heat Island effect
Solid-Waste 	**C.16:** Incineration of solid waste **C.17:** Illegal dumping of solid waste
Transport 	**C.18:** High private vehicle use and emissions from ageing vehicle fleet **C19:** Lack of alternative low-carbon mass transit and active mobility options.
Cross-Cutting 	**C.20**: Lack of adaptation strategy/plan and requisite institutional structure **C.21:** Lack of Greenhouse Gas emission data collection process and analysis **C.22**: Heightened noise pollution

0.1.1. Vision and Strategic Objectives

The GCAP and it's actions are grounded by four key principles:

- investing in a greener future,
- creating clean and resilient energy,
- developing a connected modern and accessible city with good quality of life for residents,
- promoting more responsible and sustainable resource use.

These principles will be achieved through visible and tangile imporovements to Varna's environment, social and economic landscape and are supported by a number of strategic objectives, and medium term targets. A full list of Varna's Vision and Strategic Objectives can be found in Table 4.1.

0.1.2. Roadmap to Delivery

Over the next 5 years, the Municipality of Varna will implement, monitor, and ultimately evaluate the implementation and delivery of the actions within the GCAP. Table 0.2 below outlines each of the actions detailed within the GCAP, their associated action type, Capital Expenditure (CAPEX) / Operational Expenditure (OPEX) / Design Development (DD) cost and timeframe for delivery (for associated assumptions please refer to Appendix C). The **blue** represents the development timeframe, whereas the **grey** represents the implementation timescales. The action type is reflected by icons throughout the report, which are defined below. Note that some actions have multiple types.

Investment- investments into the construction of new infrastructure or the retrofitting of existing infrastructure and other physical assets in the city. Number of actions: 11

Standards, guidelines, regulations - new or updated legislation, standards, or policy to drive more environmentally friendly activities in the city. Number of actions: 8

Strategies plans and programmes - guidance documents to provide targeted roadmaps for improving planning and management in specific sectors and thematic areas. Number of actions: 10

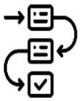
Monitoring, data collection, analysis, assessment, and studies - Measures to improve compliance with regulations through improved monitoring and potential penalties. Number of actions: 5

Awareness, demonstrations, training, and capacity-building was not treated as a specific action type but has been integrated throughout the actions where required – covering 7 in total. This can be defined as learning programmes to increase local capacity through knowledge exchange and skills development. Alternatively, initiatives to shift behaviour and build ownership of specific stakeholder groups for more sustainable practices.

Table 0.2. Action timeline

Action ID	GCAP Action	Action Type	Indicative CAPEX / OPEX / DD (EUR)	2023	2024	2025	2026	2027+
En1	Set up a community energy efficiency programme.		CAPEX: N/A OPEX: 700 DD: 23,000 – 29,000					
En2	Ensure that future Municipality Energy Strategies incorporate the findings and recommendations of this GCAP.		CAPEX: N/A OPEX: N/A DD: 38,800					

Action ID	GCAP Action	Action Type	Indicative CAPEX / OPEX / DD (EUR)	2023	2024	2025	2026	2027+
En3	Provide incentives to both developers and private homeowners, for the incorporation / installation of renewable electricity generation (e.g. tax exemptions, cost subsidisation).		CAPEX: N/A OPEX: 472,000 DD: 10,000		■			
En4	Integrate renewables at a large scale in the city.		CAPEX: N/A OPEX: 472,000 DD: 10,000	■	■			
Ind1	The Municipality to establish a supplementary reporting programme for all existing and new industries to develop and share policy on the monitoring, reporting and publication of key environmental data (e.g. air, water, carbon emissions, noise pollution and waste disposal) to inform efforts for reducing pollution in-line with EU Limit Values.		CAPEX: N/A OPEX: 1,600 DD: 118,000	■	■	■		
WCM1	Work with ViK Varna to introduce "smart" technology, i.e. IoT smart metering, across the potable water network.		CAPEX: 8,500,000 OPEX: N/A DD: N/A	■	■			
WCM2	Identify and remediate areas of cross-connection in the wastewater network and separate wastewater and rainwater runoff networks to reduce wastewater volumes at WWTP.		CAPEX: N/A OPEX: N/A DD: 232,900	■	■	■	■	
WCM3	Introduce wastewater sludge management (e.g. reuse in forestry and agricultural activities, reed beds and energy production).		CAPEX: N/A OPEX: N/A DD: 86,000		■	■		
WCM4	Integrate Water Sensitive Urban Design (WSUD) and Sustainable Drainage System (SuDS) principles into land use, transport, and industry planning; and construction permitting rules.		CAPEX: N/A OPEX: N/A DD: 34,500		■	■	■	

Action ID	GCAP Action	Action Type	Indicative CAPEX / OPEX / DD (EUR)	2023	2024	2025	2026	2027+
WCM5	Develop and implement a structured maintenance programme to reduce leakage in the potable water network with a long-term target of 60-90% efficiency.		CAPEX: 39,800,000 OPEX: N/A DD: 115,000					
WCM6	Develop a Flood Reduction Master Plan.		CAPEX: N/A OPEX: N/A DD: 23,200 – 29,000					
Bu1	Adopt and incentivise LEVEL(S)/ EDGE building standards or develop local green building standards in line with international best practices common for green building certification tools for all municipal buildings.		CAPEX: N/A OPEX: N/A DD: 23,200 – 29,000					
Bu2	Strengthen the existing planning system to ensure that private developers undertake and submit to the Municipality an options assessment report regarding the choice of energy system (heating and cooling) for new developments.		CAPEX: N/A OPEX: N/A DD: 18,600 – 26,700					
Bu3	Incentivise and encourage the incorporation of mitigation and adaptation design considerations / technologies within new developments to limit bad practices and associated impacts.		CAPEX: N/A OPEX: N/A DD: 46,000 – 58,000					
Bu4	Promote and incentivise the installation of green roofs (or walls) on private buildings through the revision of planning approvals for new construction or renovations.		CAPEX: 85 per m2 of green roof OPEX: 471,000 DD: 17,300					
Lu1	Introduce policy and tax incentives to prioritise brownfield development over greenfield.		CAPEX: N/A OPEX: N/A DD: 5,800					

Action ID	GCAP Action	Action Type	Indicative CAPEX / OPEX / DD (EUR)	2023	2024	2025	2026	2027+
Lu2	Climate change mitigation and adaptation considerations and analysis to inform policy in the General Development Plan.		CAPEX: N/A OPEX: N/A DD: 40,600 – 46,000		■	■		
Lu3	Install permeable pavements in sections of parking lots, and rain gardens can be included where required.		CAPEX: 130 per 1m2 OPEX: N/A DD: N/A	■	■	■		
SW1	Accelerate investment in recycling facilities, supported by strategic planning to ensure saleable outputs can be produced, alongside dedicated programmes to support waste separation.		CAPEX: 292,400,000 OPEX: 22,540,000 DD: 93,000 – 116,000	■	■			
SW2	Develop and implement an integrated recycling program to promote the use of resourceful construction and demolition materials and create green jobs (i.e. inert construction and demolition waste as secondary aggregate).		CAPEX: N/A OPEX: N/A DD: 111,000 – 140,000		■	■	■	
Tr1	Introduce Low Emission Zone and time-based congestion charge zone within the city centre.		CAPEX: 16,000 per junction OPEX: 29,000 per junction + 287,000 software fee DD: N/A	■	■	■	■	
Tr2	Upgrade ITS (Intelligent Transport Systems) to enhance existing traffic management/control centre.		CAPEX: 80,000 per junction OPEX: 19,000 DD: N/A		■	■		
Tr3	Develop a 'Mobility Hub' Transport Strategy as part of the on-going SUMP to increase public or pedestrian modalities. Measure and track the network demand to inform the development of the strategy.		CAPEX: N/A OPEX: N/A DD: 63,000 – 76,000	■	■	■		

Action ID	GCAP Action	Action Type	Indicative CAPEX / OPEX / DD (EUR)	2023	2024	2025	2026	2027+
Tr4	Investment in publicly available and convenient rapid Electric Vehicle charging stations across the City. This should include both Varna City Centre and residential neighbourhoods.		CAPEX: 18,000 per EV Charge point OPEX: N/A DD: N/A	■	■	■		
Tr5	Continue to invest in new electric public transport fleet (to cover bulk buses and vehicle fleets).		CAPEX: 36 solo EV Buses – 20,600,000 + 36 articulated EV Buses – 24,800,000 OPEX: 0.23/km for both bus types DD: N/A	■	■	■	■	
Tr6	Enhance the current parking plan to develop a strategy and enforce related policies around providing an alternative to on-street parking in appropriate central city areas.		CAPEX: N/A OPEX: N/A DD: 35,000 – 40,000			■	■	■
Tr7	Research and establishment of fast ferry connections for passenger-only sea transport between the port of Varna - Kv. Asparuhovo, as well as to other smaller locations on the periphery of Varna Lake.		CAPEX: 1,600,000 OPEX: 258,000 DD: 110,000 – 140,000	■	■	■	■	
CC1	Develop a Sustainable Energy and Climate Action Plan (SECAP) as part of the Covenant of Mayors on Climate and Energy, including a climate adaptation plan and sector-specific greenhouse gas emissions reduction targets.		CAPEX: N/A OPEX: N/A DD: 116,000 – 174,000	■				
CC2	Develop and commit to emission reduction targets for the City of Varna's corporate emissions by 2030 / 2050.		CAPEX: N/A OPEX: N/A DD: 5,750	■	■			
CC3	Establish statutory requirements for GHG monitoring and reporting.		CAPEX: N/A OPEX: N/A DD: 5,000	■	■			

Action ID	GCAP Action	Action Type	Indicative CAPEX / OPEX / DD (EUR)	2023	2024	2025	2026	2027+
CC4	Undertake air, water and soil quality monitoring and analysis, on a municipal level, to understand the extent of pollution, expanding the current monitoring system.		CAPEX: 10 Air Quality sensors – 116,000 OPEX: Analysis & reporting for 2 years – 11,600 – 17,400 DD: 40,600 – 64,000					

0.1.3. GCAP Actions

The 31 actions in the GCAP have been designed off the back of existing activity either completed or on-going within the Municipality of Varna and align with the Vision and Strategic Objectives. Table 0.3 below maps each of the 31 the actions against the medium-term strategic objectives (SO).

Table 0.3. Actions vs. strategic objectives matrix

	SO.1: Varna Municipality will help create opportunity for future, green investment.	**SO.2:** Varna Municipality will raise awareness around environmental challenges and climate change.	**SO.3:** Varna Municipality will help build the City's resilience to future climate change risks.	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.	**SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution.	**SO.6:** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.	**SO.7**. Varna Municipality will help create more integrated, accessible, and inter-connected green space throughout the City.	**SO.8:** Varna Municipality will promote diversity, inclusion, and equality.	**SO.9**: Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City	**SO.10:** Varna Municipality will improve the management system and physical infrastructure for solid waste collection and disposal.	**SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources.
En1				■							
En2	■			■							
En3				■							
En4				■							
Ind1				■	■						
WCM1									■		■
WCM2									■		
WCM3				■							■
WCM4									■		
WCM5									■		■
WCM6									■		
Bu1				■	■				■		
Bu2			■	■	■			■			
Bu3			■	■					■		■
Bu4	■				■				■		■
Lu1	■										■

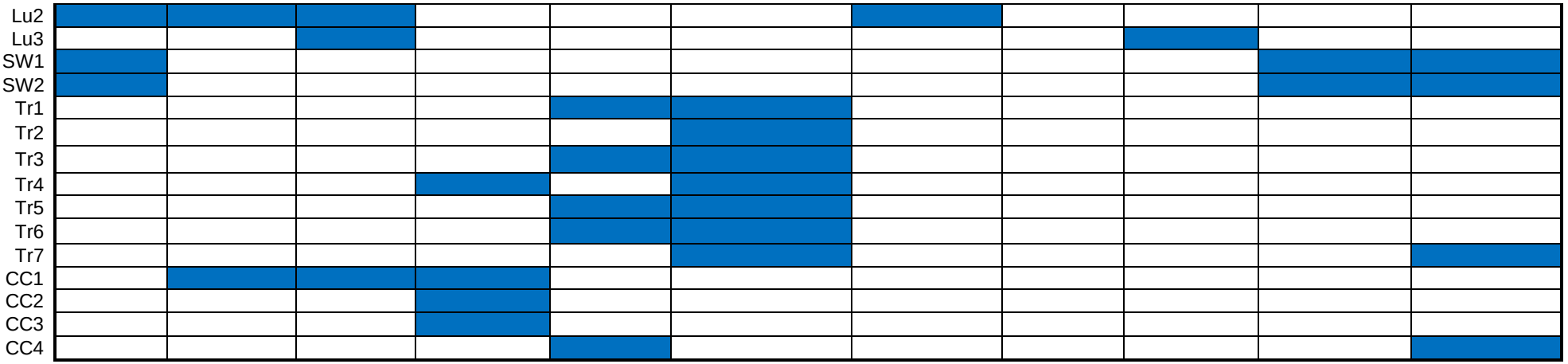


Table 0.4 summarises the total environmental benefit derived from implementing the GCAP actions including the total water savings and total CO_2 savings per sector as well as the total cost of implementing these actions. Note that the calculations for total water saving and CO_2 saving does not include enabling policy actions or consider emboddied carbon. Further assumptions on these calculations can be found in the Action Sheets and in Appendix C and D.

Table 0.4. Action Cost and Savings Summary

Total Water Savings	Total CO_2 Savings	Total CAPEX Costs
4.51 Mm3/year	217,800 Annual tCO2e	€413,425,850 - €428,056,150

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1.Introduction

1.1. Purpose of the GCAP

Varna joined the European Bank for Reconstruction and Development's (EBRD) Green Cities Programme in 2018. The Programme strives to build a better and more sustainable future for participant cities and their residents. It achieves this by connecting environmental challenges with sustainable investments and policy measures.

Varna has developed a Green City Action Plan (GCAP) as part of the Green Cities Programme. The GCAP sets out a comprehensive and complementary set of actions that address Varna's key environmental challenges to realise Varna's long-term sustainability vision. The GCAP will support Varna in facilitating and stimulating public and private green investments and supporting policy interventions to achieve the City's long-term vision. The GCAP has multiple benefits, it promotes sustainable and climate-resilient urban development, but also provides co-benefits for improved public health, economic opportunities, and access to municipal services.

The GCAP summarises the environmental, social, and economic baseline of Varna. Based on this baseline, it lays out Varna's long-term vision and medium-term strategic objectives to the City's sustainable development. The GCAP then sets out the suite of actions based on the outcomes of stakeholder engagement, that address the challenges, vision, and strategic objectives. These actions form a proposed plan that lays out a potential capital investment of BGN 765,665,000 / EUR 387,816,000[1] and associated carbon saving of 217,800 Annual tCO2e (based on minimum assumptions laid out in Table 6.24), which can be implemented depending on the circumstances of agreement within the Municipality of Varna.

The GCAP also includes a targeted monitoring and evaluation framework to ensure timely delivery of the actions and reporting on the impacts of the action on environmental indicators.

The GCAP process has also provided technical support and training to city administrators to empower them to effectively implement and monitor the GCAP.

1.1.1. Caveats

This document was developed according to the GCAP methodology set forth by EBRD, in conjunction with expert input from the Organisation for Economic Cooperation and Development (OECD) and the Local Government for Sustainability (ICLEI). The GCAP was dependent on the environmental indicator data available at the time of data collection in 2019. Not all data was available at local levels – please refer to Appendix A "Baseline Conditions in Varna" for more information.

Additionally, note that both the financial and GHG emission assessments undertaken for the GCAP Actions shown in Chapter 5 (with assumptions outlined in Appendix C) are estimates. Further feasibility studies around the costs will be required following the GCAP's approval.

1.2. How to read this document

The GCAP has been structured into eight sections described below:

Chapter 1: Introduction – An overview of the GCAP and its purpose.

Chapter 2: The GCAP Approach – The GCAP methodology and development process in Varna, alongside the discussion of governance bodies, stakeholder and public engagement protocol that occurred.

Chapter 3: City Baseline – Summary of the urban environmental, economic, and urban baseline, including the priority environmental challenges.

Chapter 4: Visions and Strategic Objectives – Setting out of Varna's long-term vision and medium-term strategic objectives which guide the short-term actions of the GCAP.

Chapter 5: Summary of GCAP Actions – Overview of the suite of actions, which have been set out in sub-chapters as follows:

- Clean and resilient energy
- Data-informed industrial practices
- Integrated water cycle management
- Efficient and sustainable buildings
- Resilient land-use planning
- Circular waste practices
- Low-carbon and active transport
- Cross-cutting actions

[1] Total inclusive of all CAPEX costs for 31 actions excluding generic figures.

Chapter 6: Implementation and Monitoring – Details the monitoring and evaluation plan that will track implementation and impact of the GCAP.

Chapter 8: Appendices – Detailed information which has been broken down into the following sub-chapters:

- **Appendix A: Baseline Conditions in Varna** – Detailed overview of Varna's city and environmental context, including environmental indicator data. That underpins the GCAP.
- **Appendix B: Medium priority actions –** A list of the 'medium priority' action headlines.
- **Appendix C: Economic Calculation Assumptions** – Underlying assumptions that make up the economic calculations accompanying the actions
- **Appendix D**: **Carbon Calculation Assumptions** – Underlying assumptions that make up the carbon emission reduction calculations accompanying the actions.

1.3. Spatial coverage of the GCAP

Varna Municipality is located in the north-eastern part of the Republic of Bulgaria in Varna Province on the Black Sea coast. While the GCAP itself focuses on actions within the City's institutional mandate, some actions will require engagement of external stakeholders and national government as many of the environmental issues are not bound by municipal limits. Figure 1.1 provides an overview of Varna's location and the spatial coverage of the GCAP.

Figure 1.1: Map of the Republic of Bulgaria showing the location of Varna Province and the City of Varna.

2. The GCAP Process

2.1. The GCAP approach

Varna has followed EBRD's Green Cities Programme methodology[2] to develop the GCAP. The methodology follows four steps: (i) Green Cities Baseline; (ii) Green City Action Plan; (iii) Green City Implementation, and (iv) Green City Reporting, which are defined as follows:

I. Green City Baseline	*What is the current state of the environment in Varna?*
II. Green City Action Development	*Where do we want to go and how do we get there?*
III. Green City Implementation	*How do we operationalise the plan and what resources are available to assist?*
IV. Green City Reporting	*What have we been able to achieve – and how?*

i. Green City Baseline

The Green City Baseline establishes the underlying conditions in Varna that influence environmental performance, and is informed by the:

- **Political framework** of supra-national, national, regional, and municipal legislative and regulatory frameworks that govern environmental management.
- **Environmental indicator data review** using a 'Pressure-State-Response' (PSR) framework of 70 core and 114 optional indices, providing a structured approach to collecting trend data on the environmental condition and the sectoral drivers for change acting upon the environment.
- **Technical assessment** of the environmental data to identify the Priority Environmental Challenges in the city and the context of the interdependencies within which they arise, and key existing and planned actions already in place to address these challenges.

ii. Green City Action Development

Green City Vision

To guide the GCAP, City stakeholders and governance bodies developed a **vision statement** reflecting the Municipality's ambitions over the next 15 or more years (see Section 4) vision was converted to a set of **strategic objectives** (10 – 15 years) and **medium-term targets** (5 to 10 years) against which Varna Municipality can monitor its progress towards a Greener future.

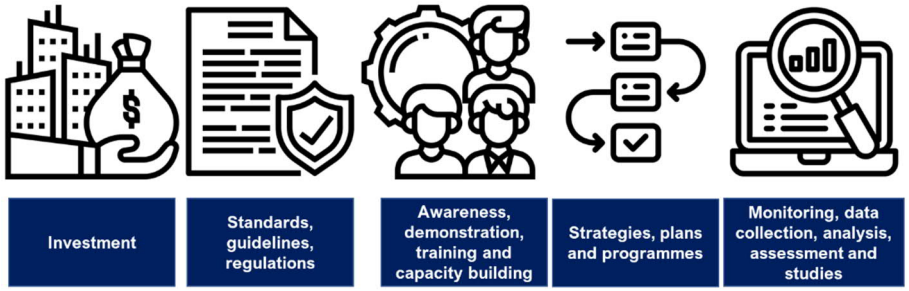
The central part of the GCAP document are the specific actions which Varna Municipality will implement over the next one to five years to help achieve the vision. Technical specialists, in partnership with municipal stakeholders, developed a long list of 101 draft actions across the eight priority sectors based on the findings of the Green City Baseline. Each of the actions were then assessed against 12 criteria across 4 themes: Environmental, Social, Economic, and Institutional as part of a multi-criteria analysis (MCA), analysing their relative scale of impact to create a prioritised list of actions, split into categories of 'high', 'medium' and 'low' and aligned against Varna's Green City strategic objectives.

Through various stakeholder engagement events and meetings with the Municipal governance bodies (as outlined in Section 2.2), this prioritised list of 101 actions was analysed, validated, and ultimately whittled down to a 'final list' of 31 'high' priority actions. These 31 actions are presented as 'actions sheets' in Section 5 of this report. Additional potential supporting actions are further outlined as action headlines in Appendix B of this report.

Types of actions

The 31 actions developed for this document are categorised into the following 'action types', which are defined in more detail within Section 5:

[2] EBRD Green City Action Plan Methodology. Framework 1. https://www.ebrdgreencities.com/assets/Uploads/PDF/6f71292055/Green-City-Action-Plan-Methodology.pdf



iii. Green City Implementation

The City of Varna will operationalise the Green City Action Plan during the Green City Implementation phase. Success at this stage requires the commitment of each action owner, as well as municipal leadership, including allocation of necessary financial and human resources.

iv. Green City Reporting

The GCAP is supported by a detailed Monitoring and Evaluation Plan (see Section 6), which documents activities that will be undertaken to track implementation progress of GCAP actions, as well as the impact these actions are having on the state of Varna's environment. This document sets the requirements for periodic reporting and follow-up actions that will be taken in response to outcomes of monitoring and evaluation (e.g. modification of actions that have proven less effective than expected).

2.2. Stakeholder Engagement

Stakeholder input has been an important feature of the GCAP process in Varna. Stakeholders were identified and mapped at the start of the GCAP process, with an Engagement Plan developed.

2.2.1. GCAP Governance

The Municipality of Varna established two governance bodies for appropriate input and guidance during the GCAP development process:

- The **Steering Committee (SC)**, which reports to the Mayor of Varna, is comprised of senior Municipality officials and other key decision-makers in the Municipality. This group was set up to provide strategic guidance, oversight and ultimately approval of the GCAP.
- The **Technical Advisory Group (TAG)** comprised of technical officers and sector experts across the Municipality was established to support the collection, analysis, and verification of evidence as well as contributions to engagement sessions and the development of Green City Actions.

2.2.2. Stakeholder engagement process

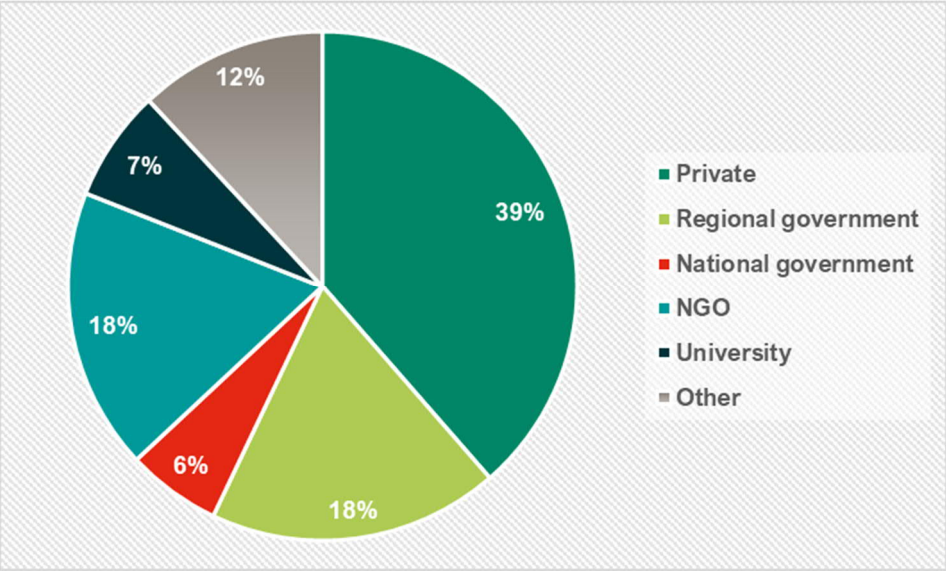
Beyond the SC and TAG, an extensive stakeholder identification process began at the outset of the project. As outlined in Figure 2.1, stakeholders included representatives from municipal government agencies, research centres and universities, civil society groups, private companies (e.g. factories, construction, tourism, transport, energy, and water), national government agencies, national utility companies and international NGOs. In total, 173 unique stakeholders were identified and included in the Stakeholder Engagement Plan. All stakeholders were invited to participate in 15 individual workshops across 5 key engagement stages.

During the identification of the external (i.e. non-municipal) stakeholders, the diversity of the individuals approached to participate in the GCAP process was a core consideration of the Municipality of Varna. Of the 173 stakeholders identified, 40% were female and 60% male. Figure 2.1 outlines the split of stakeholders per sector. Approximately one-third of external stakeholders identified attended each event. In terms of attendance at the core engagement events, the following gender split was observed, as outlined in Table 2.1, which on average shows an even 50-50 split between male and female.

Table 2.1. Observed statistics for external stakeholder attendees at core engagement events.

Stakeholder Event	Female Attendees (%)	Male Attendees (%)
3 x Challenge Prioritisation Workshops (20th September 2020)	53%	47%
Policy and Action Workshops (13th, 15th, 20th & 22nd April 2021)	46%	54%
Average	49.6%	50.4%

Figure 2.1. Breakdown of external stakeholders by industry



1. June 2019 - Kick-off meeting (KOM). *In country.*

The inception mission and KOM (see Figure 2.2) were held in June 2019. The KOM included Municipality of Varna's officials and representatives of the EBRD and consulting teams. The objective of this event was to: Introduce the GCAP process and the key deliverables to municipal officials; highlight key environmental constraints and identify existing projects the GCAP should consider; identify relevant stakeholders who should be involved into the process.

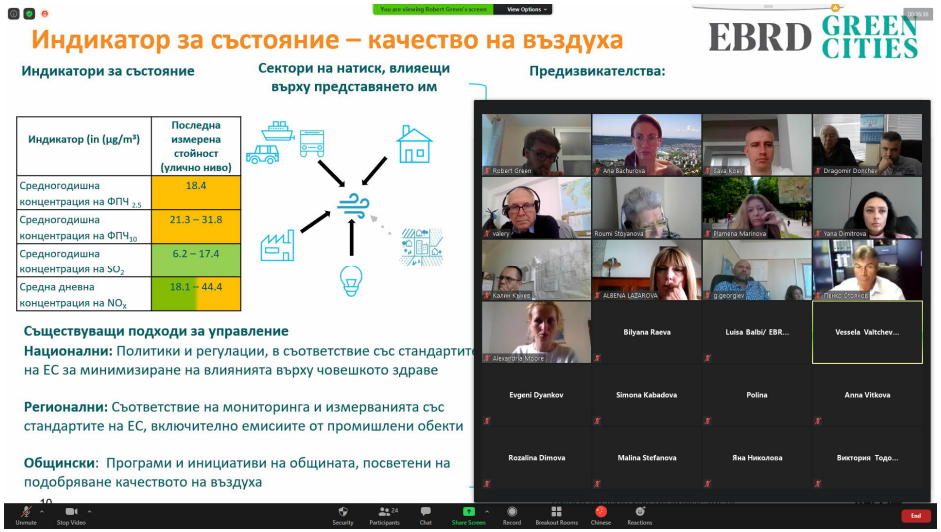
Figure 2.2. Key stakeholders follow Hiroyuki Ito's (GCAP Manager for EBRD) presentation at the launch event.

Source: AECOM. 2019.

2. September and October 2020 – Environmental Challenge Prioritisation Workshop. *Virtual.*

In September and October 2020, 4 virtual workshops were held with Non-Municipality Stakeholders, NGO's (non-governmental organization) and Private Organisation in addition the TAG. In total, 62 individual stakeholders came together across the 4 workshops to review, discuss, and comment on the highest Green City Priority Environmental Challenges (PECs) for Varna, which had been identified during the Technical Assessment of the Green City Baseline. Additionally, stakeholders were invited to identify and prioritise gaps in the list of PECs (see Section 3.4 for further details).

Figure 2.3. Screenshot from one of the Sept / Oct 2020 Challenge Prioritisation workshops, held on Zoom due to COVID-19.



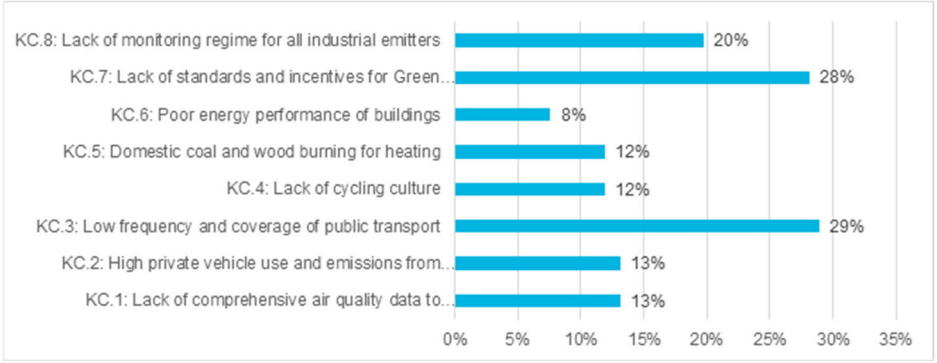
Source: EBRD. 2020.

This workshop included two engagement activities:

Activity 1: Discussion of challenges and identification of gaps. "Poll Everywhere", a real time polling website was used for active polls and discussions. Each group was split per sector (Air quality and GHG; Water and Soil Quality; Greenspace, Biodiversity and Ecosystems; Climate Change and Adaptation) and participants discussed the prepared list of challenges, their level of agreement with them, and whether any gaps existed in the challenges. Results were then presented back live (see Figure 2.3 above).

Activity 2: Review and validation of prioritised challenges per group of challenges. The prioritised challenges, including any that had been added in the previous activity, were ordered, and presented back for a round table validation activity. The Steering Committee received a briefing event to summarise the outcomes of the recent stakeholder workshops (TAG, NGO's and Private Organisations and Non-Municipality Stakeholders) and review and confirm Varna's high priority green city challenges. The prioritisation of environmental challenges concluded the first phase of setting the Green City baseline. An example of the activity completed can be seen in Figure 2.4.

Figure 2.4. Summary results of Group 1's responses to Activity 1.



Participants were asked which challenge they disagree with the most (KC = Key Challenge)

3. November 2020 - City Vision and Strategic Objectives Workshop. *Virtual.*

The next step in the GCAP process was the development of a long-term vision (<15 years) and mid-term strategic objectives (10 – 15 years) spanning the following 'principles:' clean and resilient energy, a connected modern and accessible city with a good quality of life.

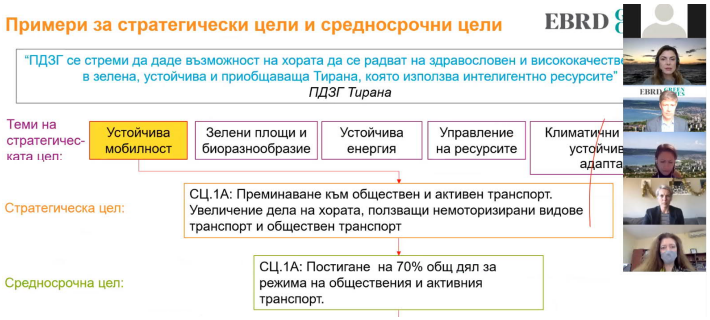
The TAG came together to review and revise the city vision and strategic objectives, which were drafted by the consultant team – no external stakeholders were involved in the initial development process of the Vision. The objective of this workshop was to ensure that city vision and strategic objectives convey a fitting and specific message tailored to the environmental, social, and economic challenge of the city. This workshop included the following engagement activities:

Activity 1: Defining a green city vision for Varna. Through a review and active discussion around the proposed visions, stakeholders refined and finalised the green city vision for Varna to ensure it is responsive to the environmental, social, and economic challenges. With the use of 'Poll Everywhere' a consensus was ensured for the proposed vision.

Activity 2: Defining the strategic objectives and then medium-term targets through back-casting. Stakeholders were presented with an overview of back-casting methodology (defining a desirable future and then working backwards to identify a vision, that will connect the specified future to the present). They then applied it to develop the strategic objectives and medium-term targets per pre-defined sector.

Activity 3: Group Discussion validating exercise. The outcome of the preliminary vision and objectives framework was presented and validated followed by an open Q&A, as shown in Figure 2.5.

Figure 2.5. Screenshot of the virtual workshop undertake on zoom due to COVID-19 restrictions.

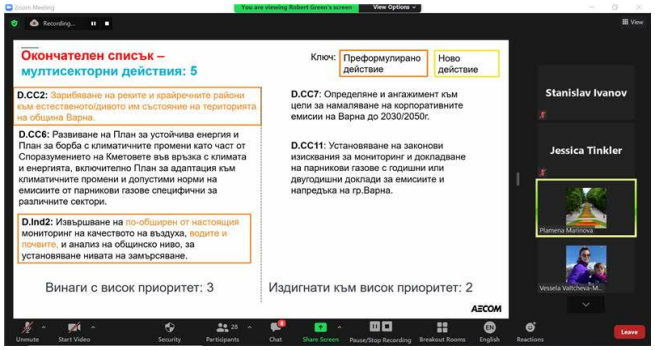


Source: AECOM. 2020.

4. April to May 2021 – Action Development and Prioritisation Workshop. *Virtual.*

This workshop laid out a plan to improve Varna's environmental performance through targeted actions in relation to the priority environmental challenges and the vision and strategic objectives identified previously. In total, 56 external stakeholders plus various TAG and SC members, came together across 6 separate meetings to provide their perspective and eventually agree upon on the prioritisation process for action development, provide any suggestions of actions that Varna could incorporate within its GCAP to achieve the vision and strategic objectives and confirm the 31 actions for inclusion within the GCAP.

Figure 2.6. Screenshot of one of the virtual workshops held on zoom due to COVID-19 restrictions.



Source: AECOM. 2021.

2.2.3. Gender & Inclusion within the GCAP

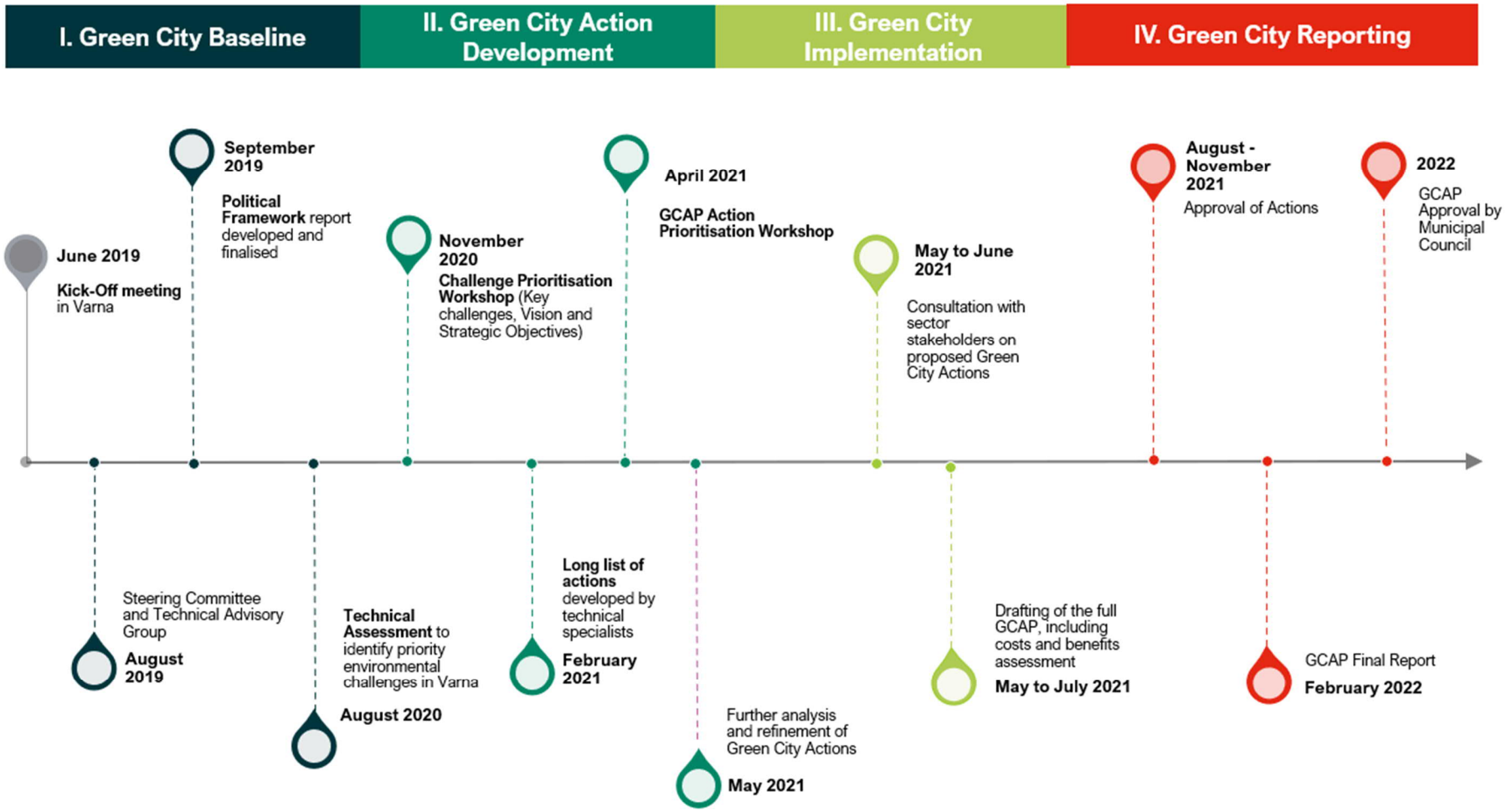
Through the process of developing this GCAP, a number of considerations have been taken to strengthen the issues of gender and inclusion.

- To encourage a balanced representation of gender at stakeholder events held throughout the GCAP Process alongside recording and publishing the gender balance achieved. As highlighted in section 2.2.2.
- To consider the impacts, both positive and negative, of the proposed actions on gender and inclusion where applicable, as seen in the "Social Inclusion" aspects of the "Estimated Co-Benefits" section of the action sheets in Chapter 5.
- To incorporate, where possible, the consideration of delivering improved gender equality and social inclusion benefits through the practical implementation of the actions. This is outlined within the 'action description' aspect of the action sheets within chapter 5.

2.3. GCAP Timeline

The below Figure 2.7, outlines the delivery timeframe of the GCAP from project inception to approval.

Figure 2.7. Varna's GCAP timeline.



Source: AECOM. 2022.

