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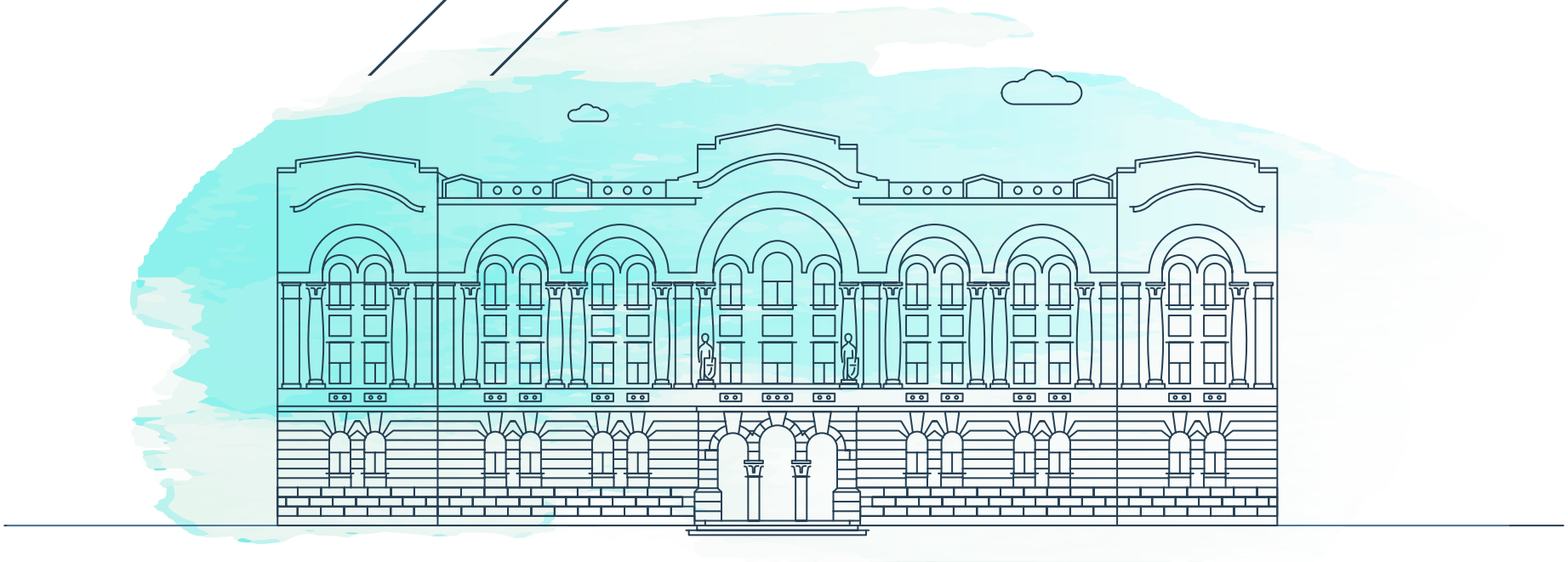

Green City Action Plan for Banja Luka

Green Cities Framework TC Support

GREEN CITY ACTION PLAN

August 2020

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Abbreviations

Abbreviation	Description
AD	Anaerobic Digestion
ANPR	Automatic Number Plate Recognition
BAM	Bosnia and Herzegovina convertible mark (currency)
BAT	Best available Technology
BD	District of Brčko
BiH	Bosnia and Herzegovina
BLCA	Banja Luka City Administration
BOD	Biochemical Oxygen Demand
BOT	Build Operate Transfer
BREEAM	Building Research Establishment Environmental Assessment Method
BRT	Bus Rapid Transit
CAPEX	Capital Expenses
CCRA	Climate Change Risk Assessment
CCTV	Closed Circuit Television
CHP	Combined Heat and Power
CIM	City Information Model
CNG	Compressed Natural Gas
CoP	Coefficient of Performance
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
CORINE LC	Coordination of Information on the Environment Land Cover
CTCN	Climate Technology Centre and Network
CSO	Civil Society Organisation
DFI	Debt Financing
DH	District Heating
DHN	District Heating Network
DHW	Domestic Hot Water
DRR	Disaster Risk Reduction
EBRD	European Bank for Reconstruction and Development
EU	European Union
EUR	Euro
FTE	Full-Time Equivalent
GBI	Green Building Index
GCA	Green City Action
GCAP	Green City Action Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gas(es)
GIS	Geographic Information System
GPS	Global Positioning System
ha	Hectare
HFO	Heavy Fuel Oil
HOV	High-Occupancy Vehicle
HW	Hazardous Waste
IFI	International Financial Institution
IMP	Impact Monitoring Plan
IRR	Internal Rates of Return
IT	Information Technology
Kg	Kilogram
KM	Bosnia and Herzegovina Convertible Mark
Km^2	Square Kilometres
kWh	Kilowatt Hour
LEED	Leadership in Energy and Environmental Design
LEZ	Low Emission Zone
LFI	Local Financial Institution
LPG	Liquefied Petroleum Gas
LRT	Light Rail Transit

Abbreviation	Description
LT	Long-Term
MoFTER	BiH Ministry of Foreign Trade and Economic Relations
MOVA	Microprocessor Optimised Vehicle Actuation
MRF	Materials Recovery Facility
MRV	Monitoring, Reporting and Verification
MSW	Municipal Solid Waste
Mt	Mega Tonne
MT	Medium-Term
MWh	Megawatt Hour
MWt	Megawatt Thermal
NABERS	National Australian Built Environment Rating System
NGO	Non-Governmental Organisation
NH_4	Ammonium
NMT	Non-Motorised Transport
NMU	Non-Motorised User
NRW	Non-Revenue Water
OECD	Organisation for Economic Co-operation and Development
OPEX	Operational Expenditure
O&M	Operations and Maintenance
PC	Personal Computer
PM	Particulate Matter
PMP	Progress Monitoring Plan
PPP	Public Private Partnership
PSR	Pressure-State-Response
PV	Photovoltaic
RE	Renewable Energy
RES	Renewable Energy Source(s)
RS	Republika Srpska
RTPI	Real Time Passenger Information

Abbreviation	Description
RYG	Red, Yellow, Green
SCOOT	Split Cycle Offset Optimisation Technique
SEA	Strategic Environmental Assessment
SEAP	Sustainable Energy Action Plan
SIDA	Swedish International Development Cooperation Agency
STHW	Solar Thermal Hot Water
SUD	Sustainable Urban Drainage System
SUMP	Sustainable Urban Mobility Plan
TA	Technical Assistance
TOD	Transit-Oriented Development
UN	United Nations
UWWTD	Urban Wastewater Treatment Directive
WFD	Water Framework Directive
WHO	World Health Organisation
WSHP	Water Source Heat Pumps
WtE	Waste-to-Energy
WTP	Waste Treatment Plant
WW	Wastewater
WWTP	Wastewater Treatment Plant
WWTW	Wastewater Treatment Works

Executive summary

Banja Luka's Green City Vision

"Banja Luka aims to be an exemplar of innovative, smart and sustainable utility and transport infrastructure, supported by an efficient land use system and increased resilience to climate change and other natural disasters. With a healthy and vibrant built environment, a network of green and blue infrastructure will protect and enhance water resources, soil quality and biodiversity, maintaining Banja Luka's status as a 'city of greenery'."

Introduction

The aim of the Green City Action Plan (GCAP) is to enhance Banja Luka's environmental performance in a cost-efficient and financially sustainable manner, while at the same time seeking to maximise the economic and social co-benefits. The city vision sets the broad direction for Banja Luka's green transformation. The GCAP, which was developed by the Banja Luka City Administration (BLCA) using an internationally recognised methodology, outlines how the city can realise this vision by breaking it down into the four elements of:

- Environmental topic visions;
- Strategic environmental objectives;
- Mid- and long-term quantitative targets, and;
- Short-term actions.

Green City challenges

The visions for each of the environmental topic areas are defined and translated into environmental strategic objectives, which were based on the key challenges identified in the green city baseline. The table below summarises the key green city challenges that were identified with the environmental topics presented in order of priority as determined by a process of technical assessment (largely informed by a review of performance against a broad set of indicators and benchmarks) and stakeholder consultation. Three sets of indicators were considered, 'state', 'pressure' and 'response'. This model enabled the assessment of the negative impacts of human activities ('pressure' indicators) on environmental assets ('state' indicators) and the identification of associated gaps in the regulatory framework ('response' indicators).