3.City Baseline

This chapter provides an overview of the regulatory and legal frameworks in which the GCAP for Varna sits. It also summarises the Priority Environmental Challenges (PECs) facing the city. A full discussion of the state of the city's environment and the pressures acting upon it are set out in Appendix A. The urban baseline establishes the foundation upon which the GCAP actions were developed. It highlights that the city's existing infrastructure, particularly around the energy efficiency of buildings and the quality of the potable water and wastewater systems, are placing pressures that are detrimentally impacting air quality, greenhouse gas (GHG) emissions, and water quality in the city. Additionally, the city lacks comprehensive planning around climate change mitigation and adaptation, which is compounded by the lack of adequate public mass transit options and a clear land use strategy.

3.1 City context

Varna is the third-largest city in Bulgaria, located in the north-eastern Black Sea Coastal region. The city is situated on the crossroads between Western Europe and the Middle East making it an important port city and a strategic transport, logistical, administrative, cultural, academic and economic hub for the region.[3] The city is referred to as the maritime capital of Bulgaria and hosts the headquarters of the Bulgarian Navy and merchant marine.

The City of Varna is the administrative centre of Varna Municipality and Varna Province/ region. Varna Municipality, with a population of 345,369 (NSI, 2018 data), is one of 12 municipalities in Varna Province. The area of Varna Municipality is 237.5km^2, of which the city of Varna and the resorts cover 80km^2. There are four key economic areas in Varna: the maritime industry, tourism, information, and communication technologies (ICT) and Black Sea Energy Cluster[4]. In addition to these, healthcare (medicine) can also be regarded as an industry of focus for the City.

3.2 Governance context relevant to the GCAP

A wide range of actors are responsible for the management of environmental assets (air quality, water use and quality, green space, biodiversity, GHG, and climate change risk) and sectors (transport, buildings, water cycle management, industry, energy, solid waste, and land use) that place pressure upon the environment. Understanding the relative role and priorities of these actors has a bearing on the scope of the GCAP and the stakeholders involved in its successful implementation.

Varna Municipality is ultimately responsible for the implementation of the GCAP. Varna Municipality is governed by the Mayor and five deputy-mayors.

The GCAP is formally adopted as an action plan and strategy document by Varna Municipality only with the approval of the Municipal Council, which consists of 51 commissions (see Appendix B for further details). Varna Municipality will be implementing the GCAP in accordance with both regional, national and EU legislation and policy. As a result, other regional Municipalities, and the national government area key stakeholders in the delivery of the GCAP. The GCAP will need to adhere to national directives and actively involve, where appropriate, national, and regional government departments in its proposed delivery. This GCAP identifies relevant action owners from Varna Municipality and indicates where coordination with other local governments and the National Ministries is needed.

Table 3.1 sets out the jurisdiction and autonomy Varna Municipality has in managing environmental assets and pressures within its jurisdiction. This has helped shape the GCAP to target areas where the Varna Municipality can use its role to assert greatest influence on impact change.

Table 3.1. Legend for Municipality of Varna level of Jurisdiction over the indicator category.

High	Has full autonomy to set policy and/or make investment decisions.
Medium	City level has autonomy to set policy and/or make investment decisions around some aspects of the category, but within the context of policy and practice set by national government ministries/committees.
Low	No Autonomy to set policy and/or make investment decisions. The city's main vector to influence policy and investments is advocacy.

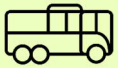
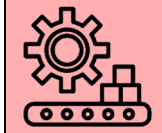
Source: AECOM, 2020.

[3] Municipal Development Plan of Varna Municipality, 2014-2020

[4] Varna baseline Assessment and Pestle analysis, 2017 – Transition of EU Cities Towards a New Concept of Smart Life and economy.

Table 3.2. The level of jurisdiction of Varna Municipality over key environmental indicators

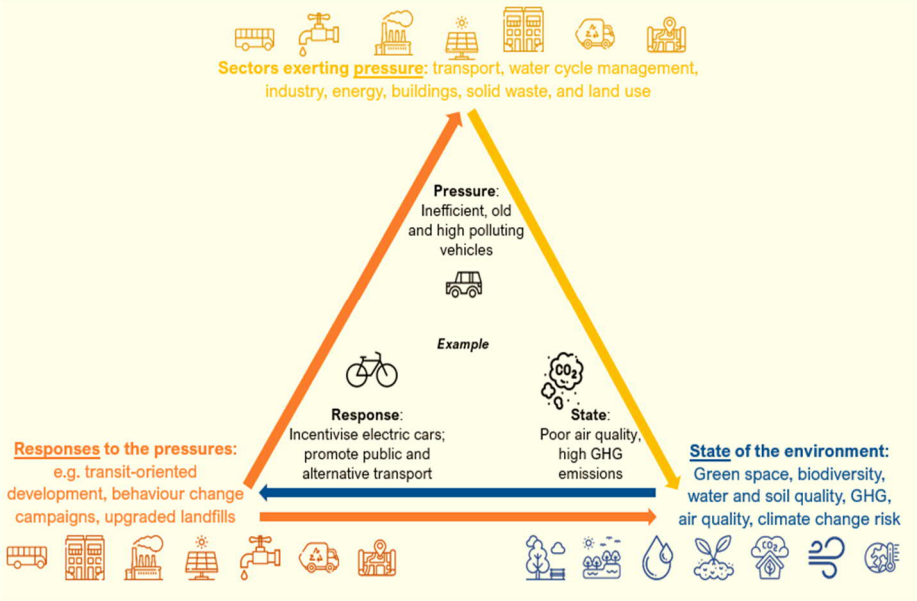
'State' Indicator	Local Governance Arrangements
Air quality 	The Mayor of Varna Municipality, the Director of the Directorate "Engineering, Infrastructure and Landscaping" and the Municipal expert "Noise and Atmospheric Air" are the municipal administration representatives directly responsible for the implementation and development of policies and plans for improving air quality. At the national level, air quality issues fall in the remit of the Ministry of Environment and Water. Bulgarian air quality regulations follow the EU Standards and objectives.
Biodiversity and ecosystems 	Biodiversity is regulated, monitored, and controlled at the regional level, rather than the municipal. The regional department of Ministry of Environment and Water (MOEW), Regional Inspectorate for Environment and Water (RIEW) Varna oversees monitoring compliance with the laws and programmes for biodiversity in Varna Municipality. Water bodies and sea water quality and ecosystems are regulated by the Black Sea Regional Directorate. The municipal entities which regulate biodiversity and ecosystems locally are the Commission on "Environmental Protection and Restoration" and the Municipal department "Management of Security and Order" – "Environmental Control". The Ministry of Environment and Water (MOEW) and the Ministry of Agriculture, Food and Forests (MAFF), provide governance on a national level.
Soils 	Regional Governors develop and implement five-year soil conservation, sustainable use, and restoration programs for their region in accordance with the national programme. A Regional Development Strategy for Varna Region 2014-2020 is the current strategy document. Monitoring and compliance regarding soil quality control for Varna Municipality is performed locally by RIEW Varna. The MOEW is responsible for soils in the Republic of Bulgaria. The national policy on soil protection is developed by the Ministry in accordance with EU legislation.
Greenhouse gases/climate mitigation and disaster risk 	The MOEW is responsible for the design and implementation of climate change policy, with its administrative unit, the Executive Environment Agency carrying out coordination and management functions within the ministry. The Regional Inspectorate of the Ministry of Environment and Water regulates and monitors compliance with the national policies on emissions and climate change. Disaster risk is under the jurisdiction of the Ministry of Economy and is governed by the Disaster Risk Protection Act.
Water quality, supply, sanitation, and drainage 	The MOEW is the responsible body for ensuring sustainable management of water resources. The ministry is assisted by four Basin Directorates that perform management and control functions and are responsible for developing and updating the River Basin Management Plan, Flood Risk Management Plans and Marine Strategy. The municipality has its own strategy and priorities regarding this indicator which is reflected in its local environmental protection programme.

'Pressure' Indicator	Local Governance Arrangements
Land use 	Varna Municipality is responsible for drafting local development plans. The Architecture and Urban Planning Department issue permits for construction development projects. Land use planning and status decisions are regulated by the Varna Municipality Department of Architecture and Urban Planning. Additionally, land use decisions must be approved by the Mayor of Varna Municipality, the Mayors of mayoralties within the municipality and the Commission on "Environmental Protection and Restoration" and the Municipal Council.
Transport 	The Varna Municipality Department of Engineering Infrastructure and Landscape implement the actions of the Development Plan for Varna Municipality. The limited liability public company 'Gradski Transport' is the legal entity that manages public transport, and related activities.
Buildings 	The Chief Architect is responsible for buildings in Varna. This is a specific designation for municipalities in Bulgaria, where a responsible party is elected by the Mayor to supervise compliance with the national Spatial Planning Act, and all related activities.
Industries 	There are five industrial zones in Varna Municipality in which the development of the main industrial manufacturing, logistics and warehouse storage is concentrated. The Ministry of Economy zones these according to those rules stated under 'land use.' The RIEW is responsible for monitoring emissions/ pollution levels.
Energy 	The energy sector in Bulgaria is under the jurisdiction of the Ministry of Energy. The Sustainable Energy Development Agency (SEDA) is the executive agency within the Ministry of Energy and is responsible for developing the relevant national programmes in line with national policy and relevant EU directives. The role of regional government is to facilitate and coordinate the implementation of national programmes. At the local level, the municipality has its own strategic and planning documents and is committed to reduce its CO_2 emissions.
Solid waste 	The MOEW sets the policy on waste management. The regional branch of the MOEW – RIEW Varna – ensures that waste disposal in the municipality is compliant with national regulations. RIEW Varna performs the monitoring functions set forth by the Ministry and reports the results back to the Executive Environmental Agency. It is the responsibility of the Mayor to develop a municipal waste management plan in line with national legislation.

3.3 Environmental baseline

This section summarises the state of Varna's environment, the pressures that are underlying this state, and any existing actions occurring in Varna that attempt to address these pressures. The Green City baseline and the state of the environment was determined as part of the Technical Assessment component of the GCAP. The Assessment used EBRD's Pressure-State-Response framework (see Figure 3.1) to identify and assess a series of 70 core and 114 optional indicators.

Figure 3.1. Pressure State Response (PSR) Framework



3.4 Developing the Priority Environmental Challenges

The key outcome of the Technical Assessment was a set of 22 Priority Environmental Challenges (PECs) as outlined in Table 3.3, which provided the basis on which the Green City Actions were developed. Each PEC has been linked to the appropriate pressure and response sector (as outlined in Table 3.2) by the associated logo. The prioritisation approach is summarised as follows:

1. **Challenges:** Using the conclusions drawn from the Technical Assessment, a technical team developed a number of challenges using route cause analysis.

2. **Scoring:** In order to prioritise the challenges, a multi-step scoring methodology was applied.

   a. **Indicator Performance Score:** Each challenge was developed against the state indicators in the Indicator Database, where 1 = Good performance and in line with international standards; 2 = insufficient performance and cause for concern; and 3 = low performance and in need of critical attention.

   b. **Initial Score**: The project team then developed an initial performance score (1 to 3) using a multi-criteria analysis (MCA) approach against the following two criteria; 'importance of the challenge to Varna and 'ability of the municipality and partners to positively influence this challenge'.

   c. **Revised Score:** The outcomes of the initial scoring undertaken by the GCAP project team, were then presented to the City stakeholders in a number of digital workshops. These stakeholders provided comment on the 'initial scoring', applying local context against the MCA criteria. This resulted in a "revised score" for each of the environmental challenges addressed by the stakeholders.

   d. **Total Score:** The 'total score' was calculated by combining the 'indicator performance score' with the 'initial score' and the 'revised score'. The ranking from high to low priority challenges was based on the below point system.

High priority challenge	7 – 9 points
Medium priority challenge	5– 7 points
Low priority challenge	3 – 4 points

   e. **Workshops:** In order to develop a revised score (in line with 2c), a workshop was held on 28th September 2020 with the Municipal TAG; followed by three non-municipality stakeholders (Public Agencies, NGO's and local businesses and institutions) workshops on the 30th September 2020. The GCAP SC was then briefed on the outcomes of the engagement.

Table 3.3. Priority Environmental Challenge and associated environmental indicators.

PECs	Related 'State of the Environment' indicators
Industry	
C.1: Lack of comprehensive air quality data to understand the spatial extent and severity of the problem	• Average annual concentration of PM2.5 • Average annual concentration of PM10 • Annual CO_2 equivalent emissions per capital
C.2: Lack of regular monitoring and reporting of waste streams from industries and associated environmental impact	• Concentration of mercury in soil
C.3: Lack of sewerage and stormwater infrastructure in parts of the municipality	• Biochemical Oxygen Demand (BOD) in rivers and lakes • Ammonium (NH_4) concentration in rivers and lakes • Nitrogen concentration in rivers and lakes (additional indicator)
C.4: Ageing and/or capacity constrained wastewater treatment plants	• Biochemical Oxygen Demand (BOD) in rivers and lakes • Ammonium (NH_4) concentration in rivers and lakes • Nitrogen concentration in rivers and lakes (additional indicator)
Water Cycle Management	
C.5: Lack of whole water cycle management	• Biochemical Oxygen Demand (BOD) in rivers and lakes • Ammonium (NH4) concentration in rivers and lakes • Nitrogen concentration in rivers and lakes (additional indicator)
C.6: Lack of resilience planning for water and wastewater infrastructure	• Estimated economic damage from natural disasters floods droughts earthquakes etc. as a share of GDP
C.7: Depreciated potable water infrastructure impacting water quality	• Biochemical Oxygen Demand (BOD) in rivers and lakes • Ammonium (NH_4) concentration in rivers and lakes • Nitrogen concentration in rivers and lakes (additional indicator)
C.8: Absence of monitoring and management process of fresh and marine water pollution	• Biochemical Oxygen Demand (BOD) in rivers and lakes • Ammonium (NH4) concentration in rivers and lakes Nitrogen concentration in rivers and lakes (additional indicator)
Buildings	
C.9: Poor energy performance of buildings	• Annual CO_2 equivalent emissions per capita
C.10: Lack of rainwater recycling in existing building level design	• Water exploitation index
Energy	
C.11: Reliance on fossil fuel electricity generation and low uptake of renewables	• Annual CO_2 equivalent emissions per capita • Average annual concentration of PM2.5 • Average annual concentration of PM10
C.12: Reduced public awareness on the opportunity and benefits of renewable energy technologies	• Annual CO_2 equivalent emissions per capita
C.13: Absence of incentives for developments to use renewable energy sources	• Annual CO_2 equivalent emissions per capita
Land Use	
C.14: Lack of holistic strategy for land-use planning	• Open green space area ratio
C.15: The Urban Heat Island effect	• Open green space area ratio
Solid Waste	
C.16: Incineration of solid waste	• Average annual concentration of PM2.5 • Average annual concentration of PM10
C.17: Illegal Dumping of solid waste	• Concentration of mercury in soil
Transport	
C.18: High private vehicle uses and emissions from ageing vehicle fleet	• Average annual concentration of PM2.5 • Average annual concentration of PM10
C19: Lack of alternative low-carbon mass transit and active mobility options	• Annual CO_2 equivalent emissions per capita
Cross-cutting	
C.20: Lack of adaptation strategy/plan and requisite institutional structure	• Estimated economic damage from natural disasters floods droughts earthquakes etc. as a share of GDP
C.21: Lack of Greenhouse Gas emission data collection process and analysis	• Annual CO_2 equivalent emissions per capita
C.22: Heightened noise pollution	• No relevant indicators in the indicator database.

4. Vision and Strategic Objectives

The Municipal proposal for the GCAP Vision statement over the next 15 years is for:

“A Green, clean city that promotes healthy and sustainable living through intelligent and resilient solutions.”

Through this Vision, Varna Municipality aims to become a connected, modern, and accessible city in regard to green space and transport infrastructure, providing a good quality of life for its citizens with equal opportunity for all. By investing in a greener future, Varna strives to be fuelled by clean and resilient energy sources, with responsible and sustainable resource use at its core, whether this be potable water, waste, or the protection and of the natural environment and Varna’s local ecosystems and biodiversity.

This vision will be achieved through visible and tangible improvements to Varna’s environmental, social, and economic landscape. Each of the principles outlined within the broader vision statement shape the strategic objectives (SO) of 10 to 15 year and then in-turn, the Medium-Term Targets (MTT) for 5 to 10 years. Th e GCAP actions outlined within this document then strive to achieve the Medium-Term Targets over a 1 to 5-year timeframe. Each MTT has been aligned with existing Municipal, Regional and National targets and strategies and designed to both complement existing efforts, while aligning with the ambition of the Municipality to further improve the environmental state of the City.

This vision statement was established through a process of baseline development and stakeholder engagement. An initial draft Municipal Vision was created d in response to the PEC’s outlined within section 3.4, whilst building on existing objectives and targets portrayed within Municipal, Regional and National Strategy reports. The Municipal TAG group were then engaged within a virtual workshop held on the 25th November 2020, where revisions to the initial draft were completed to reflect the comments made.

4.1. Principles

The Municipal Vision statement, SOs and MTTs were defined along four key principles:

Investing in a Greener Future: This principle encompasses an overarching ambition for the Municipality to ensure that all investments made are environmentally, socially, and economically responsible.

Clean and Resilient Energy: This principle seeks to promote more resilient and independent energy generation, reducing its carbon footprint. Varna Municipality will seek to decarbonise the energy sector within the Municipality by supporting cleaner and more renewable sources of energy, whilst also striving to reduce energy demand for heating and cooling by addressing the energy efficiency of the Municipal and Residential building stock within the City.

A Connected, Modern and Accessible City with a good quality of life: This principle is concerned with a plethora of aspects, from reducing pollution to improve the air and soil quality within the Municipality, to creating a more resilient and accessible transport system, enhancing the quality and accessibility of green space whilst also promoting a broader effort to promote diversity, inclusion, and equality.

Responsible and Sustainable Resource Use: Addressing how the Municipality can more sustainably manage its natural resources, particularly in relation to water, waste and the environment itself, this principle strives to create more efficient and environmentally and socially responsible system within the City of Varna.

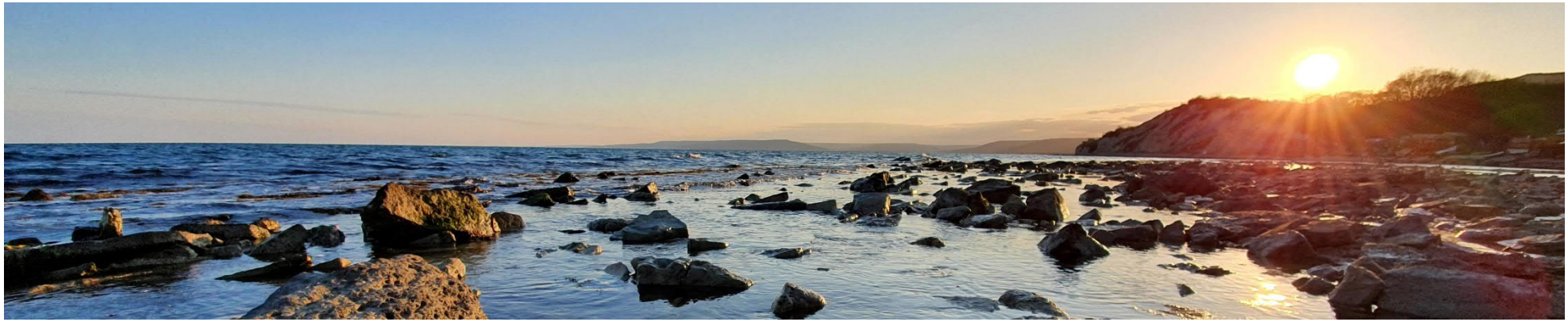


Table 4.1. Varna Municipality Vision, Strategic Objectives and Medium-Term-Targets

Principle(s)	Strategic Objectives (10-15 years)	Medium -Term Targets (5 – 10 years)
Investing in a Greener Future	**SO.1:** Varna Municipality will help create opportunity for future, green investment.	**SO.1a.** Improve incentives for green investment in the City.
	SO.2: Varna Municipality will raise awareness around environmental challenges and climate change.	**SO.2a.** Inform Varna citizens on the outcomes and process of the GCAP.
	SO.3: Varna Municipality will help build the City's resilience to future climate change risks.	**SO.3a.** Integrate the principles of resilience within the Municipality's institutional structure and policy development.
Clean and Resilient Energy	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.	**SO.4a.** Improve Energy Efficiency in residential and municipality owned / operated buildings. **SO.4b.** Increase the percentage of renewable energy used and reducing the use of fossil fuels for heating and electricity generation.
A Connected, Modern and Accessible City with a good quality of life	**SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution.	**SO.5a**. Reduce private and ageing vehicle use. **SO.5b.** Improve the monitoring and regulation of air pollution sources. **SO.5c.** Improve Varna's air quality, in-line with the Programme for Environmental Protection for Varna Municipality 2019 – 2023. **SO.5d.** Reduce levels of noise pollution in accordance with the Strategic Noise Map of Varna.
	SO.6: Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.	**SO.6a.** Increase the modal share of public transport and low-carbon alternatives such as bicycles and walking. **SO.6b**. Increase the amount of infrastructure for electric charging stations in public places and public and private buildings. **SO.6c.** Encourage a modal shift towards alternative modes of freight transport e.g. Cargo-bikes.
	SO.7. Varna Municipality will help create more integrated, accessible, and inter-connected green space throughout the City.	**SO.7a.** Increase the area ratio and quality of green spaces within the City. **SO.7b.** Increase the presence of green infrastructure within the City.
	SO.8: Varna Municipality will promote diversity, inclusion, and equality.	**SO.8a.** Reflect the Cities diversity in action and policy development.

Responsible and Sustainable Resource Use	**SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City.	**SO.9a.** Reduce the water loss ratio of potable water infrastructure. **SO.9b.** Increase the capacity and coverage of the sewerage and stormwater systems, making them more resilient to changes in demand and climatic events.
	SO.10: Varna Municipality will improve the management system and physical infrastructure for solid waste collection and disposal.	**SO.10a**. Divert solid waste away from landfill by increasing the reuse, recycling, and recovery of construction waste. **SO.10b**. Increase recycling rates of households for paper, cardboard, metals, plastics, and glass.
	SO.11: Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources**.**	**SO.11a**. Maintain and develop protected areas as part of the National Ecological Network. **SO.11b**. Improve the quality of soils. **SO.11c**. Limit pollution into fresh and marine water bodies.

5. Summary of Actions

5.1. Introduction

The actions set out in the following chapters were developed to address the Priority Environmental Challenges identified by the Municipality and other stakeholders and detailed in Chapter 4. Stakeholders ultimately prioritised a total of 31 actions from an initial list of 104.

The following sub-chapters of the report sets out the action summaries per sector – energy, industry, water cycle management, buildings, land use, solid waste, transport, and cross-cutting actions. The action sheet template is outlined below, with explanations for what is contained within each action sheet. Please note the following definitions:

- **Financing options** – for upfront capital costs of the investment; typically, not applicable for policies/strategies as that would be funding
  - **Own city budget** - costs are taken directly from the city's annual budget.
  - **National or regional government budget** - costs are provided by the budgets of national or regional governments (this includes money from specific funds that might relate to a project, for example, a Disaster Risk Management fund)
  - **Borrowings** (e.g. IFI, commercial banks, bond issues) - loans or concessional financing from financial institutions.
  - **Donor grants** – Grants or non-concessional financing provided.
  - **Private Sector / PPPs** – Capital investment cost is provided in full or in part by the private sector.
  - **Public enterprise (own budget or borrowing) / SPVs** – a business organisation owned in part or full by the state. Typically utilities such as telecoms, electricity, etc.
  - **Other** – anything not covered by the above.
- **Funding options** – for the operation and maintenance of investments, or for providing budget etc. for employees to undertake work like policy development or strategies
  - **Local taxes** – Any type of tax on citizens that makes up government budgets.
  - **Non-tax revenues (fees, charges, penalties, etc)** - Any type of funds derived from a user paying for the service, like water bills or electric bills or tickets to use public transport.
  - **Donor funding** – non-concessional funds provided to the Municipality by donor organisations.
  - **Government payments / Availability payment** – payment to the service provider from the funder based on the service provider meeting specified performance (e.g. internet access is available 24/7).

The financing and funding boxes are shaded **green** (high viability) or **yellow** (potential viability) and are unshaded if the option does not apply to the action.

Note that the following icons (1 or more) appear next to each Action Title to identify what type of action it is:

Investment- investments into the construction of new infrastructure or the retrofitting of existing infrastructure and other physical assets in the city. Number of actions: 11

Standards, guidelines, regulations - new or updated legislation, standards, or policy to drive more environmentally friendly activities in the city. Number of actions: 8

Strategies plans and programmes - guidance documents to provide targeted roadmaps for improving planning and management in specific sectors and thematic areas. Number of actions: 10

Monitoring, data collection, analysis, assessment, and studies - Measures to improve compliance with regulations through improved monitoring and potential penalties. Number of actions: 5

Awareness, demonstrations, training, and capacity-building was not treated as a specific action type but has been integrated throughout the actions where required – covering 7 in total. This can be defined as learning programmes to increase local capacity through knowledge exchange and skills development. Alternatively, initiatives to shift behaviour and build ownership of specific stakeholder groups for more sustainable practices.

5.1.1. Action sheet template

Action Title (The name of the action and the action ID).

Timeline[5]

Strategic objectives	The strategic objectives to which the action relates.						2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	The PECs this action addresses.						**Development Timeframe**			**Implementation Timeline**	
Description	What the action proposes and explanation of its importance.										
Steps for Implementation	Outlines set of steps that the action owners will take to the implement the action		Specific timeline related to each step			Specific action owner related to each step					
Plan for Delivery	**Action owner**	Refers the municipal department or public enterprise that will take responsibility for action implementation and monitoring.									
	Stakeholders	This refers to other stakeholders that are key to the successful delivery of the action.									
	Source of upfront cost[6], as applicable	Own City Budget	National or regional government budget[7]	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other			
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc)	Donor funding	Government payments / Availability payment						
	Additional comments regarding funding options	Free text to clarify additionally, if needed									
Impact measures	This identifies the key performance indicators (KPIs) for each action that relate to the Monitoring and Evaluation plan set out in Chapter 7. These KPIs are generated from the Indicator Database that informed Varna's Green City Baseline.										

Costs and benefits					
Estimated cost	The financial costs of capital expenditure (CAPEX) and operational expenditure (OPEX) of actions, as well as other design and development costs (e.g. consultant fees). Actions may require CAPEX and/or OPEX or may not require investment at all.			This includes any environmental benefits such as CO_2, water, and energy savings, if applicable or where data was available.	**Environmental benefits**
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Is there a clear health impact of the state of environment which the action is addressing?		
		Improve safety and/or security	Does the action improve physical safety and/or economic and social security?		
		Enhance the public realm	Does the action protect heritage assets, promote walkability, and improve the continuity of streetscapes?		
		Access to basic services	Does the action improve the availability and ease of access of public services?		
		Social equity	Does the action promote diversity, inclusion, and equality?		
	Economic co-benefits	**Revenue generating activities**	Does the action have the opportunity to generate revenue, either for the investor, the municipality, or in comparison to the counterfactual?		
		Promotes economic inclusion	Does the action create jobs, promote access to capital for lower socio-economic groups?		
		Avoided damages	Does the action reduce the likelihood of damage or disruption to infrastructure, services, or livelihoods?		
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Does the action build the capacity of or coordination between municipal staff and departments, in addition to external stakeholders?		
		Enhances legislative environment	Does the action fill a gap in local legislation or address governance uncertainty?		

[5] Dark blue indicates the year(s) the action is implemented, light blue indicates years where the action shall be scaled up or revisited.
[6] Upfront cost = depending on the action type – e.g., capex for investments, development costs for other initiatives, etc.
[7] * including initiatives and facilities like the RRF.

5.2. Clean and resilient energy

Energy systems are key components of sustainability. When energy systems rely on fossil fuel combustion, they are not resilient to shortages or import disruptions in fossil fuel supply. The combustion also contributes to climate change and poor air quality. Bulgaria and, by association, Varna imports much of its energy, which poses a risk to its energy security. Moreover, Bulgaria is a signatory to the Paris Agreement, with commitments to reduce its carbon emissions. Varna can support these efforts by expanding its investment in clean and resilient energy.

5.2.1. Priority environmental challenges

Varna energy supply is largely dominated by fossil fuels for both energy and electricity. Not only is this carbon intensive, but it also makes the city reliant on energy imports. As a result, one of the key challenges that stakeholder identified to address through the GCAP is Varna's **reliance on fossil fuel electricity generation and low uptake of renewables** (C.11).

The low uptake of renewables is in part due to reduced public awareness on the opportunity and benefits of renewable energy technologies (C.12). That is, the national government and the municipality have a responsibility to set direction and invest in renewable energy, but they can also support local residents and organisations to invest in these technologies. In conjunction with lack of public awareness, there is also an **absence of incentives for developments to use renewable energy sources (C.13).**

5.2.2. Ongoing actions in Varna

Varna Municipality joined the Covenant of Mayors (CoM) initiative in 2008, adopting a Sustainable Energy Action Plan (SEAP) in 2011 for the period of 2012-2020. As a signatory, Varna Municipality has voluntary commitments to reduce energy-related CO_2 emissions by at least 20%.

Additionally, any new municipal plans for energy efficiency, renewable energy systems and biofuels within the period of 2021 – 2030 must be developed in accordance with the instruction of the Sustainable Energy Development Agency, established in Varna Municipality in 2020.

Finally, according to the Energy Efficiency Act, the individual goal of Varna Municipality for energy savings up to 2016, was 5.43GWh, which was fulfilled and implemented by the Municipality according to the issued Energy Saving Certificate.

5.2.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
En1	Set up a community energy efficiency programme.		Varna Municipality will reduce the City's GHG emissions and encourage greater energy independence.					
En2	Ensure that future Municipality Energy Strategies incorporate the findings and recommendations of this GCAP.		Varna Municipality will help create opportunity for future, green investment. Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence					
En3	Provide incentives to both developers and private homeowners, for the incorporation / installation of renewable electricity generation. (e.g. tax exemptions, cost subsidisation).		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.					
En4	Integrate renewables at a large scale in the city		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence					

En1: Set up a community energy efficiency programme.

Timeline

Strategic objectives	**SO.4**: Varna Municipality will reduce the City's GHG emissions and encourage greater energy independence.			2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.11:** Reliance on fossil fuel electricity generation and low uptake of renewables **C.12:** Reduced public awareness on the opportunity and benefits of renewable energy technologies **C.13:** Absence of incentives for developments to use renewable energy source							
Description	Varna Municipality will establish a "Community Energy Efficiency Programme". This programme will seek to provide funding for residential retrofit measures and smart technologies for energy efficiency, with a specific focus on the City's most vulnerable population groups, whilst raising the awareness of the broader population about the benefits and support programmes in-place for the energy efficiency of residential housing and helping enhance the capacity for data collection on energy efficiency in Varna through smart technologies. The programme will provide a mixture of grants and subsidies for low-income households to implement energy efficiency measures at low or no cost. In order to determine eligibility of low-income households within Varna, it is suggested that an income-based eligibility means-test is undertaken. The programme will lay out a suite of energy efficiency measures that it will support, alongside guidelines on the appropriate steps a user should take to deliver them, and an approved list of suppliers / contractors. This action would not support renewable energy technologies (as per the focus of GCAP action En3), fossil fuel technologies or solid fuels (such as charcoal, wood and biomass). In conjunction with the Community Energy Efficiency Programme, an awareness campaign will be undertaken to demonstrate the benefits of improving energy efficiency from both a health and cost perspective. Targeting the less-vulnerable population groups that would not be eligible for grants and financial support through the programme itself, this awareness campaign will help explain how the extra cost of certain energy efficiency measures (i.e. insulation) and smart technologies (i.e. smart metres) can be partly offset by the long-term cost saving on utility bills such for heating and cooling. In addition, the Municipality would promote non-public sector funding routes such as loans and green mortgages – working with banks, national government, and associated stakeholders to understand how these can be accessed.							
Steps for implementation	1. Municipality to conduct an internal review of policies.	Q1 2023	IIB Directorate					
	2. Undertake a public survey to understanding the perception of existing schemes and supportive mechanisms and policies in place to promote energy efficiency within the City of Varna.	Q1 2023						
	3. Identify and partner with a Varna-based stakeholder who can support with the implementation of the programme.	Q1 2023						
	4. Identify vulnerable population groups and low-income households within the City in order define the eligibility requirements for the programme, outlining an income-based eligibility means-test,	Q1 2023						
	5. Establish a timeline and longer-term budget requirements to cover the operation and funding of the programme, identifying appropriate funding mechanisms.	Q1 2023						
	6. Allocate a grant to the partner stakeholder to enable programme implementation.	Q2 - 2023						
	7. Work with the partner stakeholder to identify and detail a suite of energy efficiency measures for residential buildings that will be accessible to residents as part of the Energy Efficiency programme.	Q2 – Q4 2023						

	8. Identify and screen a suite of approved supplies / contractors in-line with a pre-determined set of operational and financial standards.	Q4 2023 – Q1 2024
	9. Set up the appropriate online user interface and platform for residents and contractors to access the energy efficient programme.	Q1 2024
	10. Support effective marketing and outreach of the programme-	Q1 2024
	11. In conjunction with the programme, undertake an awareness raising campaign, specifically targeting the least-vulnerable population groups (those not eligible for the programme).	Q1 2024
	12. Follow-up with citizens who have used the programme as part of the Monitoring & Evaluation aspect of the Green City Action Plan, using the outcomes and lessons learned to improve the programme for future users.	2024- 2026

Plan for delivery	**Action owner**	IIB Directorate						
	Stakeholders	Bulgarian Green Building Council, Architects Chamber Varna, Architects Union Varna, City of Varna Citizens particularly vulnerable population groups, EnEFECT Energy Efficiency Centre, Local Business and Contractors that would help implement / undertake the energy efficiency measures.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes		Non-tax revenues (fees, charges, penalties, etc)		Donor funding		Government payments / Availability payment
Impact measures	• Annual average concentration of PM2.5, PM10, NOx and SOx • Annual CO_2 equivalent emissions per capita. • Fuel Poverty							

Costs and benefits

Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 1,365 EUR: 700		**Energy savings**	N/A	
	Design/development:	BGN: 46,000 – 57,000 EUR: 23,000 – 29,000		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Improving energy efficiency in residential buildings has the potential to help improve cardiovascular and respiratory health outcomes for the residents. Energy efficiency measures could also reduce combustion of fuels, leading to a city-wide reduction in air pollutants and provide greater protection for the residents against extreme temperature events.
		Improve safety and/or security	
		Enhance the public realm	
		Access to basic services	
		Social equity	Poorer neighbourhoods typically contain poorer quality housing with poor energy efficiency standards. This could particularly impact women – with a lack of access to modern energy sources having been seen to significantly contain women's time by forcing them to rely on inefficiency energy sources, whilst also increase health risk due to indoor air pollution.
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	A potential reduction in fuel poverty.
		Avoided damages	Potentially improved health outcomes would reduce pressure on local healthcare, while improved energy efficiency has the potential to reduce the cost of utility bills.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Implementing the action will take the efforts of two distinct departments/commissions, but also involve stakeholder engagement with relevant organisations and the public. Working with the Cities most vulnerable population groups will also enhance the Municipalities knowledge and working relationship with these groups, which can be used in the implementation and development of other actions.
		Enhances legislative environment	This action will support Varna to achieve air quality standards in line with EU Limit Values.

En2: Ensure that future Municipality Energy Strategies incorporate the findings and recommendations of this GCAP.

Timeline

Strategic objectives	**SO.1:** Varna Municipality will help create opportunity for future, green investment**.** **SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence	2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.11:** Reliance on fossil fuel electricity generation and low uptake of renewables **C.12:** Reduced public awareness on the opportunity and benefits of renewable energy technologies **C.13:** Absence of incentives for developments to use renewable energy source					

Description

Building on the recent "Varna Sustainable Energy Strategy 2012 – 2020", Varna Municipality will ensure that the future Energy strategy, developed by the Municipality for 2021 – 2030 and due in November 2021, will incorporate the findings and outcomes of this Green City Action Plan. This includes both the Green City Vision and associated Strategic Objectives (SO.1 and SO.6) in addition to the associated Energy Actions outlined within this GCAP - En1 and En3.

This will apply to a range of scales; from a micro grid level (i.e. individual buildings) to the macro-level (i.e. City wide) and aims to ensure that the following aspects are a focus of future Municipality Energy Strategies.

- **Ease policy barriers to renewable technologies**: Introduce policies that favour and incentivise the development of renewable energy technologies over non-renewable technologies. Providing clear policies, procedures and financing / funding mechanisms will create a more stable and predictable environment for both developers and investors alike.
- **Incentivise renewable electricity generation**: In conjunction with GCAP Action En3 and in-combination with clear policies and procedures, create financial incentives for private homeowners, businesses, and developers to install renewable electricity technologies i.e. Solar PV or Wind.
- **Reducing energy demand:** In-conjunction with GCAP Action En1 and the emission reduction targets set out in GCAP Action CC2, identify opportunities to reduce energy demand by increasing energy efficiency and encouraging behavioural change through awareness raising and capacity building activities.

Steps for implementation			
	1. Determine the timeframe for the development of the next Municipal Energy Strategy,	Q1 2023	IIB Directorate
	2. Ensure the appropriate Strategic Objectives and Actions from this GCAP are incorporated within the development of the Energy Strategy.	Q2 2023	
	3. Engage with appropriate stakeholders in the development of the Strategy	Q2 to Q3 2023	
	4. Deliver and implement the Energy Strategy	Q4 2023	

Plan for delivery								
	Action owner	IIB Directorate						
	Stakeholders	Ministry of Energy, Ministry of Regional Development and Public Works, Regional Council for Energy Efficiency, EnEFECT Energy Efficiency Centre, Photovoltaic Association, Bulgarian Green Building Council.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other

	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc)	Donor funding	Government payments / Availability payment	
Impact measures	• Annual average concentration of PM2.5, PM10, NOx or SOx • Annual CO_2 equivalent emissions per capita.					
Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 75,900 EUR: 38,800		**CO_2 savings**	N/A	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Improving energy efficiency in residential buildings can help improve cardiovascular and respiratory health outcomes for the residents by contributing to a reduction in city-wide pollution levels.			
		Improve safety and/or security				
		Enhance the public realm				
		Access to basic services	Good quality, energy efficient housing in the 21st century should be classified as a basic service and improved access to affordable, low-cost energy.			
		Social equity	By targeting the most vulnerable population groups within the City of Varna, this action can help improve the quality of life for the residents but addressing issues around poor-quality housing and energy poverty.			
	Economic co-benefits	**Revenue generating activities**	Local renewable energy generation has the potential to provide local economic benefit as opposed to this being outsources to other parts of Bulgaria.			
		Promotes economic inclusion				
		Avoided damages	Improved health outcomes could reduce pressure on local healthcare, while improved energy efficiency will reduce the cost of utility bills.			
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Improved institutional efficiency – ensuring that the information and actions developed as part of this GCAP are incorporated in future Energy Strategies prevents re-works, promotes knowledge sharing and encourages building-on existing work. Decentralizing energy generation improves resilience to future shocks and stresses from both climate, disaster, and human related impacts.			
		Enhances legislative environment	This action can support Varna to achieve air quality standards in line with EU Limit Values alongside contribute towards achieving the EU Energy Efficiency targets.			

En3 Provide incentives to both developers and private homeowners, for the incorporation / installation of renewable electricity generation. (e.g. tax exemptions, cost subsidisation).

Timeline

Strategic objectives	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.			2023	2024	2025	2026	2027
Priority Environmental Challenge(s)	**C.11:** Reliance on fossil fuel electricity generation and low uptake of renewables **C.12:** Reduced public awareness on the opportunity and benefits of renewable energy technologies **C.13:** Absence of incentives for developments to use renewable energy source				■			
Description	In order to facilitate the uptake in the delivery of renewable energy generation capacity and associated smart technology (i.e. smart metres), Varna Municipality will explore and implement localized interventions to incentivise both commercial and domestic scale renewable energy developers to deliver renewable energy installations (e.g. Solar PV panels, wind turbines or micro biogas units) and associated smart technology (e.g. smart metres). The incentives will need to support two key end markets: • **Existing Buildings** (EB)**:** Commercial or Domestic property owners considering small scale generation systems fitted to existing buildings (primarily rooftop solar). • **New Construction** (NC) within the municipality, building either new dwellings or new commercial spaces (primarily rooftop solar) There are a number of mechanisms which the Municipality could implement to incentivise the installation of renewable energy generation, being: • **Tax Exemptions** *(EB & NC):* Exemption from local taxes or charges for private residents & property owners with renewable energy installations; or a reduction in development charges levied against new buildings which incorporate renewable energy generation systems. • **Cost-subsidisations** *(EB):* Implemented through grant schemes offered by the Municipality and made available to low-income households. The Municipality will explore whether this would need to be means tested. • **Zero / Low interest loans** *(EB)*: Provided by the Municipality to be paid back (potentially via a Local Tax mechanism) over a set-period. • **Feed in Tariffs (FiT)** *(EB)***:** Which pay generators for producing renewable energy with a fixed price per kWh generated over a fixed long-term contract period (often 15-25 years). This should be developed in a way to ensure that the scheme doesn't exclude low-income households who cannot afford the initial system capital expense, potentially with additional or alternative grant support available for low-income households (the Municipality will explore double-subsidisation – or capital costs via enhanced revenues in operation – if appropriate). • **Group Buying Schemes** *(EB)***:** Whereby the Municipality facilitates the grouping of households with interest in solar energy systems so that together they form a larger project to be offered to contractors. This delivers some economies of scale for the contractor (driving down consumer costs) and helps ensure that consumers get systems installed by reputable contractors.						
Steps for implementation	1. Analyse and assign the viable/optimum incentive mechanisms for existing buildings (commercial or domestic), New Construction development and Renewable Energy developers. Identifying the likely success and impact of each option (specifically on local tax).	Q1 – Q2 2024	AGUP Directorate / IBB Directorate				
	2. Develop implementation scheme of viable incentive mechanism(s) including future programme adjustment plans and eligibility criteria designed to accommodate low-income households.	Q2 2024					
	3. Undertake public awareness campaign about benefits of renewable energy and the incentive mechanisms policy.	Q2 – Q3 2024					
	4. Gain approval for the associated policy	Q4 2024					
	5. Monitor associated policy	Q1 2025 – Q4 2027+	Engineering Infrastructure Directorate				

Plan for delivery	**Action owner**	AGUP Directorate / IBB Directorate in collaboration with Engineering Infrastructure Directorate						
	Stakeholders	Varna Municipality's Legal and regulatory services, Energy-Pro JSC (Joint Stock Company), Developers, private homeowners, Municipality.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes		Non-tax revenues (fees, charges, penalties, etc.)		Donor funding		Government payments / Availability payment
Impact measures	• PM 2.5, 10, NOx, and SO_2 concentration • GHG emissions per capita • Proportion of energy derived from renewable sources • Fuel Poverty levels							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 919,000 EUR: 472,000		**Energy savings**	N/A	
	Design/development:	BGN: 19,500 EUR: 10,000		**CO_2 savings**	125,800 Annual tCO2e	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Increasing the penetration of renewable energy would ideally lead to a reduction in the amount of natural gas and coal burned for electricity by TPP Varna EAD , thereby reducing the external PM10 emissions that pollute Varna Municipality, in-turn helping to improve air quality.
		Improve safety and/or security	This action has the potential to improve the resilience of Varna's energy network by creating redundancy in generation and distribution, making the overall system less sensitive to the impacts of a natural or human-caused disaster event that could knock out power or impact supplies.
		Enhance the public realm	N/A
		Access to basic services	N/A
		Social equity	The programme should be available to all residents and organisations, and the support mechanisms will be designed to specifically ensure that low-income residents are able to participate in and benefit from them.
	Economic co-benefits	**Revenue generating activities**	Potential revenue generation should Municipality-owned land by suitable for large scale renewable energy projects.
		Promotes economic inclusion	The programme will support the real income of households through the FiT payment, with the potential to reduce the cost of energy bills, allowing households a greater buffer in their income, although this is based on the potential impact of the FiT on local taxes. Local job creation associated with the deployment of renewable energy capacity.

		Avoided damages	Decentralizing energy would mean that Varna's overall system is more resilient to infrastructure disruptions, thereby avoiding the direct monetary implications of making repairs to a centralized system, but more importantly by avoiding the indirect damages that power cuts can have on productivity and well-being.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	This action has the potential to help Varna to align its policies on energy efficiency, renewable energy generation, and the city's contribution toward national INDCs.
		Enhances legislative environment	This policy would fill an existing gap around incentives for renewable energy generation.

En4 Integrate renewables at a large scale in the city

Timeline

Strategic objectives	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.					
Priority Environmental Challenge(s)	**C.11:** Reliance on fossil fuel electricity generation and low uptake of renewables **C.12:** Reduced public awareness on the opportunity and benefits of renewable energy technologies **C.13:** Absence of incentives for developments to use renewable energy source					
Description	In order to facilitate the uptake in the delivery of renewable energy generation capacity and associated smart technology (i.e. smart metres), Varna Municipality will explore and implement localized interventions to incentivise both commercial and domestic scale renewable energy developers to deliver renewable energy installations (e.g. Solar PV panels, wind turbines or micro biogas units) and associated smart technology (e.g. smart metres). The incentives will need to support one key end markets: • **Renewable Energy Development** (RED) where land is used primarily for renewable energy generation at large scale. This would include ground mounted solar, wind projects or waste to energy projects. Special emphasis will need to be put on ensuring that low-income residents within the City of Varna are able to access the incentives scheme and can benefit from the generation of low-cost clean energy. There are a number of mechanisms which the Municipality could implement to incentivise the installation of renewable energy generation, being: • **Contract for Difference/Power Purchase Agreements** *(RED)* Enabling Renewable Energy developers to receive price guarantees for the energy they generate. This could be achieved by the Municipality buying energy from the developers directly for their own facilities (Power Purchase Agreement) or by fixing the price a project receives for generating electricity (Contract for Difference) with the Municipality accepting the Risk (or even benefit) of long-term price fluctuation on the wholesale markets. Additional benefits to renewable energy developers that derive as a result of more predictable revenue streams in the future include the potential to access lower cost finance products to support their capital investment. • **Offering Municipality Owned Land** *(RED):* Suitable land owned by the Municipality could be offered to renewable developers to support the delivery of new renewable energy projects, potentially at favourable lease rates. This should not reduce public access green space.					
Steps for implementation	1. Analyse and assign the viable/optimum incentive mechanisms for existing buildings (commercial or domestic), New Construction development and Renewable Energy developers. Identifying the likely success and impact of each option (specifically on local tax).	Q1 – Q2 2023	AGUP Directorate / IBB Directorate			
	2. Develop implementation scheme of viable incentive mechanism(s) including future programme adjustment plans and eligibility criteria designed to accommodate low-income households.	Q2 2023				
	3. Undertake public awareness campaign about benefits of renewable energy and the incentive mechanisms policy.	Q2 – Q4 2023				
	4. Gain approval for the associated policy	Q1 2024				
	5. Monitor associated policy	Q2 2024 – Q4 2027+	Engineering Infrastructure Directorate			
Plan for delivery	**Action owner**	AGUP Directorate / IBB Directorate in collaboration with Engineering Infrastructure Directorate				
	Stakeholders	Varna Municipality's Legal and regulatory services ,Energy-Pro JSC (Joint Stock Company), Developers, private homeowners, Municipality.				

	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			
Impact measures	• PM 2.5, 10, NOx, and SO_2 concentration • GHG emissions per capita • Proportion of energy derived from renewable sources • Fuel Poverty levels							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 919,000 EUR: 472,000		**Energy savings**	N/A	
	Design/development:	BGN: 19,500 EUR: 10,000		**CO_2 savings**	125,800 Annual tCO2e	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Increasing the penetration of renewable energy would ideally lead to a reduction in the amount of natural gas and coal burned for electricity by TPP Varna EAD, thereby reducing the external PM10 emissions that pollute Varna Municipality, in-turn helping to improve air quality.
		Improve safety and/or security	This action has the potential to improve the resilience of Varna's energy network by creating redundancy in generation and distribution, making the overall system less sensitive to the impacts of a natural or human-caused disaster event that could knock out power or impact supplies.
		Enhance the public realm	
		Access to basic services	
		Social equity	The programme should be available to all residents and organisations, and the support mechanisms will be designed to specifically ensure that low-income residents are able to participate in and benefit from them.
	Economic co-benefits	**Revenue generating activities**	Potential revenue generation should Municipality-owned land by suitable for large scale renewable energy projects.
		Promotes economic inclusion	The programme will support the real income of households through the FiT payment, with the potential to reduce the cost of energy bills, allowing households a greater buffer in their income, although this is based on the potential impact of the FiT on local taxes. Local job creation associated with the deployment of renewable energy capacity.
		Avoided damages	Decentralizing energy would mean that Varna's overall system is more resilient to infrastructure disruptions, thereby avoiding the direct monetary implications of making repairs to a centralized system, but more importantly by avoiding the indirect damages that power cuts can have on productivity and well-being.

	Institutional co-benefits	**Improve institutional capacity or efficiency**	This action has the potential to help Varna to align its policies on energy efficiency, renewable energy generation, and the city's contribution toward national INDCs.
		Enhances legislative environment	This policy would fill an existing gap around incentives for renewable energy generation.

5.3. Data-informed industrial practices

Industry is key to the economic dynamism of Varna. In order to ensure that it is robust, industrial organisations in Varna must ensure that their operations and practices meet international standards for environmental and social welfare.

5.3.1. Priority environmental challenges

Unreliable and missing data and monitoring mechanisms were flagged as overarching challenges in Varna, which were particularly applicable to the industrial sector.

One of the main challenges facing Varna is the **lack of comprehensive air quality data to understand the spatial extent and severity of problems** associated with poor air quality (C.1). Similarly, stakeholders flagged **lack of regular monitoring and reporting of waste streams from industries and their associated environmental impact** (C2) as a challenge. Data scarcity makes it challenging for decision makers to develop informed policies and investments, and therefore these challenges were prioritised for the GCAP.

Another theme was that of constrained wastewater services. This includes **lack of sewerage and stormwater infrastructure in parts of the municipality** (C3) and **ageing and/or capacity constrained wastewater treatment plants** (C4).

5.3.2. Ongoing actions in Varna

There is a lack of ongoing action around industrial data collection and monitoring, which is addressed through the following GCAP actions.

5.3.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
Ind1	The Municipality to establish a supplementary reporting programme for all existing and new industries to develop and share policy on the monitoring, reporting and publication of key environmental data (e.g. air, water, carbon emissions, noise pollution and waste disposal) to inform efforts for reducing pollution in-line with EU Limit Values.		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. Varna Municipality will help improve air quality standards and reduce levels of noise pollution.					

Ind1: The Municipality to establish a supplementary reporting programme for all existing and new industries to develop and share policy on the monitoring, reporting and publication of key environmental data to support efforts for reducing pollution in-line with EU Limit Values

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.4.** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. **SO.5.** Varna Municipality will help improve air quality standards and reduce levels of noise pollution.					
Priority Environmental Challenge(s)	**C.1:** Lack of comprehensive air quality data to understand the spatial extent and severity of the problem **C.2**: Lack of regular monitoring and reporting of waste streams from industries and associated environmental impact **C.21**: Lack of Greenhouse Gas emission data collection process and analysis					
Description	**Monitoring, Reporting and Publication Programme** An absence of comprehensive air quality data, and regular monitoring and reporting of pollution, carbon emissions and waste currently hinders effective decision making for reducing emissions and pollution. To address this, Varna Municipality will launch a digitalised voluntary reporting programme for both pre-existing and new industries that will be monitored by the Ecology and Environmental Protection Directorate. Improved reporting of key environmental data will guide investments and initiatives to reduce pollution from industry in the future with the aim to reach EU Limit Values. The programme will devise standards for the reporting and monitoring of key environmental data on; i) air, ii) water, iii) carbon emissions, iv) noise pollution and v) waste, in partnership with the Regional Inspectorate for Environment and Water (RIEW). This action will also supplement the implementation of GCAP action CC4. **Capacity Building** The programme will be accompanied by a capacity building component that aims to better inform industry stakeholders around how they can transition to renewable energy systems (RES) within the industry sector. Led by the Municipality, Industries in Varna will be encouraged to accelerate the uptake of renewable energy and improve energy efficiency in industrial processes. Energy by-products, like heat, can be converted into energy for reuse, saving costs and improving efficiency.					
Steps for implementation	1. Partner with RIEW and industry stakeholders to support the design of the programme.	Q1 2023	Ecology and Environmental Protection Directorate,			
	2. Undertake an assessment of current EU standards for reporting and monitoring of environmental data to identify challenges in current reporting and inform new programme.	Q1 2023				
	3. Develop baseline reporting standard for air and water pollution, carbon emissions and waste disposal in line with current RIEW and EU standards.	Q2 2023 - Q4 2023				
	4. Use the review and development of national and EU standards to define targets for environmental performance and reporting to inform subsequent action plans and direct capacity building in order to meet those targets.	Q4 2023				
	5. Develop a digitalised programme for monitoring, reporting and publication of environmental data.	Q1 2024-Q2 2024				
	6. Develop content for capacity building initiative and identify target audience.	Q1 2024 – Q2 2024				
	7. Approve programme.	Q3 2024				
	8. Launch programme for monitoring, reporting and publication of environmental data including identification of appropriate targets and development of action plans as appropriate.	Q1 2025				
	9. Launch capacity building initiatives alongside programme to incentivise transition to RES.	Q1 2025				

Plan for delivery	**Action owner**	Ecology and Environmental Protection Directorate, Environmental Protection Department.						
	Stakeholders	Regional Inspectorate for Environment and Water (RIEW), All industrial enterprises in Varna, Devnya Industrial facility, Energo-Pro Varna Joint Stock Company, ViK Varna Ltd, Ecobulpack Ltd.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			
Impact measures	• Average annual concentration of PM2.5 • Average annual concentration of PM10 • Annual CO_2 equivalent emissions per capital • Concentration of mercury in soil • BOD In rivers and Lakes • NH3 concentration in rivers and lakes • % of water samples in a year that comply with national potable water quality standards • Bathing water quality • Levels of noise pollution.							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 3,100 EUR: 1,600		**Energy savings**	N/A	
	Design/development:	BGN: 230,000 EUR: 118,000		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Reducing air, water and soil pollution is likely to have positive public health benefits including reducing respiratory and cardiovascular diseases.
		Improve safety and/or security	
		Enhance the public realm	Reducing pollution and waste is likely to enhance public spaces.
		Access to basic services	
		Social equity	
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	
		Avoided damages	Reduced pollution is likely to have a positive impact on health reducing pressure on local healthcare systems. Improving waste processes as a result of effective monitoring would reduce costs incurred from illegal dumping.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Addressing the action would involve coordination between sectors and various Municipal commissions and stakeholder engagement, thereby improving the institutional capacity and stakeholder relationships.
		Enhances legislative environment	The action can help inform and enhance capacity of the Municipality to achieve EU value limits for reducing pollution.

5.4. Efficient and sustainable buildings

Buildings provide the homes, offices, and community spaces we need to enjoy a good quality of life. Buildings are also one of the biggest sources of carbon emissions through heating and electricity use and implementing efficient practices can have a huge impact on overall emissions. Additionally, building design can help improve human and ecosystem well-being through the integration of green infrastructure and passive design.

5.4.1. Priority environmental challenges

Varna's buildings are integral to its cultural heritage. At the same time much of the building stock is energy inefficient having been built decades ago. Therefore, the poor energy performance of buildings (C.9) has a huge impact on overall energy consumption and resident comfort.

Presently, Varna's buildings could be leveraged to better integrate sustainable design techniques, as there is a lack of rainwater recycling in existing building level design (C.10). The GCAP actions seek to holistically integrate building stock into the broader urban ecosystem.

5.4.2. Ongoing actions in Varna

The national building renovation programme is being implemented within the municipality, though it is understood to be limited in scale. The forecasted CO_2 savings in 2020 of 630 tCO2 / 1,595,751 kWh and in total, over four years of 6,351 tCO2 / 12,505,563 KwH. However, there are currently on local incentives for energy efficiency.

Varna Municipality has invested in energy efficiency measures in 27 municipal buildings and 30 multifamily buildings.

5.4.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
Bu1	Adopt and incentivise LEVEL(S)/ EDGE building standards or develop local green building standards in line with international best practices common for green building certification tools for all municipal buildings		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. Varna Municipality will help improve air quality standards and reduce levels of noise pollution. Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City					
Bu2	Strengthen the existing planning system to ensure that private developers undertake and submit to the Municipality an options assessment report regarding the choice of energy system (heating and cooling) for new developments.		Varna Municipality will help build the City's resilience to future climate change risks Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. Varna Municipality will help improve air quality standards and reduce levels of noise pollution Varna Municipality will promote diversity, inclusion, and equality.					
Bu3	Incentivise and encourage the Incorporation of Mitigation and Adaptation design considerations / technologies within new developments to limit bad practices and associated impacts		Varna Municipality will help build the City's resilience to future climate change risks Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City					

		Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources	
Bu4	Promote and incentivise the installation of green roofs (or walls) on private buildings through the revision of planning approvals for new construction or renovations.	Varna Municipality will help create opportunity for future, green investment. Varna Municipality will help improve air quality standards and reduce levels of noise pollution. Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources	

Bu1: Adopt and incentivise LEVEL(S)/ EDGE building standards or develop local green building standards in line with international best practices common for green building certification tools for all municipal buildings.

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. **SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution. **SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City					
Priority Environmental Challenge(s)	**C.9:** Poor energy performance of buildings **C.10:** Lack of rainwater recycling in existing building level design. **C.6:** Lack of resilience planning for water and wastewater infrastructure **C.13:** Absence of incentives for developments to use renewable energy sources **C.15**: The Urban Heat Island effect					

Description

For all Municipal buildings Varna Municipality will develop a best practice green building standard based on platforms created for use by the open market and the EC, or shall utilize existing such tools:

- **LEVEL(s**): A new European approach to assess and report on sustainability performance of buildings, focusing on: resource use and environmental performance, health and comfort and cost, value, and risk.
- **EDGE:** Applicable to a number of building types such as homes, hospitality, offices, retrial, education and hospitals, EDGE (Excellence in Design for Greater Efficiencies) is an innovation of the International Finance Corporation (IFC) which focuses on energy, material, and water efficiency measures.

Varna Municipality will incentivise the voluntary adoption of international green building standards for Privately owned developments within the City of Varna from the locally applicable market driven international tools. The type of green building certification adopted should be assessed by the design team in relation to the specifics to the project, with options for certifications including EDGE, BREEAM, LEED and DGNB, or similar .The Municipality will provide incentives through building permit fee cost reductions, expedited permitting and/or local tax credits, the extent of which are to be dependent upon the 'targeted' (at design stage) and then 'achieved' (at construction stage) level of certification i.e. for LEED this is Silver, Gold and Platinum. This action should be considered in relation to the Bulgarian National Plan to increase the number of Nearly Zero-Energy Buildings in accordance with Article 9 of Directive 2010/31/EU on Energy Performance of Buildings and the associated requirements that are brought into force within the geographical jurisdiction of the Municipality of Varna.

Steps for implementation

1. Assemble project team across relevant directorates and include appropriate stakeholders.	Q1 2024	Directorate AGUP
2. Appoint external experts to work with the project team to determine whether a local green building standard will be developed for the Municipality, or which of the available tools (LEVELS and/or EDGE) will be suitable for adoption; translate and adapt the selected strategy to become valid and ready for use.	Q1 2024	
3. Devise policy outline and determine a clear scheme of incentives against the various building certification rating levels.	Q2 2024	
4. Seek stakeholder input and revise if relevant	Q3 2024	
5. Establish online and paper permitting application alongside associated local tax exemption processes and assign team to assess applications on on-going basis.	Q4 2024	
6. Gain approval for policy	Q1 2025	

Plan for delivery

Action owner	Directorate AGUP
Stakeholders	Bulgarian Green Building Council, Bulgarian Chamber of Architects, Architects Union of Varna, Bulgarian Construction Chamber, Green Building Certification Experts.

	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc)	Donor funding			Government payments / Availability payment	
Impact measures	• Fossil fuel energy source use reduction • Overall energy use in buildings reduction through heating cooling consumption reduction • Potable water use reduction • Building life cycle assessment (life span will increase) • Energy poverty reduction • Health and wellbeing improvement of occupants based on improved indoor environmental quality (less moisture and mould issues, better ventilation, thermal comfort and lighting levels, less harmful chemical emissions from building products) • Improved air quality							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	On Average Sustainability Certified buildings use 30% less water than conventional buildings[8].	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	Compared to gas boiler: • District heating: 13.14 kWh / year • Heat pumps: 11.32 kwh/m2	
	Design/development:	BGN: 45,900 – 57,300 EUR: 23,200 – 29,000		**CO_2 savings**	• Solar thermal: 10-35 gCO2e/kw • Ground source heat pump: 50-125 gCO2e/kw • Air source heat pump: 60-170 gCO2e/kw • District electric heating: ~250 gCO2e/kw	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Health and wellbeing, plus energy and water efficiency specifications in the certification can support building occupant comfort, particular in the event of extreme heat or cold conditions and issues around damp and mould.
		Improve safety and/or security	
		Enhance the public realm	Green building certifications help enhance the surrounding public realm, through increased green space, on site stormwater control, restoration of ecosystems and local habitats, improved quality and life span of the built environment, preservation of water bodies, and access to transport services.
		Access to basic services	Green building certifications also support resources efficiency for water, energy, and materials, including enhancing access to local services such as transport nodes and amenities thus stimulating the development of local community economy.
		Social equity	Health and wellbeing, plus energy and water efficiency specifications in the certifications can reduce utility bills and improve standard of living in both affordable and social housing. Energy poverty which is a big issue in Bulgaria can be reduced.
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	Greater adoption of these certifications may promote the growth of specialised services around building sustainability and promote green job growth within Varna.
		Avoided damages	

	Institutional co-benefits	**Improve institutional capacity or efficiency**	This action will likely require coordination between municipal directorates, national government, and local stakeholders to develop an effective policy in-line with EU commitments. The increased lines of communication builds knowledge on all levels are building sustainability in the country and across the City of Varna.
		Enhances legislative environment	The policy creates more direction and guidance around the municipalities commitment to improving the efficiency of housing stock.

[8] Ememinejad, N & Kalhor, K. 2019. How grey water reuse in buildings can enhance sustainable water resources management? Conference: 2nd International Conference on Civil Engineering, Architecture and Urban Management.

Bu2: Strengthen the existing planning system to ensure that private developers undertake and submit to the Municipality an options assessment report regarding the choice of energy system (heating and cooling) for new developments.

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.3:** Varna Municipality will help build the City's resilience to future climate change risks **SO.4**: Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. **SO.5**: Varna Municipality will help improve air quality standards and reduce levels of noise pollution. **SO.8**: Varna Municipality will promote diversity, inclusion, and equality.					
Priority Environmental Challenge(s)	**C.9**: Poor energy performance of buildings **C.11:** Reliance on fossil fuel electricity generation and low uptake of renewables **C.13:** Absence of incentives for developments to use renewable energy sources					

Description

The choice of energy system for heating and cooling in buildings can have a big impact on the associated greenhouse gas emissions, depending on the fuel source and the efficiency of the system selected. In order to encourage an informed selection of alternative, low-carbon and economically efficient energy systems in private developments, Varna Municipality will update existing planning policy to enforce a requirement for private developers to undertake and submit an 'options assessment' to the Municipality when seeking planning approval. Given the network of district heat and gasification that are available as sources of heat for new developments in Varna, the action aims to stimulate the informed decision of new developments to connect to these sources as a potential low carbon alternative to heating from electricity. The options assessment should contain, as a minimum, 1 low-carbon energy system out of 3 systems in total. A comparison of the energy systems should be included, demonstrating anticipated generation against predicted heating and hot water demand (kW), estimated cost of installation, estimated operational costs per year (for the future occupants) and the associated GHG Emissions (CO_2e) per annum during operation. Energy systems can include but are not exclusive of connecting to local district heating network, heat pumps (air, ground water), solar thermal and cylinders.

Steps for implementation

1. Assemble project team across relevant directorate colleagues and stakeholders.	Q1 2024	Directorate AGUP
2. Select and external expert to develop the framework for the options assessment including an outline of required information and compliance handbook for developers.	Q1 2024	
3. Devise policy outline and identify funding sources.	Q1 – Q2 2024	
4. Seek stakeholder input and revise if relevant.	Q3 2024	
5. Set up online and paper platform for submitting options assessments and assign team to assess on a regular basis.	Q2 – Q3 2024	
6. Adopt policy.	Q4 2024	
7. Enforce policy.	2025+	

Plan for delivery

Action owner	Directorate AGUP						
Stakeholders	Bulgarian Green Building Council, Architects Chamber Varna, Architects Union Varna, private developers, energy service providers, Experts in the field of energy efficiency and renewable energy						
Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other

	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment
Impact measures	• Heating cooling consumption in buildings fossil fuels residential buildings fossil fuels • Heating cooling consumption in non-residential buildings fossil fuels • Share of new developments containing low-carbon energy system for heating and cooling.				

Costs and benefits						
Estimated cost	**CapEx /OpEx:**	N/A		**Water / Energy**	N/A	**Environmental benefits**
	Design/development:	BGN: 37,000 – 53,000 EUR: 18,600 – 26,700		**CO_2 savings**	The gCO_2e/kWh of heat for the different options: • Solar thermal: 10-35 • Ground source heat pump: 50-125 • Air source heat pump: 60-170 • District electric heating: ~250	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Encouraging the selection of low-carbon energy system alternatives is expected to reduce associated emission and pollution levels, which in turn would reduce the risk of associated respiratory health problems. Occupant indoor comfort and wellbeing can also be improved by ensuring that residents have access to affordable adequate heating in winter and cooling or ventilation in summer.
		Improve safety and/or security	
		Enhance the public realm	
		Access to basic services	This policy supports the consideration of more economically and environmentally efficient energy systems in privately developed buildings.
		Social equity	
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	This action encourages the consideration and advertisement of the cost implications of the energy system on future residents, with a potential to help combat fuel poverty.
		Avoided damages	
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Submitting options assessment to the Municipality will help increase knowledge and capacity of the Municipality on the associated energy systems, alongside improving information about which developments are adopting which systems.
		Enhances legislative environment	This policy helps develop a more informed legislative environment, whilst cresting more guidance around the municipality's commitment to climate change mitigation and energy efficiency in buildings.

Bu3: Incentivise and encourage the Incorporation of Mitigation and Adaptation design considerations / technologies within new developments to limit bad practices and associated impacts

Timeline

Strategic objectives	**SO.3** Varna Municipality will help build the City's resilience to future climate change risks **SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. **SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City **SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources	2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.11**: Reliance on fossil fuel electricity generation and low uptake of renewables **C.12**: Reduced public awareness on the opportunity and benefits of renewable energy technologies **C.13:** Absence of incentives for developments to use renewable energy sources **C.6:** Lack of resilience planning for water and wastewater infrastructure **C.15**: The Urban Heat Island effect					

Description

Varna Municipality will pass a policy offering expedited permitting and reduced permit fees for developments which prepare a mitigation and adaptation plan that address specific measures in line with the National Action Plan of Bulgaria. The measures will be implemented during the course of construction and the developer will submit documentation to verify the implementation upon construction completion in order to receive Act 16. At a minimum, the measures covered by the adaptation and mitigation plan will include:

- An assessment of mature and valuable vegetation (mainly trees) existing on site including the identification of existing habitats by a qualified ecologist, arborist or similar
- A construction staging plan which demonstrates measures to protect trees and habitats which have been identified as valuable, showing an access route for construction vehicles which protects root systems of select trees, as well as areas prone to erosion and areas where local species have a developed natural habitat established to be of protected species.
- An assessment of possible energy sources including a cost analysis with return-on-investment calculations for on-site and offsite renewable energy and low carbon energy mix options.
- A life cycles assessment of building materials calculated to include material ingredients, sourcing of raw materials, embodied energy in materials and demolition and disposal impact.
- A stormwater management plan where rainwater is captured, treated and/or reused on site

For the developer's reference, the policy and the associated compliance handbook can incorporate guidelines such as the EU design standards for infrastructure projects, EU adaptation taxonomy, and climate resilience principles for green bonds and other market driven financial mechanisms available to them.

Steps for implementation

1. Assemble project team across relevant directorates	Q1 2024	Directorate AGUP
2. Select and external expert to develop the framework for the climate change adaptation and mitigation plan including an outline of required information and compliance handbook for developers.	Q1-Q3 2024	
3. Devise policy outline and identify funding sources	Q1 – Q2 2024	
4. Seek stakeholder input and revise if relevant	Q3 2024	
5. Set up online and paper permitting application and assign team to assess applications on an ongoing basis	Q2 – Q3 2024	
6. Adopt policy	Q4 2024	
7. Enforce policy	2025+	

Plan for delivery

Action owner	Directorate AGUP
Stakeholders	Bulgarian Green Building Council, Bulgarian Chamber of Architects, Architects Union of Varna, Bulgarian Construction Chamber, Developers.

	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes		Non-tax revenues (fees, charges, penalties, etc.)	Donor funding		Government payments / Availability payment	
Impact measures	• Reduction of erosion along the black coast due to deforestation as a result of construction • Reduction of heat island effects due to over-development • Reduction of stormwater in an already over saturated and inadequate sewage network • Protection of natural water bodies and natural ecosystems • Share of city enterprises with ISO50001/EMAS certification or similar • Total value of projects with green building certification as a share of the total value of projects granted a building permit per year • Water Exploitation Index							
Costs and benefits								
Estimated cost	**CapEx:**	N/A			**Water savings**	Up to 11% of total potable water use can be saved through rainwater harvesting[9].	**Environmental benefits**	
	OpEx:	N/A			**Energy savings**	N/A		
	Design/development:	BGN: 92,000 – 115,000 EUR: 46,000 – 58,000			**CO_2 savings**	N/A		
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Including adaptation-related design specifications (e.g. energy efficiency, passiveness, green walls) can support building occupant comfort, particularly in the vent of extreme heat or cold conditions.					
		Improve safety and/or security	Erosion reduction, stormwater management and protection of mature vegetation and existing natural habitats can lead to the reduction of coastal erosion in peak weather events which can protect new developments and their residents from literally sinking into the ground or falling into the sea					
		Enhance the public realm	Mitigation and adaptation design specifications typically include increased green space and enhanced architecture that mimic natural spaces, improving the public realm as a result.					
		Access to basic services	Mitigation and adaptation design specifications also support resource management through measures such as rainwater reuse and improved energy efficiency and life cycles assessment of building impact.					
		Social equity	Design specifications like energy efficiency can reduce energy bills.					
	Economic co-benefits	**Revenue generating activities**						
		Promotes economic inclusion	The new specifications may promote the growth of specialised services around mitigation and adaptation design, promoting job growth in the city.					

[9] Belmeziti, A et al., (2014). How much drinking water can be saved by using rainwater harvesting on a large urban area? Application to Paris Agglomeration. Water Science & Technology. 70.11.

		Avoided damages	Mitigation and adaptation design specifications inherently seek to avoid damages such as carbon emissions, reduced productivity from climate-related stressors (heat waves, power disruptions, material extraction, manufacturing and supply chain emissions and disposal etc.)
	Institutional co-benefits	**Improve institutional capacity or efficiency**	The action will likely require coordination between municipal leadership and national government to develop the policy in line with Bulgaria's NDCs and NAPs and its EU commitments. This increase lines of communication and builds knowledge on all levels around the climate agenda in the country.
		Enhances legislative environment	This policy creates more guidance around the municipality's commitment to climate change mitigation and adaptation.

Bu4: Promote and incentivise the installation of green roofs (or walls) on private buildings through the revision of planning approvals for new construction or renovations.

Timeline

Strategic objectives	**SO.1:** Varna Municipality will help create opportunity for future, green investment. **SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution. **SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City **SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
Priority Environmental Challenge(s)	**C.14**: Lack of holistic strategy for land-use planning **C.5:** Lack of whole water cycle management **C.6:** Lack of resilience planning for water and wastewater infrastructure **C.9**: Poor energy performance of buildings **C.10:** Lack of rainwater recycling in existing building level design **C.15**: The Urban Heat Island effect					
Description	Incorporating green roofs (or walls) onto existing or new buildings is an effective way to integrate green space, enhance biodiversity, improve energy efficiency in buildings and address rainwater runoff, and reduce the urban heat island effect using what would otherwise be underused space. Moreover, when installed properly green roofs extend roof life by protecting the roof membrane from extreme temperatures and weather. They can also save energy by providing greater insulation and reducing heating and cooling loads. Green roofs serve to capture rainwater on site, thus relieving municipal stormwater sewer infrastructure and associated pollution. Varna Municipality will seek to double the number of buildings with green roofs / walls on new construction by 2026. The Municipality will achieve this by providing tax incentive and expedited construction permit where green roofs are part of the green building requirements under GCAP action Bu1 and Bu3. The Municipality will consider establishing public-private partnership (PPPs) to help finance green roofs. Varna Municipality will seek to increase the uptake of green roofs/walls by providing tax allowances, utilising the tax increment financing mechanism established as part of GCAP action Lu1 *"Introduce policy and tax incentives to prioritise brown-field development over greenfield."* The amount of tax allowance will be dependent on the share of the green roof area and/or walls in the total surface of the roof and/or walls.					
Steps for implementation	1. Assemble project team to lead project.	Q1 2023	AGUP Directorate			
	2. Engage with external experts to define the design and construction parameters for green roofs.	Q2 – Q4 2023				
	3. Identify required funds and appropriate financing mechanisms, implementing where appropriate.	Q3 – Q4 2023				

	4. Review best practice for green roof tax allowance programme.	Q4 2023 – Q1 2024	
	5. Undertake economic analysis to identify the amount of tax allowance per square foot of green space incorporated.	Q1 2024	
	6. Gain approval to pass the policy into law.	Q2 2024	Municipal council
	7. Launch programme with engagement campaign.	Q3 2024	AGUP Directorate
	8. Monitor effectiveness.	Q4 2024 onwards	

Plan for delivery	**Action owner**	AGUP Directorate; Local Taxes Directorate						
	Stakeholders	Chamber of Engineers in Investment Design, Bulgarian Chamber of Architects, Architects Union – Varna, Bulgarian Construction Chamber, green building certification experts, Bulgarian Green Building Council, Developers.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			
Impact measures	• Open green space area ratio • Share of green space areas within urban limits • Average annual concentration of PM2.5 • Average annual concentration of PM10 • Average daily concentration of SO_2							

Costs and benefits

Estimated cost	**CapEx:**	Green roof per m2: - BGN: 170 - EUR: 85		**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 919,400 EUR: 471,000		**Energy savings**	N/A	
	Design/development:	BGN: 34,000 EUR: 17,300		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Green roofs/walls are linked to improved air quality, reduced heat island impacts, and associated health outcomes. Green roofs improve energy efficiency and will improve thermal comfort for building occupants. Moreover, they are generally correlated to improved mental wellbeing as well.
		Improve safety and/or security	
		Enhance the public realm	Green roofs/walls revitalize the public realm by providing usable green space for recreation and/or habitat restoration.

		Access to basic services	
		Social equity	
	Economic co-benefits	**Revenue generating activities**	Green roofs/walls increase building value.
		Promotes economic inclusion	
		Avoided damages	Green roofs/walls can reduce energy costs, improve air quality, and mitigate extreme heat. They can also protect roof membranes, thereby reducing the likelihood that major repairs are required after severe weather.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	
		Enhances legislative environment	Green roofs have the potential to become lungs of a city. This serves to address cross sectoral environmental challenges such as reducing GHG emissions, improving air quality, restoring natural habitats and ecosystems, providing rainwater management on site, and improving energy efficiency in buildings.

5.5. Integrated water cycle management

The quality and availability of water is critical to both human and ecosystem health. Varna is home to diverse freshwater and marine environments and draws on these resources to support local lives and livelihoods. As the climate changes, it is especially important to carefully steward these resources to ensure they continue to provide their live giving services to the city.

5.5.1. Priority environmental challenges

Presently, Varna's residents nearly all have access to potable water and wastewater. At the same time, the city struggles with non-revenue water loss, losing up to 54% of potable water to leaks. This is reflected in the priority challenge focused on **depreciated potable water infrastructure impacting water quality** (C.7). Additionally, bathing water quality has historically been poor according to the Annual Report by the Black Sea Basin Directorate, however improvements have been seen in recent years. This is in part related to the **absence of monitoring and management processes of fresh and marine water pollution** (C.8).

Overall, stakeholders noted that there was a lack of whole water cycle management (C.5) in Varna, in that the water and wastewater systems are quite siloed and there is little data on the quality of water bodies. Similarly, Varna would like to do more to address the **lack of resilience planning for water and wastewater infrastructure** (C.6), to consider current and future climate change risks.

5.5.2. Ongoing actions in Varna

Varna Municipality has several completed or ongoing projects related to water quality and infrastructure. These include *Programme for environmental protection for Varna Municipality 2019-2023,* which sets out measures to mitigate the potential sources of water pollution.

Additionally, upgrades to water and wastewater infrastructure, including wastewater treatment plants are planned and/or underway for WWTP Varna and WWTP Golden Sands.