Priority environmental issues ('state')

Environmental topic	Priority challenges
1. Water resources	• Inadequate wastewater collection (coverage) and treatment provision • Inadequate public water supply network provision – moderately high losses and coverage • Water quality in local water bodies fluctuates (good in some years and inadequate in others)
2. Air quality	• Moderately polluted air with fluctuations throughout the year and reduced SO_2 concentrations • Increasing number of fossil fuelled private vehicles in road transport • Limited options for non-motorised users • Low percentage of households connected to district heating and use of coal for heating purposes
3. Green space	• Limited public green spaces • Low level of urbanisation (urban sprawl)
4. Mitigation of GHG emissions	• Increasing number of fossil fuelled private vehicles in road transport • Limited provision for non-motorised users • High building energy consumption • Low percentage of households connected to district heating and use of coal for heating purposes.
5. Soils	• Low level of treatment of industrial and municipal wastewater • Non-sanitary MSW (Municipal Solid Waste) disposal and unregulated / uncontrolled urban development • Road vehicle emissions containing lead and other heavy metal emissions

Environmental topic	Priority challenges
6. Biodiversity and ecosystems	• Lack of monitoring of biodiversity • Low level of urbanisation (urban sprawl) • Lack of treatment of industrial and municipal wastewater • Non-sanitary MSW disposal and unregulated / uncontrolled urban development
7. Adaptation and resilience to natural disaster risks	• Insufficient flood risk management and extreme events • Thermal comfort • Urban planning • Water resource efficiency

Environmental topic visions and strategic environmental objectives

The vision statements, which summarise what Banja Luka wants to achieve with this GCAP, and strategic objectives for each priority environmental challenge are listed below. The strategic objectives each have a set of corresponding mid-term and long-term targets, which are based on the state and pressure indicators underlying the challenges.

GCAP visions and objectives

Environmental topic	Vision statement	Strategic objectives
Water resources	"Banja Luka will maintain high quality water supply, and improve wastewater treatment and collection accessible to everyone"	**WR1** Improve wastewater treatment and collection **WR2** Improve integration of water supply and wastewater treatment/collection with drainage and land use planning and management
Air quality	"Banja Luka will have clean, healthy air quality throughout the city and all EU ambient air quality objectives will be met"	**AQ1** Improve ambient air quality
Green space	"Banja Luka will be a compact city with a sustainable and efficient system of land uses and a connected network of green spaces to maintain its status as 'city of greenery'"	**GS1** Enhance extent, quality and diversity of green spaces and other green infrastructure **GS2** Reduce urban sprawl
Mitigation of GHG emissions	"Banja Luka will be an exemplar of innovative, smart, affordable, reliable zero/low carbon transport and buildings across all sectors"	**GH1** Reduce GHG emissions
Soils	"Banja Luka will prevent land contamination and maintain and enhance soil quality across the city"	**SL1** Protect and enhance soil quality across the city

Environmental topic	Vision statement	Strategic objectives
Biodiversity and ecosystems	"Banja Luka will establish a connected network of green and blue infrastructure that links natural assets such as urban parks, the River Vrbas and surrounding environment in order to preserve or enhance local biodiversity"	**BE1** Encourage development of green infrastructure across the city as an interconnected network of built environment and natural assets to preserve biodiversity, enhance recreational purposes and minimise risk to natural disasters **BE2** Protect, maintain and enhance natural assets across the city
Adaptation and resilience to natural disaster risks	"Banja Luka will increase resilience to climate variability and climate change, and in so doing secure sustainable development gains"	**AR1** Promote safe and resilient infrastructure, housing and urban development

Priority actions (policies and investments)

A long-list of 58 actions was developed based on their potential to maximise social and economic benefits, as well as realise environmental impacts. These actions were prioritised using a process of technical assessment and stakeholder consultation involving both international and local experts from the public and private sectors. This resulted in the identification of 32 short-term (priority) actions, which are the vehicles for achieving the environmental strategic objectives and, when implemented, therefore contribute towards meeting mid-term and long-term quantitative targets. 26 additional actions are presented in Appendix C. The priority actions are presented overleaf alongside a summary of the nature of each action and its implementation timeframe. This is followed by a table summarising the estimated CAPEX and annual OPEX costs of implementing these actions by sector.

Priority GCAP actions listed by sector

Action reference and title	Action classification		Implementation timescale
	Primary	Secondary	
TRANSPORT			
TR01: Develop car parking and management policies and strategies	Policy	Developing policy, plan, legislation, regulations	2021-2025
TR05: Expand and enhance cycling infrastructure	Investment	Capital investment: implementation – improving existing	2022-2025
TR07: Promotional campaigns for car sharing, walking and cycling	Policy	Awareness raising	2021-2022
TR08: Upgrading of bus stop infrastructure and technology	Investment	Capital investment: implementation – improving existing	Phase 1: 2022-2026 Phase 2: 2026-2031
TR09: Implement bus network infrastructure	Investment	Capital investment: implementation – new	2022-2026
TR10: Implement pedestrian priority infrastructure	Investment	Capital investment: implementation – new	2022-2026
TR13: Implement bus operational reforms	Investment	Capital investment: implementation – improving existing	2022-2031
ENERGY AND BUILDINGS			
EN01: Development and adoption of the Energy Efficiency Action Plan of the City of Banja Luka for the period 2021-2023	Policy	Developing policy, plan, legislation, regulations	2021-2022
EN04: Improved home energy efficiency – building users taking steps to reduce energy use	Investment	Capital investment: implementation – new	2021-2028
EN05: Improved insulation in residential and public spaces in order to decrease the load of the heat network and free capacities for other areas	Investment	Capital investment: implementation – new	2021-2031
EN06: Rehabilitation of district heat network to reduce water losses and improve thermal efficiency - thermal supply network metering and monitoring: Detailed Study	Investment	Improving information base, modelling	2022-2023
EN07: Rehabilitation of district heat network to reduce water losses and to improve thermal efficiency – Pipework replacement, substation automation, network expansion: Detailed Study	Investment	Capital investment: feasibility, planning, design, piloting	2022-2023
INDUSTRY			
IN01: Capacity building through the City Administration to enhance the quality of environmental permitting instruments to support energy and material efficiency and cleaner production in industry	Policy	Training, capacity building	2021-2022
WATER RESOURCES			
WR01: Modernisation of GIS data systems for water supply and wastewater networks, assets and customer management	Investment	Improving information base, modelling	2021-2023
WR03: Sustainable Drainage Systems (SuDS) and Decentralised Sewage Treatment Study	Policy	Capital investment: feasibility, planning, design, piloting	2021-2023
WR06: Prepare designs for Wastewater Treatment Plant	Investment	Capital investment: feasibility, planning, design, piloting	2022-2023

Action reference and title	Action classification		Implementation timescale
	Primary	Secondary	
WR07: Repair and improve the existing water supply system to reduce water losses	Investment	Capital investment: implementation – improving existing	2021-2031
WR08: Develop new water supply network to allow connection of entire city population to the public water supply	Investment	Capital investment: implementation – new	2023-2030
WR09: Wastewater network construction: extension, refurbishment and new build	Investment	Capital investment: implementation – improving existing	2021-2031
WR10: Wastewater Treatment Works construction	Investment	Capital investment: implementation – new	2023-2031
SOLID WASTE			
SW01: Development of Integrated Waste Management Plan	Policy	Developing policy, plan, legislation, regulations	2021-2023
SW02: Feasibility study on waste treatment options	Investment	Capital investment: feasibility, planning, design, piloting	2021-2022
SW03: Development of implementation strategy for separate collection system for recyclable waste and its implementation	Investment	Capital investment: feasibility, planning, design, piloting	2021-2023
SW04: Development of waste treatment infrastructure	Investment	Capital investment: implementation – new	2021-2030
SW05: Development of waste disposal infrastructure	Investment	Capital investment: implementation – new	2021-2030
SW06: Increase of waste awareness through education campaigns	Investment	Awareness raising	2021-2023
LAND USE			
LU01: Develop and legally adopt an overarching Sustainable Urban Planning Framework for the City of Banja Luka	Policy	Developing policy, plan, legislation, regulations	2021-2023
LU03: Screening and de-risking of contaminated sites	Investment	Improving information base, modelling	2021-2023
LU05: The continued effective management and enhancement of public parks and green spaces	Investment	Capital investment: implementation – improving existing	2021-2030
LU06: Provision of new public parks and green infrastructure	Investment	Capital investment: implementation – new	2021-2030
ADAPTATION AND RESILIENCE			
AR01: Conduct a Climate Change and Natural Disaster Risk Assessment of Banja Luka's infrastructure	Investment	Improving information base, modelling	2021-2022
AR02: Develop an Action Plan on Climate Change Adaptation and Natural Disaster Resilience	Policy	Developing policy, plan, legislation, regulations	2022-2023