5.5.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
WCM1	Work with ViK Varna to introduce "smart" technology, i.e. IoT smart metering, across the potable water network.		Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
WCM2	Identify and remediate areas of cross-connection in the wastewater network and separate wastewater and rainwater runoff networks to reduce wastewater volumes at WWTP		Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City					
WCM3	Introduce wastewater sludge management (e.g. reuse in forestry and agricultural activities, reed beds and energy production)		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					

WCM4	Integrate Water Sensitive Urban Design (WSUD) and Sustainable Drainage System (SuDS) principles into land use, transport, and industry planning; and construction permitting rules.		Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City
WCM5	Develop and implement a structured maintenance programme to reduce leakage in the potable water network with a long-term target of 60-90% efficiency		Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources
WCM6	Develop a Flood Reduction Master Plan		Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City

WCM1: Work with ViK Varna to introduce "smart" technology, i.e. IoT smart metering, across the potable water network

Timeline

Strategic objectives	**SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City **SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources	2023	2024	2025	2026	2027+	
Priority Environmental Challenge(s)	**C.7:** Depreciated potable water infrastructure impacting drinking water quality (and standard of service provision) **C.5:** Lack of whole water cycle management						
Description	Acting as a pre-curser to the implementation of GCAP action WCM5, WCM1 will introduce smart technology across the potable water network that is able to both identify leaks and monitor consumption patterns across the City of Varna in real-time. There are a number of actors which contribute to compromised water quality including water leakage within a network associated with an ageing infrastructure and pipe damage from cold weather or heavy traffic. Leaks can also be responsible for substandard water production and poor disinfection of water. This action strives to allow the Municipality and Vik Varna Ltd to tackle the problem of non-revenue water loss and water quality challenges at scale, minimising service disruption and cost, and improving quality. The smart technology that this action shall adopt will be used to identify leaks across a number of assets such as mains, customer, ferrule, valve, and smart hydrant. These technologies include: 1. Satellite leak detection (overlaying images from Satellite-mounted sensors with GIS to detect leaks), 2. Smart-Metering IoT LPWAN (installed at key points in the network to form an IoT suite, they can help identify consumption inefficiencies, patterns, and water wastage) and 3. Acoustic instrument methods (such as correlators, noise loggers and ground microphones). The product of this work may ultimately lead to rehabilitation, repair, and replacement programmes, and the full programme approach should keep this in mind.						
Steps for implementation	1. Assemble a team in collaboration with Vik Varna Ltd to develop and manage a structured maintenance programme in-line with the heightened efficiency target	Q1 2023	IBB Directorate in partnership with Vik Varna Ltd				
	2. Identify the most appropriate and cost-effective smart technology to introduce across the potable water network.	Q2 2023					
	3. Develop technical requirements, financing mechanisms and tender documents to procure services for the appropriate smart technology	Q3 2023					
	4. Procure and supervise the appropriate smart technology works.	Q4 2023 – Q2 2024					
	5. Use the output of the works to inform GCAP action WCM5.	Q2 2024					
	6. Undertake regular / continuous monitoring of leaks and consumption patterns across the Varna network.	Q2 2024 onwards					
Plan for delivery	**Action owner**	IBB Directorate in partnership with Vik Varna Ltd					
	Stakeholders	TPO Varna, Ministry of Regional Development and Public Works, Regional Inspectorate of Environment and Water, Eco Varna, Manufacturers of appropriate technologies, Bulgarian Water and Wastewater Holding, Bulgarian Water and Energy Regulation Commission					

	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			
Impact measures	• Non-revenue water • Annual average of daily number of hours of continuous water supply per household							

Costs and benefits						
Estimated cost	**CapEx:**	BGN: 16,800,000 EUR: 8,500,000		**Water savings**	Up to a 10% reduction in water consumption can be observed through smart meter installation per household[10]	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	n/a	
	Design/development:	N/A		**CO_2 savings**	300 Annual tCO2e	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	
		Improve safety and/or security	Helps improve water availability and quality standards through reducing non-revenue water and drinking water quality improvements.
		Enhance the public realm	
		Access to basic services	Enables an improved level of service to customers
		Social equity	
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	Cost-savings in the operation and maintenance phase may reduce pressure on suppliers and, consequently, on customers.
		Avoided damages	The cost associated with non-revenue water will be reduced and/or provision of alternative more costly water e.g. bottled water.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Undertaken in conjunction with GCAP action WCM5, this action would require collaboration between the Municipality and Vik Varna Ltd, enhancing relationships and also knowledge base and skills around water loss reduction/water quality practices. This action helps Varna progress towards digital utility.
		Enhances legislative environment	

[10] Smart water metering and the climate emergency' report: https://www.waterwise.org.uk/knowledge-base/smart-metering-and-the-climate-emergency-2021/

WCM2. Identify and remediate areas of cross-connection in the wastewater network and separate wastewater and rainwater runoff networks to reduce wastewater volumes at WWTP

Timeline

Strategic objectives	**SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City			2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.4:** Ageing and/or capacity constrained wastewater treatment plants **C.5:** Lack of whole water cycle management **C.6:** Lack of resilience planning for water and wastewater infrastructure **C.7:** Depreciated potable water infrastructure impacting water quality							
Description	This action aims to identify and address cross-connections with the wastewater network can cause excess flow in the foul systems of up to five-times the dry-weather levels, leading to sewer bypasses / discharging of water that has not been fully treated into the sea or surrounding water bodies. This can occur either locally in the system or at wastewater treatment plants (WWTPs). Property owners (both commercial and residential) are responsible for ensuring that there are no cross-connections in their properties. For all other conditions, it is Varna Municipality's via ViK Varna Ltd. responsibility to monitor and address any cross-connections in these systems, an example being exfiltration and infiltration for the sewerage network which cross-over with other networks. Varna Municipality will monitor and identify cross-connections using a combination of the following methods: (1) sanitary sewer flow monitoring; (2) manhole inspections and 3D technology; (3) smoke testing; (4) dye testing; (5) pipe inspection/CCTV inspection; and/or (6) private property inspections, (7) Rainfall Derived Infiltration and Inflow (RDII) Modelling, (8) Biological / pollutant monitoring on discharge / bypass receiving watercourses. Focus would be given to where the problems exist in the system and the source (inflow, cross-connections, and infiltration etc).							
Steps for implementation	1. Assess digital readiness of the City to implement digital solutions, with focus on data collection, data storage, and date evaluation.	Q1 2023	IIB Directorate in partnership with Vik Varna Ltd.					
	2. Based on the assessment, assemble a team in collaboration with Vik Varna Ltd. to manage the monitoring and identification of cross-connections	Q1 2023						
	3. Obtain records from Vik Varna Ltd of flow rates at WWTP and identify preferred method of identifying areas of cross-connection as described above.	Q2 2023						
	4. Undertake the appropriate method of identification and set out a monitoring and implementation schedule; undertake monitoring.	Q2 2023 – Q2 2024						
	5. Based on results of monitoring for cross-connections, decide whether upgrades shall be handled by Vik Varna Ltd. or in combination with contractor. It may be worthwhile to bundle works with GCAP Action WCM5 ' Develop and implement a structured maintenance programme to reduce leakage in the potable water network with a long-term target of 60-90% efficiency'. Additionally, if it becomes evident that cross-connections on private property may be an issue, Varna Municipality will assess the need to introduce further policy or awareness campaigns to address this issue.	Q3 – Q4 2024						
	6. Identify the design specifications and develop contracts if private contractor required. Support tender process. Alternatively carry out works through Vik Varna Ltd, or via a remediation programme financed by the city.	Q1 2025 – Q1 2026						
	Action owner	IIB Directorate, Vik Varna Ltd.						

Plan for delivery	**Stakeholders**	Black Sea Basin Directorate – Varna, Bulgarian Energy and Water Regulatory Commission, Ministry of Environment and Water; Regional Inspectorate of Environment and Water; local property owner, Bulgarian Water and Wastewater Holding						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes		Non-tax revenues (fees, charges, penalties, etc.)		Donor funding		Government payments / Availability payment
Impact measures	• Biochemical Oxygen Demand (BOD) in rivers and lakes • Bathing water quality coastal ecological status • Non-revenue water							

Costs and benefits

Estimated cost	**CapEx:**	N/A		**Water savings**	N/A
	OpEx:	N/A		**Energy savings**	N/A
	Design/development:	BGN: 454,100 EUR: 232,900		**CO_2 savings**	300 Annual tCO2e

Environmental benefits

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Separating cross-connections can reduce instances of wastewater contamination in water bodies, thereby improving health of residents and sea bathers.
		Improve safety and/or security	
		Enhance the public realm	This programme would see fewer instances of wastewater discharge during heavy rain events, thereby improving the public realm, from both the foul network, WWTW (waste-water treatment works) and surface water networks. Similarly, a programme of overflow monitoring could be included to assess network performance.
		Access to basic services	Separating wastewater and stormwater connections has the potential to reduce the pressure placed on WWTPs, enhancing their ability to provide their services.
		Social equity	Lower-income or vulnerable residents tend to be located nearer to WWTP due to property prices, etc. Reducing the likelihood of wastewater discharge from these plants has the potential to improve the well-being of those in the immediate vicinity.
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	
		Avoided damages	This action supports avoided damages by reducing the pressure on existing WWTPs, meaning that less money will need to be spent on upgrading or replacing them over time, and the indirect damages of WWTP overloads (e.g. wastewater discharge into water bodies) and associated impacts would be avoided.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	This action could be undertaken in conjunction with GCAP Action WCM5, and would require collaboration across different departments, thereby enhancing communication and knowledge-sharing among them.

		Enhances legislative environment	

WCM3. Introduce wastewater sludge management (e.g. reuse in forestry and agricultural activities, reed beds and energy production)

Strategic objectives	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. **SO.11**: Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources							
Priority Environmental Challenge(s)	**C.11:** Reliance on fossil fuel electricity generation and low uptake of renewables							
Description	Wastewater sludge refers to the organic by-product of the wastewater treatment process. Wastewater sludge's high organic content means that it provides multipurpose uses that Varna Municipality will leverage to improve the circularity of its resource management. This includes reusing sludge for compost/fertilizer in agricultural or forestry-related activities and renewable energy (e.g. biogas). Varna Municipality will support local WWTPs in developing the market for sludge reuse by assessing if there are any policies to support the market and can consider developing this project as a PPP if applicable.							
Steps for implementation	1. Develop a project team in collaboration with ViK Varna Ltd and appropriate WWTP operators.	Q1 2024	IIB Directorate in collaboration with Vik Varna Ltd.					
	2. Carry out analysis to determine the size of the potential local biosolids market (the term for reused sludge).	Q2 – Q4 2024						
	3. Identify any policies that need to be enacted to incentivize the market.	Q2 – Q4 2024						
	4. Contract supplier to package and distribute the biosolids.	Q3 2024 – Q2 2025						
Plan for delivery	**Action owner**	IIB Directorate ; Vik Varna Ltd.						
	Stakeholders	Ministry of Environment and Water; Regional Inspectorate of Environment and Water; agricultural providers, Bulgarian Water and Wastewater Holding.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			

Timeline	2023	2024	2025	2026	2027+
		■	■		

Impact measures	• Annual CO_2 equivalent emissions per capita					
Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 168,000 EUR: 86,000		**CO_2 savings**	4,400 Annual tCO2e	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	The use of biosolids in energy generation has the potential to contribute to reduce the greenhouse gas emissions associated with WWTP and therefore improving local air quality and associated health impacts.			
		Improve safety and/or security				
		Enhance the public realm	The proper use of biosolids as opposed to synthetic fertilizers has a host of benefits included reducing the amount of runoff and associated eutrophication of water bodies, thereby improving the public realm.			
		Access to basic services				
		Social equity				
	Economic co-benefits	**Revenue generating activities**	This action would create a market in biosolids, and revenue could be generated from the sale of the solids, particularly for organic or regenerative producers.			
		Promotes economic inclusion	This action would provide an opportunity for people to get involved in the biosolids market, prompting employment and other opportunities			
		Avoided damages	The use of organic material in the form of biosolids for agriculture reduces the dependency on synthetic fertilizers and the associated challenges they can pose to food production or ecosystems more generally.			
	Institutional co-benefits	**Improve institutional capacity or efficiency**	This action sets out a foundation for private or publicly funded organisations to work cooperatively with the Municipality around developing markets for resources to better use the resource across its lifecycle.			
		Enhances legislative environment				

WCM4: Integrate Water Sensitive Urban Design (WSUD) and Sustainable Urban Drainage System (SuDS) principles into land use, transport, and industry planning; and construction permitting rules

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.9**: Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City					
Priority Environmental Challenge(s)	**C.5**: Lack of whole water cycle management **C.6:** Lack of resilience planning for water and wastewater infrastructure					

Description	Varna Municipality will implement Sustainable Urban Drainage Systems (SuDS) and Water Sensitive Urban Design (WSUD) principles with the aim to tackle surface water runoff and consequent environmental pollution and flooding. The intention of this action is to streamline effective water cycle management into urban planning and design in the city. WSUD will focus on a holistic land planning approach to urban water cycling, encompassing stormwater, groundwater, wastewater, and water supply into urban development. Meanwhile, SuDS are a series of water management processes which seek to utilise natural water cycle processes by aligning with traditional drainage systems, with the aim to slow water cycling and naturally extract pollutants. Examples of design interventions that could be introduced as a result of effective planning for WSUD can include a combination of bioretention systems, stormwater harvesting and rainwater recycling, SuDS can also be a component of WSUD where examples include permeable surfaces, bioswales, green roofs and constructed wetlands. Following the completion of the Flood Reduction Master Plan (GCAP action WCM6) in Q4 2022, WSUD and SuDS will be integrated into urban design where applicable to increase resilience throughout Varna. The Flood Reduction Master Plan will use GIS mapping and flood risk hazard assessment techniques to identify areas prone to surface water runoff and flooding and direct the implementation of WSUD and SuDS in combination with traditional hard engineered solutions as appropriate.						
Steps for implementation	1. Complete Flood Reduction Master Plan (GCAP action WCM6.) aligned with other urban plans.	Q1-Q4 2024	IIB Directorate				
	2. Assemble a cross-sectoral team (land use, transport, industry, buildings) to consult on the appropriate implementation of SuDS and WSUD principles, ensuring a conjoined approach.	Q1 2025					
	3. In the next revision cycle, update planning and building regulations to include WSUD and SuDS principles.	Q2 – Q4 2025					
	4. Seek Council Approval of the new planning documents.	Q1 2026					
Plan for delivery	**Action owner**	IIB Directorate					
	Stakeholders	Architecture, Urban and Development Panning Department, Regional Inspectorate of Environment and Water, Ministry of Regional Development and Public Works, Municipal administration Healthcare department, ViK Varna Ltd., TPO Varna, EcoVarna, WWF Danube-Carpathian Program, Za Zemiata, Bulgarian Water and Wastewater Holding.					
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			
Impact measures	• Biochemical Oxygen Demand (BOD) in rivers and lakes • Ammonium (NH_4) concentration in rivers and lakes • Nitrogen concentration in rivers and lakes (additional indicator) • Estimated economic damage from natural disasters floods droughts earthquakes etc. as a share of GDP.						

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	

	Design/development:	BGN: 67,300 EUR: 34,500		**CO_2 savings**	N/A	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Air and water pollutants will be filtered through the SuDS system reducing the incidences of water borne and vector borne diseases, respiratory infections etc.			
		Improve safety and/or security	Reduces the risk of surface water flooding and also enhances water security.			
		Enhance the public realm	Reduction in flooding will reduce damage to public spaces, increase usability, improve aesthetics, and reduce odours to improve the public realm.			
		Access to basic services				
		Social equity				
	Economic co-benefits	**Revenue generating activities**				
		Promotes economic inclusion				
		Avoided damages	SuDS will reduce the impact of flooding thereby reducing damage to properties and infrastructure.			
	Institutional co-benefits	**Improve institutional capacity or efficiency**				
		Enhances legislative environment				

WCM5: Develop and implement a structured maintenance programme to reduce leakage in the potable water network with a long-term target of 60-90% efficiency

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City **SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
Priority Environmental Challenge(s)	**C.7:** Depreciated potable water infrastructure impacting water quality **C.5**: Lack of whole water cycle management					

Description	On a global level in 2019, the non-revenue water (NRW) was calculated to be 30% of water system inputs. Varna is no exception to potable water losses and in 2019, the 'Programme for Environmental Protection for Varna Municipality 2019 - 2023' set a target to reducing water leaking to **57.3%,** by 2021 and an IFI (infrastructure Leakage Index) of **1.5**. Significant investment has already been put towards upgrading the existing potable water network by ViK Varna. This action aims to build on current efforts to further reduce leakage in the potable water network with an efficiency target of between **60 to 90%** by 2031 (in line with the GCAP 5 to 10-year Medium-Term-Target SO.9a). The most recent, publicly available data from ViK Varna Ltd shows that the efficiency of Varna's Potable water network in 2019 was at **54%.** Effective management is an important part of helping reduce losses within the water distribution network. The Municipality, in partnership with Vik Varna will utilise the smart metering technology to be introduced by GCAP action WCM1 in order to help identify areas of the potable water network with low efficiencies and high leakage rates. Using this information, a targeted and structured maintenance programme will be rolled out, adopting one or more of the following practices to control water losses: 1. Ground water infrastructure deterioration modelling 2. Pressure Management 3. Infrastructure Management 4. Pipe Corrosion Control 5. Leak Control 6. Measurement Error Control and 7. Capacity Building for staff (e.g. asset managers) on Non-revenue water.		
Steps for implementation	1. Assess digital readiness of the City to implement digital solutions, with focus on data collection, data storage, and date evaluation.	Q1 2023	IBB Directorate in partnership with Vik Varna Ltd
	2. Assemble a team in collaboration with Vik Varna Ltd to develop and manage a structured maintenance programme in-line with the heightened efficiency target	Q1- Q2 2023	
	3. Identify financing opportunities and appropriate funders to accelerate investment into water infrastructure.	Q3 2023	
	4. Develop a suite of water loss control / maintenance practices that could be applied to areas of low efficiency within the network to reduce water losses.	Q4 2023 – Q3 2024	
	5. Building on the "smart" technology metering system proposed in GCAP action WCM1, identify the areas of the potable water network that have low efficiency ratings and maintain regular monitoring.	Q3 2024	
	6. Prepare an ongoing leakage strategy.	Q4 2024 – Q1 2025	
	7. Implement the maintenance programme.	Q2 2026 Onwards	
	8. Complete regular reviews and continuous improvement sessions to track the progress of the loss-leakage ratio against the 2031 targets, ensuring maintenance practices applied are best-practice.	Q3 2024 Onwards	

Plan for delivery	**Action owner**	IBB directorate in partnership with Vik Varna Ltd.						
	Stakeholders	Ministry of Regional Development and Public Works, Regional Inspectorate of Environment and Water, Eco Varna, Bulgarian Water and Energy Regulation Commission.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			

Impact measures	• Non-revenue water • Annual average of daily number of hours of continuous water supply per household					
Costs and benefits						
Estimated cost	**CapEx:**	BGN: 78,600,000 EUR: 39,800,000		**Water savings**	10-40% reduction in potable water leakage over the lifespan of the action.	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	n/a	
	Design/development:	BGN: 224,250 EUR: 115,000		**CO_2 savings**	2,600 Annual tCO2e	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Pressures on water availability will reduce and the quality of water will improve, both of which have positive impacts of the health of the Citizens who consume the potable water.			
		Improve safety and/or security	Helps improve water security through reducing non-revenue water.			
		Enhance the public realm				
		Access to basic services	Enables an improved level of service to customers.			
		Social equity				
	Economic co-benefits	**Revenue generating activities**				
		Promotes economic inclusion				
		Avoided damages	The cost associated with non-revenue water will be reduced, reducing the pressure on suppliers and subsequently on customers.			
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Undertaken in conjunction with GCAP action D.WCM1, this action would require collaboration between the Municipality and Vik Varna Ltd, enhancing relationships and also knowledge base and skills around water loss reduction practices.			
		Enhances legislative environment				

WCM6: Develop a Flood Reduction Master Plan.

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.9:** Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City					
Priority Environmental Challenge(s)	**C.7:** Lack of whole water cycle management **C.6:** Lack of resilience planning for water and wastewater infrastructure					

Description	A Flood Reduction Drainage Master Plan for Varna will outline the city's approach to planning and designing stormwater infrastructure for 2023-2038. The Master Plan will be effective for up to 15 years devising a strategy to protect Varna's natural and built environment to current and future natural hazards. In preparing the Master Plan, relevant stakeholders will be assembled to jointly identify the challenges and prepare actions for the Master Plan. GIS (Geographic Information System) will be employed to assess the current baseline for Varna. Using a digital tool such as GIS and approaches such as Flood Risk Hazard Mapping, a risk assessment will be performed to identify the points of high risk for flooding and outline key actions to build resilience to climate change and reduce the impact of storms and excess precipitation. Mapping can be an aid in the planning phase and for testing the recommendations of the plan. Consideration will also be given to data collection, data transfer, storage and digital interpretation and utilisation for modelling, planning, and visualisation of the information of flooding gathered. Recommendations of the plan will include soft and hard interventions. Soft measures could include Sustainable Urban Drainage Systems (SuDS) and Water Sensitive Urban Design (WSUD) in line with GCAP action WCM4 or the development of an early warning system, with more hard interventions outlining traditional storm separation, pumping/conveyance solutions. The Master Plan needs to consider; interaction with high groundwater levels, the ability of ground to accept stormwater infiltration and the impact of saltwater intrusion and sea level rise on groundwater. In addition to this, for SuDS and WSUD there is a need to consider how future changes in climatic conditions (under appropriate projection scenarios RCP6.0 and RCP8.5) could impact the solutions selected, such as increased rainfall levels, increased river and stream levels and sea level rise and how this could impact outfalls from storm systems and cause flooding via the surface water networks. Consideration also needs to be given to Varna's most vulnerable population groups, such as the elderly, disabled, economically deprived, women and refugees, as events such as flooding can have a disproportionate impact on these communities. The Master Plan should be developed alongside GCAP action WCM2; identifying cross connections in the wastewater network and separate wastewater and rainwater runoff networks to reduce wastewater volumes at WWTP.

Steps for implementation	1. Assemble relevant stakeholders to input into the Master Plan.	Q1 2024	IIB Directorate
	2. Utilise internal resources or procure external GIS services to develop base maps and to support preparation of the Master Plan.	Q2 2024	
	3. Using GIS software and adopting formal Flood Risk Management assessment, map and identify areas within the Municipality at high risk from flooding (both from surface and riverine flooding), cross-referencing this against information on the wastewater and surface water network (as per GCAP action WCM2). Map how this has the potential to change under appropriate climate change projection scenarios (RCP6.0 and RCP8.5)	Q3-Q4 2024	IIB Directorate in Partnership with TPO Varna
	4. Develop Flood Reduction Master Plan based on findings. That Masterplan should consider impact of flooding to vulnerable and critical infrastructure and property and inform other strategic urban plans (as required).	Q1 -Q3 2024	IIB Directorate
	5. Receive Council approval of Flood Reduction Master Plan.	Q4 2024	

Plan for delivery	**Action owner**	IBB Directorate.						
	Stakeholders	Commission for transport, commission for urban development and communal activities, commission for environmental protection and recovery, Regional Inspectorate of Environment and Water, ViK Varna Ltd., EcoVarna, WWF Danube-Carpathian Program, Za zemiata, Bulgarian Water and Energy Regulation Commission, TPO Varna,						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			

Impact measures	• Estimated economic damage from natural disasters floods droughts earthquakes etc. as a share of GDP.					
Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 742,000 EUR: 380, 400		**CO_2 savings**	N/A	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	The development of the plan and subsequent actions will reduce incidences and severity of flooding and surface water events, reducing exposure to water carrying water borne and vector borne diseases.			
		Improve safety and/or security	Improving Varna's stormwater management would potentially result in less frequent and severe storm and flooding events which could lessen damage to infrastructure and assets, reducing the risk of injury.			
		Enhance the public realm	Improving Varna's stormwater management would potentially result in less frequent and severe storm and flooding events which could reduce damage to people, private property, public infrastructure including public spaces, improve aesthetics and reduce nuisance odours to improve the public realm.			
		Access to basic services				
		Social equity	The most vulnerable population groups within society are those that tend to be disproportionately impacted by flood events – consideration of these vulnerable groups in the design of the master plan could help reduce their risk and alleviate this impact.			
	Economic co-benefits	**Revenue generating activities**				
		Promotes economic inclusion				
		Avoided damages	With fewer flooding events and increased resilience to storm events damages will be avoided with a lower impact on assets and therefore reduced expenditure.			
	Institutional co-benefits	**Improve institutional capacity or efficiency**	The development of an overarching Flood reduction Master Plan will improve institutional efficiency by demarking responsibilities and identifying priority actions with regards to stormwater management.			
		Enhances legislative environment				

5.6. Resilient land-use planning

Land use planning provides the foundation upon which the patterns of urban life are laid. It dictates access to opportunities and services, how easily people can get from place to place, and contributes to the health of ecosystem services when properly designed. It is therefore crucial to citizen well-being.

5.6.1. Priority environmental challenges

As an urbanizing city, Varna currently **lacks a holistic strategy for land-use planning** (C.14). The proximity of industrial and port activities to areas with significant biodiversity is a particular challenge. Urban expansion (including illegal construction, in the south of the municipality) adversely affects habitats. The GCAP therefore seeks to address urban expansion in a way that protects ecosystems.

Additionally, Varna experiences the **urban heat island effect** (C.15), which means that it is hotter than surrounding peri- or ex-urban areas because its built-up land absorbs heat. Climate change is likely to exacerbate this effect. Therefore, it's important to plan land use to mitigate the effect as much as possible.

5.6.2. Ongoing actions in Varna

There are several ongoing actions related to land use in Varna. The municipality is required to develop a detailed Spatial Plan at the local level that sets out land use, development densities and other priorities. Under the (national) *Spatial Development Act 2001*, municipality mayors (or ward mayors) are required to appoint an expert board on spatial development.

Varna Municipal Council has adopted an ordinance for the construction and protection of the green system on the territory of the municipality, which defines the obligations and rights of the municipality, organisations and citizens in the management and use of the landscaped areas and ornamental tree and shrub vegetation.

Land use planning and status decisions are all regulated by the Varna Municipality Department of Architecture and Urban Planning. Additionally, land use decisions must be approved by the Mayor, commission on "Environmental Protection and Restoration", and the Municipal Council.

A public register of green areas including parks and gardens, is intended as an information monitoring system on the condition and use of such areas.[11] It is used to inform measures to improve the condition of green spaces.

Finally, under the "Implementation of Integrated plans for urban reconstruction and development 2014 – 2020" as part of the "Operations Programme "Region's growth 2013 – 2020", Varna Municipality has implemented the project "Anesthetization and Modernization of the Urban Environment in Varna", the aim of which has been to increase the quality of life, social inclusion and ecological environment through improving the physical environment of urban spaces. This project repairs and reconstruction 7 sites, covering an area of 500m2 between apartment buildings.[12]

[11] Programme for environmental protection for Varna Municipality 2019-2023, pg. 279
[12] Aesthetics and modernization of the urban environment in Varna https://www.Varna.bg/bg/349

5.6.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
Lu1	Introduce policy and tax incentives to prioritise brown-field development over greenfield.		Varna Municipality will help create opportunity for future, green investment. Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
Lu2	Climate change mitigation and adaptation considerations and analysis to inform policy in the General Development Plan		Varna Municipality will help create opportunity for future, green investment. Varna Municipality will raise awareness around environmental challenges and climate change. Varna Municipality will help build the City's resilience to future climate change risks Varna Municipality will help create more integrated, accessible, and inter-connected green space throughout the City.					
Lu3	Install permeable pavements in sections of parking lots, and rain gardens can be included where required		Varna Municipality will help build the City's resilience to future climate change risks Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City.					

Lu1: Introduce policy and tax incentives to prioritise brownfield development over greenfield.

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.1:** Varna Municipality will help create opportunity for future, green investment. **SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
Priority Environmental Challenge(s)	**C.14**: Lack of holistic strategy for land-use planning **C.3**: Lack of sewerage and stormwater infrastructure in parts of the municipality **C.6:** Lack of resilience planning for water and wastewater infrastructure					

Description

Rehabilitating or redeveloping brownfield land (brownfield land refers to any land that has been previously developed and may be contaminated) is essential to sustainable development. It combats urban sprawl and the conversion of green spaces into built up areas, rehabilitates potentially contaminated, previously used land and restores habitats, and reconnects brownfield sites with the surrounding community. To incentivize the redevelopment of brownfield sites, Varna Municipality will consider the following incentives:

Tax increment financing, in which Varna Municipality or appropriate stakeholder would issue bonds to fund redevelopment of these sites. These bonds would be repaid using business tax revenue generated via the new development/infrastructure.

Tax on uncompleted development on brownfield land, in which Varna Municipality would levy a tax on unfinished developments that had previously received planning permission. Developers will occasionally use this tactic of sitting on properties to benefit from changes in land value, rather than funding the full development. Therefore, the Municipality can combat this inefficient use of land by levying taxes. To do this, the Municipality will require a brownfield remediation and development framework plan including a reasonable date of completion which will serve to evaluate projects which fall into non-compliance on a case-by-case basis

Provide technical assistance for brownfield remediation which includes developing a brownfield remediation and development plan which clearly outlines the steps based on a best practice minimum. As a minimum this must include a soil test and environmental assessment, with the relevant remediation strategies based on the output of this analysis. The brownfield remediation and development plan must also demonstrate that an appropriate use for the brownfield site is proposed (e.g. affordable housing, energy efficient build, employment delivery) and that the proposed development will serve to improve the area, restore natural habitat, and positively contribute to the social and economic state of the community.

Steps for implementation			
	1. Assemble project team to research and develop the policy mechanisms.	Q1 2024	AGUP Directorate
	2. Appoint an external expert to develop a brownfield remediation framework which should be used by developers to apply for tax incentives and funding	Q1 -Q2 2024	
	3. Identify existing brownfield sites in Varna and undertake economic analysis to quantify potential value.	Q1 – Q2 2024	
	4. Based on the economic analysis, identify the requisite amount of funding required to support development of these areas.	Q3 2024	
	5. Designate a unit within AGYP Directorate to facilitate the programme.	Q3 2024	
	6. Gain approval to pass the policy into law.	Q4 2024	Municipal council
	7. Launch programme with engagement campaign.	Q1 2025	AGUP Directorate
	8. Monitor effectiveness.	Q2 2025 onwards	
	Action owner	AGUP Directorate	

Plan for delivery	**Stakeholders**	Local Taxes Directorate, Local developers, RIEW Varna,						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)		Donor funding		Government payments / Availability payment	
Impact measures	• Concentration of mercury in soil • Concentration of cadmium in soil • Concentration of zinc in soil • Concentration of mineral oil in soil using infrared spectroscopy • Open green space area ratio • Share of green space areas within urban limits • Population density on urban land • Average annual growth rate of built-up areas • Utilize existing water and sewage infrastructure							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	Environmental benefits
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 11,200 EUR: 5,800		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Remediating brownfield land can decrease the chances of health impacts from chemical or biological agents
		Improve safety and/or security	Brownfield land can draw vandalism and make residents feel unsafe. Developing this land rather than leaving it vacant or disused can remedy this.
		Enhance the public realm	Redeveloping brownfield land can improve the public realm through reintegrating blighted, abandoned areas back into the community. Appropriate development can improve social and economic prosperity in the area.
		Access to basic services	Redeveloping brownfield land can improve access to services through proper design, including affordable housing, business, or other services needed in the area. In a city with insufficient infrastructure, redeveloping previously developed sites will provide access to sewage and water services which are already in place.
		Social equity	See ‘access to basic services’ and also, with proper design, redeveloping brownfield land can better serve marginalised communities or those who are differently abled.
	Economic co-benefits	**Revenue generating activities**	Ideally, redevelopment of brownfield land will generate revenue through new economic activity
		Promotes economic inclusion	This programme would like generate employment beyond just initial remediation and construction of land.
		Avoided damages	Damages avoided include environmental pollution from non-remediated land, environmental degradation, or urban heat island from encroachment on green space.

	Institutional co-benefits	**Improve institutional capacity or efficiency**	This action will support cross-departmental collaboration and also connect the Municipality to local developers and relevant stakeholders.
		Enhances legislative environment	This action will support Varna Municipality's budget and incentive environment to promote best practice development

Lu2: Climate change mitigation and adaptation considerations and analysis to inform policy in the General Development Plan

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.1**: Varna Municipality will help create opportunity for future, green investment. **SO.2:** Varna Municipality will raise awareness around environmental challenges and climate change. **SO.3**: Varna Municipality will help build the City's resilience to future climate change risks **SO.7:** Varna Municipality will help create more integrated, accessible, and inter-connected green space throughout the City.					
Priority Environmental Challenge(s)	**C.14:** Lack of holistic strategy for land-use planning **C.20**: Lack of adaptation strategy/plan and requisite institutional structure					

Description

The aim of this action is to is to encourage a more holistic and resilient approach to land-use planning in Varna. By incorporating best practice adaptation and mitigation considerations within the policy of the General Development plan, it will help ensure that future policies and activities are more resilient – planned, designed, and implemented in a way that helps reduce potential future impacts and enhance opportunities. To ensure a holistic approach, this action should be aligned with the following GCAP actions; CC1, CC2 and CC3

Mitigation:

The climate change projections that should be incorporated within future Municipal policy documents will align with those published in the National Climate Change Adaptation Strategy and Action Plan (2019) and research by the Department of Meteorology, National Institute of Meteorology and Hydrology and the Bulgarian Academy of Sciences. This incorporates timeframes of 2050 and 2080, considering the projection scenarios Representative Concentration Pathways (RCP)6.0 and RCP8.5. All general development plan policies should be updated to align with any future revisions and publications of the climate change projection data.

Adaptation:

The National Climate Change Adaptation Strategy and Action Plan (2019) highlights the main climate related hazards and vulnerabilities for Bulgaria. This action will undertake a climate change risk assessment for the geographical jurisdiction of Varna Municipality by building on the national assessment and considering the likely climate change impacts from projection scenarios RCP6.0 and RC8.5 incorporated within the mitigation aspect of this action. Aligned with GCAP Action CC.6, the risk assessment will follow best practice guidance with clear definitions for risk and vulnerability adopted, such as those introduced by WGII Assessment Report 5 (AR5) published by IPCC. (Intergovernmental Panel on Climate Change). Extensive stakeholder engagement will help ground-truth the analysis undertaken, with an exercise to collect and publish data on diversity and inclusion to ensure representation from all vulnerable community groups.

Steps for implementation

Adaptation		
1. Identify and fund an inter-agency project team to manage / lead the risk assessment	Q1-Q2 2024	AGUP Directorate
2. Procure the appropriate specialist support to undertake the risk assessment	Q2 2024	
3. Complete risk assessment covering appropriate spatial area and time periods (e.g. 2030, 2050, 2080	Q2 2024 – Q1 2025	
4. Integrate findings of the risk assessment into the general development plan.	Q1 2025	

	Mitigation							
	1. Allocate Municipal budget and fund an inter-agency project team to manage the work.						Q1 – Q2 2024	AGUP Directorate
	2. Procure appropriate specialist report if required.						Q2 2024	
	3. Develop urban masterplan documents with appropriate considerations.						Q2 – 2024 – Q1 2025	
	4. Determine budget and human resource implications to implement in full and integrate into forward planning.						Q2 2025	
Plan for delivery	**Action owner**	AGUP Directorate						
	Stakeholders	Ministry of Regional Development, IIB Directorate, RIEW, specialists' consultants,						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			
Impact measures	• Consideration of climate change adaptation and mitigation in development policies							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 80,000 – 92,000 EUR: 40,600 – 46,000		**CO_2 savings**	N/A	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**				
		Improve safety and/or security				
		Enhance the public realm				
		Access to basic services				
		Social equity	This action will help promote an understanding of the impacts of climate change on Varna's most vulnerable population groups.			
	Economic co-benefits	**Revenue generating activities**				
		Promotes economic inclusion				
		Avoided damages	Understanding the potential future impact of climate change would inform future mitigating efforts that could potentially reduce the severity and frequency of impacts due to future hazardous events.			

	Institutional co-benefits	**Improve institutional capacity or efficiency**	Increased capacity and knowledge on delivering best-practice urban planning considerations in relation to climate change mitigation and adaptation considerations.
		Enhances legislative environment	The urban planning regulations and standards would become best-practice and create a more resilient and sustainable environment.

Lu3: Install permeable pavements in sections of parking lots, and rain gardens can be included where required

Timeline

Strategic objectives	**SO.9**: Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City **SO.3:** Varna Municipality will help build the City's resilience to future climate change risks	2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.5:** Lack of whole water cycle management **C.6:** Lack of resilience planning for water and wastewater infrastructure **C.15**: The Urban Heat Island effect					
Description	Following the development of the stormwater drainage Master Plan in line with GCAP action WCM6 and the integration of Water Sensitive Urban Design (WSUD) and Sustainable Urban Drainage Systems (SuDS) principles into Municipal planning through GCAP action WCM4, this action will implement the installation of permeable pavements and rain gardens throughout the City of Varna. The use of permeable pavement systems is a structural stormwater management practice designed to manage the quantity and quality of stormwater run-off, permeable pavements are an alternative paving surface that allow stormwater runoff to filter through voids in the pavement surface into an underlying stone reservoir, where the run-off is temporarily stored. This action should consider the four typical categories of permeable pavements: porous asphalt, pervious concrete, permeable interlocking concrete pavement and grid pavement systems. Raingardens can be defined as a shallow depression with absorbent, yet free draining soil planted with vegetation that can withstand occasional temporary flooding. Designed to mimic the natural water retention of underdeveloped land, they aim to reduce the volume of rainwater run-off into the stormwater systems, whilst also treating low levels of pollution. A feasibility study assessing the technical, economic, and social aspects of the proposed project will be conducted, based upon the findings of a flood risk assessment (FRA) which will identify the areas within the City that are at high risk to surface-water flooding. The action will be accompanied by an awareness campaign and maintenance strategy to stimulate engagement in the new measure and to maintain the quality and functionality of the installations.					
Steps for implementation	1. Assemble a project team to manage and implement the solution.	Q4 2023 – Q1 2024	AGUP Directorate			
	2. Conduct a flood risk assessment (FRA) to map areas within the City that are at high-risk to surface water flooding.	Q1 2024 – Q3 2024				
	3. Based on the outcomes of the FRA, complete a feasibility study to identify locations and identify appropriative technical, economic, and social aspects for the installation of permeable pavements and raingardens throughout the City.	Q4 2024 - Q1 2025				
	4. Engage private sector and/or IFIs to develop investment plan.	Q1 2025				
	5. Construct and implement the rain gardens and permeable pavements.	Q3 2025				

	6. Launch maintenance strategy for rain gardens and green spaces alongside community awareness campaign.					Q4 2025		
Plan for delivery	**Action owner**	AGUP Directorate						
	Stakeholders	Permanent Commissions on 'Architecture, construction, organization and development' and Urban development and communal activities, Municipal Property Management Directorate, Bulgarian Construction Chamber, Vik Varna, Bulgarian Chamber of Architects - Varna						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			
Impact measures	• % of permeable surface as part of the total pavement network in Varna							
Costs and benefits								
Estimated cost	**CapEx:**	BGN per 1m2: 250 EUR per 1m2: 130			**Water savings**	N/A	**Environmental benefits**	
	OpEx:	N/A			**Energy savings**	N/A		
Estimated co-benefits	**Social co-benefits**	**Action will improve health**						
		Improve safety and/or security	Fewer incidences of flooding are likely to occur with this action and therefore risk of injury is reduced to likely improve safety or Varna's residents. Likely to enhance water security and reduce heat island effect					
		Enhance the public realm	This action can increase the amount of natural green space in the urban environment, enhancing habitat for local wildlife, alongside providing recreational green space for residents.					
		Access to basic services	Enhanced access to green space within the City.					
		Social equity	Flooding disproportionately affects vulnerable groups, in reducing the likelihood and severity of flooding this action is likely to reduce damages, injuries and loss of life in vulnerable groups.					
	Economic co-benefits	**Revenue generating activities**						
		Promotes economic inclusion						
		Avoided damages	This action is likely to reduce flooding and surface water runoff and therefore reduce damage to assets, infrastructure and communities likely reducing the costs associated.					
	Institutional co-benefits	**Improve institutional capacity or efficiency**						
		Enhances legislative environment						

5.7. Circular waste practices

Varna's solid waste programme covers municipal solid waste (MSW), industrial waste, construction, and demolition waste (CDW), and hazardous waste. The municipality has a separate collection system for packaging waste, including paper, cardboard, glass, metal, and plastics. At the same time, Varna would like to expand and institutionalise circular principles aligned with the waste hierarchy, to mitigate increasing solid waste generation in the municipality.