Priority GCAP actions: CAPEX and OPEX costs by sector (EUR and BAM)

Sector	Total CAPEX (EUR)	Total CAPEX (BAM)	Mid-term CAPEX (EUR)	Mid-term CAPEX (BAM)	Annual OPEX (EUR)	Annual OPEX (BAM)	Number of priority actions
Transport	37,900,000	74,284,000	27,400,000	53,704,000	1,200,000	2,352,000	7
Energy and buildings	29,815,000	58,280,600	17,565,000	34,270,600	65,000	127,400	5
Industry	25,000	49,000	25,000	49,000	0	0	1
Water resource	150,750,000	295,470,000	61,770,000	121,069,200	3,890,000	7,624,400	7
Solid waste	65,530,000	128,438,800	33,030,000	64,738,800	6,539,000	12,816,440	6
Land use	5,125,000	10,045,000	3,325,000	6,517,000	108,400	212,464	4
Adaptation and resilience	1,000,000	1,960,000	1,000,000	1,960,000	0	0	2
Total	**290,145,000**	**568,527,400**	**144,115,000**	**282,308,600**	**11,802,400**	**23,132,704**	**32**

Next steps

The GCAP will be used to elaborate Banja Luka's annual budgets, capital investment plans, triennial development programmes, and other mid-term and long-term development plans. This first stage of the Green City Implementation period, Step 3 of the GCAP process, is due to begin in late 2020. This will mark the start of the 60-month implementation period.

The implementation progress and impact of the GCAP will be monitored to understand opportunities for improvement and to identify any necessary corrective measures that might be needed. It will also enable GCAP challenges, objectives, actions and targets to be periodically revisited and if necessary refined. Implementation and the contribution of GCAP actions towards achieving mid-term and long-term targets will therefore be subject to regular reporting. This document outlines the monitoring process that will be used to do so, as well as associated governance arrangements, but this will be revisited and refined by the City Administration at the start of the process. This is reflected in the following figure, which provides an overview of next steps.

Type of Activity	Activity	Year							
		2020	2021	2022	2023	2024	2025	2026	2027
	Confirm GCAP Coordinator								
	Engage politicians, other decision-makers and their bodies								
	Include the GCAP actions in annual budgets and mid-term and long-term development plans								
	Commission feasibility studies for GCAP actions								
	Select key GCAP measures and prepare a detailed Implementation Plan								
	Review and mitigate GCAP implementation risks								
	Pursue sources of funding								
	Establish and formalise implementation partnerships								
	Implement GCAP actions								
	Agree and refine monitoring process								
	Monitor GCAP implementation								
	Monitor contribution of GCAP towards targets								
	Report GCAP implementation progress and plan and implement any necessary corrective measures								
	Report contribution of GCAP actions towards targets and plan and implement any necessary corrective measures								
	Identify and report on changes in State, Pressure and Response indicators								
	Prepare for the next GCAP cycle								

Internal engagement
Finance / budgeting
Execution
Reporting
Step 3: Green City Implementation
Internal and external engagement
Feasibility
Monitoring
Step 4: Green City Reporting

Programme of activities for GCAP next steps - GCAP Step 3: Green City Implementation and Step 4: Green City Reporting

1. About the plan

1.1. Context of the GCAP

The aim of the Green City Action Plan (GCAP) is to enhance Banja Luka's environmental performance in a cost-efficient and financially sustainable manner, while at the same time seeking to maximise the economic and social co-benefits.

This GCAP is the newest of a series of documents that reflect the City of Banja Luka's commitment to the sustainable use of natural resources and ecosystem services and to maximise the opportunities to improve the environment that are created by all development processes. The GCAP is a strategic document that has been developed in the context of the wider framework, including Banja Luka's Development Strategy for the period 2018-2027, for which the Green City concept, defined by the measures outlined in this GCAP, is intended to fulfil Strategic Objective 3 of the City: "Ecologically sustainable, equipped utilities, energy efficient and safe environment – Green City."

The GCAP has been developed in recognition that cities face a range of environmental challenges and that improvements to related performance and resilience can only be achieved via an inter-disciplinary and holistic approach that covers all environmental topics and all urban sectors. It articulates Banja Luka's sustainable development vision and associated strategic objectives, actions and investments to address priority environmental issues. The GCAP has been prepared under the European Bank for Reconstruction and Development (EBRD) Green Cities, a programme that connects cities' environmental challenges with sustainable infrastructure investments and regulatory measures. The GCAP methodology promoted by the GrCP[1] reflects the increasingly decentralised nature of green or sustainable city actions and the increasing need for a systematic approach to city development that covers the broad range of environmental issues and links these to economic and social objectives to provide a comprehensive set of solutions that can translate into investable projects.

[1]Organisation for Economic Co-operation and Development (OECD) and the International Council for Local Environmental Initiatives (ICLEI) (2016) Green Cities Programme Methodology. Available at http://www.ebrd.com/documents/technical-cooporation/green-city-action-plan-in-tirana.pdf.

1.2. Introduction to Banja Luka

The City of Banja Luka occupies 102.73 km^2 and the urban area of Banja Luka is generally situated on the valley of the River Vrbas. With over 180,000 inhabitants, it represents the largest populated city of Republika Srpska and its political, administrative, financial and cultural centre.

This makes the city susceptible to flooding, and in 2014 the city experienced a once in every 500 years flood event that caused millions of Euros worth of damage. Banja Luka is also susceptible to seismic activity, with a major earthquake occurring in 1969.

Banja Luka has a developed economy characterised by the tertiary sector, especially trade, catering, transport and financial services. Until the 1990s, the Banja Luka industry was dominated by large economic systems employing several thousand workers each, while today no Banja Luka industrial company employs more than 500 workers. In the process of privatisation of state-owned capital in enterprises, buyers of state-owned capital were more attracted to invest in trade, construction, catering and financial institutions than in industrial capacity [12]. This has presented considerable potential for brownfield revitalisation projects to be conducted in the city. In the last 20 years Banja Luka has increasingly adopted the principles of a market economy, with strategic development seeking to develop its trade, tourism, agriculture and industries. Micro and small enterprises and entrepreneurs, which are primarily in trade and service activity, are dominant in the city's economic activities. In 2018, GDP per capita was estimated to be EUR 9,003 and was almost twice the RS average [7].

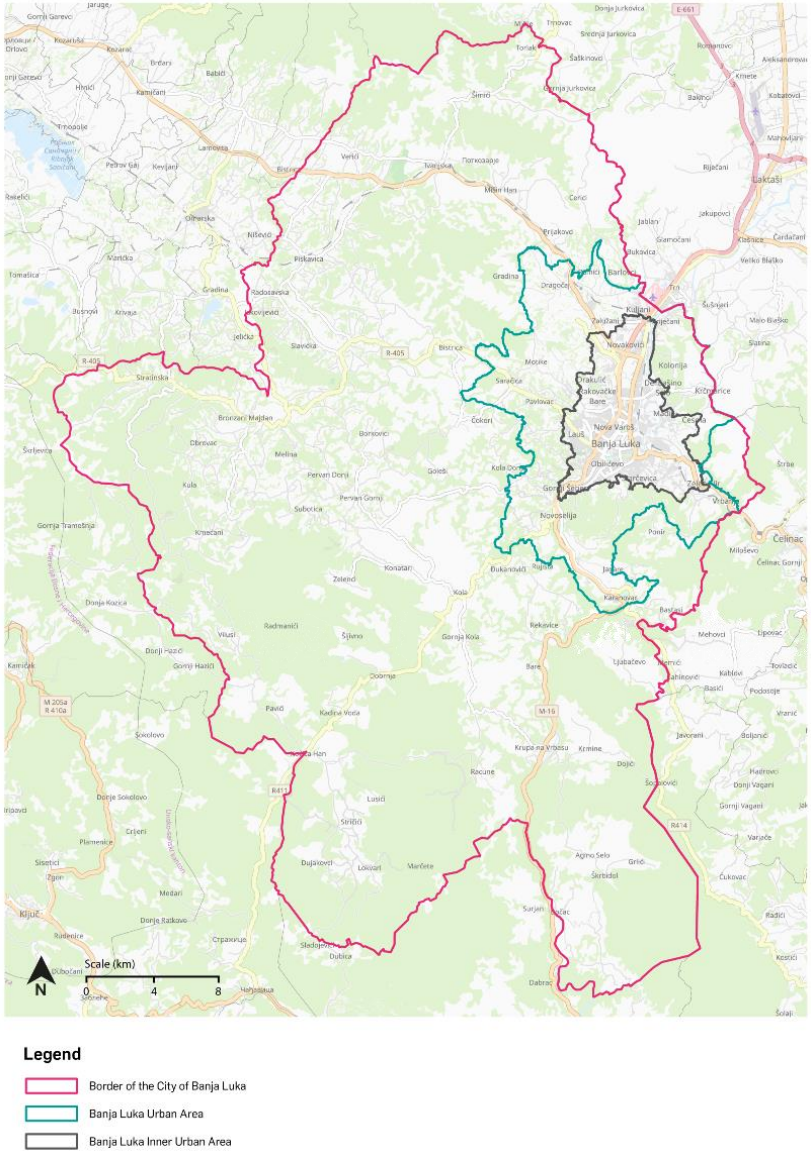


Figure 1-1 - Banja Luka City area and urban area

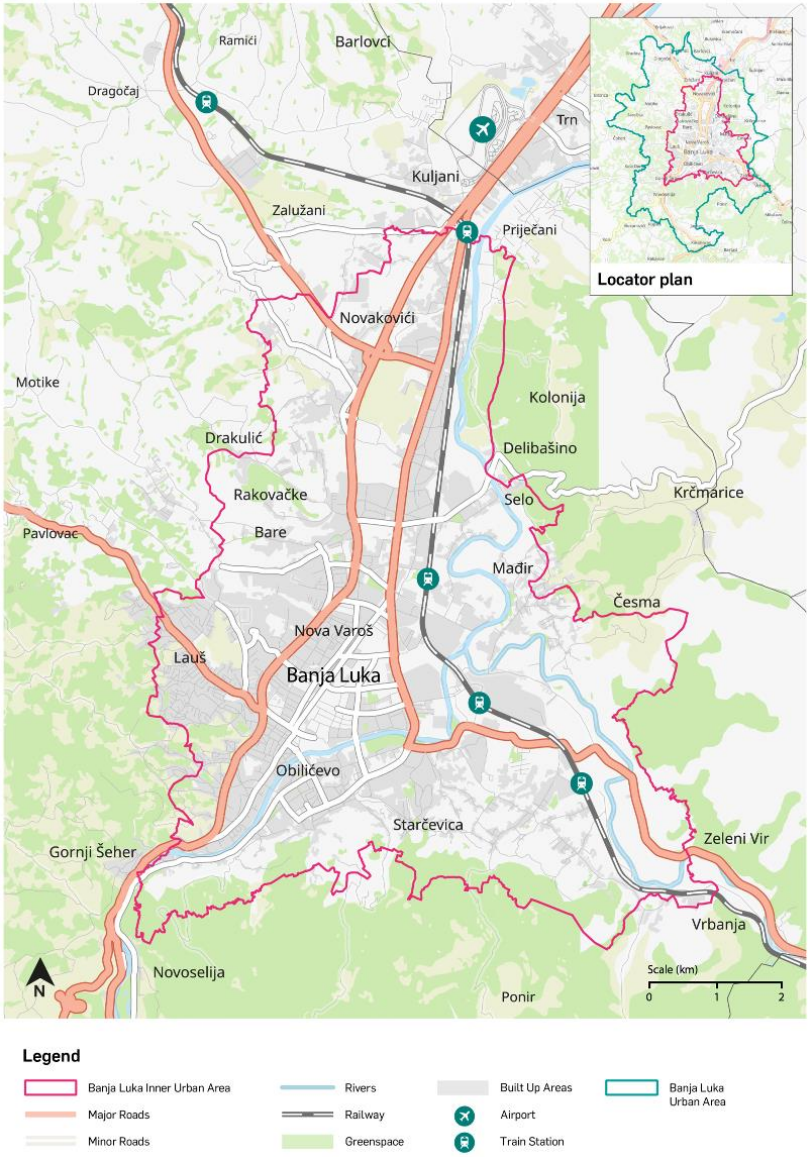


Figure 1-2 - Banja Luka City inner urban area plan

Banja Luka is experiencing a period of rapid development and as its economy grows many areas of the city have become construction sites with many new projects being implemented. It still, however, lives up to its reputation as the 'city of greenery' owing to its many green areas, including parks and tree-lined roads although there remains considerable potential to increase the amount of green space in the urban area, including via the establishment of forest parks. Banja Luka is also known as a city of young people, sport and culture.

The total number of employees in the City of Banja Luka as a proportion of total employees in RS increased from 25.33% in 2012 to 26.18% in 2016[12]. In the period 2013 to 2018 Banja Luka's population grew from 180,056 to 184,257, an increase of 2.3% [7].

The urban planning framework for Banja Luka is relatively underdeveloped, which has led to a lack of clarity, extending to uncertainty regarding the ownership of various areas of land. The Urban Plan for Banja Luka was last updated in 1975, and while this is currently being updated there remain other gaps that need to be addressed. There are, for example, currently no adopted strategies for local utility services (water supply system, sewage system, public lighting, public greenery, district heating), and the only previous related strategy that exists is a now-expired Waste Management Plan. The impact of these gaps is widely apparent. The current regional landfill, for example, is limited in capacity to nine years' operation, the River Vrbas is contaminated with raw sewage, and the energy efficiency of infrastructure and services including district heating and street lighting needs to be improved. Energy efficiency in all buildings is indeed inadequate and traffic congestion in the inner-city area, which is the result of high and increasing use of private cars and the low share of public transport, is contributing towards air pollution levels that need to be addressed as a matter of urgency. In addition, systems for natural disaster risk reduction need to be strengthened.

A number of projects have been prepared to address these concerns. But the availability of funding for implementation means that they have not progressed. This has impacted all sectors. There are, however, initiatives in all sectors that are having a positive impact. These include a successful bike-share initiative in the transport sector (BL-Bike – Public bike system) and the introduction of a large 100% biomass facility linked to the district heating system in 2017.There is thus a lot of potential that this GCAP will capitalise upon.

1.3. GCAP structure

The structure of the rest of this GCAP is outlined below.

Chapter 2 GCAP contributors: introduces the work team and also the wider stakeholders who made an active contribution to the GCAP development.

Chapter 3 Green City Action Plan methodology: presents the approach and methodology adopted to develop the GCAP.

Chapter 4 Green City baseline: highlights the key environmental issues being experienced in Banja Luka, introduces the institutional and regulatory framework of the GCAP along with the City Administration's budget, and presents the results of the baseline technical assessment and stakeholder prioritisation that was used to identify the environmental challenges facing the city, based on a comparison with benchmarked international indicators.

Chapter 5 Green City vision, objectives and actions: presents the Green City vision, set of strategic objectives and recommended actions and targets for each urban sector (transport; buildings and energy; industry; water resources; solid waste, and; land use) as well as adaptation and resilience actions that are not limited to a specific sector.

Chapter 6 Green City monitoring, reporting and verification (MRV): sets out the approach that will be followed to measure the effectiveness of the GCAP in relation both to actions taken and outcomes achieved. It also outlines governance arrangements for managing implementation of the process.

Chapter 7 GCAP costs and funding options: provides a summary of the CAPEX and OPEX costs of the GCAP actions, as well as commentary on the potential options for funding.

Chapter 8 Next steps: sets out the next steps and timelines for implementation of the GCAP and its associated actions.

The Appendices contain additional detail on State, Pressure and Response indicators (**Appendix B**) and the additional actions **(Appendix C)**.

2. GCAP contributors

2.1. GCAP Working Team

The GCAP was prepared by the Banja Luka City Administration with support from a team of local and international consultants (Atkins (a member of the SNC Lavalin Group), HCL Consulting and LDK) and the European Bank for Reconstruction and Development (EBRD). The team members and the roles and responsibilities of each are listed in Table 2-1.