5.7.1. Priority environmental challenges

Stakeholders in Varna noted that both the **incineration of solid waste** (C.16) and the **illegal dumping of solid waste** (C.17) are key challenges in the city. For example, eight illegal dump sites were cleaned up in 2018. Discussions with municipal staff indicated that illegal dumping is a problem with all types of waste streams including hazardous (e.g. from hospitals) and industrial waste.

5.7.2. Ongoing actions in Varna

The municipality has an initiative for composting of green waste from municipal parks and green areas as part of an EU funded project[13]. There are 493 collection points for packaging waste across the municipality, which (as reported in 2019) were to be increased to 642 collection points to comply with changes in national legislation.[14] Since 2017, the service is provided by Eco Partners Bulgaria AD under a cooperation agreement with the municipality.

The Waste Management Plan of Varna Municipality (2015-2020) sets out the municipalities commitment to waste reduction through combination of legal instruments and campaigns. For 2020, an investment of BGN 394,000 is planned for the construction of waste container locations and BGN 72,000 for control of waste collection activities.

5.7.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
SW1	Accelerate investment in recycling facilities, supported by strategic planning to ensure saleable outputs can be produced, alongside dedicated programmes to support waste separation		Varna Municipality will help create opportunity for future, green investment. Varna Municipality will improve the management system and physical infrastructure for solid waste collection and disposal Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
SW2	Develop and implement an integrated recycling program to promote the use of resourceful construction and demolition materials and create green jobs (i.e. inert construction and demolition waste as secondary aggregate).		Varna Municipality will help create opportunity for future, green investment. Varna Municipality will improve the management system and physical infrastructure for solid waste collection and disposal Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					

[13] Bilateral meetings with municipal staff, June 2019
[14] Programme for environmental protection for Varna Municipality 2019-2023, pg. 162

SW1: Accelerate investment in recycling facilities, supported by strategic planning to ensure saleable outputs can be produced, alongside dedicated programmes to support waste separation

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.1:** Varna Municipality will help create opportunity for future, green investment. **SO.10:** Varna Municipality will improve the management system and physical infrastructure for solid waste collection and disposal **SO.11**: Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources.					
Priority Environmental Challenge(s)	**C.16:** Incineration of solid waste.					

Description

Strategic Planning

Varna Municipality will devise a strategic plan which provides direction on how to ensure saleable outputs are produced from the recycling facilities and infrastructure within the City of Varna for paper, cardboard, metal, plastic, and glass. In line with the "Programme for Environmental Protection for Varna Municipality 2019-2023" which outlines targets for re-use and recycling, the separation of household waste and the recovery of construction and demolition waste, alongside alignment with GCAP action SW2, this strategy will require effective communication and collaboration with relevant stakeholders including local manufacturers and producers and will help inform the investment decisions made as part of this action.

Accelerate Investment

Varna Municipality will accelerate investment in recycling facilities for either paper, metal, plastic, and glass to improve the re-use and recycling of materials within the City of Varna. In the territory of the Municipality of Varna, there are currently 24 sites for collection and storage of recyclable waste from paper, cardboard, plastic, metals, and glass (where citizens can bring and drop-off their recyclable waste), with only one on-site recycling facility for plastic waste. There is also a system of containers distributed across 471 locations within the Territory of the Municipality of Varna for the collection of packaging waste (defined as any type of packaging or packing material). In conjunction with the strategic plan development aspect of this action, the Municipality will partner directly with industry stakeholders to understand the current pipeline of existing and future investment opportunities that could be adopted and / or enhanced by appropriately identified funders. Initially, the municipality will explore and identify potential Public Private Partnership (PPP) arrangements which could finance recycling facilities while addressing regulatory barriers to investment. Investment opportunities could span from the construction or re-generation of recycling facilities, investing in the infrastructure and assets required in waste collection. Where possible, these opportunities should seek to retain value within Varna, promoting sustainable local trade, ensure that finance opportunities identified support local markets and prioritise long-term contracts to foster economic growth.

Steps for implementation

Strategic Planning		
1. Complete market research to identify saleable outputs	Q1 2023	Directorate "Ecology and Environmental Protection"
2. Assess current infrastructure, materials, processes, and regulations for recycling in Varna, understanding the availability of additional material from current residual waste.	Q1 2023	
3. Assess and review the local national and international markets for recycled material, incorporating a business risk assessment.	Q2 2023	
4. Develop a strategic plan, in collaboration with industry stakeholders and in co-ordination with GCAP action SW2 for the separation of waste. Specifically, the plan should consider i) Source separation, ii) Collection, Transport and Processing, and iii) Markets for recycled materials.	Q2 – Q4 2023	
5. Implement updated waste separation and recycling programme.	Q1 2024 onwards	
Accelerate Investment		

	1. Identify key stakeholders and partners for investment in facilities and programmes.	Q2 2023	Directorate “Ecology and Environmental Protection”
	2. Partner with industry stakeholders to understand the pipeline of current investment opportunities for recycling facilities in addition to identifying new opportunities for investment.	Q3 2023	
	3. In-line with the Strategic plan, undertake independent feasibility study of existing investment opportunities, understanding the economic feasibility, key materials, and potential for recycling.	Q1-Q2 2023	
	4. Identify funding opportunities and appropriate funders to accelerate investment dependent on outcome of feasibility study.	Q3 2024	
	5. Initiate investment opportunity.	Q4 2024	

Plan for delivery	**Action owner**	Directorate “Ecology and Environmental Protection”						
	Stakeholders	RIEW Varna, Organization for Recovery of Packaging Waste, Ecobulpack Ltd; Ecomax Waste management; Vyglen landfill company; EcoVarna, Ecoinvest Assets, recycling site operators. Eco Partners Bulgaria AD and Euro Impex Varna Ltd.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding		Government payments / Availability payment		
Impact measures	• Proportion of waste to landfill							

Costs and benefits

Estimated cost	**CapEx:**	BGN: 577,300,000 EUR: 292,400,000	**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 43,900,000 EUR: 22,540,000	**Energy savings**	N/A	
	Design/development:	BGN: 183,000 – 229,000 EUR: 93,000 – 116,000	**CO_2 savings**	39,100 Annual tCO2e	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	
		Improve safety and/or security	
		Enhance the public realm	
		Access to basic services	
		Social equity	
	Economic co-benefits	**Revenue generating activities**	The saleable outputs will generate income while investing in recycling facilities will lead to the creation of employment.
		Promotes economic inclusion	Recycling processes will provide economic opportunities for disadvantaged and low skilled groups.
		Avoided damages	Accelerating recycling lowers the costs associated with illegal dumping and waste collection.

	Institutional co-benefits	**Improve institutional capacity or efficiency**	
		Enhances legislative environment	Sub-national policy will be advanced to better accommodate waste separation and economically advantaged recycled waste.

SW2. Develop and implement an integrated recycling programme to promote the use of resourceful construction and demolition materials and create green jobs (i.e. inert construction and demolition waste as secondary aggregate).

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.1:** Varna Municipality will help create opportunity for future, green investment. **SO.10**: Varna Municipality will improve the management system and physical infrastructure for solid waste collection and disposal. **SO.11**: Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
Priority Environmental Challenge(s)	**C.17:** Illegal Dumping of Solid Waste					

Description	Varna Municipality will develop a recycling programme that seeks to create a circular waste process for construction and demolition waste, reducing demand for harmful and inert materials and focus on recycling and reuse of these products, which will generate income whilst reducing volume to landfill and illegal dumping. This action seeks to help achieve the targets laid out within the “Programme for Environmental Protection for Varna Municipality 2019-2023” on re-use and recycling and the recovery of construction waste, whilst also striving to tackle the challenge of illegal solid waste dumping experienced within the Municipality. The integrated recycling programme will develop a comprehensive understanding of the status of existing recycling infrastructure and strategies in-place for building and construction waste, building on the regional system for waste disposal and recycling that already exists or is under development, helping to understand the potential of these projects for future investment. An example includes the construction waste recycling facilities planned for Klise Bair. Outlined within the ‘Municipal Pan for Development for Varna Municipality 2014 – 2020’, this investment opportunity, which has not yet been realized, would be an expansion of the Regional landfill for non-hazardous waste based within Vaglen village under the jurisdiction of Aksakova Municipality, servicing Varna Municipality and Beloslav Municipality. Key to the success of the action is a demand for the recycled material products of the process, which could remain high if the outputs are of high quality. To help ensure that this programme is successfully implemented and bought-into, the municipality will implement the following aspects: Mandating the use of recycled construction and demolition material products in municipality-funded public works in order to establish a market for the associated outputs from the recycling programme. Implement a cross-agency approach (with law enforcement) to address fly-tipping and divert construction and demolition waste into the formal recycling sector. Completing capacity building and awareness raising sessions for the appropriate stakeholders who will play a key role in the programme’s implementation.		
Steps for implementation	1. Understand the status of existing collection and recycling infrastructure, management protocols, policies, and incentives currently in use for managing construction and demolition waste.	Q1 2024	Directorate "Ecology and Environmental Protection”
	2. Conduct feasibility study to ascertain the best options for an integrated recycling programme, including the identification of additional facility requirements and development of investment projects if necessary.	Q2-Q3 2024	
	3. Develop strategy in conjunction with industry stakeholders, considering financial and regulatory measures to support the programme.	Q3 2024	
	4. Work with appropriate stakeholders to promote sustainable site practices through capacity-building and training programmes to encourage responsible construction and demolition waste practices.	Q3 2024-2026	

	5. Implement recycling programme.						Q4 2026	Directorate "Ecology and Environmental Protection / RIEW – "Engineering and Development Department"
Plan for delivery	**Action owner**	Directorate "Ecology and Environmental Protection"						
	Stakeholders	Vaglen landfill company, RIEW Varna; Aksakova Municipality, Beloslav Municipality, Eco Partners Bulgaria AD, Ecobulpack Ltd; Ecomax Waste management; EcoVarna.						
	Financing options if applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector/ PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Funding options if applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)		Donor funding		Government payments / Availability payment	
Impact measures	• % of construction waste to landfill.							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 220,000 – 275,000 EUR: 111,000 – 140,000		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	An integrated recycling programme will have a positive benefit on human health by reducing illegal dumping, therefore reducing reduce air, water and soil pollution which are responsible for communicable diseases, respiratory diseases etc.
		Improve safety and/or security	
		Enhance the public realm	Reducing illegal dumping will have a positive effect on the public realm, reducing pollution and unsightly dumpsites.
		Access to basic services	
		Social equity	
	Economic co-benefits	**Revenue generating activities**	High quality products of the recycling program will generate income.
		Promotes economic inclusion	Creation of employment and green jobs through the programme supports economic inclusion.
		Avoided damages	Reducing illegal dumping reduces costs associated with collection and disposal of waste and resultant damages from pollution.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	
		Enhances legislative environment	Sub-national policy will be advanced to better accommodate construction waste separation and economically advantaged recycled waste.

5.8. Low-carbon and active transport

Transport in Varna is a mix of private cars, public transport – predominantly buses, and active transport to a small degree. The modal mix has a significant impact on carbon emissions and air quality. It is Varna's aim to optimise transport modes to reduce the carbon intensity of transit and to improve health outcomes for residents, both by improving air quality and expanding active modes of transport.

5.8.1. Priority environmental challenges

Varna has a **high percentage of private vehicles, and an aging vehicle fleet** (C.18), which contributes to both carbon emissions and sub-standard particulate matter concentrations in the vicinity of roads.

Private vehicle use is driven in part by the **lack of alternative low-carbon mass transit and mobility options** (C.19). Varna will therefore work to create an integrated transport system that unites multiple different transport modes.

5.8.2. Ongoing actions in Varna

Varna Municipality has completed or is currently advancing multiple initiatives around transport. The Municipality began developing a Sustainable Urban Mobility Plan in 2019. Investment is ongoing to upgrade the public transport fleet with 30 electric trolley buses purchased in the last five years.[15] 60 electric buses are to be purchased with part EU funding for the period 2019-2023. The municipality has been looking at the potential of the EU Mobility Week (16th to 22nd September each year) to be used as an opportunity to promote the human and environmental benefits that cycling will produce.

Additionally, they are investigating the feasibility of increasing the use of electric cargo bikes in the municipality under a pilot (European) Horizon 2020 scheme. The city is proposing longer narrow bicycles and intending to promote these to food delivery companies and couriers for use in the central part of Varna. The Municipality also began procuring charging stations for electrical cars in 2019 to encourage the uptake of electric vehicles.

[15] http://umispublic.government.bg/srchProjectInfo.aspx?org=beneficient&id=99158

5.8.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
Tr1	Introduce Low Emission Zone and time-based congestion charge zone within the city centre		Varna Municipality will help improve air quality standards and reduce levels of noise pollution. Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Tr2	Establish ITS (Intelligent Transport Systems) to enhance existing traffic management/control centre.		Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Tr3	Develop a 'Mobility Hub' Transport Strategy as part of the on-going SUMP to increase public or pedestrian modalities. Measure and track the network demand to inform the development of the strategy.		Varna Municipality will help improve air quality standards and reduce levels of noise pollution. Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Tr4	Investment in publicly available and convenient rapid Electric Vehicle charging stations across the City. This should include both Varna City Centre and residential neighbourhoods.		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Tr5	Continue to invest in new electric public transport fleet (to cover bulk buses and vehicle fleets)		Varna Municipality will help improve air quality standards and reduce levels of noise pollution. Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Tr6	Enhance the current parking plan to develop a strategy and enforce related policies around providing an alternative to on-street parking in appropriate central city areas.		Varna Municipality will help improve air quality standards and reduce levels of noise pollution Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Tr7	Research and establishment of fast ferry connections for passenger-only sea transport between the port of Varna - Kv. Asparuhovo, as well as to other smaller locations on the periphery of Varna Lake		Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility. Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					

Tr1: Introduce Low Emission Zone and time-based congestion charge zone within the city centre.

Timeline

Strategic objectives	**SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution. **SO.6:** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.		2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.18:** High private vehicle uses and emissions from ageing vehicle fleet **C.19:** Lack of alternative low-carbon mass transit and active mobility options **C.22:** Heightened noise pollution						
Description	Varna Municipality will introduce a Low Emission Zones (LEZs) alongside time-based congestion charges (CCs) within the city centre. This action seeks to improve Varna's air quality and shift the city towards public and non-motorised transport options. LEZs limit the amount of certain types of vehicles driving through the specified zone to reduce harmful air pollution. CCs also aim to reduce air pollution but also work to free up road space for public and non-motorised transit. The LEZ will be in effect 24 hours a day, 7 days a week. The LEZ charge will apply for those vehicles which do not meet the following standards: • Heavy goods vehicles (HGVs), privately-owned buses, privately-owned minibuses, and coaches will be required to meet the Euro 4 standard for PM emissions. • All other cars and vans will be required to meet the Euro 3 standard for PM emissions. • Owners of vehicles that do not meet the emissions standards can seek to improve their vehicles' emissions standards through the following options: fit a filter, replace the vehicle, reorganise their fleet (applicable to logistics/transport companies), pay the LEZ charge. The congestion charge will apply between 7:00 and 22:00 in a concentrated area of the city identified by the analysis of transport planning data. The charge will apply to all vehicles except for the following: two-wheeled motorbikes and mopeds, emergency service vehicles (e.g. ambulances and fire engines), vehicles used by disabled people and have applied for and received an exemption, vehicles for more than one disabled person and have applied for and received an exemption. All charges paid from the LEZ and CC will be utilised within the public budget. Note that the LEZ and CC apply equally. Even low-emission vehicles are subject to the CC if they enter a zone during the aforementioned hours.						
Steps for implementation	1. Use transport planning data to identify commuter patterns and key congestion zones within Varna city centre. Based on this analysis, identify both the coverage of the LEZ and the coverage of the CC.	Q1 2023	Directorate of OP Parking's and Blue Zone				
	2. Develop and implement a stakeholder engagement plan to ensure a participatory planning process, particularly to ensure that low-income individuals have sufficient access to vehicle retrofits or public transport to ensure those unable to afford upgraded cars are not disproportionately penalized.	Q2 2023 – Q2 2024					
	3. Develop a phased introduction plan.	Q3 - Q4 2024					
	4. Gain approval to pass the policy through the City Council.	Q1 2025					
	5. Development and installation of IT infrastructure required for payment and enforcement of the LES and CC, including the associated procurement of necessary expertise.	Q1 2025– Q4 2026					
	6. Phased installation of signage about LEZ and CC zones in relevant areas. Ensure functioning CCTV cameras to enforce the programme.	Q1 2025 to Q4 2026-					

	7. Implement and enforce the policy					Q4 2026 onwards (In-line with phased introduction plan)		
Plan for delivery	**Action owner**	Engineering & Development Department; Varna City Council; Directorate of OP Parking's and Blue Zone.						
	Stakeholders	Gradski Transport, City Walk, EcoVarna.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes		Non-tax revenues (fees, charges, penalties, etc.)	Donor funding		Government payments / Availability payment	
Impact measures	• Concentration of PM10, PM2.5, NOx, SO_2 concentrations • Number private vehicles that meet Euro 3 standard for PM emissions • Number of HGVs, privately-owned buses, privately-owned minibuses, and coaches that meet the Euro 4 standard for PM emissions.							

Costs and benefits						
Estimated cost	**CapEx:**	Per junction: - BGN: 32,000 - EUR: 16,000		**Water savings**	N/A	**Environmental benefits**
	OpEx:	Per junction: - BGN: 57,000 - EUR: 29,000 Software plus license fees: - BGN: 560,000 - EUR: 287,000		**Energy savings**	N/A	
	Design/development:	N/A		**CO_2 savings**	56% saving per petrol car with EV 45% saving for fossil-fuel vs EV Bus (See Tr4 and 5 for total savings)	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	LEZs and CCs have a positive impact on respiratory health outcomes due to pollutant reductions.
		Improve safety and/or security	Reduction in congestion will improve pedestrian safety in zones covered by the CC.
		Enhance the public realm	Reduction in traffic volume will reduce noise pollution and improve pedestrian access to areas.
		Access to basic services	
		Social equity	

	Economic co-benefits	**Revenue generating activities**	The action generates revenue through the charges associated with both the LEZ and the CC.
		Promotes economic inclusion	
		Avoided damages	Improved health outcomes will reduce pressure on the local healthcare system.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Implementing the action will take the efforts of two distinct departments/commissions, but also involve stakeholder engagement with relevant organisations and the public. Working to integrate the charge system online will also improve the Municipality's ability to do this for future policies.
		Enhances legislative environment	This action will support Varna to achieve air quality standards in line with EU Limit Values.

Tr2. Upgrade ITS (Intelligent Transport Systems) to enhance existing traffic management/ control centre.

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.6** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Priority Environmental Challenge(s)	**C.18:** High private vehicle uses and emissions from ageing vehicle fleet **C.19**: Lack of alternative low-carbon mass transit and active mobility options					
Description	A municipal company (TASRUD) operates ITC that covers (i) operation of traffic lights (84 intersections, part of which are synchronized), (ii) public transport traffic management system and real time information and (iii) electronic public transport ticketing system. The existing ITS include: • Bus priority signalling at 27 intersections • Real-time bus stop information at 84 stops • Traffic counting and real time traffic light management along four main routes • 25 intelligent pedestrian crossings The city will enhance the existing traffic management centre and its ITS with new functionalities to provide for optimal use of road traffic and travel data collected and for continuity of traffic and ITS services following completion of the ongoing Sustainable Urban Mobility Plan (SUMP). This action will focus on both software functionality and physical extension of the current ITS services. On top of technology to track the number of vehicles at intersections at different times of the day, the upgraded system will provide the users with better pre-trip and on-trip traffic and travel information. It will be upgraded so to allow adaptive traffic management and control, this incl. dynamic and coordinated traffic management, travel guidance using variable message signs. Beside the real time information and traffic management, the upgraded the ITS will facilitate planning and forecasting traffic conditions and will help to better regulate vehicle flow and reduce car traffic in favour of public transport vehicles' traffic. The rerouting of vehicle traffic during times of high pedestrian traffic will help to improve the experience of the city for pedestrians (residents and visitors/tourists alike). Moreover, ITS will enhance data collection and inform future transport planning and decision-making. It will also support right of way for public transport and bicycles and support optimized street parking.					

Steps for implementation	1. Varna Municipality and relevant experts to prioritise the aspects of ITS that are most critical to Varna (e.g. traffic congestion, pedestrian movement, safety, parking, real-time public transport movement, etc.) and ensure that these are communicated to national authorities to ensure proper integration into existing systems.	Q3 – Q4 2024	MC Transport and Automated Systems for Traffic Management, MC Municipal Car Parks and Blue Zone, Gradski Transport
	2. Varna Municipality to develop a mechanism, legislation, and policies to add incentives into the use, generation, and management of ITS data by different users and relevant agencies.	Q1 2025	Security Management and Public Order Control Department, MC Transport and Automated Systems for Traffic Management, Legal Department
	3. Varna Municipality to employ additional qualified staff at MC Transport and Automated Systems for Traffic Management to operate, manage and maintain the upgraded ITS.	Q1 2025	MC Transport and Automated Systems for Traffic Management
	4. Transportation and specialised information technology experts to identify the proper technology-related matters, including the framework architecture and the digital hardware and software elements for the mobility platform, with proper integration of geospatial analysis technologies.	Q2 2025	
	5. Procure the upgrade of the ITS system.	Q3 2025 – Q3 2026	
	6. Launch the upgraded system and monitor its development and performance for an initial period of 3-6 months.	Q4 2026	
	7. Depending on the evaluation, scale-up action accordingly.	Q1 2027+	

Plan for delivery	**Action owner**	MC Transport and Automated Systems for Traffic Management						
	Stakeholders	Security Management and Public Order Control Department, Legal Department, Permanent Transport Commission, Municipal Council, Gradski Transport; EcoVarna.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			

Impact measures	• Average annual concentration of PM2.5 • Average annual concentration of PM10 • Annual CO_2 equivalent emissions per capita

Costs and benefits

Estimated cost	**CapEx:**	Per junction: - BGN: 157,000 - EUR: 80,000		**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 37,000 EUR: 19,000		**Energy savings**	N/A	
	Design/development:	N/A		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	ITS work to reduce congestion and, by association, point-source air pollution. This may impact on health by improving air quality.
		Improve safety and/or security	ITS seek to reroute traffic to improve safety and can also enhance pedestrian safety through data gathering and understanding of pedestrian crossing patterns. Overall, it has potential to reduce morbidity from traffic accidents.
		Enhance the public realm	The reduction in traffic congestion would likely improve the public realm.
		Access to basic services	Enhanced traffic flow would allow residents better access to services.
		Social equity	
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	
		Avoided damages	Improved traffic flows could improve air quality, thereby reducing poor health outcomes associated with poor air quality. Additionally, in the event of an emergency, ITS can support evacuation of residents through optimising traffic routing.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	The data collection and ongoing monitoring systems required for the ITS will involve multiple different agencies and organisations, improving collaboration and knowledge-sharing within the municipality and with its external stakeholders.
		Enhances legislative environment	As part of the ITS, the Municipality will pass legislation that will mandate data collection, which can support other development and/or planning endeavours.

Tr3. Develop a 'Mobility Hub' Transport Strategy as part of the on-going SUMP to increase public or pedestrian modalities. Measure and track the network demand to inform the development of the strategy.

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution. **SO.6:** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.					
Priority Environmental Challenge(s)	**C.18**: High private vehicle uses and emissions from ageing vehicle fleet **C.19**: Lack of alternative low-carbon mass transit and active mobility options.					
Description	The city will incorporate Mobility Hubs at critical junctions that connect with the key modalities (e.g. bus stops, railway stations, etc.). Mobility hubs (based on the Dutch mobipunt model) are neighbourhood-level transport hubs that link sustainable and shared transport modes. Mobility hubs incorporate car-sharing parking spots, bicycle storage, shared bikes, shared scooters or pedestrian paths through green space so people can easily get to public transport junctions. Mobility hubs also often incorporate services like public restrooms, small cafes, and post boxes/delivery lockers, among other amenities and are closely linked to online systems such as travel apps and established ITS systems. These will be tailored to Varna's context and the needs of residents, whilst also considering aspects of accessibility and safety needs, such as improved access for pushchairs and wheelchairs and improved lighting and visibility at bus stops. A specifically example of a location for a Mobility hub in Varna would be Varna Train station and/or Varna beach. This work will be informed by the on-going SUMP and be undertaken in collaboration with GCAP actions Tr4 and Tr7. Furthermore, this action will be linked to Tr2 (upgrading Intelligent Transport System (ITS)) in order to track demand.					

Steps for implementation	1. Using the information scoped in the SUMP, identify critical junctions within the City that would be well-served by a mobility hub.	Q3 2023	Directorate of OP Parking's and Blue Zone
	2. Launch a public engagement campaign to get feedback on what citizens would want to see at a mobility hub.	Q3 2023	
	3. Have at least three focus groups with the public to further identify their needs, and how they would use the mobility, or what it would need to have for them to want to use it.	Q4 2023 – Q1 2024	
	4. Procure the development of identified mobility hubs.	Q2 2024 – Q2 2025	
	5. Launch the mobility hub system and monitor its performance.	Q3 2025	
	6. Depending on the evaluation, update services accordingly.	Q4 2025	

Plan for delivery	**Action owner**	Directorate of OP Parking's and Blue Zone						
	Stakeholders	Gradski Transport; The Ministry of Transport, Information, Technology and Communication; Travel App Operators (i.e. City Mapper), Local Businesses, local E-Scooter and bike hire operators (i.e. Hop Scooter)						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment			

Impact measures

- Average annual concentration of PM2.5
- Average annual concentration of PM10
- Annual CO_2 equivalent emissions per capita
- Transport modal share in total trips

Costs and benefits

Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 123,000 - 148,000 EUR: 63,000 – 76,000		**CO_2 savings**	N/A	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Mobility hubs seek to shift transport modes to active modalities, thereby improving health outcomes. Moreover, they ideally shift people away from private car use, which theoretically improves air quality and associated health outcomes.			

		Improve safety and/or security	Mobility hubs can incorporate design measures that can improve women and vulnerable communities experience using public transport (e.g. bright lights at night, emergency buttons in place, facilities for differently abled community members and support to help them use public transport).
		Enhance the public realm	Mobility hubs can act as community spaces, even for those not using public transport services, dependent on their design (e.g. having small open space, cafes, etc.).
		Access to basic services	Mobility hubs aim to increase the ease of use of public transport services in Varna.
		Social equity	As per 'improve safety and/or security' this action should have a focus on challenges faced by vulnerable populations groups such as women and people with a disability when using public transport, by improving the accessibility and safety of services in Varna.
	Economic co-benefits	**Revenue generating activities**	Mobility hubs can generate revenue through facilities like bicycle storage, or through extra services like cafes, or services like Amazon lockers for people to pick up packages, etc.
		Promotes economic inclusion	
		Avoided damages	
	Institutional co-benefits	**Improve institutional capacity or efficiency**	
		Enhances legislative environment	

Tr4: Investment in publicly available and convenient rapid Electric Vehicle charging stations across the City. This should include both Varna City Centre and residential neighbourhoods.

Timeline

Strategic objectives	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence. **SO.6:** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.	**2023**	**2024**	**2025**	**2026**	**2027+**
Priority Environmental Challenge(s)	**C.18:** High private vehicle uses and emissions from ageing vehicle fleet					

<table>
<tr><td>Description</td><td colspan="4">Activities under this action will include the review, implementation, and ultimate expansion of EV charge points across the City of Varna, in line with the 2019 Sustainable Urban Mobility Plan's (SUMP) smart parking policy. This action will build upon previous investment agreed in 2018 with the City of Varna (a €10million EBRD loan and €28 million EU grant), part of which was intended for the installation of 31 electric vehicle (EV) charging stations. To date, Varna City has installed 22 free EV charging stations, the operational costs of which are sponsored by the municipality.

In order to accommodate a more extensive uptake of electric and hybrid vehicles, this action will facilitate the expansion of the charging infrastructure in central City Varna and surrounding residential neighbourhoods in both an on street and off-street parking, following the existing business model established for the 22 EV charging stations installed by the Municipality to date. Either Rapid chargers (DC provide power at ~50kW, AC at ~43kW) or Fast Chargers (ranging from 7kW to 22kW) are recommended to be installed dependent on the grid capacity. In order to alleviate the additional load pressures that the charge points would impart upon the electricity transmission network, options for construction charge stations that draw from micro renewable-energy sources (e.g. compact solar panels, wind turbines etc) should be considered.</td></tr>
<tr><td rowspan="7">Steps for implementation</td><td>1. Establish an interagency Working Group to organize and manage the implementation of the action</td><td>Q3 2023</td><td colspan="2">Municipal Company (MC) Municipal Car Parks and Blue Zone and stakeholders</td></tr>
<tr><td>2. Undertake mapping of dedicated parking areas and street parking, incorporating existing charge points, in Varna City Centre and appropriate residential neighbourhoods.</td><td>Q3 – Q4 2023</td><td colspan="2">MC Municipal Car Parks and Blue Zone</td></tr>
<tr><td>3. Development provisional standards for EV charging sites (including catchment / distribution density, charging capacity (speed), type of charging connections</td><td>Q3 2023 – Q2 2024</td><td colspan="2" rowspan="2">Energo Pro Varna and Working Group</td></tr>
<tr><td>4. Work with local electricity utility provider to produce a feasibility study in order to evaluate grid capacity for the installation of the charging infrastructure at various speeds.</td><td>Q3 2023 – Q2 2024</td></tr>
<tr><td>5. Work with private parking operators to encourage their support of priority parking for EVs and installation of charging infrastructure.</td><td>Q3 2023 – Q2 2024</td><td colspan="2" rowspan="3">Engineering Infrastructure and Public Works Directorate</td></tr>
<tr><td>6. Work with EV charging operators to fund, install and operate charge points. These could be connected to existing infrastructure such as lighting columns or use micro renewable energy sources to reduce load on the transmission network where feasible.</td><td>Q3 2024 – Q4 2025</td></tr>
<tr><td>7. Undertake stakeholder engagement consultation and public awareness campaigns for the use of EV's and the associated charge stations.</td><td>Q4 2023 – Q4 2025</td></tr>
<tr><td rowspan="4">Plan for delivery</td><td>Action owner</td><td colspan="4">MC Municipal Car Parks and Blue Zone</td></tr>
<tr><td>Stakeholders</td><td colspan="4">Energo Pro Varna, Natsionalna Elektricheska Kompaniya, EV charge point suppliers, private parking operators</td></tr>
<tr><td>Source of upfront cost, as applicable</td><td colspan="4">Own City Budget | National or regional government budget | Borrowings (e.g. IFI, commercial banks, bond issues) | Donor grants | Private Sector / PPPs | Public enterprise (own budget, or borrowing) / SPVs | Other</td></tr>
<tr><td>Source of funding for operations and maintenance, as applicable</td><td colspan="4">Local Taxes | Non-tax revenues (fees, charges, penalties, etc.) | Donor funding | Government payments / Availability payment</td></tr>
</table>

Impact measures	• Number of publicly available electric charge points delivered • Number of electric cars and taxis. • CO_2 emissions from transport • Concentrations of PM2.5, PM10, NO_x and CO_3

Costs and benefits

Estimated cost	**CapEx:**	Cost per EV Charge point: - BGN: 36,000 - EUR: 18,000		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	N/A		**CO_2 savings**	31,700 Annual tCO2e	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	This action could result in improved respiratory health due to the associated reduction in pollution as proportion of EV / hybrid vehicles increase.
		Improve safety and/or security	
		Enhance the public realm	
		Access to basic services	This action would improve the availability of public electric charging infrastructure.
		Social equity	By increasing the number of publicly available, free charging infrastructure, this action would help make the operation of an EV vehicle more affordable and ultimately accessible.
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	
		Avoided damages	
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Increased capacity of electric charging infrastructure.
		Enhances legislative environment	

Tr5: Continue to invest in new electric public transport fleet (to cover bulk buses and vehicle fleets)

Strategic objectives	**SO.5**: Varna Municipality will help improve air quality standards and reduce levels of noise pollution. **SO.6**: Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.	***Timeline***	**2023**	**2024**	**2025**	**2026**	**2027+**
Priority Environmental Challenge(s)	**C.18**: High private vehicle uses and emissions from ageing vehicle fleet **C.19:** Lack of alternative low-carbon mass transit and active mobility options. **C.22**: Heightened noise pollution						

Description	Varna Municipality will continue to scale up investment in low emission energy efficient vehicles for public transport, building on the 60 electric buses planned to be purchased by EU funding under OPE between 2014 – 2020, with 15 new buses purchased in 2018, with the procedure for selection of the supplier of the remaining 45 currently underway. Another phase of old diesel fleet replacement is intended, but no open operation programmes are yet in place to allocate such as project. The transition will retire old buses which were responsible for high emissions and air pollution in favour of a fully electric fleet. The aim of this action is for Varna Municipality to build on the momentum of existing purchasing schemes to implement an ambitious replacement schedule of the existing transport fleet with electric vehicles, creating a revised target completion date with annual targets for the transition up until 2024/2025. This investment will also help enhance user experience and ridership of the bus fleet, building on the improvements to the e-ticketing system made as part of Varna's SUMP. This action will also consider the expansion and/or upgrade of existing charging infrastructure in order to accommodate the purchasing of electric vehicles within the public transport fleet. This includes the charging either 'en-route' - or 'off-duty" and will consider the space requirements, charging rates and grid capacity. The Municipality will engage with relevant donors and IFIs to devise a financing strategy for the project and ongoing funding. Considering the potential impact of electrification on transport workers, the city will involve the affected workers and communities at early planning stage. Measures including reskilling and job relocation may be taken to protect their interests and achieve a "just transition" towards sustainable urban mobility.		
Steps for Implementation	1. Establish a target completion date with multi- annual targets for vehicle replacements based on the currently available transport fleet and existing replacement schedule.	Q1 2023	Municipal Property, Economy and Economic Activities Department and Gradski Transport
	2. Identify extension of the public transport services to improve the city coverage, taking into consideration current capacity and future replacement targets.	Q1 2023–Q4 2023	Municipal Property, Economy and Economic Activities Department and Gradski Transport
	3. Conduct a Feasibility Study, incl. financial and economic assessment for the future needs of vehicles' replacement, the expansion of charging infrastructure and funding the operations.	Q1 2024–Q3 2024	Engineering & Development Department and Gradski Transport
	4. Engage with donors and IFIs to initiate financing.	Q3 2024-Q2 2025	Municipal Property, Economy and Economic Activities Department, European and National Operation Programs Department
	5. Prepare tender strategy, launch tenders, and purchase new vehicles and installation of charging infrastructure in accordance with prescribed targets.	Q2 2025–Q4 2026	Municipal Property, Economy and Economic Activities Department and Gradski Transport
	6. Monitor public transport use and air quality improvements.	Q4 2026-2027+	Municipal Property, Economy and Economic Activities Department, MC Transport & Automated Systems for Traffic Management and Ecology and Environmental Protection Department
Plan for delivery	**Action owner**	Municipal Property, Economy and Economic Activities; Permanent Commission on Transport and Municipal Council in partnership with Gradski Transport;	
	Stakeholders	European and National Operation Programs Department, MC Transport & Automated Systems for Traffic Management, Ministry of Regional Development and Public Works, Ministry of Environment and Waters; EcoVarna.	

	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other

	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment	
Impact measures	• Average annual concentration of PM2.5 • Average annual concentration of PM10 • Annual CO_2 equivalent emissions per capita					
Costs and benefits						
Estimated cost	**CapEx:**	36 Solo Electric Buses: - BGN: 40,700,000 - EUR: 20,600,000 36 Articulated electric buses: - BGN: 48,900,000 - EUR: 24,800,000		**Water savings**	N/A	**Environmental benefits**
	OpEx:	For both bus types: - BGN: 0.46/km - EUR: 0.23/km		**Energy savings**	N/A	
	Design/development:	N/A		**CO_2 savings**	13,600 Annual tCO2e	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Low emission vehicles are likely to reduce air and noise pollution, with positive outcomes for public health.			
		Improve safety and/or security				
		Enhance the public realm	Developing the public transport fleet is likely to reduce the number of private vehicles, likely reducing air and noise pollution to enhance the public realm.			
		Access to basic services				
		Social equity	Air pollution disproportionately affects the health of marginalised groups, reducing air pollution through low emission vehicles is likely to reduce negative health outcomes for marginalised communities.			
	Economic co-benefits	**Revenue generating activities**	Replacement vehicles are likely to improve economic efficiency and generate revenue through ticket charging and reduced maintenance costs compared to equivalent			
		Promotes economic inclusion				
		Avoided damages	Health outcomes are likely to be improved with the reduction in air pollution and therefore there is likely to be a reduced impact on local healthcare systems.			
	Institutional co-benefits	**Improve institutional capacity or efficiency**				
		Enhances legislative environment	This action is likely to support Varna to achieve air quality standards in line with EU Limit Values.			

Tr6. Enhance the current parking plan to develop a strategy and enforce related policies around providing an alternative to on-street parking in appropriate central city areas.