The Banja Luka City Administration led both the preparation and coordination of the GCAP. This was facilitated by the establishment of a City GCAP Working Team, which was formed by the Mayor at the outset. This Team was headed by a 'Team Chief' who was in charge of communication between the City Administration, local stakeholders and the consultant team. This helped to ensure that all stakeholders, crucially those from across the wider City Administration, were kept informed and had the opportunity to participate in all stages of the GCAP process.

The EBRD provided both technical and financial support under EBRD Green Cities Programme. Financial support was also provided by the Federal Ministry of the Republic of Austria. The wider stakeholders who were involved in the development of the GCAP, which was produced using a participatory process, are introduced in the next sub-section.

Table 2-1- City Staff Involved in the GCAP Process

Name	Job Title	Department
Igor Radojičić	Mayor - *GCAP Leader*	
Branko Sladojević	Mayor's Adviser for Economic and International Projects - *GCAP Team Chief*	Mayor's Cabinet
Siniša Kurteš	Mayor's Adviser for Economic Affairs - *GCAP Deputy Team Chief*	Mayor's Cabinet
Jasna Brkić	Mayor's Adviser for Financial Management and Control - *City Development Team Coordinator*	Mayor's Cabinet
Ivan Rašković	City Architect	Mayor's Cabinet
Ognjen Šukalo	City Landscape Architect	Mayor's Cabinet
Božana Šljivar	Head of Department	Department of Finance
Petar Bilčar	Head of Department	Department of Utilities
Slobodan Stanarević	Head of Department	Department of Spatial Development
Slaviša Sandić	Head of Department	Department of Traffic and Roads
Radenko Komljenović	Head of Department	Department of Economy
Dejan Vujić	Head of Section for Budget	Department of Finance
Sanja Mataruga	Professional Associate – Coordinator for Horticulture	Department of Utilities
Nevena Šljivić Babić	Professional Advisor in the Department	Department of Utilities
Sanja Adžić	Professional Associate for Accounting and Contracts	Department of Utilities
Sanela Kecman	Professional Advisor	Department of Spatial Development
Ana Štikić	Professional associate for ecology and water management	Department of Spatial Development
Slavko Davidović	Head of the Unit for Traffic	Department of Traffic and Roads
Jelena Pavlović	Senior Associate – Coordinator for Project Documentation	Department of Traffic and Roads
Milenko Džever	Expert Associate for Traffic Safety	Department of Traffic and Roads
Dragan Novaković	Professional Advisor for the Economy and Corporate Governance	Department of Economy
Maja Jovanović	Head of Department of Local Economic Development and Strategic Planning	Department of Local Economic Development and Strategic Planning
Dejan Todorović	Head of the Team - Strategic Planning, Public-Private Partnerships and Preparation of Projects	Department of Local Economic Development and Strategic Planning
Sanja Jovanović	Professional Associate - Coordinator for Strategic Planning	Department of Local Economic Development and Strategic Planning
Manja Đuđić	Professional Associate for City Property	Department of Local Economic Development and Strategic Planning

City Administration led technical GCAP meeting

2.2. Stakeholder contribution and engagement process

The Banja Luka City Administration involved essential partners and stakeholders in the GCAP process in order to ensure the production of an integrated and effective GCAP and ultimate ownership of, and commitment to, the GCAP. A Stakeholder Engagement Plan outlining stakeholder engagement activities and communication protocols was therefore developed at the beginning of the GCAP process. This ensured that stakeholder interests were taken into account at each stage of GCAP development and reflected in each deliverable. The key objectives of the Stakeholder Engagement Plan were as follows:

- To ensure that all engagement is inclusive and is undertaken in a manner that fits with local business culture;
- To ensure that all stakeholders are clear on the purpose, format and timing of all stakeholder engagement activities;
- To provide a regular flow of information to key stakeholders; and
- To ensure the project's approach, recommendations and outcomes meet the key stakeholders' aspirations and gain their support them.

The participatory process was initiated at the Kick-Off Meeting, where approximately 60 stakeholders participated in the launch of the GCAP process. Participation was sustained throughout, with stakeholders contributing time and expertise, and generating much motivation and momentum, towards the GCAP. They have actively participated in meetings and workshops, shared relevant data, commented on draft reports and elicited feedback more widely and generated and shared new ideas.

The stakeholders involved were identified via a stakeholder mapping exercise, which was conducted at the beginning of the GCAP development process to ensure that a range of stakeholders were invited to participate in all stages. The institutions and organisations identified are listed in Table 2-2 and can be summarised as follows:

- RS level ministries (5 ministries engaged);
- RS level institutions, agencies and public companies (12);
- City level public utility companies (4);
- Non-Governmental Organisations (NGOs) and academia (6).

A GCAP workshop

Table 2-2- Institutions which participated in GCAP development

Category	Institution Name
Republika Srpska ministries	Ministry of Spatial Planning, Civil Engineering and Environment (Department of Environmental Protection)
	Ministry of Agriculture, Forestry and Water Management (Department of Water Management)
	Ministry of Transport and Communications (Department of Road Traffic and Roads)
	Ministry of Industry, Energy and Mining (Department of Energy Sources)
	Ministry of Trade and Tourism
RS level institutions, agencies and public companies	Agricultural Institute
	Institute of Statistics
	Institute for Urban Planning, Civil Engineering and Ecology
	Institute for Public Health
	Institute for Protection of Cultural, Historical and Natural Heritage
	Hydrometeorological Institute
	Administration for Civil Protection (Banja Luka Field Office)
	Public Institution "Vode Srpske"
	Fund for environmental protection and energy efficiency
	Public company for roads-RS / J.P. "Putevi RS"
	Agency for transport safety RS
	Electric distribution "Elektrokrajina" JSC Banja Luka
City level public utility companies	Public water supply utility "Vodovod" JSC Banja Luka
	District heating utility "Ekotoplane" Ltd Banja Luka
	Regional solid waste management utility/ Public Company "DEP-OT" Ltd Banja Luka
	City solid waste management utility "Čistoća" JSC Banja Luka
NGOs and academia	Centre for the Environment
	Arbor magna
	"Mladica" (fish protection)
	Kayak-canoe club "Vrbas"
	Faculty for Architecture, Civil Engineering and Geodesy of University of Banja Luka (Centre for Sustainability and Integrated Design)
	Faculty of Forestry of University of Banja Luka

In total, more than 60 individuals from 27 different institutions, companies and organisations took part in GCAP workshops, focus groups and consultations on key deliverables. Engagement with stakeholders was organised via email and/or phone both before and after events, which are listed in Chapter 3.

The level and quality of stakeholder engagement was continually monitored and assessed through informal dialogue organised by the work team, including the EBRD. This was undertaken in a number of ways, including by requesting written feedback from stakeholders after each event, the responses from which were recorded in workshop notes.

Focus group GCAP engagement

3. Green City Action Plan methodology

The GCAP is a strategic document that presents Banja Luka's environmental vision for 2035. Its aim is to enhance the City's environmental performance in a cost-efficient and financially sustainable manner, while at the same time maximising economic and social co-benefits. This section introduces the methodology used to develop the GCAP and that will continue to be applied to monitoring the progress of its implementation.

3.1. Overview of approach

The Banja Luka GCAP has been developed according to the EBRD Green Cities methodology, as defined by OECD and ICLEI. It is the outcome of the GCAP process, which has been tailored to the Banja Luka context.

The GCAP Methodology guides the development of environmentally sound actions and is based on the key principles of:

- Evidence-based technical analysis;
- Stakeholder participation and engagement; and
- Political commitment to the green city concept.

The EBRD Green Cities methodology defines a Green City as a city "which shows high environmental performance relative to established benchmarks in terms of i) **quality of environmental assets** (air, water, land/soil and biodiversity), ii) **efficient use of resources** (water, energy, land and materials) and iii) **mitigating and adapting to risks deriving from climate change**, while maximising the **economic and social co-benefits** and considering its context (population size, socio-economic structure and geographical and climate characteristics)."[2]

[2]OECD and ICLEI (2016) Green Cities Programme Methodology. Available at http://www.ebrd.com/documents/technical-cooporation/green-city-action-plan-in-tirana.pdf.

Source: Based on OECD and ICLEI (2016), op. cit.

Figure 3-1 - Green City Action Plan (GCAP) process overview – steps

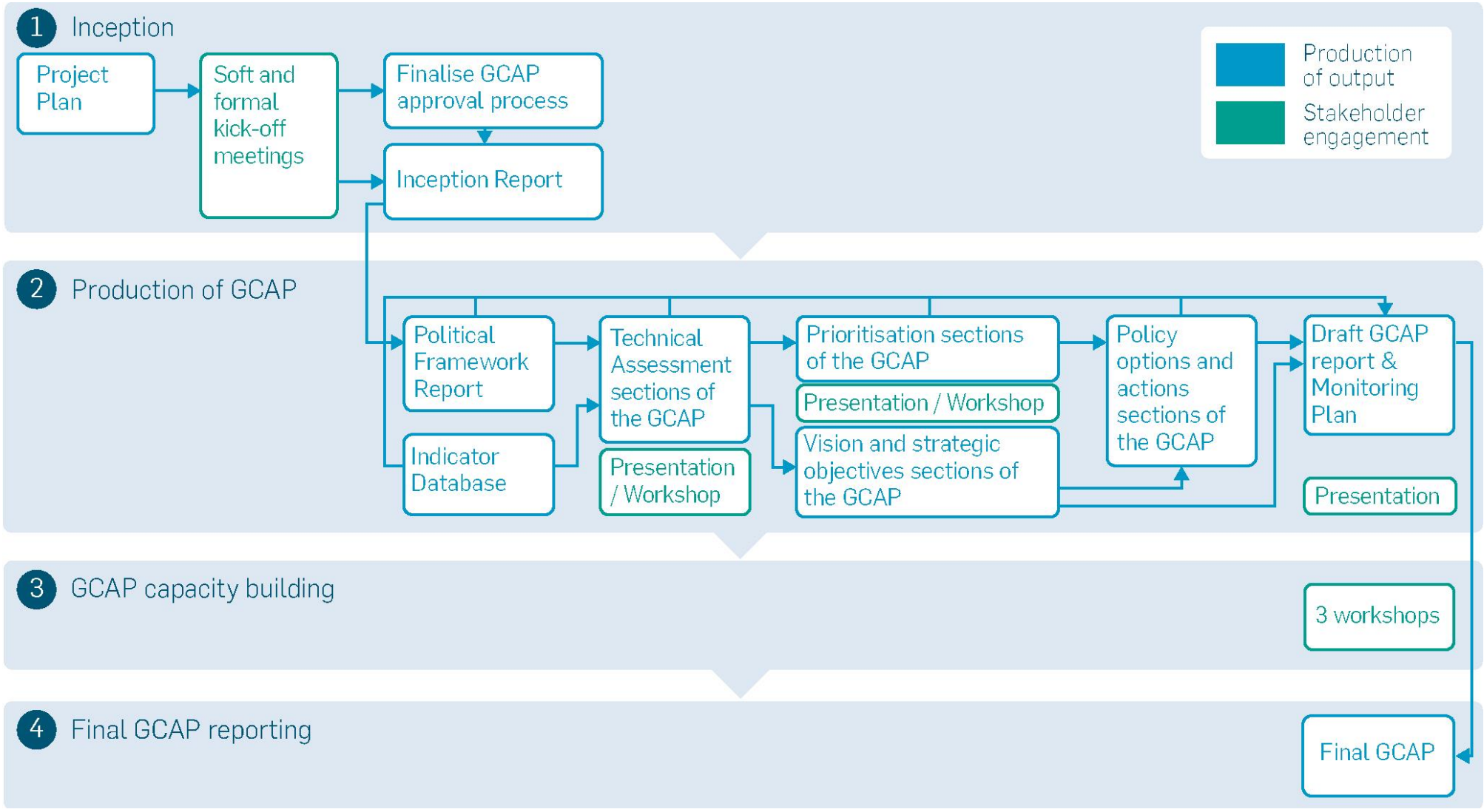
The GCAP process consists of the four main steps listed in Figure 3-1. It is an iterative process that requires periodic review and the consequent updating of the strategic framework to reflect the Green City actions' implementation progress as well as other relevant developments.

The completed GCAP developed at the end of Step 2 is the outcome of a detailed study of relevant policies and planning documents, as well as a technical assessment of environmental indicators. This process is highly participatory. In the course of the development of the GCAP, for example, workshops and discussions were held with the City Administration and wider stakeholders in order to minimise data gaps and enhance the understanding of local social, cultural and historical challenges and community needs. The stakeholder consultation also allowed for the participatory identification of green city challenges, ensured that urban issues were addressed systematically, supported the prioritisation of actions that would have maximum impact and attract donor co-financing, and facilitated capacity development. Table 3-1lists all formal stakeholder engagement events that took place during GCAP development. These were supplemented by a number of informal discussions between the local consulting team, City Administration representatives and other stakeholders.

Table 3-1- List of formal stakeholder engagement meetings and workshops

Date	Engagement type	Title of meeting/workshop
July 2018	City Administration Meeting	Internal Kick-off and Inception
August 2018	Stakeholder Meetings	Initial Stakeholder Meetings
September 2018	Stakeholder Workshop	External Kick-off and Inception
December 2018	Stakeholder Workshop	Technical Assessment, Green City Political Framework and Emerging Challenges
April 2019	Stakeholder Workshop	Visions, Strategic Objectives and Actions Workshop
July 2019	City Administration Workshop	GCAP Implementation
October 2019	City Administration Workshop	Political Prioritisation Workshop
December 2019	City Administration Meeting	Meeting

Figure 3-2 shows the tasks that either have been, or will be, completed at each stage in the GCAP development process (Steps 1 and 2 in Figure 3-1), delineating the sequential dependencies (blue arrows) between them. It is an integrated, multi-sector process where Banja Luka's environmental challenges are periodically identified and prioritised. Proposed short-term actions to address the environmental challenges, comprising targeted investments together with regulations and other regulatory instruments, have been developed and sit in a structural framework of visions and long-term strategic objectives with corresponding mid-term and long-term targets.



Source: Based on OECD and ICLEI (2016), op. cit.

Figure 3-2 - GCAP development process and tasks

3.2. Methodology

This sub-section outlines each of the four GCAP process steps, introduced in Figure 3-1, in more detail.

3.2.1. Step 1: Green City Baseline development

Step 1 involved the development and analysis of an evidence base to identify the most pressing environmental challenges facing Banja Luka and their causes. It involved the delivery of three outputs, specifically:

- **Regulatory Framework Report** (the output of a multi-sector review and evaluation of existing instruments and plans that can inform and influence the GCAP's direction);
- **Indicator Database** (a repository containing data for Banja Luka in relation to environmental State, Pressure and Response indicators, a model that is explained in this sub-section, and international benchmarks of the same); and
- **Technical Assessment Report** (this accompanies the Indicator Database and contains prioritised Green City Challenges, which were identified via a process of technical assessment and stakeholder prioritisation).

The Green City Baseline is the evidence base of the GCAP. It aims to inform policy and strategic decision-making throughout the GCAP process and provides the reference for the identification and prioritisation of challenges as well as the monitoring of the success of the implementation of GCAP actions. It was informed by an analysis of the regulatory framework and by identifying, collecting and processing environmental data related to Banja Luka with the results presented in an indicator database. These two elements are detailed below.

The first component of the Green City Baseline, the analysis of the **regulatory framework**, extended to an analysis of the international and local legal and regulatory framework as well as Banja Luka's previous and existing strategies, reports and actions. The purpose was to identify, review and evaluate existing instruments and plans that can inform and influence the GCAP's direction across all the sectors covered. The regulatory framework is referenced throughout the GCAP and more detail is provided where necessary.

The second component of the Green City Baseline, the **indicator database**, is a collection of relevant city environmental data. These data are presented as three sets of indicators – State, Pressure and Response. The **State-Pressure-Response Model** (see Figure 3-3) was applied as it enables the assessment of the negative impacts of human activities (Pressure indicators) on environmental assets (State indicators) and identifies associated gaps in the policy framework (Response indicators).