Timeline

Strategic objectives	**SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution **SO.6:** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.			2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.18**: High private vehicle uses and emissions from ageing vehicle fleet **C.19:** Lack of alternative low-carbon mass transit and active mobility options.							
Description	On-street free of charge parking in large parts of the city causes parasite traffic and congestions. Easily accessible parking also poses a challenge in that it incentivises the use of private vehicles to commute to the city centre on the expense of public transport. Therefore, Varna Municipality should implement a SMART on-street parking system, following the development of the ITS (GCAP Action Tr2), in addition to time-limited parking and pay-for-parking measures. These measures will be complemented by those transport actions that will improve accessibility and comfort of public transport options in the city, alongside the incorporation of EV charge points available throughout the City, as per GCAP Action Tr.9. The aim is to install a SMART on-street parking system to improve traffic flows and reduce non-essential and inefficient car trips, which links to the Mobility as a service (Maas) established as part of Varna's SUMP. This will involve the use of technology (such as parking sensors, CCTV, and inductive loops) to define the parking slots in commercial streets and show available slots on the mobile application, whilst tracking the cars with their vehicle registration plate number. It will be able to allow online payment through the mobile application and SMS / telephone (for those without a smartphone) and issue fines in case of non-payment. No cash payment will be allowed and only payment through the application, mobile wallets and SMS system will be accepted.							
Steps for implementation	1. Varna Municipality to identify what streets will be included in the pilot project using data collected in the city by the traffic management centre and public security department.		Q1 – Q3 2025	MC Municipal car Parks and Blue Zone, MC Transport and Automated Systems for Traffic Management				
	2. Varna Municipality and relevant experts to develop a financial model of the system		Q3 2025	Municipal Property, Economy and Economic Activities Department, MC Municipal car Parks and Blue Zone, MC Transport and Automated Systems for Traffic Management				
	3. Varna Municipality to check or gain approval to pass legislation to charge a parking tariff and parking fines.		Q3 – Q4 2025	Legal Department, Municipal Council				
	4. Varna Municipality and relevant experts to identify the system's operating needs such as HR, maintenance hardware and operational cash requirements.		Q3 – Q4 2025	MC Municipal car Parks and Blue Zone, MC Transport and Automated Systems for Traffic Management				
	5. Transportation and specialised information technology experts to identify the proper technology-related matters, including the framework architecture and the digital hardware elements for the parking platform, with proper integration of geospatial analysis technologies.		Q4 2025					
	6. Procure the development of the SMART on-street parking system.		Q1 2026 – Q1 2027+					
Plan for delivery	**Action owner**	Municipal Property, Economy and Economic Activities Department, MC Municipal Car Parks and Blue Zone, MC Transport and Automated Systems for Traffic Management, Legal Department, Municipal Council						

	Stakeholders	EcoVarna.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding		Government payments / Availability payment		
Impact measures	• Average annual concentration of PM2.5 • Average annual concentration of PM10 • Annual CO_2 equivalent emissions per capita • Transport modal share in total trips							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 69,000 – 78,000 EUR: 35,000 – 40,000		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	The parking management scheme will seek to reduce the amount of air quality
		Improve safety and/or security	
		Enhance the public realm	Streamlining parking can reduce traffic congestion and thereby improve the public realm.
		Access to basic services	
		Social equity	
	Economic co-benefits	**Revenue generating activities**	SMART parking will generate revenue through the payment mechanism.
		Promotes economic inclusion	
		Avoided damages	
	Institutional co-benefits	**Improve institutional capacity or efficiency**	By collecting live data on on-street parking, it will help provide an understanding of parking spot occupancy and help inform infrastructure and space usage and planning in the future
		Enhances legislative environment	

Tr7: Research and establishment of fast ferry connections for passenger-only sea transport between the port of Varna - Kv. Asparuhovo, as well as to other smaller locations on the periphery of Varna Lake

Timeline

Strategic objectives	**SO.6:** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility. **SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources						
Priority Environmental Challenge(s)	**C.18:** High private vehicle uses and emissions from ageing vehicle fleet **C.19**: Lack of alternative low-carbon mass transit and active mobility options. **C.22:** Heightened noise pollution						
Description	This action aims to develop an alternative approach to public transport that connections North and South Varna. Building on the 2019 Sustainable Urban Mobility Plan (SUMP), this action will research and then aim to establish express passenger ferry connections between the Port of Varna and Kv Asparuhova at peak commute times as a primary focus, before then considering other, additional locations and a more extensive timetable (i.e. weekends / all-day service). With Asparuhov Bridge in Varna the only link across the canal between the Black Sea and Varna Lake, it is subject to frequent congestion and is a main source of air and noise pollution through private and freight vehicles use. The creation of fast-ferry routes between Port of Varna and Kv. Asparuhovo would improve connectivity between North and South Varna and provide an alternative transport route that could help reduce both congestion and pollution levels associated with vehicle use. The location of the terminals will be considered in relation to GCAP action Tr3 and the development of “mobility hubs” to ensure the availability of on-ward public transport connections such as bus connections. This action will require extensive research and financing to implement the passenger ferry routes, including understanding appropriate land-based infrastructure such as ferry terminals and car parking facilities to support the implementation. The environmental impact of the fast ferries should be considered across the proposed routes – including GHG emissions and the impact on water quality and pollution levels. This could be implemented by considering the purchase of battery hybrid or LNG (Liquefied Natural Gas) powered vessels as opposed to diesel powered, with LNG vessels having a comparative reduction in nitrogen oxide emissions by 85% and a 20% reduction on CO_2 emissions compared to diesel.						
Steps for implementation	1. Identify key stakeholders for ongoing stakeholder engagement.	Q1 2023	Engineering & Development Department				
	2. Conduct an Origin-Destination survey combined with stakeholder research to identify essential ferry or passenger sea transport routes and terminal locations.	Q2 - Q4 2023					
	3. Conduct an Environmental Impact Assessment of proposed new transport routes.	Q1–Q2 2024					
	4. Assess CAPEX and OPEX costs for transport connections over the lifespan of the project.	Q3-Q4 2024					
	5. Engage Private Sector and IFI’s to finance transport connections.	Q1 2025 – Q2 2025					
	6. Construct required infrastructure (including new ferry terminals, roads, car parks etc.).	Q3 2025 – Q3 2026					
	7. Launch additional transport connections.	Q4 2026					
	Action owner	Directorate of OP Parking and Blue Zone in Partnership with Gradksi Transport					

Plan for delivery	**Stakeholders**	The Ministry of Transport, Information, Technology and Communication; EcoVarna; Port of Varna EAD; Port Lesport S.A.; PMCHV AD (Marine Antipollution Enterprise JSCO), Black Sea Basin Directorate – Varna, Ferry Varna.						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding		Government payments / Availability payment		
Impact measures	• Average annual concentration of PM2.5 • Average annual concentration of PM10 • Annual CO_2 equivalent emissions per capita • Biochemical Oxygen Demand (BOD) and Nitrogen concentration in Lake Varna.							

Costs and benefits

Estimated cost	**CapEx:**	BGN: 3,100,000 EUR: 1,600,000		**Water savings**	N/A	**Environmental benefits**
	OpEx:	BGN: 477,000 EUR: 258,000		**Energy savings**	N/A	
	Design/development:	BGN: 218,000 – 275,000 EUR: 110,000 – 140,000		**CO_2 savings**	N/A	

Estimated co-benefits	**Social co-benefits**	**Action will improve health**	
		Improve safety and/or security	
		Enhance the public realm	
		Access to basic services	
		Social equity	Improved ferry connections are likely to connect marginalised and vulnerable communities living out with of Varna city centre.
	Economic co-benefits	**Revenue generating activities**	Additional ferry routes and increased passenger numbers are likely to increase the revenue generated through charges.
		Promotes economic inclusion	Fast ferry connections will likely improve economic opportunities for individuals living out with of Varna. Additionally, construction of relevant infrastructure will generate jobs for outlying communities.
		Avoided damages	Additional, fast ferry routes will likely decrease private vehicle use, reducing air and noise pollution to have a positive impact on public health.
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Implementing the action will require coordination between multiple departments and commissions of the municipality in addition to stakeholder engagement with NGOs, private sector and the public which is likely to improve institutional capacity and strengthen communication.
		Enhances legislative environment	

5.9. Cross-cutting actions

Varna seeks to build up data availability and accessibility to inform decision-making, particularly to support environmental and climate resilience initiatives. This applies across sectors in Varna, and the actions in this sub-chapter aim to integrate data collection, monitoring, and reporting as standard practice in Varna. Further, data shall inform investments and policymaking to ensure that Varna supports Bulgaria's INDCs.

5.9.1. Priority environmental challenges

In order to better inform its mitigation strategy, stakeholders acknowledged the need to address the **lack of greenhouse gas emission data collection processes and analysis** (C.21). Beyond mitigation though, Varna also **lacks an adaptation strategy and requisite institutional structures** (C.20) to prepare for the impacts of climate change. Finally, industry, transport, and construction all contribute to **heightened noise pollution** (C.22).

5.9.2. Ongoing actions in Varna

In 2017, the Municipality undertook a mapping exercise for environmental noise pollution within the territory This assessed the impact of noise on humans and the environment, alongside mapping sources of noise including but not limited to road, railway, aircraft, and industry.[16]

The municipality has set an objective to implement preventive measures to deal with extreme natural disasters and mitigate the impacts of climate change. It is committed to developing a climate change adaption plan, set up the relevant management practices and organisational structure, and raise public awareness of climate change and its impact on environment and quality of life[17].

The municipality has experience with delivering a pilot project on 'Adaptation to Climate Change through territorial development strategies' (under an EU knowledge exchange programme 2007-2013), an example of climate adaptive planning practice for a peri-urban area.

[16] Spectri. 2017. Strategic Map for Environmental Noise of the Agglomeration of Varna http://old.Varna.bg/bg/getfile.html/id/080eb9c2c128e1337fcc84d8680f404c
[17] Programme for environmental protection for Varna Municipality 2019-2023, pg. 390

5.9.3. Actions

ID	Action	Type	Strategic Objectives	2023	2024	2025	2026	2027+
CC1	Develop a Sustainable Energy and Climate Action Plan (SECAP) as part of the Covenant of Mayors on Climate and Energy, including a climate adaptation plan and sector-specific greenhouse gas emissions reduction targets.		Varna Municipality will raise awareness around environmental challenges and climate change. Varna Municipality will help build the City's resilience to future climate change risks Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.					
CC2	Develop and commit to emission reduction targets for the City of Varna's corporate emissions by 2030 / 2050.		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.					
CC3	Establish statutory requirements for greenhouse gas (GHG) monitoring and reporting.		Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.					
CC4	Undertake air, water and soil quality monitoring and analysis, on a municipal level, to understand the extent of pollution, expanding the current monitoring system.		Varna Municipality will help improve air quality standards and reduce levels of noise pollution. Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					

CC1: Develop and Sustainable Energy and Climate Action Plan (SECAP) as part of the Covenant of Mayors on Climate and Energy, including a climate adaptation plan and sector-specific greenhouse gas emissions reduction targets.

Timeline

Strategic objectives	**SO.2:** Varna Municipality will raise awareness around environmental challenges and climate change. **SO.3:** Varna Municipality will help build the City's resilience to future climate change risks **SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.						
Priority Environmental Challenge(s)	**C.20**: Lack of adaptation strategy/plan and requisite institutional structure **C.21:** Lack of Greenhouse Gas emission data collection process and analysis						
Description	The aim of this action is to develop a comprehensive Greenhouse gas emissions inventory and risk and vulnerability assessment for the City of Varna, whilst setting out a wide-ranging suite of actions with the specific objective to reduce emissions and enhance resilience to future impacts. Established by the European Commission's Joint Research Centre (JRC) the SECAP presents a common reporting framework for Covenant signatories who have pledged to reduce CO_2 emissions by at least 40% by 2030 and increase their resilience to the impacts of climate change. Varna Municipality originally became a signatory of the Covenant of Mayors (CoM) initiative in 2008, committing to a mitigation target of a 25% reduction in Greenhouse gas emissions by 2020 against the 2011 baseline. This commitment led to the development and submission of a Sustainable Energy Action Plan (SEAP) from 2011 to 2020, although monitoring of the progress against this target was never submitted to the CoM[18]. By implementing a SECAP, the Municipality will renew their original mitigation target commitment whilst further committing to increase their resilience to the impacts of climate change. Furthermore, the SECAP (in contrast to the SEAP) allows the Municipality will advance it's understanding of greenhouse gas emissions and the future risks and hazards that will potentially impact the population in the short, medium- and long-term timeframes as a result of climate change. The SECAP and its monitoring plan will also allow the Municipality to collect and analyse data in a structured and systematic manner, serving as a basis for good climate and energy management and for tracking progress and implementation towards the associated commitments.						
Steps for implementation	1. Further commit to the Covenant of Mayors Mitigation and Adaptation targets.	Q1 2023	Mayor's Office				
	2. Identify and allocate appropriate funding	Q2- 2023	Finance and Budget Directorate				
	3. Procure appropriate specialist support	Q2 - 2023	EIB Directorate				
	4. Develop and approve SECAP, submitting the output to the CoM.	Q3 – Q4 2023	EIB Directorate				
	5. Implement SECAP	Q1 2024					
	6. Monitor Progress against targets and report to CoM.	Q1 2024 - 2030					
Plan for delivery	**Action owner**	EIB Directorate					
	Stakeholders	RIEW, Gradksi Transport, Energo-Pro, Veolia, OverGas, Primagas, TEC Varna Ltd, Natsionalna Elektricheska Kompania EAD, Planex Construction, ViK Varna, EcoMax Waste Management, Port of Varna. Varna Breaths, Eco Varna, Za Zemiata, Ecological Association, Bulgarian Green Building Council, Association of Environmentalists from the Municipalities in Bulgaria.					

	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other	
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding			Government payments / Availability payment		
Impact measures	• Annual CO_2 equivalent emissions per capita. • % change in costs for recovery and reconstruction associated with extreme climate events.								
Costs and benefits									
Estimated cost	**CapEx:**	N/A			**Water savings**	N/A	**Environmental benefits**		
	OpEx:	N/A			**Energy savings**	Dependent on associated target and actions.			
	Design/development:	BGN: 229,000 - 343,000 EUR: 116,000 – 174,000			**CO_2 savings**	30% by 2030 against agreed baseline year.			
Estimated co-benefits	**Social co-benefits**	**Action will improve health**							
		Improve safety and/or security							
		Enhance the public realm							
		Access to basic services							
		Social equity							
	Economic co-benefits	**Revenue generating activities**							
		Promotes economic inclusion							
		Avoided damages	In the longer term, this action can help enhance Varna's resilience to future shocks and stresses, ultimately reducing the impact and associated costs of hazardous events.						
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Further develop the Municipalities understanding and skills around Greenhouse gas emission reporting and risk and vulnerabilities.						
		Enhances legislative environment							

[18] Covenant of Mayors for Climate & Energy Europe. 2013. Signatories – Varna. ONLINE. Accessed on 25th June 2021. Available at: https://www.covenantofmayors.eu/about/covenant-community/signatories/overview.html?scity_id=11593

CC2: Develop and commit to emission reduction targets for the Municipality of Varna's organisational emissions by 2030 and 2050.

Timeline

Strategic objectives	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.	2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.21:** Lack of Greenhouse Gas emission data collection process and analysis	■	■			
Description	The intention of this action is for the Municipality of Varna to develop and commit to a GHG emissions reduction target for their organisational emissions against a pre-determined baseline. Organisational emissions or an "organisational carbon footprint" will help develop an understanding of the GHG emissions associated with the operational activity of the Municipality itself. An organisational carbon footprint incorporates scope 1, 2 and 3 emissions as defined by the GHG Protocol. It will cover activity areas within the Municipality, such as those listed below, each of which are assessed with the aim of achieving the overall reduction target set: • Buildings; Equipment / Site, Public Lighting • Transport i.e. Municipal Vehicle Fleet • Commuting • Business travel • Solid waste disposal • Wastewater treatment • Supply chain procurement Varna Municipality will develop a two-stage organisational emission reduction target. In-line with GCAP action CC.6, the Municipality will commit to a 55% reduction in organisational emissions by 2030 against a pre-determined baseline year, and net-zero by 2050 (to align with the EU-wide emissions reduction target). .					
Steps for implementation	1. Assemble appropriate colleagues to develop the two-stage organisational emission reduction target, clearly outlining the scope of analysis.	Q1 2023	EIB Directorate and the Directorate of Ecology and Environmental Protection.			
	2. Seek Municipal Council approval for organisational targets.	Q2 2023	Municipal Council			
	3. Procure specialist support to complete baseline analysis and on-going reporting.	Q2 2023	EIB Directorate and the Directorate of Ecology and Environmental Protection.			
	4. Complete a Baseline Emissions Inventory (BEI) for the Municipalities Organisational Emissions	Q3 2023 to Q1 2024				
	5. Outline emission reduction pathway to both 2030 and 2050 targets and actions required to meet targets.	Q4 2023 to Q1 2024				
	6. Monitor and report progress towards reduction targets.	Q3 2024 – onwards				

Plan for delivery	**Action owner**	EIB Directorate and the Directorate of Ecology and Environmental Protection.						
	Stakeholders	EDPS Directorate (European and National Operational Programs Directorate) Regional Inspectorate of Environment and Water, Energy sector stakeholders, ViK – Varna, Varna Breaths, EcoVarna						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding			Government payments / Availability payment	
Impact measures	• Annual scope 1, 2 and 3 CO_2 equivalent organisational emissions per activity area for the Municipality.							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	Dependent on commitment made by the Municipality.	
	Design/development:	BGN: 11,200 EUR: 5,750		**CO_2 savings**		
Estimated co-benefits	**Social co-benefits**	**Action will improve health**				
		Improve safety and/or security				
		Enhance the public realm				
		Access to basic services				
		Social equity				
	Economic co-benefits	**Revenue generating activities**				
		Promotes economic inclusion				
		Avoided damages				
	Institutional co-benefits	**Improve institutional capacity or efficiency**	Addressing the action will require coordination between various Municipal commissions and stakeholders, therefore improve the institutional capacity and stakeholder relationships. It will also enhance the Municipalities corporate social responsibility, helping inform a dedicated plan to reduce organisational emissions.			
		Enhances legislative environment	The action will help inform and enhance capacity of the Municipality to achieve EU value limits for reducing pollution.			

CC3: Establish statutory requirements for greenhouse gas (GHG) monitoring and reporting

Timeline

Strategic objectives	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.			2023	2024	2025	2026	2027+
Priority Environmental Challenge(s)	**C.21:** Lack of GHG emission data collection process and analysis							
Description	A lack of local comprehensive monitoring and reporting standards for GHG emissions prohibits Varna Municipality from understanding the City of Varna's contribution to Bulgaria's Nationally Determined Contribution (NDC) and the EU-wide carbon emissions reduction target of 55% by 2030 and net-zero by 2050[19]. To address this information gap and to support the consistent reporting of emissions in-line with NDCs, this action will establish statutory requirements for the monitoring and reporting of all greenhouse gas emissions (CO_2 equivalent) across the following sectors within the geographical jurisdiction of the Municipality: • Energy • Industrial processes and product use • Agriculture • Waste • Land Use, Land-Use Change and Forestry Annual or biannual reports will be prepared, which align with United Nations Framework Convention on Climate Change (UNFCCC) reporting guidelines of quantitative submissions in the Common Reporting Format (CRF) tables and feed into the National Inventory Report (NIR) for Bulgaria. As per the UNFCCC outline, Varna Municipality's monitoring and reporting approach will follow the 2006 IPCC Guidelines for National Greenhouse Gas Inventories in addition to the Greenhouse Gas Protocol For Cities , ensuring that the monitoring and reporting process is coherent with the needs of the UNFCCC and is comparable with other countries. Pursuant to the IPCC guidelines, monitoring and reporting will cover land use, land use change and forestry in Varna Municipality. Additionally, Varna's approach to monitoring and reporting will align with the national government's monitoring plan and should therefore be responsive and adaptable to national changes in monitoring and reporting. Reporting should be transparent, ensuring that Varna Municipality can accurately monitor progress towards targets and identify impeding challenges with annual or biannual reports to accordingly adjust the approach to emission reduction and make progress.							
Steps for implementation	1. Partner with RIEW and appropriate stakeholders to support the design of the statutory reporting requirements and alignment with EU and national level standards.		Q1 2023 – Q2 2024	Ecology and Environmental Protection' Directorate				
	2. Develop statutory monitoring and reporting requirements.		Q2 –Q4 2023					
	3. Approve statutory requirements for GHG monitoring and reporting.		Q4 2023					
	4. Initiate statutory requirements for GHG monitoring and reporting in Varna.		Q1 2024	Municipal Council and Ecology Directorate				
	5. First annual report due.		Q4 2024	Ecology and Environmental Protection' Directorate				
	Action owner	Directorate of Ecology and Environmental Protection.						

Plan for delivery	**Stakeholders**	Municipal Council, Ministry of Environment and Water, Regional Inspectorate of Environment and Water, Energy sector stakeholders, ViK – Varna, Varna Breaths, EcoVarna						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) / SPVs	Other
	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding			Government payments / Availability payment	
Impact measures	• Annual CO_2 equivalent emissions per capita							

Costs and benefits						
Estimated cost	**CapEx:**	N/A		**Water savings**	N/A	**Environmental benefits**
	OpEx:	N/A		**Energy savings**	N/A	
	Design/development:	BGN: 9,750 EUR: 5,000		**CO_2 savings**	N/A	
Estimated co-benefits	**Social co-benefits**	**Action will improve health**				
		Improve safety and/or security				
		Enhance the public realm				
		Access to basic services				
		Social equity				
	Economic co-benefits	**Revenue generating activities**				
		Promotes economic inclusion				
		Avoided damages				
	Institutional co-benefits	**Improve institutional capacity or efficiency**	The action requires close collaboration with the national government and therefore will likely improve coordination between departments.			
		Enhances legislative environment	Monitoring and reporting of GHG emissions is essential for monitoring progress towards target emission reductions including Bulgaria's NDC and EU wide emission reduction targets.			

[19] European Commission. 2021. Progress made in cutting emissions. https://ec.europa.eu/clima/policies/strategies/progress_en

CC4: Undertake air, water and soil quality monitoring and analysis to understand the extent of pollution, expanding the current monitoring system.

Timeline

		2023	2024	2025	2026	2027+
Strategic objectives	**SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution. **SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources					
Priority Environmental Challenge(s)	**C.1:** Lack of comprehensive air quality data to understand the spatial extent and severity of the problem **C.2:** Lack of regular monitoring and reporting of waste streams from industries and associated environmental impact **C.8:** Absence of monitoring and management process of fresh and marine water pollution.		■	■		

Description	Data collection, availability, and accessibility is critical to making evidence-based decisions around policy and investment for infrastructure and sustainable development. Varna Municipality will develop a comprehensive environmental data collection and monitoring scheme to supplement the current system, and to align with the GCAP monitoring plan. This monitoring system will be an Integrated Environmental Monitoring System (IIEMS). The programme will be comprised of a mobile unit with a server-based platform, in addition to the micro-sensors placed around the city that are co-located with reference continuous analysers to aid collaboration. IIEMS is a 'smart' platform that will provide real-time access to data. Varna Municipality will release yearly data summaries that includes data trends over time and a comparison against relevant standards, making the data available monthly in .csv format for use by municipal and non-municipal entities alike.		
Steps for implementation	1. Assemble project team.	Q1 2024	Directorate of Ecology and Environmental Protection
	2. Identify existing data collection and monitoring system and relevant data leads in each department, if applicable. Discuss existing challenges/barriers to data collection and monitoring.	Q1 – Q2 2024	
	3. Map existing sensors for air, water, and soil quality to identify gaps close to pollution sources.	Q1 – Q2 2024	
	4. Determine suitable monitoring equipment and identify key locations for new micro-sensors, and develop associated monitoring scheme (e.g. where will the data be located for public information? Who is in charge of the programme and the annual reporting?)	Q2 – Q3 2024	
	5. Procure IIEMS installation	Q4 2024	
	6. Establish appropriate data management protocols and launch IIEMS	Q1 – Q3 2025	
	7. Conduct period Quality Assessment / Quality Check on the data collected.	Q4 2025+	
	8. Routinely report on data quality	Q4 2025+	

Plan for delivery	**Action owner**	Directorate of Ecology and Environmental Protection						
	Stakeholders	Local universities and research organisations and public						
	Source of upfront cost, as applicable	Own City Budget	National or regional government budget	Borrowings (e.g. IFI, commercial banks, bond issues)	Donor grants	Private Sector / PPPs	Public enterprise (own budget, or borrowing) /SPVs	Other

	Source of funding for operations and maintenance, as applicable	Local Taxes	Non-tax revenues (fees, charges, penalties, etc.)	Donor funding	Government payments / Availability payment

Impact measures	• Daily and average annual concentration of PM2.5 • Daily and average annual concentration of PM10 • Average daily concentration of SO_2 • Average daily concentration of NO2 and NOx • Annual mean NO2 concentrations • Annual average concentrations of particulates • Biochemical Oxygen Demand BOD in rivers and lakes • Ammonium NH_4 concentration in rivers and lakes • Nitrogen N2 concentration in rivers and lakes • Bathing water quality coastal ecological status • Concentration of mercury in soil • Concentration of cadmium in soil • Concentration of zinc in soil

Costs and benefits

Estimated cost	**CapEx:**	For 10 Air Quality Sensors: - BGN: 229,000 - EUR: 116,000		**Water savings**	N/A	**Environmental benefits**
	OpEx:	AQ data analysis & annual reporting for 2 years: - BGN: 29,000 – 34,000 - EUR: 11,600 – 17,400		**Energy savings**	N/A	
	Design/development:	IEMS: - BGN: 80,000 - 126,000 - EUR:40,600 -64,000		**CO_2 savings**	N/A	

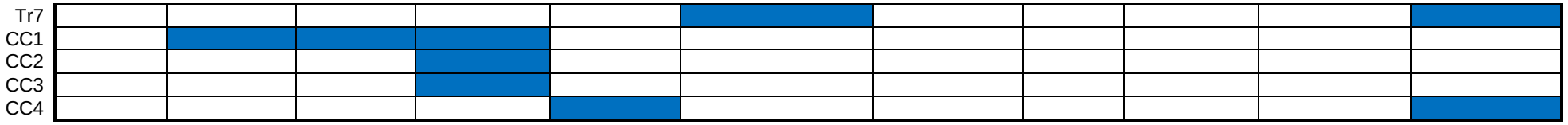
Estimated co-benefits	**Social co-benefits**	**Action will improve health**	Developing comprehensive data collection on relevant environmental factors may have the indirect effect of improving health outcomes as data provides direction on evidence-based policy or planning.
		Improve safety and/or security	Real time information tracking
		Enhance the public realm	Data can improve the public realm indirectly by providing insight into environmental quality, thereby allowing decision-makers the opportunity to implement policies/plans/investments to improve environmental quality in areas where it is subpar and above relevant standards.
		Access to basic services	
		Social equity	Vulnerable communities more often live near areas of poor environmental quality or contamination, as land value is lower. Improving data on where hotspots of poor quality are will help to implement policies that ideally improve quality, and thereby the lives and livelihoods of those living or working in/around these areas.
	Economic co-benefits	**Revenue generating activities**	
		Promotes economic inclusion	
		Avoided damages	See “improve safety/security”
	Institutional co-benefits	**Improve institutional capacity or efficiency**	The Municipality may have more streamlined communication and easier access to data through development of the IIEMS. This will improve reporting and decision-making capabilities.

5.10. Delivering our targets

The actions outlined were developed to be complementary and implemented to holistically contribute to Varna's long-term vision. Table 5.1 maps the actions against the medium-term strategic objectives, and Table 5.2 visualises a comprehensive action timeline over the following five years.

Table 5.1. Actions vs. strategic objectives matrix

	SO.1: Varna Municipality will help create opportunity for future, green investment.	**SO.2:** Varna Municipality will raise awareness around environmental challenges and climate change.	**SO.3:** Varna Municipality will help build the City's resilience to future climate change risks.	**SO.4:** Varna Municipality will reduce the City's GHG emissions and develop a greater energy independence.	**SO.5:** Varna Municipality will help improve air quality standards and reduce levels of noise pollution.	**SO.6:** Varna Municipality will help develop a high-quality, resilient, and accessible transport system which promotes sustainable mass-transit options and active modes of local mobility.	**SO.7**. Varna Municipality will help create more integrated, accessible, and inter-connected green space throughout the City.	**SO.8:** Varna Municipality will promote diversity, inclusion, and equality.	**SO.9**: Varna Municipality will optimise surface and groundwater management, building a more resilient system that covers the whole City	**SO.10:** Varna Municipality will improve the management system and physical infrastructure for solid waste collection and disposal.	**SO.11:** Varna Municipality will help protect and promote the sustainable use and restoration of the natural environment and its resources.
En1				■							
En2	■			■							
En3				■							
En4				■							
Ind1				■	■						
WCM1									■		■
WCM2									■		
WCM3				■							■
WCM4									■		
WCM5									■		■
WCM6									■		
Bu1				■	■				■		
Bu2			■	■	■			■			
Bu3			■	■					■		■
Bu4	■				■				■		■
Lu1	■										■
Lu2	■	■	■				■				
Lu3			■						■		
SW1	■									■	■
SW2	■									■	■
Tr1					■	■					
Tr2						■					
Tr3					■	■					
Tr4				■		■					
Tr5					■	■					
Tr6					■	■					



The following Table 5.2 clearly demonstrates the development (blue) and implementation (grey) timeframes for each of the actions detailed within this GCAP.

Table 5.2. Action timeline

Action ID	GCAP Action	2023	2024	2025	2026	2027+
En1	Set up a community energy efficiency programme.					
En2	Ensure that future Municipality Energy Strategies incorporate the findings and recommendations of this GCAP.					
En3	Provide incentives to both developers and private homeowners, for the incorporation / installation of renewable electricity generation. (e.g. tax exemptions, cost subsidisation).					
En4	Integrate renewables at a large scale in the city					
Ind1	The Municipality to establish a supplementary reporting programme for all existing and new industries to develop and share policy on the monitoring, reporting and publication of key environmental data (e.g. air, water, carbon emissions, noise pollution and waste disposal) to inform efforts for reducing pollution in-line with EU Limit Values.					
WCM1	Work with ViK Varna to introduce "smart" technology, i.e. IoT smart metering, across the potable water network.					

Action ID	GCAP Action	2023	2024	2025	2026	2027+
WCM2	Identify and remediate areas of cross-connection in the wastewater network and separate wastewater and rainwater runoff networks to reduce wastewater volumes at WWTP	■	■	■	■	
WCM3	Introduce wastewater sludge management (e.g. reuse in forestry and agricultural activities, reed beds and energy production)		■	■		
WCM4	Integrate Water Sensitive Urban Design (WSUD) and Sustainable Drainage System (SuDS) principles into land use, transport, and industry planning; and construction permitting rules.		■	■	■	
WCM5	Develop and implement a structured maintenance programme to reduce leakage in the potable water network with a long-term target of 60-90% efficiency.	■	■	■	■	■
WCM6	Develop a Flood Reduction Master Plan	■	■			
Bu1	Adopt and incentivise LEVEL(S)/ EDGE building standards or develop local green building standards in line with international best practices common for green building certification tools for all municipal buildings.		■	■		
Bu2	Strengthen the existing planning system to ensure that private developers undertake and submit to the Municipality an options assessment report regarding the choice of energy system (heating and cooling) for new developments.		■	■		
Bu3	Incentivise and encourage the Incorporation of Mitigation and Adaptation design considerations / technologies within new developments to limit bad practices and associated impacts		■			
Bu4	Promote and incentivise the installation of green roofs (or walls) on private buildings through the revision of planning approvals for new construction or renovations.	■	■			
Lu1	Introduce policy and tax incentives to prioritise brown-field development over greenfield.		■	■		

Action ID	GCAP Action	2023	2024	2025	2026	2027+
Lu2	Climate change mitigation and adaptation considerations and analysis to inform policy in the General Development Plan					
Lu3	Install permeable pavements in sections of parking lots, and rain gardens can be included where required					
SW1	Accelerate investment in recycling facilities, supported by strategic planning to ensure saleable outputs can be produced, alongside dedicated programmes to support waste separation					
SW2	Develop and implement an integrated recycling program to promote the use of resourceful construction and demolition materials and create green jobs (i.e. inert construction and demolition waste as secondary aggregate).					
Tr1	Introduce Low Emission Zone and time-based congestion charge zone within the city centre					
Tr2	Upgrade ITS (Intelligent Transport Systems) to enhance existing traffic management/control centre.					
Tr3	Develop a 'Mobility Hub' Transport Strategy as part of the on-going SUMP to increase public or pedestrian modalities. Measure and track the network demand to inform the development of the strategy.					
Tr4	Investment in publicly available and convenient rapid Electric Vehicle charging stations across the City. This should include both Varna City Centre and residential neighbourhoods.					
Tr5	Continue to invest in new electric public transport fleet (to cover bulk buses and vehicle fleets)					
Tr6	Enhance the current parking plan to develop a strategy and enforce related policies around providing an alternative to on-street parking in appropriate central city areas.					

Action ID	GCAP Action	2023	2024	2025	2026	2027+
Tr7	Research and establishment of fast ferry connections for passenger-only sea transport between the port of Varna - Kv. Asparuhovo, as well as to other smaller locations on the periphery of Varna Lake					
CC1	Develop a Sustainable Energy and Climate Action Plan (SECAP) as part of the Covenant of Mayors on Climate and Energy, including a climate adaptation plan and sector-specific greenhouse gas emissions reduction targets.					
CC2	Develop and commit to emission reduction targets for the City of Varna's corporate emissions by 2030 / 2050.					
CC3	Establish statutory requirements for GHG monitoring and reporting.					
CC4	Undertake air, water and soil quality monitoring and analysis, on a municipal level, to understand the extent of pollution, expanding the current monitoring system.					

6. Implementation and Monitoring

The following section describes the structure which will be used by Varna Municipality to ensure GCAP actions are implemented and their potential impact for addressing Varna's challenges is understood and maximised. This Implementation and Monitoring framework will facilitate informed and evidence-based decision making, ensuring effective and efficient use of resources, alongside public accountability through reporting requirements.

6.1. Implementation roles and Responsibilities

The proposed roles and the structure of reporting is outlined within Figure 6.1 below, followed by an outline of the key responsibilities for each role.

Figure 6.1 Key M&E Roles in Varna

6.1.1. GCAP Coordination Board

The Varna Municipality Steering Committee have been the central body responsible for the delivery of this GCAP and will remain in charge of overseeing its implementation by forming the GCAP Coordination Board. The GCAP Coordination Board will have the following responsibilities:

- Meet at least twice a year
- Advise on the appointment of a 'Green City Coordinator'.
- Provide technical advice to Green Champions and Green City Coordinator
- Provide insight into departmental priorities and opportunities for new green city actions

6.1.2. Green City Coordinator

The GCAP Coordination Board will recommend a colleague to assume the role of Green City Coordinator, who will have the following key responsibilities and competencies. The competencies are set out as per the EBRD GCAP Methodology

Table 6.1. List of key responsibilities and competencies for a Green City Coordinator

Responsibilities	Competencies
• Oversee implementation, liaising with relevant municipal departments	• A change agent that can organise resources, support and buy-in for innovative work
• Help identify and establish Green Champions	• Capable to bridge between policy and implementation and able to build partnerships and alliances between diverse stakeholder groups.
• Collaborate with action leads to ensure the proper progress monitoring of actions	• Excellent managerial and coordination skills including organising ‘green’ events.
• Set standards for data collection and storage	• An excellent communicator and inspirational champion of ‘green’ measures and initiatives
• Collaborate with the GCAP Coordination Board, seeking high-level technical input from the Board as and when required	
• Lead green city actions and initiatives within the Municipality	

6.1.3. Green Champions

Each action area outlined within the GCAP will have a nominated a Green Champion within the Municipality, who will have the following responsibilities:

Table 6.2. List of Key responsibilities and competencies for a Green Champion

Responsibilities	Competencies
• Monitoring the progress of the relevant actions within their department	• Good knowledge and connections with appropriate departmental stakeholders
• Determine and liaise with appropriate stakeholders for data collection and action implementation.	• Ability to recognise and analyse key data required
• Responsible for completing relevant sections of the Monitoring and Evaluation Tool	• Eye for detail in recording and reporting action progress

• Work collaboratively with other Green Champions, especially on cross-cutting issues	• Excellent managerial and coordination's kills including organising 'green' events
	• An excellent communicator and inspirational champion of 'green' measures and initiatives.

6.1.4. Internal Auditor

The Green City Coordinator will appoint an Internal Auditor, whose role is it to independently evaluate the GCAP management process and achievements at **two-year** intervals. The person who holds this position can be a Municipal colleague OR external consultant but MUST be removed from the process of GCAP development and implementation.

6.2. Monitoring our progress and impact

Monitoring and evaluation are important management tools necessary to track the progress and facilitate decision making for present and future interventions. This allows the project implementers to make informed and evidence-based decisions regarding the project operations and service delivery, ensures effective and efficient use of resources and reporting requirements are met, ensures public accountability, and based on evidence, enables the extent to which the project is having the desired impact to be assessed.

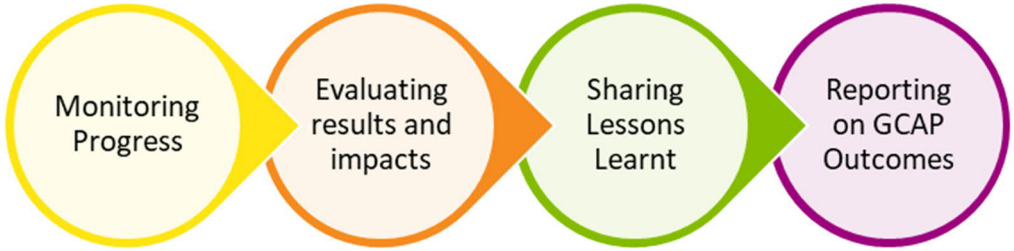
Monitoring involves the continuous process of routine data collection to measure progress toward achieving the project/program objectives while evaluation involves measuring how well the program activities have met expected outcomes. The monitoring and evaluation process should be planned at the design stage, with monitoring being a continuous process recording real time data with a focus on quality control. Meanwhile the evaluation phase is periodical, based on the monitoring data and the focus is on quality assurance.

The monitoring and evaluation stages, shown in Figure 6.2, are used to track changes in program performance over time and sometimes referred to as the process of evaluation. The steps are as follows:

- Track implementation progress of GCAP actions (Progress Monitoring Plan (PMP))
- Identify whether each implemented action is having the desired results and impacts, linking back to state and pressure indicators (Impact Monitoring Plan (IMP))
- Facilitate learning about what is and is not working, both in terms of the actions and the management and delivery structures in place
- Determine what adjustments need to be made during GCAP implementation to maximise the potential for positive impact

The departmental Green Champions will **update the IMP** for their respective indicators on **an annual basis** and feed this back to the Green City Coordinator. As many actions will be impacting indicators across the board, it is suggested that Green Champions across departments work collaboratively to monitor annual impacts. Subsequently, the Green City Coordinator will provide an update to the Green City Coordination Board. This feedback can be provided through an **annual Action Impact Meeting.**

Figure 6.2 Key Monitoring and Evaluation Steps during GCAP Implementation



Source: AECOM. 2021.

6.2.1. Monitoring Progress

The Progress Monitoring Plan (PMP) is a built-in excel used for tracking the implementation progress of the GCAP actions. It sets out all the GCAP actions broken down by strategic objective and target as well as key milestones to provide a timeline and sequence for each milestone over the short to medium-term. The responsibility for the **PMP** lies with the Green City Coordinator, while the **Green Champions will be responsible for updating respective parts of the PMP quarterly.**

Figure 6.3 Screenshot of GCAP Varna's Progress Monitoring Plan

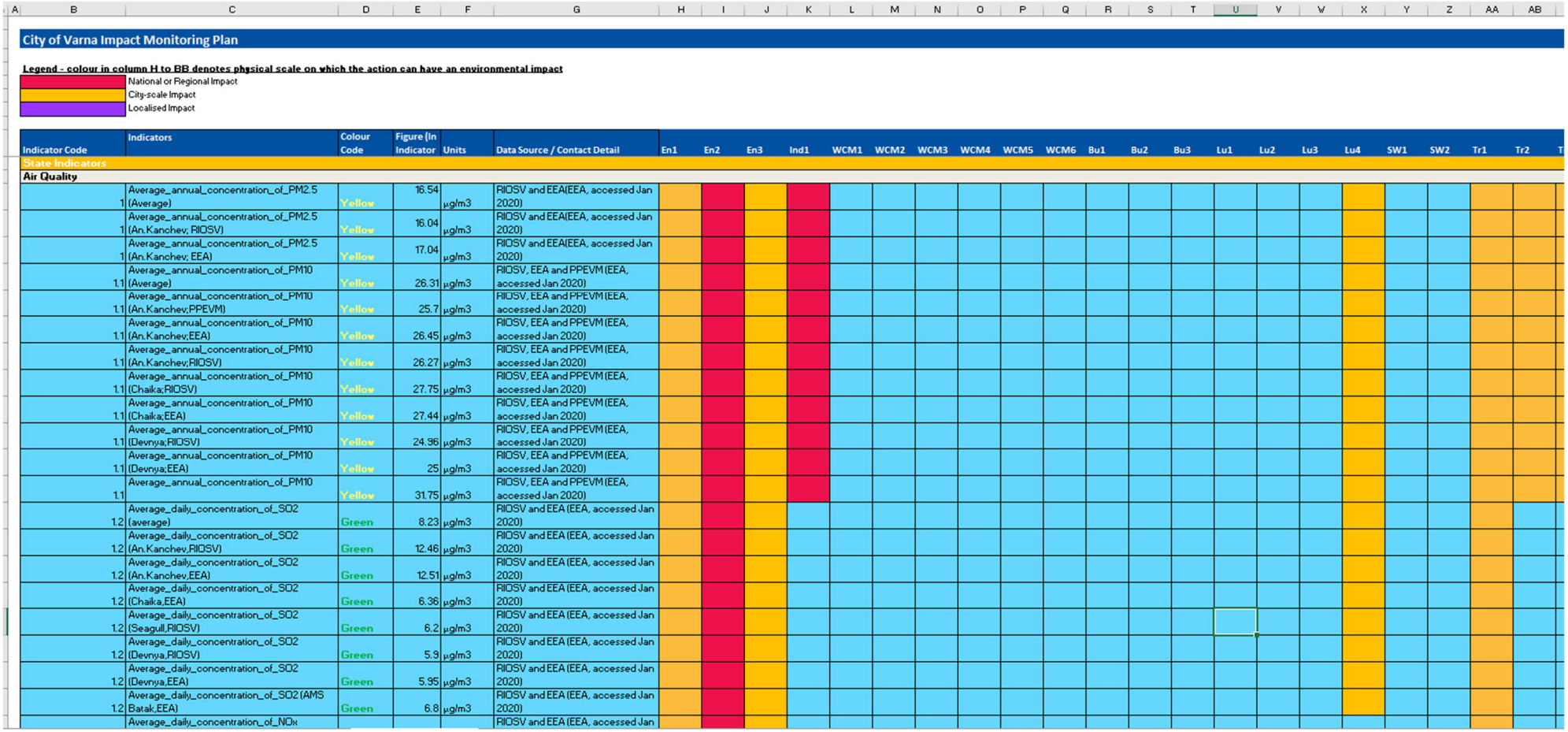
A	B	C	D	E	F	G	H	O	P	Q	R	S	T	U
										To be completed by Varna Municipality				
	City	Country	Sector	GCAP Policy Actions sub-category	E-mobility related investments	GCAP Action Smart potential	Action Code	Surce of Funding (Potential) (Municipal budget, national budget, PPP, Private sector, IFIs, Donors)	Potential Support (EBRD Follow-on investment and/or TC/Policy)	Status Implementation	Status against planned	Description Note	Date	Entered by
	Varna	Bulgaria	Energy	E3. Policies and support for Energy Performance Contracting		Smart Component	EN1	Municipal budget, national or regional budget, borrowings (e.g. IFIs commercial banks, bond issues), Donar Grants						
	Varna	Bulgaria	Energy	E1. Improved energy performance for public buildings		No Smart	EN2	Municipal budget, national or regional budget						
	Varna	Bulgaria	Energy	E7. Promotion of renewable electricity generation		No Smart	EN3	Municipal budget, national or regional budget						
	Varna	Bulgaria	Energy	E7. Promotion of renewable electricity generation		No Smart	EN4	Municipal budget, national or regional budget						

Source: AECOM. 2021.

6.2.2. Evaluating results and impacts

The Impact Monitoring Plan (IMP) is a built-in excel which is used to evaluate whether the GCAP actions being implemented are having the desired results and impacts. It is based on the Indicator Database (developed as part of the GCAP process) which established the quantitative baseline for Varna's GCAP. The IMP lists out the baseline condition for each indicator against the annual monitoring which will be undertaken. The responsibility for overseeing the **IMP** is held by the Green City Coordinator, while the Green Champions will monitor the indicators, reporting on an **annual basis.**

Figure 6.4 Screenshot of Varna's Impact Monitoring Plan



City of Varna Impact Monitoring Plan

Legend - colour in column H to BB denotes physical scale on which the action can have an environmental impact

National or Regional Impact
City-scale Impact
Localised Impact

Indicator Code	Indicators	Colour Code	Figure (In Indicator	Units	Data Source / Contact Detail	En1	En2	En3	Ind1	WCM1	WCM2	WCM3	WCM4	WCM5	WCM6	Bu1	Bu2	Bu3	Lu1	Lu2	Lu3	Lu4	SW1	SW2	Tr1	Tr2
State Indicators																										
Air Quality																										
1	Average_annual_concentration_of_PM2.5 (Average)	Yellow	16.54	µg/m3	RIOSV and EEA(EEA, accessed Jan 2020)																					
1	Average_annual_concentration_of_PM2.5 (An.Kanchev; RIOSV)	Yellow	16.04	µg/m3	RIOSV and EEA(EEA, accessed Jan 2020)																					
1	Average_annual_concentration_of_PM2.5 (An.Kanchev; EEA)	Yellow	17.04	µg/m3	RIOSV and EEA(EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (Average)	Yellow	26.31	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (An.Kanchev;PPEVM)	Yellow	25.7	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (An.Kanchev;EEA)	Yellow	26.45	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (An.Kanchev;RIOSV)	Yellow	26.27	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (Chaika;RIOSV)	Yellow	27.75	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (Chaika;EEA)	Yellow	27.44	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (Devnya;RIOSV)	Yellow	24.96	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10 (Devnya;EEA)	Yellow	25	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.1	Average_annual_concentration_of_PM10	Yellow	31.75	µg/m3	RIOSV, EEA and PPEVM (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (average)	Green	8.23	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (An.Kanchev,RIOSV)	Green	12.46	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (An.Kanchev,EEA)	Green	12.51	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (Chaika,EEA)	Green	6.36	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (Seagull,RIOSV)	Green	6.2	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (Devnya,RIOSV)	Green	5.9	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (Devnya,EEA)	Green	5.95	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
1.2	Average_daily_concentration_of_SO2 (AMS Batak,EEA)	Green	6.8	µg/m3	RIOSV and EEA (EEA, accessed Jan 2020)																					
	Average_daily_concentration_of_NOx				RIOSV and EEA (EEA, accessed Jan																					

Source: AECOM. 2021.

6.2.3. Reporting and Sharing lessons learnt

The Green City Coordinator will provide bi-annual updates to the Green City Coordination Board on the PMP and IMP. An **Annual Progress Report** will be produced and shared with the Green City Coordination Board and the **EBRD.** The report will include as a minimum:

- Action implementation status and any issues encountered
- Recommendations for revisions to any GCAP actions
- Changes in a 'dashboard' of key state indicators
- Potential new GCAP actions for consideration

Furthermore, a public fact sheet on implementation progress will be published on the Varna Municipality website. Press releases and case studies may also be considered to highlight specific success stories.

6.2.4. A Summary of Components

Table 6.5 summarises the key components of the implementation and monitoring plan for the GCAP, alongside which role is responsible for each component, and the timeframe for delivery.

Table 6.3 Overview of Implementation and Monitoring components.

Evaluation / reporting Mechanisms	Responsible for Delivery	Timeframe of Delivery
Progress Monitoring Plan	**Green City Champions** updates relevant actions **Green City Coordinator** has general oversight	Quarterly
Impact Monitoring Plan	**Green City Champions** update indicator monitoring **Green City Coordinator** has general oversight	Annually
Annual Progress Report	**Green City Coordinator** presents to Green City Coordination Board and shared with EBRD.	Annually

Appendix A Baseline Conditions in Varna

This appendix A summarises the key findings of the Varna Political Framework Report and the Varna Technical Assessment Report which were conducted in 2019 to inform the GCAP actions detailed in Chapter 5. The following appendix will outline the social, economic, environmental and governance context of Varna within the GCAP has been developed.

1.1 Social, economic, and institutional context

With a population of 345,369,[20] Varna Municipality is the third largest in Bulgaria, after Plovdiv and Sofia Municipalities. Net migration has fluctuated in recent years but remained positive of 0.07%-0.63% between 2017 and 2020.[21] Unemployment rates have also fluctuated but increased from a low of 3% in 2017 to 4.1% in 2020, a marked difference.[22] In Varna, poverty and low minimum wages are persistent challenges with 20.4% of men and 26.1% of women living below the poverty line.[23]

Over the last 30 years, Bulgaria's economy has undergone a significant transformation following the cold war and its assession to the European Union (EU) in 2007; becoming increasingly open and market-based, transitioning from its former highly centralised, planned economy. With rapid growth in recent years it has become an established upper-middle income economy with an estimated gross domestic product (GDP) per capita, PPP of $24, 579 (in 2019)[24], and an average gross monthly salary of 1281 leva (657 Euros).[25]

The maritime industry and associated businesses contribute a large share of the municipality's received revenue, approximately 14-15%.[26] Tourism is also a key industry in Varna, it is one of the fastest developing areas and becoming an increasingly significant share of the economy. Of Bulgaria's national income from tourism, Varna region alone contributes approximately 23%.[27] Through its growth, the tourism sector has shaped the image of Varna with an abundance of hotels and beaches supplying the recreation needs of tourists. Numerous resort complexes like Golden Sands, St. Constantine and Helena, Riviera, and Sunny Day feature throughout the city with tourists drawn by beaches along the Black Sea coast, mineral springs, and cultural heritage sites. The municipality is seeking to improve and diversify tourist services and products offered, and there are initiatives to develop new parks, sport facilities, and cultural and recreational facilities to attract further tourism. As Varna features an international airport, train and bus station, and seaport it has become a tourist traffic hub. Many tourists with final destinations in other Black Sea locations pass through Varna, often staying for one-night en-route.[28]

1.2 State of and key pressures on environmental conditions in Varna

The following section summarises the baseline environmental conditions of key indicators in Varna. The assessment was conducted according to EBRD's Pressure-State-Response (PSR) Framework and builds on the qualitative and quantitative data collected for the Political Framework Report and the Indicators Database.

In the subsequent sections, the State and Pressure indicators will be presented with the most recently available "latest value" data. Initially desk-based research using published sources enabled a broad understanding of the baseline situation to be developed. The remaining indicator data was collected from identified relevant stakeholders and analysed between 2019 and 2020. At the time of writing the technical assessment 65% of the indicator data was collated which EBRD confirmed was sufficient to complete the technical assessment. The data and analysis included is based on available data, interviews, and stakeholder validation at the time of writing. Since the completion of the assessment no further investigation has been undertaken, therefore while new data may be available it has not been incorporated into this Appendix, which serves as a summary of the Technical Assessment Report.

The presented data is colour-coded based on the predetermined benchmarks of EBRD's GCAP methodology. These fall within a "traffic-light screening" with red indicating low

[20] National Statistics Institute, 2018
[21] National Statistics Institute, 2021
[22] National Statistics Institute, 2021
[23] National Statistics Institute, 2019
[24] The World Bank. 2021.GDP per capita, PPP (current international $) – Bulgaria. Available: https://data.worldbank.org/indicator/NY.GDP.PCAP.PP.CD?locations=BG
[25] National Statistics Institute, April 2019
[26] Varna Baseline Assessment and PESTEL Analysis, 2017
[27] Programme for the Protection of the Environment for Varna Municipality 2019-2023
[28] Municipal Development Plan of Varna Municipality 2014-2020

performance, yellow indicating insufficient performance and green indicating good performance against the benchmark. The benchmarks are assigned based on a combination of international standards, EU directives and national laws where applicable (EBRD, 2017). Regional, or in some cases national data, is presented where no local data is available.

1.1.1. Air Quality

Table 6.4. Air Quality: Available Indicator Data

Indicator (in µm^3)	Latest Value
Average annual concentration of PM2.5	18.4
Average annual concentration of PM10	27.13 (2019) (Average of 4 AMS)
Average annual concentration of SO_2	9.65 (2016 – 2019) (Average of 4 AMS)
Average annual concentration of NO_2	29.8 (2016 – 2019) (Average of 4 AMS)

Source: AECOM. 2019.

In 2020, the European Environment Agency (EEA) classified the Air Quality Index in the Varna region as Good/Fair based on concentration values of PM10, PM2.5, ozone (O_3), NO_2, and SO_2 (EEA website, accessed Jan 2020). There are two permanent automatic monitoring stations (AMS) for air quality in the municipality, AMS Chaika and AMS Angel Kanchev. AMS Chaika replaced the previous measuring point, AMS Batak, in early 2018. RIEW Varna recognised in its 2018 report that the Varna-Devnya area has a particular challenge with air quality due to the industrial activity.[29]

PM10

Annual PM10 emissions data from municipal documents indicates that the PM10 emissions contributed by the industry sector is, on average, much lower than emissions generated by the transport and buildings sectors. Heating in buildings, in particular the use of solid fuels such as coal and wood, account for more than 40% of the annual emissions of PM10 in the municipality based on data for 2017.[30] Industrial processes (including energy generation) account for around 13% of annual emissions based on 2017 data. Despite this, industrial and port facilities within Varna and those in adjoining regions have a significant localised impact on air quality. This is reflected in the higher emissions measured at the AMS Batak station located in the southern industrial area.

As Varna is a port city, ships and other water transport are a contributor to air pollution including emissions of SO_2, NO_x, and particulate matter. This may be a contributing factor for the higher-than-average PM10 and NO_2 concentrations measured at the (now discontinued) AMS Batak measuring station in addition to industrial sector emissions.

PM2.5

Like PM10, concentrations of PM2.5 exceed the GCAP green benchmark values. Average annual concentrations for PM2.5 are seeing an upward trend in 2018 and 2019, with values in 2019 exceeding the previous peak in 2014. High levels of PM2.5 could result from high private vehicle use, aged polluting vehicles and water transport.

SO_2

Sulphur dioxide (SO_2) concentrations fall largely below the limit of 50µg/m3 and are not an issue locally. Ships and water transport contribute to air emissions like SO_x, NO_x and particulate matter. The use of solid fuels in buildings, particularly coal combustion is associated with air pollutants including SO_2, NO_x, particulates, and other hazardous pollutants like mercury.

NO_x

NO_x concentrations fall between 18.1 – 44.4µm^3, with most monitoring stations falling in the good performance benchmark, one station falls under the insufficient performance benchmark. Shipping and water transport contribute to the emissions of NO_x, potentially accounting for the higher-than-average NO_2 concentrations measured at the (now discontinued) AMS Batak measuring station. Industrial sector emissions and Coal combustion in the buildings sector are associated with a number of air pollutants including SO_2, NO_x, particulates, and other hazardous pollutants such as mercury.

The gas network supplies approximately 40,000 household users and 30 industrial sites, based on 2013 data. While gas burning is associated with NO_x emissions, the use of solid fuels, has the greatest impact on air quality in Varna.

[29] Regional Inspectorate of Environment and Water– Varna. 2018. Regional status report on environment

[30] Programme for environmental protection for Varna Municipality 2019-2023, pg. 45

Key Air Quality Challenges

Table 6.5. Air Quality: Challenges in Varna

Sector	Challenge	Description
Transport	Lack of comprehensive air quality data	Air quality monitoring data is not comprehensive; therefore, the extent of the air quality issues in specific areas the proportion of the population exposed to harmful level of pollutants are not fully understood.
	High private vehicle use and emissions from ageing vehicle fleet	Nearly half of all journeys are made by private transport and more than a third of vehicles run on diesel, with low penetration to date of cars using alternative fuels.
	Low frequency and limited coverage of public transport	Reliability, frequency, coverage, and speed of public transport are likely contributing factors to the high private vehicle use.
	Lack of cycling culture	Scale and terrain mean a significant proportion of the city centre is inaccessible by cycling and walking. There has been more investment in new cycle lanes, though discussions with municipal staff indicate residents currently do not use their own bikes as these tend to get stolen.
Buildings	Domestic coal and wood burning for heating, and low uptake of district heating	Infrastructure investment and enforcement powers are needed to facilitate the transition to cleaner fuels. To date, uptake of gas networks and district heating has been limited despite spare capacity. Discussions with municipal staff suggest energy/ fuel costs are a key factor driving the use of solid fuels.
	Poor energy performance of buildings	The impact on air quality from the use of solid fuels is compounded by the poor energy performance of existing buildings. Most residential buildings were built between 1981-1990 using prefabricated concrete panel construction, with benchmark energy consumption values ranging between 290-364 kWh/m^2. Energy efficiency improvements can also reduce fuel costs, facilitating the uptake of cleaner fuels.
	Lack of incentives for 'Green Buildings'	Significant growth in Varna mean it is critical for new buildings to be designed to minimise energy use, use clean fuels, and maximise opportunities to integrate renewable sources of energy. Adopting a "green building" standard to enforce these opportunities would ensure new buildings do not significantly add to the air quality problems.
Industry	Lack of monitoring regime for all polluting industries	The municipality has limited control over emissions from the industrial sector within its territory and the Devnya industrial area, which are regulated, monitored, and enforced by RIEW Varna. Larger emitters are required to periodically monitor emissions, a monitoring regime for other industrial facilities would help identify localised problems due to breaches of legal emission limits.

Source: AECOM. 2019.

1.1.2. Water Quality and Availability

Table 6.6. Water Quality and Availability: Available Indicator Data

Indicator	Latest Value
Biochemical Oxygen Demand (BOD) in rivers and lakes (mg/L)	4.72 (2018-2019) (Average of 13)
Ammonium (NH_4) concentration in rivers and lakes (mg/L)	0.28 (2018) (Average of 11)

Nitrogen concentration in rivers and lakes (additional indicator) (mg/L)	7.9 (2019) (Average of 2)
Percentage of water samples in a year that comply with national potable water quality standards	100% (2019)
Bathing water quality coastal ecological status	Bad (2017)
Water Exploitation Index	9% (Regional) (2015)

Source: AECOM. 2019.

Water supply, sewage and waste treatment services in Varna municipality are provided by ViK Varna Ltd., a public company with 51% shares owned by the state and 49% by 10 municipalities in the region.[31] The main water supply is provided by the Kamchia Dam and is treated by Kamchia Water and Wastewater Treatment Plant, owned, and operated by W&C - Burgas. Lack of maintenance and timely replacement has led to a significant deterioration of the system and high-water losses. Non-revenue water was 66.56% in 2015 although this is projected to decrease to 63.84% by 2021.[32] The most serious water supply issues are in the south of the Municipality where supply is insufficient for seasonal demand. As development and demand increases, it will be necessary to invest in new water supply infrastructure and reservoirs to service the area.

Wastewater is predominantly collected separately to stormwater though some areas, like the city centre, have a common system for wastewater and stormwater collection.[33] There is good sewage network coverage in urban areas, however some settlements are not connected to the network, including Konstantinovo, Zvezditsa and Kazashko villages, and part of Galata neighbourhood. Nearly 30,000 acres of agricultural land that has been designated for development is also devoid of a sewage system.[34] Due to physical depreciation, at least 20% of the system needs refurbishing and some areas, require complete replacement due to the inadequate sewage disposal capacity.[35] These capacity limitations result in the discharge of untreated water into the Black Sea and Varna lake during periods of high rainfall. Such events are becoming more frequent and are observed with most high intensity and duration rainfall events. However, there is no untreated wastewater discharged at the official discharge points operated and maintained by ViK Varna Ltd.[36]

Biochemical Oxygen Demand (BOD) and ammonium (NH_4) concentrations in rivers and lakes fall into the red performing benchmarks of over 4mg/L and 0.2mg/L respectively. BOD in the lakes exceed acceptable levels at all measuring stations with significant exceedance (red benchmark) at the eastern end of Beloslav Lake and the channel connecting it to Varna Lake. The Varna Lake west station (i.e. towards Beloslav Lake) registered the highest values every year. NH_4 concentration is a particular issue for the Beloslav Lake and Varna Lake with significant exceedances since 2014 though there is a downward trend in the last 2 years at Beloslav Lake and concentrations declining to acceptable levels at the eastern edge of Varna Lake in the last year. At the WWTP outlets, WWTP Varna and WWTP Golden Sands, BOD and Nitrogen concentration both significantly exceed benchmark values for the measurement stations. The Programme for environmental protection for Varna Municipality 2019-2023 alludes to capacity constraints in the summer months for the WWTP at Golden Sands due to increase in tourist numbers which may justify the overshoot. WWTP discharges, and diffuse sources from areas without sewerage infrastructure and agricultural land (e.g. use of fertilizers and other agricultural products) also pollute the four groundwater bodies in 3 aquifers in the territory. Data from municipal documents indicates that not all groundwater bodies are in a good chemical state[37].

Key Water Quality Challenges

Table 6.7. Water Quality: Challenges in Varna

Sector	Challenge	Description
Solid Waste	Illegal dumping of solid waste	Illegal dumping of waste in stormwater channels drains pollutants into surface water bodies and the Black Sea. Waste also reduces capacity of stormwater channels and increases the risk of flooding.

[31] Avren Municipality 1%; Aksakovo Municipality 2%; Byala Municipality 1%; Varna Municipality 35%; Vetrino Municipality 1%; Municipality of Valchi Dol 2%; Devnya Municipality 1%; Dalgopol 2%; Provadia Municipality 3% and Suvorovo Municipality 1%
[32] Varna Municipality Programme for Environmental Protection 2019-2030, p. 61.
[33] Varna Municipality Operational Programme 2014-2020, p. 147
[34] Varna Municipality Operational Programme 2014-2020, p. 147
[35] Strategy for Development and Management of the water supply and sanitation sector in the Republic of Bulgaria 2014-2023
[36] Varna Municipality Programme for Environmental Protection 2019-2030, p. 69.
[37] Programme for environmental protection for Varna Municipality 2019-2023, pg. 99

Water Supply and Treatment	Limited capacity of combined sewerage and stormwater systems	Parts of the existing sewage and stormwater system in the central part of the city are capacity constrained causing overflows and untreated water discharge into the Black Sea and Varna Lake during extreme rainfall events. Overflows are now regularly observed with most high intensity rainfall events.
	Lack of sewerage and stormwater infrastructure in parts of the municipality	Most of the population (~95%) is connected to the sewage system, but some villages in the south of the municipality and areas on former agricultural zones lack required infrastructure, risking pollution of groundwater and surface water bodies.
	Ageing and/or capacity constrained wastewater treatment plants	Discharged waste from WWTPs do not meet the required environmental standards which impacts both water quality and biodiversity. The issue affects several WWTPs. Further investment in new infrastructure and/ or improved processes are required.
	Lack of whole water cycle management	Varna manages water linearly; water is abstracted, distributed for use, collected for treatment then discharged back into the environment. Best practice water management focuses on the whole water cycle, making use of wastewater (both greywater as well as storm water) which puts less pressure on natural water resources and relieves pressure on wastewater collection and treatment facilities. A water sensitive approach to urban design is desirable, including integrating permeable paving or green infrastructure, and maximising opportunities for water recycling in buildings.
	High system losses in water supply network	Lack of maintenance and renewal of aged infrastructure has led to a significant deterioration of the potable water distribution system and high water losses. Additional pressure is anticipated from tourism and indigenous growth.
Industry	Lack of regular monitoring of wastewater discharge from industries	Several local businesses/ industries require on-site wastewater treatment and operate independently, however, treated wastewater discharged from such on-site facilities contain a high contaminant levels. Implementing a rigorous regime for periodic and/or automated monitoring would help identify and address non-compliance issues more quickly and effectively.
	Lack of effective management of the disposal site for scrapped ships	The ship scrapping site is located on the shore of Varna lake and close to protected biodiversity areas. Its location makes it a significant risk for contaminating the adjoining lake with heavy metals and other pollutants.

Source: AECOM. 2019.

1.1.3. Soil Quality

Table 6.8. Soil Quality: Available Indicator Data

Indicator	Latest Value
Number of Contaminated Sites (CSs) (CSs / 1000 km^2)	0 (2019)
Concentration of mercury in soil (mg/kg)	0.3 (Regional, 0-20cm) (2018)
Concentration of cadmium in soil (mg/kg)	0.28 (Regional, 20-40cm) (2016) - 0.405 (Regional, 0-20cm) (2018)
Concentration of zinc in soil (mg/kg)	87.8 (Regional, 0-20cm) - 92.5 (Regional, 20-40cm) (2018)

Concentration of mineral oil in soil using infrared spectroscopy (mg/kg)	Not Available

Source: AECOM. 2019.

Generally, soil quality in Varna falls within the green benchmark against international standards. However, there is no routine monitoring of soil quality and therefore no comprehensive data is available for recent years. At the regional level soils are tested once a year in locations specified by the MEOW. Nearest Varna the samples are taken in Aksakovo Municipality. Additional measurements are carried out on a case-by-case basis as needed.[38] These did not find any contaminated sites in the last year in the municipality. Periodic measurements of soil quality in the region show that while levels of cadmium and zinc are within acceptable limits, those for mercury are in the orange benchmark range. This is based on data for three years between 2015 and 2018. Additional measurements are carried out on a case-by-case basis as needed.[39] These did not find any contaminated sites in the last year in the municipality. Data from these measurements indicates that the content of metals and metalloids in soils is within permissible limits (RIEW Varna, 2019).

Testing of soil samples from the water source sanitary protection zones between 1996 - 2004 indicate that acidity was within the limits typical of the soil type. The average annual concentration of nitrates and the proportion of samples above the annual average increased significantly compared to levels measured each year since 1999. Phosphates were not detected in the soil samples. For the same period, measured concentrations of lead in kindergarten playground soils in Varna region were well below the permissible limits.[40]

Unregulated disposal of waste has likely led to soil contamination though no data is available on the scale of impact. As reported in 2014, contaminated areas covered approximately 2 km^2. In 2018, 8 unregulated illegal dump sites were identified and cleaned after the Mayor set up an organization to collect illegal waste as part of the Waste management Act. Discussions with municipal staff indicated that illegal dumping is a problem with all types of waste including hazardous (e.g. medical) and industrial waste. Awareness campaigns were delivered by the municipality to address the issue.

Soil erosion and landslides are an issue flagged in multiple municipal documents, with agricultural land and water catchment areas for Varna and Beloslav Lakes most affected.

[38] Phone conversation with ExEA, Jan 2020
[39] Phone conversation with ExEA, Jan 2020

Rainfall pattern and relief of the land have resulted in erosion of approximately 60% of the agricultural topsoil, primarily affecting land in the northeast.

Key Soil Quality Challenges

Table 6.9. Soil Quality: Challenges in Varna

Sector	Challenge	Description
Solid Waste	Illegal dumping of solid waste	The scale of illegal dumping of waste is unknown but has significant implications for soil quality. It also creates a financial and administrative burden for the municipality. A combination of awareness campaigns, stricter enforcement and penalties, and mobilising community groups to aid enforcement may be needed to address the problem.
	Low rates for recovery of recyclables from waste streams	Increasing the source-separation of recyclables can improve recovery rates for recyclable waste and reduce plastic waste and other contaminants in the outputs from the MBT plant (including compost and RDF), thereby minimising impact on soil, water, and air quality.
	Lack of regular monitoring and reporting of waste streams from industries	Lack of data on type and quantity of waste and lack of clarity on current waste management practices for industrial facilities is a key barrier to effective management and mitigation of the environmental impact.
	Lack of management strategy for dredged material	There is no effective management of dredged material from ports and waterways, which may include of hazardous waste. A coordinated approach in consultation with other stakeholders, is needed to develop a long-

[40] Programme for environmental protection for Varna Municipality, 2019-2023

		term management strategy for this waste stream.
Water Supply and Treatment	Limited capacity of combined sewerage and stormwater systems	Parts of the existing combined sewage and stormwater system in the central city are capacity constrained causing overflow during high rainfall events. This increases the risk of flooding and reduces the effectiveness of sewage treatment which can have a detrimental impact on soil quality. Climate change and extreme rainfall events are likely to exacerbate the problem.
	Lack of sewerage and stormwater infrastructure in parts of the municipality	While most of the population (~95%) are connected to the sewerage system, some parts lack the required infrastructure. This can lead to soil contamination.
Crosscutting	Lack of comprehensive data on soil quality	Current data is not comprehensive to draw meaningful conclusions on the level of soil contamination. Localised testing may allude to an issue given the extent of industrial activity and illegal waste disposal.

Source: AECOM. 2019.

1.1.4. Green and Public Open Spaces

Table 6.10. Green and Public Open Spaces: Available Indicator Data

Indicator	Latest Value
Open green space area ratio (m^2/ capita)	10.6 (2019)

Source: AECOM. 2019.

Green space in Varna is unevenly distributed and there are high levels of green space fragmentation, with a significant proportion of accessible green space for the city located along the coast or periphery. This creates inequalities in access between residents close to green space and those in other areas. Many of the larger green spaces are designated for tourists, which reduces access for residents.

Density provides one indicator of the urbanisation pressure on green space. On average, Varna Municipality is relatively low density with 0.23km^2 of developments per km^2 which suggests that on average there is sufficient green space per inhabitant in the municipality. There are 10.6m^2/capita of public green spaces actively used by the population. The total green space, including publicly accessible green areas, nature parks and forests with access infrastructure, amounts to 23.02 m^2/ capita. Specialised green areas (i.e. areas not accessible to the public such as those in residential developments, resorts, sports complexes, protective areas, and forests, etc.) amount to a further another 176.7 m^2/capita.

Of the total land area in the municipality, 40% is agricultural land, approximately 26% is forests,[41] and 21% settlements with the remaining land designated for water bodies, transport infrastructure and other urban development.[42] The zoning plan illustrates mixed zoning and the proximity of residential areas, green spaces, and agricultural land to manufacturing zones. Anecdotal evidence suggests that green space may be more limited in higher density newer developments.

Both at national and local level the legislative framework promotes the continuity and unity of green spaces. The Programme for Environmental Protection for Varna Municipality 2019-2023 includes guidelines and proposals to improve the quality of the green space including increasing area of soft landscaping, measures to retain top-soil and optimise use of water resources for irrigation, and review species composition to improve diversity and microclimatic benefits.

Key Green and Public Spaces Challenges

Table 6.11. Green and Public Spaces: Challenges in Varna

Sector	Challenge	Description
Land Use	Competing land use priorities and lack of green space standards	Due to urban expansion, green space competes with other developments and lack of guidelines or standards at local level for integrating green space into urban development and regeneration projects (in terms of area and quality of green space) may result in missed opportunities to maximise benefits. Open green space can

[41] Note data from National Forest Directorate gives a figure of 29%

[42] Municipal Development Plan of Varna Municipality, 2014-2020

	support human physical and emotional wellbeing and provide ecosystem services including urban heat island mitigation, reduction in surface water runoff and flood mitigation.
Green space accessibility	Green space is unevenly distributed. Many larger green spaces designed for tourists, limiting local resident use. Given the presence and proximity to forests and other protected areas within/close to the municipality, consideration could be given to increasing the accessibility of natural areas for residents and visitors.
Green space connectivity	Green space has not been planned reasonably for connectivity to benefit the environment and public health. The current policy framework encourages this approach with a view to create a unified and interconnected network of green spaces. The next iteration of the municipal development plan (i.e. 2020 onwards) provides an opportunity to embed tangible measures towards achieving this objective.
Green space typology	Most green space is multi-functional, with human use prioritised. However, there is a need to balance recreational demands versus ecological benefits and needs. Green space that does not readily provide recreational opportunities for residents and visitors remains essential for the ecological and environmental integrity of the city.

Source: AECOM. 2019.

[43] Programme for environmental protection for Varna Municipality, 2019-2023
[44] Forestry Plan 2017, National Forest Directorate

1.1.5. Biodiversity and Ecosystems

Table 6.12 Biodiversity and Ecosystems: Available Indicator Data

Indicator	Latest Value
Abundance of bird species (all species) (Annual % of change)	1450% (Varna Lake monitoring site) (2019)

Source: AECOM. 2019.

Bulgaria's highly varied climatic, geological, topographical, and hydrological conditions create an environment rich in biodiversity. At the national level, protected areas are regulated under the Biodiversity Act and the Protected Territories Act.[43] Bulgaria is an active participant in Natura 2000, the EU's largest network for the preservation of biodiversity and endangered species. The national ecological network defines environmentally protected areas including both areas designated by Natura 2000, and areas outside of this network which are protected under the national designation of environmental significance.

There are six levels of designation for protected territories in Bulgaria; nature reserve, national park, natural landmark, maintained reserve, natural park, and protected area. Each has regulatory restrictions of various levels and measures to ensure environmental protection. In Varna Municipality there is one national park and five protected areas. Forests are predominantly under the ownership of the national government (>80%) with some under, municipal (~3%), or private/ corporate ownership and equal 614 hectares.[44] The condition of the forests is described as 'fairly good'.[45]

Beaches and forests both contribute to the rich biodiversity of Varna region. There is one Blue Flag beach, a prestigious certification for transparent, clean water and compliance with internationally recognized ecological standards.

Municipal documents refer to the negative human impacts on natural habitats and biodiversity from activities like urbanisation, which particularly impacts wetlands, though the extent of impact has not been quantified. The Regional Environmental Report (2018) lists several species across various habitats that are on the endangered list, including forest areas, fresh and saltwater wetlands, grasslands, water, sandy and rock terrains.

Beloslav Lake is a designated area under the EU Birds Directive. It provides habitat for 112 birds species, including 53 species of migratory birds and is an area of international

[45] Programme for environmental protection for Varna Municipality 2019-2023, pg. 274

importance for wintering waterfowl. There has been a significant increase in annual percentage change in bird species at the Varna Lake monitoring site (derived from data provided by ExEA). The significant increase in species was recorded in 2019 although the previous 3 years indicate substantial fluctuations. There was a 46% decrease in species count in 2018 before which there was a 46% increase in 2017 compared to the previous year. For 2019, the 12 species which were record remained stable however, in the previous year 11 of the 15 species decreased by up to 80%.

Key Biodiversity and Ecosystems Challenges

Table 6.13. Biodiversity and Ecosystems: Challenges in Varna

Sector	Challenge	Description
Transport	Impact of maritime traffic on wetlands and marine ecosystems	Maritime traffic has a significant impact on marine ecosystems from pollution (including oil discharges), emissions, collisions and noise, grounding and anchor damage, and introduction of invasive species. The proximity of port activities and traffic to protected areas and periodic dredging poses a particular challenge.
Industry	Lack of regular monitoring of wastewater discharge from industries	Several local businesses/ industries require on-site wastewater treatment and operate independently, however, treated wastewater discharged from such on-site facilities contain a high level of contaminants. Implementing a more rigorous regime for periodic and/or automated monitoring would help identify and address non-compliance issues more quickly and effectively.
Land Use	Urban development pressures	Biodiversity areas are in proximity to and interwoven into the urban and sub-urban landscape. Urban expansion like new construction and transport infrastructure, tourism and industrial activity, pressures natural ecosystems. Existing planning controls may not provide adequate protection for such areas as impacts can be cumulative or indirect.
Solid Waste	Illegal dumping of solid waste	Illegal dumping of waste has direct and indirect implications for biodiversity. Dumping in stormwater channels drains pollutants, plastics and other litter into surface water bodies and the Black Sea impacting wetlands and marine ecosystems. Some mammals and birds may be out compete by species which feed on residues, such as rats and crows.
Water Supply and Treatment	Lack of sewerage and stormwater infrastructure in parts of the municipality	Construction in areas without adequate wastewater infrastructure and illegal construction are adding to the problem. While ~95% of the population are connected to the sewerage system, some areas lack the required infrastructure which risks pollution of groundwater and surface water bodies.
	Limited capacity of combined sewerage and stormwater systems	Parts of the existing sewerage and stormwater system in the central part of the city are capacity constrained causing the system to overflow and discharge untreated water into the Black Sea and Varna Lake during extreme rainfall events. Overflows are observed with most high intensity rainfall events.
	Ageing and/or capacity constrained water treatment plants	Discharge from WWTPs does not meet the required environmental standards across multiple metrics which has implications for both water quality and biodiversity. The issue affects several WWTPs. Investment in new infrastructure and/or improved processing is required to address this.
Crosscutting	Lack of comprehensive data on biodiversity impacts	There is currently no comprehensive system to understand, assess or quantify biodiversity impacts and identify key risk factors. The

	jurisdiction for conservation areas, forests, marine ecosystems, agricultural and development land is organised in a segmented manner between national, regional, and municipal entities, hindering coordination and impact assessment.
Low levels of biodiversity awareness	The municipality could support awareness-raising efforts and popularisation of sustainable eco-tourism. This would likely result in economic as well as wider environmental benefits.

Source: AECOM. 2019.

1.1.6. Greenhouse Gas Emissions

Table 6.14. Greenhouse Gas Emissions: Available Indicator Data

Indicator	Latest Value
Annual CO_2 equivalent emissions per capita (Tonne / year / capita)	3.47 (2017)
Annual CO_2 emissions per unit of GDP (Tonne / year/ USD of GDP)	0.0005 (2017)

Source: AECOM. 2019

An exhaustive GHG inventory for Varna Municipality is not available in the public domain. Data on annual CO_2 emissions (equivalent) per capita from municipal documents,[46] and data on annual CO_2 emissions per unit GDP derived from this figure, indicate that both metrics are in the green benchmark range. Long term energy efficiency measures are forecast to reduce annual CO_2 emissions from 3.47 tCO2 per capita in 2017 to 2.5 tCO2 in 2030. However, the methodology analysis boundary (i.e. inclusions and exclusions) and any assumptions underpinning the figures and forecasts remain unclear. It is also unknown if investments to deliver such reductions have been recognised in financial plans. The data is only available as it was reported in 2017, with no historical data to produce trends. Therefore, it is not possible to gauge the impact of demographic changes, industrial and tourism activities, or municipal interventions for GHG emission reduction.

Varna Municipality joined the Covenant of Mayors (CoM) initiative in 2008, adopting a Sustainable Energy Action Plan (SEAP) in 2011 for the period of 2012-2020. As a signatory, Varna Municipality has voluntary commitments to reduce energy-related CO_2 emissions by at least 20%. The SEAP only focuses on GHG emissions related to energy use within the municipality (as against total GHG emissions). The analysis provided in the *Varna Sustainable Energy Strategy 2012-2020* predicts that under a business-as-usual scenario energy-related CO_2 emissions will undergo a linear increase between 2013 and 2020, from a baseline of ~878,500tCO2 in 2005 to 1,250,000tCO2 in 2020, an increase of around 42%. The implementation of proposed measures across household, municipal, transport and industrial sectors outlined in the strategy, as well as increase in renewable energy generation, are projected to result in CO_2 emissions of 659,000tCO2 in 2020, a reduction of around 25% relative to 2005 baseline and nearly half of those predicted in 2020 under business-as-usual scenario.[47]

The absolute GHG emissions by sector as reported in 2017 are presented in the table below.[48]

Table 6.15. GHG emissions breakdown by sector, 2017

Sector	million tonnes CO_2 per annum
Buildings, equipment/ facilities, and Industries	1.18
Residential	0.5930
Transport	0.11932
Public lighting	0.02356

[46] Varna Baseline Assessment and PESTEL Analysis, 2017
[47] Varna Sustainable Energy Strategy 2012-2020, p. 127
[48] Varna Baseline Assessment and PESTEL Analysis, 2017, Section 3.3.1

Municipal	0.09405
Industry	0.3872

Source: AECOM. 2019.