In this context, the 'state' of the environment data is presented in relation to the following environmental topic areas:

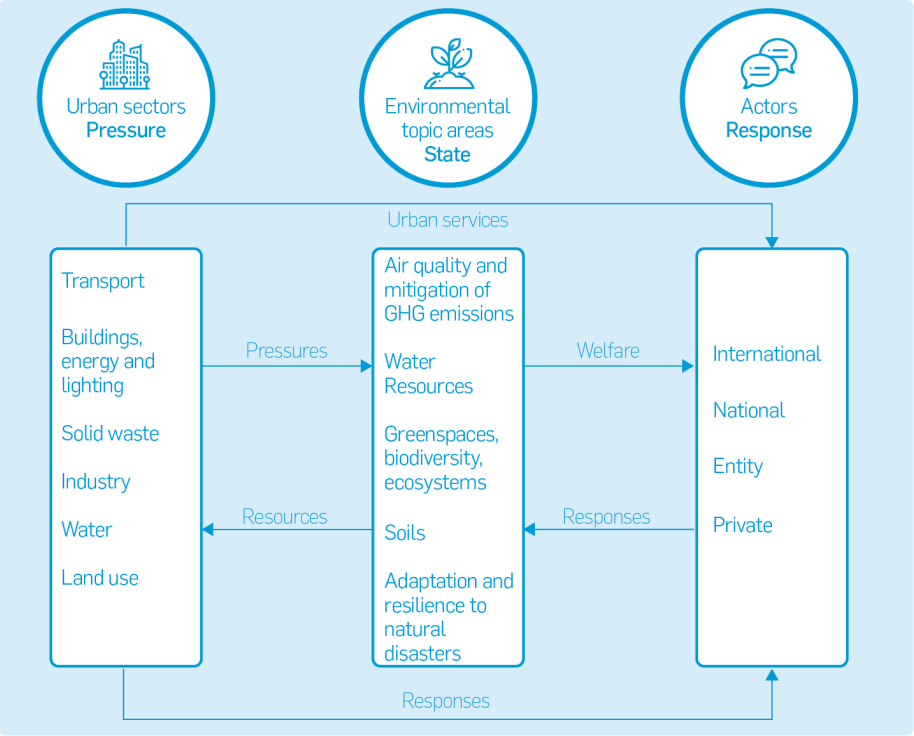
- Water resources;
- Air quality;
- Green space;
- Mitigation of GHG emissions;
- Soils;
- Biodiversity and ecosystems; and
- Adaptation and resilience to natural disaster risk.

Human activities that impact these 'state' indicators, so called 'pressures,' are presented for the main urban sectors, specifically:

- Transport;
- Energy, buildings;
- Industries;
- Water resources;
- Solid waste; and
- Land use.

Response indicators account for measures that seek to improve the environmental performance of the city such as existing actions, policies or regulations aiming to reduce pollution, the consumption of resources or investments in the protection of natural assets. In contrast to state and pressure indicators, this category is mostly qualitative and builds on the findings of the regulatory framework report**.** Responses can refer to different actors such as:

- Foreign governments and international organisations;
- Government bodies;
- Public institutions; and
- Private actors.



Source: Based on OECD and ICLEI (2016), op. cit.

Figure 3-3 - State-Pressure-Response model

Availability and reliability of data, as well as the harmonisation of data sets with diverse ownership covering different geographic scales of the urban area, are some of the challenges related to developing the indicator database. In Banja Luka, data are available across a wide range of indictors. However, there are some limitations and gaps. For example, there is no information on the current transport mode share within the city, which makes the planning of future transport modes and options more difficult. As such, a focus of this GCAP is to improve data collection, analysis and monitoring across selective environmental topic areas and sectors, as well presenting implementable actions.

The indicator database, in the context of the findings of the regulatory framework analysis, was used as the basis for identifying and prioritising Green City Challenges, which were presented in a **Technical Assessment Report**. The Green City Challenges were identified and prioritised by a three-step prioritisation process, which is introduced below.

Technical Assessment

Green City challenges are identified based on the figures in the indicator database. Data collected to populate the GCAP Indicators Database are pre-evaluated using a Red, Yellow, Green (RYG) traffic light system based on standardised benchmarking values provided by the GCAP Methodology. Benchmarking of indicator values according to this traffic light system allows systematic comparison of performance (in terms of environmental outcomes) across the indicator set, referenced to international benchmark values[3]. For the state and pressure indicators, the most urgent environmental problems faced by Banja Luka are benchmarked as “red”; areas which do not present a critical priority but require improvement nonetheless are benchmarked as “yellow”; and areas demonstrating alignment with international green city benchmarks are marked as “green”. In the case of the state and pressure indicators, benchmark values vary for each indicator and typically comprise numerical value ranges for each RYG categorisation. For response indicators the focus is on identifying both the presence or absence of policies and the quality of those policies, using the traffic light categorisations defined in Table 3-2.

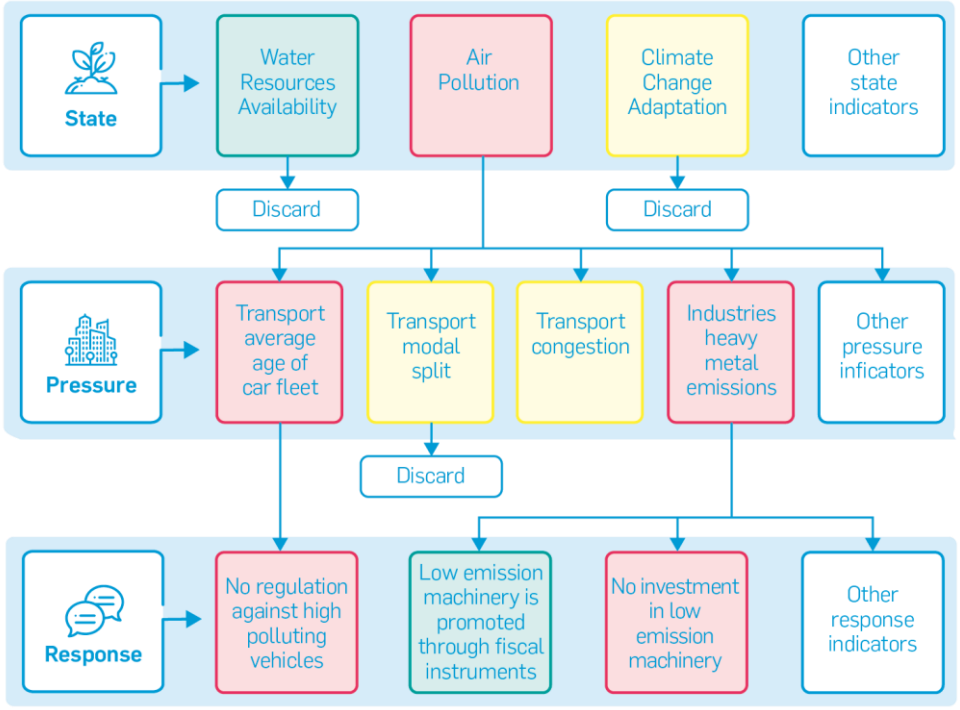
Table 3-2 - Benchmark flags and criteria for response indicators

Benchmark flag	Criterion
Red	Not existing
Yellow	Existing, but implementation challenges have been observed, and/or existing policies are not sufficient to solve the issue at stake
Green	Existing and well implemented, and there is no significant need to further expand this type of response

Source: OECD and ICLEI (2016), op. cit.

[3] The international benchmarks used in the GCAP methodology combine the benchmarks used by leading international organisations, such as WHO, EEA, IADB, Dutch Values, OECD and ICLEI, Odyssee, CIBSE, IEA.

The indicators benchmarked as red or yellow form the basis for identifying key Green City Challenges, using a problem tree approach. This ensures a focus on the most pressing environmental challenges in Banja Luka.



Source: Based on OECD and ICLEI (2016), op. cit.

Figure 3-4 - Indicator benchmarking and problem tree approach for technical prioritisation

Figure 3-4 shows the interlinkages between State, Pressure and Response indicators. A state indicator highlighted in red or yellow points to an environmental problem in Banja Luka. This can be the quality of environmental assets, the availability of resources or a climate change related risk. An environmental problem links to several red or yellow pressure indicators which represent deficiencies within urban sectors responsible for the environmental problem. In this generic example, the transport sector is causing air pollution. If there is no response in place or the response fails to solve the identified environmental problem(in this case the insufficient regulation on vehicles and shortcomings in extension of public and non-motorised transport), the GCAP will prioritise the related group of indicators as a key Green City Challenge.

Stakeholder-based prioritisation and political prioritisation

Steps two and three of the prioritisation process were combined for Banja Luka, in agreement with the City Administration. The initial set of key Green City Challenges identified using analysis of the Indicator Database was developed and refined with the input of local knowledge and expertise, including from representatives of the City Administration and other stakeholders, via stakeholder workshops and meetings, including the Kick-Off and Inception Workshops held in July and September 2018, as well as through stakeholder group working meetings held in July and August 2018.