The buildings and industry and the residential sector are the biggest contributor to GHG emissions. Electricity is the main source of energy across all sectors except the transport sector. The electricity grid in Bulgaria is one of the most carbon intensive in Europe which impacts the baseline although any measures to minimise demand and/or generate electricity from renewable/ less carbon intensive sources will also deliver significant savings.[49]

Key Greenhouse Gas Emissions Challenges

Table 6.16 Greenhouse Gas Emissions: Challenges in Varna

Sector	Challenge	Description
Transport	High private vehicle use and emissions from ageing vehicle fleet	High private vehicle use and a significant number of older, polluting vehicles. Nearly half of all journeys are made by private transport and more than a third of vehicles run on diesel, with low penetration to date of cars using alternative fuels.
	Low frequency and limited coverage of public transport	Reliability, frequency, coverage, and speed of public transport are likely contributing factors to the high private vehicle use.
	Lack of cycling culture	The scale and terrain mean a significant proportion of the city centre is inaccessible by cycling and walking and investment has been made to build more cycle lanes.
Industry	Lack of local programmes to reduce the carbon intensity of the industrial sector	The industrial sector consists of micro, small, medium, and large enterprises. While the latter are well targeted under national programmes, SME's could benefit from local programmes and incentives for improving energy efficiency and reducing GHG emissions.
Energy	Reliance on fossil fuel electricity generation and low uptake of renewable energy sources:	Renewable energy sources are not currently utilised at scale. Uptake of renewable energy, both at grid-scale and micro-renewables have been limited particularly in building and industrial sectors which are the largest high carbon electricity consumers despite fiscal incentives being available.
	Use of coal for heating in residential buildings	Enforcement and infrastructure investments needed to facilitate the switch to cleaner fuels is a challenge for the Municipality. To date, the uptake of gas networks and district heating has been limited despite spare capacity. Discussions suggest energy/ fuel costs are a key factor driving the use of solid fuels.
Solid Waste	Low rates for recovery of recyclables from waste streams	Increasing source-separation of recyclables can improve recovery rates for recyclable waste and reduce plastic waste and other contaminants in the outputs from the MBT plant (including compost and RDF), thereby minimising impact on soil, water, and air quality.
Buildings	Poor energy performance of buildings	Most residential buildings were built between 1981-1990 using prefabricated concrete panel construction, with typical energy consumption values ranging between 290 - 364 kWh/m^2. Energy efficiency improvements can also reduce fuel costs for residents thereby facilitate uptake of cleaner sources of energy.
	Lack of incentives for Green Buildings	Varna is experiencing significant growth, so it is critical for new buildings to be designed to minimise energy use, use clean fuels, and

[49] Varna Baseline Assessment and PESTEL Analysis, 2017

		maximise opportunities to integrate renewable sources of energy.
Crosscutting	Lack of comprehensive data/ inventory on GHG emissions	There is limited data available on GHG emissions. Data which is available is out of date, does not provide a detailed breakdown of emissions, a detailed methodology or clarity on the source. Good data is critical for monitoring, ongoing diagnosis and to inform policy making.
	No structured approach to implementation of GHG reduction measures	While the municipality is committed to reducing energy related GHG emissions as a signatory to the Covenant of Mayors, there is no periodic monitoring and evaluation. The evaluation of progress and a new inventory with realistic growth assumptions is needed to inform effective future policy decisions, in addition to a structured and coordinated approach to implementing past commitments. The municipality lacks a strategy and commitment to reducing its overall GHG footprint (e.g. including emissions from solid waste, wastewater, and non-energy related emissions from industries).

Source: AECOM. 2019.

1.1.7. Climate Change and Disaster Risk

Table 6.17. Climate and Disaster Risk: Available Indicator Data

Indicator	Latest Value
Estimated economic damage from natural disasters floods droughts earthquakes etc. as a share of GDP (%)	0.4% (National) (2007- 2015) 0.29% (National) (1980 – 2017)

[50] Regional Development Strategy for Varna Region 2014-2020, p. 95
[51] National Climate Change Adaptation Strategy and Action Plan, 2019
[52] Nomenclature of Territorial Units for Statistics (NUTS) as developed by the EU for statistical reporting
[53] Municipal Development Plan of Varna Municipality 2014-2020, pg. 219

Source: AECOM. 2019.

No specific information was found in the public domain on disaster risk assessments or management at the local level. The *Regional Development Strategy for Varna Region 2014-2020* has a section on climate change risks which states that Varna region falls within the climate change risk index NUTS 2, Group 4 which is a high-risk area particularly for the sectors agriculture, tourism, management of water resources and forestry.[50]

Climate projections for Bulgaria indicate an increase in air temperatures by as much as 4°C on average by 2080 which is expected to be more significant during the summer season (from July to September). Precipitation is projected to decrease by as much as 40% by 2080 although most climate change scenarios predict rainfall to increase during the winter and decrease in the summer which would offset the changes.[51] The scenario analysis indicates a trend toward increased frequency of extreme events and disasters, such as heavy rainfalls, heat and cold waves, floods and droughts, hurricane winds, forest fires, and landslides. The northeast of Bulgaria (NUTS 2 region within which Varna region lies)[52] is one of the parts of the country most affected by events such as increase in the number and intensity of dry and hot periods in the summer, droughts, floods and torrential rainfall.[51] It falls within the climate change vulnerability index 4, i.e. an area with high vulnerability to climate change, with the most vulnerable sectors being agriculture, tourism, water management, and forestry.[53]

Table 6.18. Climate projections for Bulgaria

Variable	By 2020	By 2050	By 2080
Change in annual air temperature (˚C)[54]	0.7°C–1.8°C	1.6°C–3.1°C	2.9°C–4.1°C
Change in annual mean precipitation (%)[55]	-10%	-15%	Between -30% to -40%

Source: AECOM. 2019.

The increase in temperature during the summer months has direct positive and negative implications on the tourism industry in Varna. While higher summer temperatures and

[54] National Climate Change Adaptation Strategy and Action Plan, 2019. Increase in temperature relative to average annual temperature for the period 1961–1990
[55] National Climate Change Adaptation Strategy and Action Plan, 2019. Decrease in precipitation relative to average annual precipitation for the period 1961–1990

frequent heat waves may reduce tourist numbers, this may be partially offset by a prolonged summer and shoulder seasons for tourist activities where the resilience of local infrastructure is increased. This includes, for instance, planning for water shortages and/or increase in energy demand for cooling/ electricity over the summer period.

No specific information was found in the public domain on climate change and/or disaster risk assessment at the local/ municipal level or on the economic impact of natural disasters at the local level. The municipal development plan indicates that, to date, 'small-scale' floods have been observed which have caused problems for transport but result in limited direct material damage. Secondary impacts include landslides which have in the past resulted in significant economic damage.[56] Heavy rains also cause capacity issues with wastewater treatment (i.e. for areas where stormwater and wastewater infrastructure are combined) which in turn has implications for coastal water quality. Figures derived from national data suggests that the economic impact is not significant to date.

Key Climate Change and Disaster Risk Challenges

Table 6.19. Climate Change and Disaster Risk: Challenges in Varna

Sector	Challenge	Description
Transport	Limited adaptation potential in the transport sector	The transport sector is critical to Varna's economy. There is limited local data, however national analysis indicates adaptive capacity of the transport sector is insufficient. Therefore, there is a need to integrate long-term climate change projections into development planning and new transport infrastructure investments.
Energy	Limited information regarding energy network resilience planning	Planning and implementation of resilience measures at the local level in the energy sector is unclear. Exacerbation of extreme weather events and changes in energy demand patterns with climate change requires comprehensive network resilience planning.
Land Use	Risk of coastal erosion	Varna, and the region, is vulnerable to coastal erosion which will be exacerbated by climate change.
Buildings	Poor energy performance of buildings	Existing building stock is poor quality and therefore it is highly sensitive to climate change, with vulnerable residents most at risk.
	Lack of consideration of climate change impacts in construction of new buildings	With Varna's significant growth it is critical new buildings are designed integrating climate resilience. Currently codes and standards for new buildings and local planning policies do not take consider future climate scenarios for informing design and planning decisions.
Water Supply and Treatment	Lack of resilience planning for water and wastewater infrastructure	Resilience planning is critical as the water sector will be highly impacted by projected changes in rainfall patterns and increased frequency of extreme rainfall events.
Crosscutting	Lack of adaptation strategy/plan and requisite institutional structure	Local analysis of climate risks and vulnerabilities will ensure the scale of risk to critical infrastructure is well understood and the municipality is prepared to address these challenges. Currently, the institutional structure at municipal level for adaptation and resilience is unclear, this must be formalised to ensure that relevant practices are mainstreamed into all aspects of city governance.

Source: AECOM. 2019.

[56] Municipal Development Plan of Varna Municipality 2014-2020, pg. 220

Appendix B : Medium Priority GCAP Actions

Table 6.20. List of all medium-priority actions identified through the GCAP process.

Action Name	Action Type
Industry	
Undertake comprehensive mapping of former industrial sites, expected areas of contamination and illegal dump sites	
Identify additional targeted air-quality improvements through data analysis and community and private sector engagement and agree on commitments to ongoing monitoring of measures.	
Conduct marketing campaigns to raise people's awareness and knowledge including alerts in high pollution episodes (e.g. High AQI).	
Water Cycle Management	
Create a comprehensive water network resilience plan, considering supply risks as well as management measures for natural hazard risks	
Buildings	
Enhance/ expand national policy adding more detail on the specification of rapid charging points in new constructions.	
Implementation of energy and water efficiency management systems at a building / neighbourhood level.	
Introduce New Policy and supporting scheme to phase out stoves and solid fuel boilers that do not meet the requirements of the eco-design regulations	
Incorporate sustainable building design techniques (such as passive design) into new building efficiency standards and land use planning regulations	
Expand the “Implementation of Energy Efficiency Measures in Administrative Buildings Programme” to include RES, energy efficient lighting, insulation, windows, and HVAC systems.	
Implement nature-based solutions on municipal buildings - including green facades on selected municipal buildings and rainwater recycling	
Promote the establishment of temporary rainwater catchment systems and water “kiosks” in areas and houses with a scarcity of water.	
Prepare guidance on climate ready design and encourage it's adoption by developers, planners, and designers, with a focus on building retrofit to ensure long-term viability.	
Introduce a municipal rebate or subsidy scheme for the replacement of old inefficient cooling units with more modern equivalents - Including safe disposal of high GWP refrigerants	
Promote climate mitigation and adaptation project for new developments through reducing document processing fees and expedite building permits	
Energy	
Analysis of the alternative energy sources, to diversify what is already accessible in Varna such as – solar, geothermal, wind, waves and what kind of technologies can be developed and used in the time frame of the next up to 5 years.	
Strategy to promote renewable energy production and uptake in residential buildings	
Incentivise small-scale or community renewable schemes and micro-grids in new developments through tax exemptions to increase network redundancy and increase resilience where appropriate	
Require all municipal outdoor lighting (e.g. streetlamps) to be LED; all replacement bulbs should be LED)	
Invest in large scale multipurpose solar energy infrastructure, improving energy diversity, independence, and resilience.	
Work with the industry to identify appropriate alternative heating options that can be brought into the market - such as heat pumps. Then provide import tax exemptions or other incentives	

Establish a centre for environmental education and associated outreach programme into schools & industry	
Public awareness campaign outlining potential savings & other benefits associated with a switch to low carbon technologies.	
Impose carbon offset costs on developers to further incentivise deployment of low carbon technologies (and incentivise refurbishment) and fund other municipal carbon reduction projects.	
Develop a funding program to inject financial stimulation for private households to connect to district heat and natural gas	
Land Use	
Investigate and establish innovative financing mechanisms that will support in the financing of new social infrastructure (education, health, community centres, etc), social housing, climate adaptation and green spaces (e.g. land value capture; impact bonds; free leasing of city-owned vacant land to community collectives).	
Establish new 'greenways' linking Varna's main boulevards to areas of green space located in other parts of the city and countryside.	
Create a new natural landscape within the built environment which contributes to the expanding and preserving the natural landscape by planting native and non-invasive species in landscape areas	
Develop an Urban Heat Vulnerability Index and Mitigation Plan to Prepare for Higher Temperatures and More Frequent Extreme Heat	
Development of a City-wide wayfinding system that focuses on improving accessibility of local residents to green space and green links	
Solid Waste	
Work with the Ports to better understand processes in place for managing waste. Then develop Policy to regulate waste management and recycling requirements at Ports (develop approaches for both generated and collected waste).	
Increase resourcing for education and enforcement around illegal waste dumping, which can be part funded by penalties.	

Strengthen enforcement of regulations on illegal dumping and adopt measures to "capture" these waste streams into the formal system (e.g. provision of transfer stations).	
Deposit refund system for certain recycling material (bottles, cardboard etc.)	
Establish a city-wide/ Municipality-wide campaign for waste reduction and separation.	
Develop a pilot scheme for organic / food waste collection / treatment scheme from commercial businesses (e.g. restaurants).	
Identify and implement improvements at facilities incinerating waste (e.g. air pollution control equipment, waste acceptance criteria, firing conditions)	
Carry out survey of illegal dumpsites to identify locations, waste quantities and composition	
Gap analysis to identify problem waste streams for which suitable management routes are not available (i.e. lack of suitable facilities / infrastructure)	
Work with Devnya Municipality to address the incineration of solid waste through an integrated waste management approach.	
Port waste reception facilities need to be upgraded. This also impacts water quality of the bay	
More efficient control by custom agencies, border police. Increase their capacity for monitoring and enforcement of solid waste management.	
Capacity building sessions with local authorities, to help manage local waste management inspectorate contracts.	
Cross-cutting	
Implement an ambitious and diverse native tree planting/afforestation schemes in appropriate locations around the city.	

Develop a circular economy strategy for all new buildings and infrastructure.	
Revise local regulatory framework to include incentives for green investment (inc. sanctions for "non-green" investment").	
Develop and commit to emission reduction targets for the City of Varna's community carbon emissions by 2030 / 2050.	
Develop information products and tools for climate adaptation and resilience tailored to Varna’s climate, as well as social and economic factors.	
Establish a metropolitan air quality fund to support projects by the Municipality and NGOs to improve air quality.	
Measure metropolitan carbon emissions and report on progress	
Transport	

Work with the local tech industry to develop a public transport app for Varna, acting as an information resource for integrated mass-transit and "last-mile" mobility solutions.	
Trial periodic car-free / pedestrianisation days in city centre, re-allocating central city road space to more active modes and public transport priority routes.	
Upgrade and extend the Trolleybuses network within the city centre and from business districts to residential areas, with the consideration of hybrid vehicle technology to expand the network "off-Wire".	
Work with Ports to identify opportunities to reduce emissions at ship berths (e.g. reduce engine idling times)	
Join AIVP (global network of port cities) to increase leverage to address shipping emissions	
Electric vehicle conversion tax credits	

Appendix C : Economic Assessment Assumptions

The following Appendix outlines all the Capital Expenditure (CAPEX), Operational Expenditure (OPEX) and Design Development (DD) costs calculated for the 30 GCAP Actions detailed in section 5 of the report. These calculations are based on a number of key assumptions, which are outlined within the "Key assumptions" column in Table 6.23.

Where the cost calculated was based on international costs from a UK comparative example, a blanket location factor of **0.4** was then applied to reflect the prices in Bulgaria[57] as seen in Table 6.21. All prices have also been converted into Euro (EUR) and Bulgarian Lev (BGN) from British Pounds (GBP), based on a conversion rate GBP1 = EUR1.16 and GBP1 = BGN 2.29[58] as seen in

Table 6.22. All costs exclude VAT and Local Taxes and are either presented as a range or have been rounded to the nearest appropriate figure i.e. 100's, 1000's, 100,000's. All CAPEX costs calculated also include the following up-lifts; main contractor preliminaries (15% assumed), main contractor overheads & profits (5% assumed) and fees (10% assumed). Furthermore, a 15% contingency has been applied to all costs provided (CAPEX, OPEX and DD) to cover the potential for increasing costs as more detailed information becomes available.

Table 6.21. UK to Bulgaria comparative price levels[64]

2021 Comparative Price Levels	
UK	1
Bulgarian	0.4

Table 6.22. Currency exchange rate - GBP to EUR to BGN[65]

	GBP	EUR	BGN
GBP	1.00	1.16	2.29
EUR	0.85	1.00	1.95
BGN	0.43	0.51	1.00

Table 6.23. Table of assumptions for Economic analysis of GCAP Actions - CAPEX, OPEX and Design Development

ID	Action	Cost estimates - CAPEX	Cost estimates - OPEX	Cost estimates – Design / Development	Key Assumptions

[57] *https://stats.oecd.org/Index.aspx?DataSetCode=CPL#*
[58] https://www.xe.com/

En1	Set up a community energy efficiency programme.	N/A	**BGN:** 1,365 **EUR:** 700	**BGN:** 46,000 – 57,000 **EUR:** 23,000 – 29,000	**Design Development:** Based on the costs provided by an international Energy Expert for similar work. Steps 1, 6 and 12 assumed as internal Municipal process so no costs provided. **OPEX:** Based on costs provided by a local Energy expert to produce a single annual report, assuming an average salary in administration of EUR700 per month.
En2	Ensure that future Municipality Energy Strategies incorporate the findings and recommendations of this GCAP.	N/A	N/A	**BGN:** 75,900 **EUR:** 38,800	**Design Development:** As per costs provided by a local Energy Expert, based on the development of the current energy strategy of Varna 2021-2030 and associated long and short-term programs to promote the use of energy from renewable sources.
En3	Provide incentives to both developers and private homeowners, for the incorporation / installation of renewable electricity generation. (e.g. tax exemptions, cost subsidisation).	N/A	**BGN:** 919,000 **EUR:** 472,000	**BGN:** 19,500 **EUR**: 10,000	**OPEX** and **Design Development**: based on the costs provided by a local Energy Expert as per similar public procurements, with the following assumptions: - **OPEX**: 5% of taxpayers have a 50% reduction in real estate tax to the Municipality of Varna, based on 2021 revenues from Varna Municipality of EUR 16.4 million **Design Development**: Preparation of appropriate regulatory documents.
En4	Integrate renewables at a large scale in the city.	N/A	**BGN:** 919,000 **EUR:** 472,000	**BGN:** 19,500 **EUR**: 10,000	**OPEX** and **Design Development**: based on the costs provided by a local Energy Expert as per similar public procurements, with the following assumptions: - **OPEX**: 5% of taxpayers have a 50% reduction in real estate tax to the Municipality of Varna, based on 2021 revenues from Varna Municipality of EUR 16.4 million **Design Development**: Preparation of appropriate regulatory documents.
Ind1	The Municipality to establish a supplementary reporting programme for all existing and new industries to develop and share policy on the monitoring, reporting and publication of key environmental data (e.g. air, water, carbon emissions, noise pollution and waste disposal) to	N/A	**BGN:** 3,100 **EUR:** 1,600	**BGN:** 230,100 **EUR:** 118,000	**OPEX** and **Design Development Cost** based on figures provided by a local Policy Expert guided by the fulfilment of public procurements, assuming the following: - **OPEX:** the delivery of a single annual report, assuming the average salary in administration of EUR700 per month. - **Design Development:** Assumes the establishment of a single local environmental monitoring system, for assessment and analysis of air quality within the Territory of Varna and the delivery of a single training and capacity building sessions.

	inform efforts for reducing pollution in-line with EU Limit Values.				
WCM1	Work with ViK Varna to introduce "smart" technology, i.e. IoT smart metering, across the potable water network.	**BGN:** 16,800,000 **EUR:** 8,500,000	N/A	N/A	**CAPEX:** costs are based on figures provided by a local Water Expert based on current market price[59] for the IoT metre (EUR76.69) and assumes the installation of 70,000 units (i.e. IoT metres) across the potable water network. This price includes installation costs.
WCM2	Identify and remediate areas of cross-connection in the wastewater network and separate wastewater and rainwater runoff networks to reduce wastewater volumes at WWTP	N/A	N/A	**BGN**: 454,100 **EUR**: 232,900	**Design Development:** based on figures provided by a local Water Expert guided by the fulfilment of public procurements and assumes: - Analysis of wastewater Network - Creation of a GIS model of the network - Delivery of a single training and capacity building session.
WCM3	Introduce wastewater sludge management (e.g. reuse in forestry and agricultural activities, reed beds and energy production)	N/A	N/A	**BGN:** 168,000 **EUR**: 86,000	**Design Development:** based on figures provided by a local Water Expert guided by the fulfilment of similar feasibility studies.
WCM4	Integrate Water Sensitive Urban Design (WSUD) and Sustainable Drainage System (SuDS) principles into land use, transport, and industry planning; and construction permitting rules.	N/A	N/A	**BGN**: 67,300 **EUR**: 34,500	**Design Development:** based on figures provided by a local Water Expert guided by the fulfilment of public procurements.
WCM5	Develop and implement a structured maintenance programme to reduce leakage in the potable water network with a long-	**BGN:** 78,600,000 **EUR:** 39,800,000	N/A	**BGN:** 224,250 **EUR:** 115,000	**All costs** are based on figures provided by a local Water Expert guided by the fulfilment of similar public procurements. **CAPEX:** costs assume the replacement of 100 km of the existing network and building of areas for measuring water consumption - shafts with water meters,

[59] https://www.marketdataforecast.com/market-reports/internet-of-things-iot-market

	term target of 60-90% efficiency (confirm with water authority / national regulator)				alongside the modelling of the potable water network and introduction / upgrade of SCADA. **Design Development:** The assumed cost to develop the maintenance programme.
WCM6	Develop a Flood Reduction Master Plan	N/A	N/A	**BGN:** 742,000 **EUR:** 380, 400	**Design Development:** based on figures provided by a local Water Expert guided by the fulfilment of similar public procurements, based on man-month amounts for the following experts: Hydrologist, hydrogeologist, geologist, urbanist, water services engineer, Economic and IT specialist (GIS).
Bu1	Adopt and incentivise LEVEL(S)/ EDGE building standards or develop local green building standards in line with international best practices common for green building certification tools for all municipal buildings.	N/A	N/A	**BGN:** 45,900 – 57,300 **EUR:** 23,200 – 29,000	**Design Development:** based on costs provided by a local building's expert guided by the delivery of similar work. Assumes active participation from the Municipality
Bu2	Strengthen the existing planning system to ensure that private developers undertake and submit to the Municipality an options assessment report regarding the choice of energy system (heating and cooling) for new developments.	N/A	N/A	**BGN:** 37,000 – 50,000 **EUR:** 18,600 – 26,700	**Design Development:** based on costs provided by an international building expert guided by the delivery of similar work. Step 1, 5, 6 and 7 assumed to be an internal municipal process so no costs provided.
Bu3	Incentivise and encourage the Incorporation of Mitigation and Adaptation design considerations / technologies within new developments to limit bad practices and associated impacts	N/A	N/A	**BGN:** 92,000 – 115,000 **EUR:** 46,000 – 58,000	**Design Development:** based on costs provided by an international building expert guided by the delivery of similar work. Step 1, 5, 6, and 7 assumed to be an internal municipal process so no costs provided.

Bu4	Promote and incentivise the installation of green roofs (or walls) on private buildings through the revision of planning approvals for new construction or renovations.	**Green roof per m2:** - **BGN:** 170 - **EUR**: 85	**BGN**: 919,400 **EUR:** 471,000	**BGN**: 34,000 **EUR**: 17,300	**CAPEX:** Costs for green roofs (based on Spons 2014) assumed to be £182.50/m^{260} **OPEX** and **Design Development** figures based on costs provided by a local Urban Sustainability expert, assuming the following: - **OPEX**: 5% of taxpayers have a 50% reduction in real estate tax to the Municipality of Varna, based on 2021 revenues from Varna Municipality of EUR 16.4 million **Design Development:** Development of guidelines as per fulfilled public procurements
Lu1	Introduce policy and tax incentives to prioritise brown-field development over greenfield.	N/A	N/A	**BGN:** 11,200 **EUR:** 5,800	**Design Development:** figures based on costs provided by a local Urban Sustainability expert, assuming the development of guidelines as per fulfilled public procurements.
Lu2	Climate change mitigation and adaptation considerations and analysis to inform policy in the General Development Plan	N/A	N/A	**BGN:** 80,000 – 92,000 **EUR:** 40,600 – 46,000	**Design Development:** based on costs provided by an international policy consultant referring to similar studies undertaken. Assumes desk-based analysis with 1 x digital stakeholder workshop.
Lu3	Install permeable pavements in sections of parking lots, and rain gardens can be included where required	**BGN per 1m^2:** 250 **EUR per 1m^2:** 130	N/A	N/A	**CAPEX:** Included as a cost per 1m^2 for permeable paving and rain gardens provided by International Urban Sustainability Expert based on Spons 2020[60].
SW1	Accelerate investment in recycling facilities, supported by strategic planning to ensure saleable outputs can be produced, alongside dedicated programmes to support waste separation	**BGN**: 577,300,000 **EUR:** 292,400,000	**BGN:** 43,900,000 **EUR:** 22,540,000	**BGN:** 183,000 – 229,000 **EUR:** 93,000 – 116,000	**CAPEX & OPEX:** based on costs provided by an international Waste Consultant and assumes: - Industrial and biological waste treatment plant and RDF fuel production plant with a waste treatment capacity of 400,000 tons of waste per year[61] - RDF combustion plant, incl. Equipment, Construction work, External connections, Preparatory activities and design, Construction supervision and compliance assessment of the investment project[62]

[60] AECOM (Ed.). (2020). Spon's External Works and Landscape Price Book 2020. London: CRC Press, https://doi.org/10.1201/9780429294792
[61] https://www.buildingoftheyear.bg/bg/buildings/view/455/Zavod-za-mehanichno-biologichno-tretirane-MBT--na-otpadatzi-s-proizvodstvo-na-RDF-gorivo
[62] CBA, prepared by the consultant for a private client (2021)

					Design Development: based on costs provided by an international Waste Consultant for similar work.
SW2	Develop and implement an integrated recycling program to promote the use of resourceful construction and demolition materials and create green jobs (i.e. inert construction and demolition waste as secondary aggregate).	N/A	N/A	**BGN:** 220,000 – 275,000 **EUR:** 111,000 – 140,000	**Design Development:** based on costs provided by an international Waste Consultant for similar work with the following assumptions: - A scoping study of existing activities in this sector is completed - New C&D waste processing facilities are procured on a PPP basis - Estimates for an initial campaign is delivered with additional on-going costs required to embed sustainability practices over time.
Tr1	Introduce Low Emission Zone and time-based congestion charge zone within the city centre	**Per junction:** - **BGN**: 32,000 - **EUR**: 16,000	**Per junction:** - **BGN:** 57,000 - **EUR:** 29,000 **Software plus license fees:** - **BGN:** 560,000 - **EUR:** 287,000	N/A	**CAPEX and OPEX** figures based on costs provided by a local Transport expert, assuming the following: - Cost per crossroad (junction) and includes the purchase of appropriate equipment: cameras and readers, plus annual maintenance[63] - Start-up costs for charging software plus annual license fees for a single year.
Tr2	Upgrade ITS (Intelligent Transport Systems) to enhance existing traffic management/control centre.	**Per junction:** - **BGN:** 157,000 - **EUR:** 80,000	**BGN:** 37,000 **EUR:** 19,000	N/A	All **CAPEX** costs are shown as a cost / crossroad (junction)[64]. - Per single real-time bus stop installation: EUR 3,928 - Per single traffic counting and real time traffic lights: EUR 392,840 - Per single real time traffic router: EUR 213,500 - Per single variable traffic signs: EUR 17,080 **OPEX** Costs assumes the average administration salary of a single individual of EUR700 per month for 24 months.

[63] https://www.geovision.bg/bg/kameri-za-razpoznavane-na-registratsionni-nomera/hikvision-ds-2cd7a26g0-p-izs-ultra-low-light-kamera-s-deepinview-algoritym-za-avtomatichno-razpoznavane-na-registratsionni-nomera-na-mps-obektiv-2-8-12-mm)=

[64] Feasibility study for upgrading under project №BG161PO001-1.5.03-0002: Integrated urban transport in Varna, 2016

Tr3	Develop a 'Mobility Hub' Transport Strategy as part of the on-going SUMP to increase public or pedestrian modalities. Measure and track the network demand to inform the development of the strategy.	N/A	N/A	**BGN**: 123,000 - 148,000 **EUR:** 63,000 – 76,000	**Design Development:** based on costs provided by a local transport expert from similar work, using the average consulting rate per day in Bulgaria of EUR350.
Tr4	Investment in publicly available and convenient rapid Electric Vehicle charging stations across the City. This should include both Varna City Centre and residential neighbourhoods.	**Cost per EV Charge point:** - **BGN:** 36,000 - **EUR**: 18,000	N/A	N/A	**CAPEX** figures based on costs provided by a local Transport expert, assuming the following: - Per 30kw DC EV Charge point, includes the construction of a connection to the electricity transmission network.[65]
Tr5	Continue to invest in new electric public transport fleet (to cover bulk buses and vehicle fleets)	**36 Solo Electric Buses:** - **BGN**: 40,700,000 - **EUR:** 20,600,000 **36 Articulated electric buses:** - **BGN:** 48,900,000 - **EUR:** 24,800,000	**For both bus types:** - **BGN:** 0.46/km - **EUR:** 0.23/km	N/A	**CAPEX** figures based on costs provided by a local Transport expert, assuming the cost for 35 solo electric buses at EUR450,000 per bus and 35 articulated electric buses at EUR540,000 per bus, as per fulfilled public procurements. **OPEX** figures based on costs provided by a local Transport expert and refers to reporting data from a Sofia bus operator for a similarly composed fleet of electric buses. Electricity price sources from EnergoPro – Varna.
Tr6	Enhance the current parking plan to develop a strategy and enforce	N/A	N/A	**BGN:** 69,000 – 78,000	**Design Development:** based on costs provided by a local Transport expert from similar work using the average consulting rate in Bulgaria of EUR350 per day.

[65] https://evpoint.bg/%D0%BA%D0%B0%D1%82%D0%B0%D0%BB%D0%BE%D0%B3/886/%D0%B1%D1%8A%D1%80%D0%B7%D0%BE-%D0%B7%D0%B0%D1%80%D1%8F%D0%B4%D0%BD%D0%B0-%D1%81%D1%82%D0%B0%D0%BD%D1%86%D0%B8%D1%8F-ecotap-%D0%BA%D0%B0%D0%B1%D0%B5%D0%BB-ccs-2-30-kw-dc

	related policies around providing an alternative to on-street parking in appropriate central city areas.			**EUR**: 35,000 – 40,000	
Tr7	Research and establishment of fast ferry connections for passenger-only sea transport between the port of Varna - Kv. Asparuhovo, as well as to other smaller locations on the periphery of Varna Lake	**BGN:** 3,100,000 **EUR:** 1,600,000	**BGN**: 477, 000 **EUR:** 258,000	**BGN**: 218,000 – 275,000 **EUR**: 110,000 – 140,000	**All costs** provided by a local Transport expert. The **CAPEX** Costs are based on fulfilled public procurements within Bulgaria and assume: - Two speed passenger ferry boats[66] - Two passenger terminals - 1 parking lot for 100 cars The **OPEX** costs are a forecast value for the following: - Staff: 2 x boat captains. - Maintenance of terminals - Maintenance of vessel - Fuel (for 365 days for both vessels, assuming 1 days consists of twelve (6 per vessel) 4km roundtrips at EUR1.15 per 1 litre per 1km_ The_**Design Development** costs provided are based on the average consulting rate in Bulgaria of EUR350 per day.
CC1	Develop a Sustainable Energy and Climate Action Plan (SECAP) as part of the Covenant of Mayors on Climate and Energy, including a climate adaptation plan and sector-specific greenhouse gas emissions reduction targets.	N/A	N/A	**BGN**: 229,000 - 343,000 **EUR:** 116,000 – 174,000	**Design Development**: Based on the delivery of SECAPs for similar European cities, as provided by international Climate Change Expert

[66] https://grandseaboat.en.made-in-china.com/product/KBUxCfevfSpM/China-Chinese-52FT-40-Persons-Fiberglass-Aluminum-River-Speed-Passenger-Ferry-Boat-for-Sale.html Speed Passenger Ferry Boat

CC2	Develop and commit to emission reduction targets for the City of Varna's corporate emissions by 2030 / 2050.	N/A	N/A	**BGN:** 11,200 **EUR:** 5,750	**Design Development**: a forecast value based on costs provided by a local Energy expert from similar work and includes the preparation of regulatory documents for the creation of Greenhouse gas emission process and analysis.
CC3	Establish statutory requirements for GHG monitoring and reporting.	N/A	N/A	**BGN**: 9,750 **EUR:** 5,000	**Design Development**: a forecast value based on costs provided by a local Energy expert from similar work and includes the preparation of regulatory documents and the reporting standards for GHG emissions.
CC4	Undertake air, water and soil quality monitoring and analysis, on a municipal level, to understand the extent of pollution, expanding the current monitoring system.	**For 10 Air Quality Sensors:** - **BGN:** 229,000 - **EUR:** 116,000	**AQ data analysis and annual reporting for 2 years:** - **BGN:** 29,000 – 34,000 - **EUR:** 11,600 – 17,400	**IEMS:** - **BGN: 80**,000 - 126,000 - **EUR:** 40,600 -64,000	**CAPEX, OPEX and Design Development**: Based on costs provided by international Air Quality expert. **IEMS:** - Approx. value of a tender to develop a monitoring platform to analyse data and import data from a range of sensors, assuming the sensors have APIs on the. - No information known about hosting, timescales to help with costing etc **Air Quality Sensors:** - Ball park costs given to identify suitable sites and conduct 2 years monitoring using low-cost instruments provided by UK supplier (not reference standard instruments). - Cost given is per site and up to 10 sensors monitoring NO2, PM10, PM2.5 and SO_2 across Varna. Cost includes the units, delivery, SIM and data charges, solar panel. - Cost does not include local site work (assumed to be carried out by local council staff) to arrange site permissions, install and periodically check units. - Costs does not include replacement of parts (outside of warranty) **AQ reporting** - Costs for AECOM staff to ratify/adjust data and report annually (two reports for two years).

Appendix D : Carbon Analysis Assumptions

The following table outlines the assumptions made in the high-level analysis of carbon emissions saved as a result of the associated actions within this GCAP report.

Table 6.24. Carbon Calculation Assumptions

Action ID	Action name	Potential carbon saving	Unit of measure	Assumptions made
WCM1	Work with ViK Varna to introduce "smart" technology, i.e. IoT smart metering, across the potable water network.	300	Annual tCO2e	Varna population - 345,369 (as per Appendix A) Water consumption assumed to be 148.5 litres/capita/day (taken from Technical Assessment Report as outlined in Appendix A of this report) Assumes a 10% reduction in water consumption if smart meters installed[67] (based on Waterwise 'Smart water metering and the climate emergency' report - https://www.waterwise.org.uk/knowledge-base/smart-metering-and-the-climate-emergency-2021/) Uses Defra EF for water supply[68]
WCM2	Identify areas of cross-connection in the wastewater network and separate wastewater and rainwater runoff networks to reduce wastewater volumes at WWTP	300	Annual tCO2e	Average annual rainfall in Varna – 467mm Area draining to sewer system – 18,276,576m2 50% runoff coefficient Assumed 25% (by volume) of stormwater connections into the sewer system can be identified and resolved Which equates to 8,535 million litres of wastewater annually. Uses Defra EF for water treatment[69]
WCM3	Introduce wastewater sludge management (e.g. reuse in forestry and agricultural activities, reed beds and energy production)	4,400	Annual tCO2e	Assumes 7584m3 of sludge sent to landfill annually. Assumes 100% of this is used in AD as opposed to being sent to landfill Assumes 1:1 ratio for density of sludge based on https://www.climate-policy-watcher.org/wastewater-sludge/physical-and-biological-properties.html#:~:text=The%20density%20of%20primary%20sludge,1.2%20to%201.4%20g%2F%20cm3.
WCM5	Develop a structured maintenance programme to reduce leakage in the potable water network with a long-term target of 60-90% efficiency (confirm with water authority / national regulator)	2,600	Annual tCO2e	Assumes leakage in water network is 54% (taken from Varna GCAP Technical Assessment Report – as outlined in Appendix A of this report) Assumes the 60-90% correlates to reducing leakage to 10-40% in the long-term. Calculations based on reducing leakage from 54% to 20% Uses Defra EF for water supply[68]

[67] 'Smart water metering and the climate emergency' report: https://www.waterwise.org.uk/knowledge-base/smart-metering-and-the-climate-emergency-2021/
[68] BEIS-Defra Conversion Factors 2021: Water supply
[69] BEIS-Defra Conversion Factors 2021: Water treatment

Bu1	Adopt and incentivise LEVEL(S)/ EDGE building standards or develop local green building standards in line with international best practices common for green building certification tools for all municipal buildings.	For buildings receiving EDGE certification, a minimum 20% reduction in energy, water, and embodied carbon in materials.	N/A	As per EDGE Buildings Certification requirements[70].
Bu2	Strengthen the existing planning system to ensure that private developers undertake and submit to the Municipality an options assessment report regarding the choice of energy system (heating and cooling) for new developments.	The gCO2e/kWh of heat for the different options: • **Solar thermal**: 10-35 • **Ground source heat pump:** 50-125 • **Air source heat pump**: 60-170 • **District electric heating**: ~250	gCO2e/kWh	Based on information from the Parliament Office of Science and Technology which considered cradle to grave emissions.[71]
En3/ En4	Provide incentives to both developers and private homeowners, for the incorporation / installation of renewable electricity generation. (e.g. tax exemptions, cost subsidisation). And Integrate renewables at a large scale in the city.	125,800	Annual tCO2e	The area of the city is 18,276,576m2. It is assumed that the building density of Varna is 50% and total roof area is 9,138,288. It is assumed that approximately 60% of this is residential buildings and therefore roof area for residential buildings is 5,482,972m2 Assumption that 30% of the total roof area is suitable and used for solar PV. Carbon intensity of grid electricity used at 384gCO2e/kWh[72], have assumed 100% self-consumption of electricity for the CO2 reduction
SW1	Accelerate investment in recycling facilities, supported by strategic planning to ensure saleable outputs can be produced, alongside dedicated programmes to support waste separation	39,100	Annual tCO2e	Assumes household waste sent to landfill is 183,981.802 tonnes per year. Assumes 50% of household waste will be recycled instead of sent to landfill.
Tr1	Introduce Low Emission Zone and time-based congestion charge zone within the city centre	See Tr4 and Tr5		

[70] https://edgebuildings.com/certify/
[71] https://researchbriefings.files.parliament.uk/documents/POST-PN-0523/POST-PN-0523.pdf)
[72] https://app.electricitymap.org/zone/BG

Tr4	Investment in publicly available and convenient rapid Electric Vehicle charging stations across the City. This should include both Varna City Centre and residential neighbourhoods.	31,700	Annual tCO2e	Assumes 145,054 cars in Varna Assumes 50% electrified by 2035, an average of 25% per year Assumes 1 car travels 7,000km per year. Assumes UK emissions factor for petrol cars[73]. EV emissions factor based on Defra methodology used for UK factors using Bulgaria energy intensity[74]
Tr5	Continue to invest in new electric public transport fleet (to cover bulk buses and vehicle fleets)	13,600	Annual tCO2e	Assumes the number of buses in Varna is 336 and that all of these will become electric. Assumes average distance 1 bus travels in a year is 29,673 km Assumes UK emissions factor for local bus (not London). EV emissions factor based on Defra methodology used for UK factors using Bulgaria energy intensity[67]

[73] BEIS-Defra Conversion Factors 2019: Passenger vehicles - Average size petrol car
[74] https://app.electricitymap.org/zone/BG