Discussion on the prioritisation of challenges was held through a workshop which included representatives of the City Administration as well as external stakeholders from RS ministries, RS level agencies, institutions and public companies, City utilities, NGOs, public institutes and academia. In this Technical Assessment workshop, held in December 2018, stakeholders also had the chance to rank Green City Challenges in order of priority per sector, as well as pressures identified for each challenge, using a proforma. Stakeholders were also invited to suggest additional challenges and linked pressures. Stakeholders were able to provide comments and feedback during a question and answer session, as part of break-out group discussions which formed part of the workshop, and also via written communications following the workshop.

The identified Green City Challenges formed the baseline for step two of the Green City process.

3.2.2. Step 2: Green City Action Plan development

Step 2 involved developing the strategic framework for the GCAP consisting of visions and strategic objectives, which are linked to mid-term and long-term targets, and a set of prioritised short-term actions addressing the priority challenges outlined in the Green City Baseline. This GCAP document is the output of this step, which was delivered via a process of technical assessment, stakeholder prioritisation and political prioritisation.

Figure 3-5 summarises the elements of the GCAP's strategic framework. The strategic framework was developed using a systematic, evidence-based and participatory approach, which helped to ensure that the GCAP actions developed were grounded in a holistic view of the city. This will ultimately increase the effectiveness of its implementation and the ability to address each of the identified challenges in due time.

Vision: The GCAP presents an integrated Green City vision for Banja Luka as well as visions for each environmental topic area through to 2035. The visions are based on the environmental topic challenges as well as the corresponding sector challenges and allow for understanding of what should be achieved in terms of environmental performance and quality of life in Banja Luka. The visions facilitate the communication between the City on the one side and the stakeholders and public on the other.

Strategic objectives: The GCAP presents strategic objectives for each environmental topic area for the period of 2020-2035. Strategic objectives are general and long-term environmental goals that need to be achieved in order to realise the GCAP's visions. They were developed based on the state, pressure and response indicators related to environmental topic challenges.

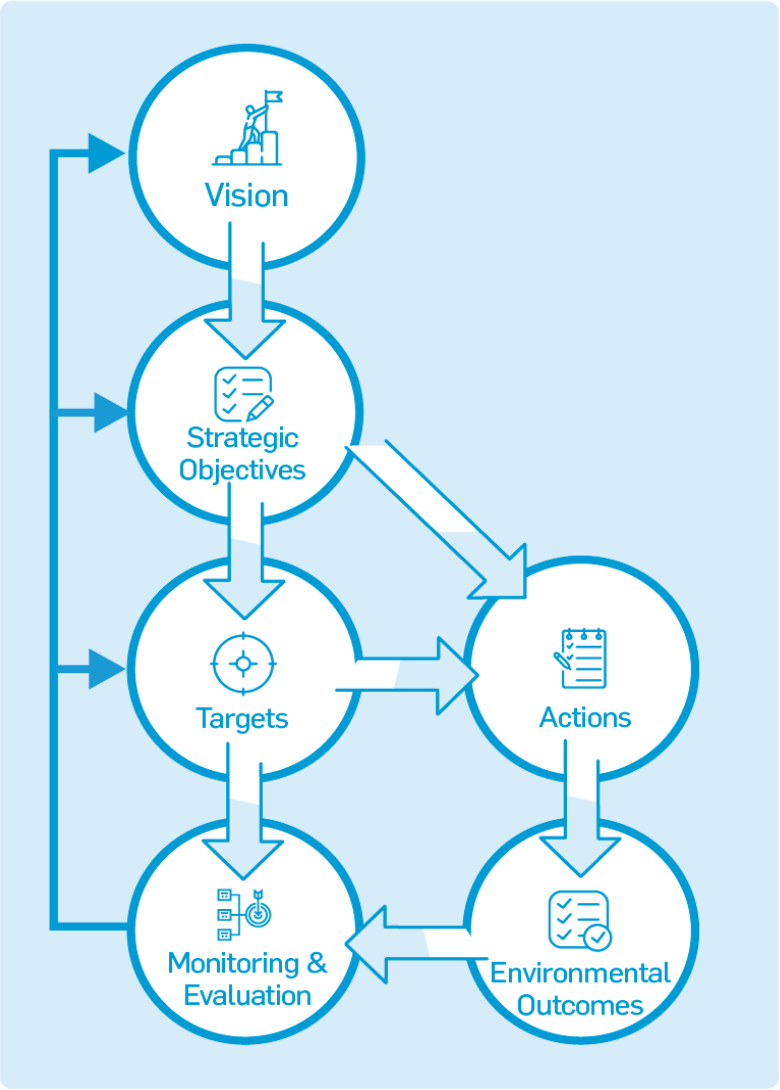


Figure 3-5 - GCAP framework

Targets: The GCAP presents measurable mid-term targets for 2025 and long-term targets for 2035, focused on environmental outcomes. Each strategic objective is operationalised with a set of targets linked to it that set the level of ambition over the medium and long term. The targets allow monitoring of the process towards achieving the strategic objectives. Targets are developed by setting an indicator value for the red and yellow benchmarked state, pressure and response indicators that identified the Green City Challenges at an improved and achievable level.

Short-term actions: Short-term actions are suggested activities that the GCAP recommends starting to implement between 2020 and 2025. Actions are the vehicle to achieve the strategic objectives for Banja Luka's environment. Actions were developed by local and international sector experts and take environmental as well as economic and social impacts into account. The short-term (prioritised) actions will be taken forward by the City Administration in the triennial development programmes. The success of the actions will be monitored against the targets.

Initially, a long list of short-term actions was developed, from which priority actions have been identified. The three-step action prioritisation process, as outlined below, is aimed at focusing on actions with the highest environmental, economic and social benefits while also considering budgetary constraints.

Technical prioritisation

Each action was scored from 0 to 3 (zero being no impact and three being high impact) according to their contribution to filters reflecting the three key dimensions of sustainability: environment, economy and society.

- The environmental filters comprised the GCAP strategic objectives. The evaluated impact of actions on strategic objectives was scored. This allowed an understanding of how actions address multiple objectives.
- Economic filters covered the categories of economic return for the investor, economic growth, employment and economic inclusion.
- Social filters covered the categories of public health, access to services, safety and gender equality.

Stakeholder prioritisation

At the stakeholder workshop in April 2019 the set of draft actions was discussed and ranked by GCAP stakeholders. The actions were ranked from highest (1) to lowest (number of sector actions) within each sector. Following this workshop, the set of actions was revised and updated to incorporate stakeholder feedback. At the workshop with City Administration representatives in July 2019 the updated set of actions was presented and discussed, with participants providing further comments and feedback during and after the workshop. The set of actions was then further revised and updated.

Political prioritisation

The results of both the technical and stakeholder prioritisation of actions was presented to representatives of the City Administration at the meeting in October 2019. At this meeting, following discussion by participants, each action was given a priority scoring of 'high', 'medium' or 'low'.

Based on the three steps of prioritisation, 30 actions were selected as priority actions (with a political prioritisation score of high or medium).

The completed GCAP is to be presented to the City Administration in spring 2020. Once the GCAP has been adopted by the City Council, the City Administration will use it as the basis for elaboration of Banja Luka's annual budgets, capital investment plans, triennial development programmes, and other mid-term and long-term development plans.

GCAP Approval Process

An approval process was defined in cooperation with legal experts and the City Team Chief to ensure that the GCAP would be formally adopted as City policy and embedded within the City Administration's budget. The process for GCAP approval is:

- When the GCAP is prepared, the Mayor, as an authorised proposer, submits it in the form of a draft to the Assembly of the City of Banja Luka for adoption. The City Assembly is the decision-making body and it is authorised to adopt plans and programs generally and specifically in the area of environmental protection. A public hearing will be organised on the draft GCAP, after which relevant comments will be included in the document and submitted to the City Assembly for adoption in the form of a proposal. The

plan is anticipated to be adopted by a simple majority of the total number of Assembly representatives.

- According to applicable laws, local governments are responsible for environmental issues. However, jurisdictions in some areas are divided between the RS Government and City Administration. This will need to be taken into consideration through the approval process.

3.2.3. Step 3: Green City Implementation

Step 3, Green City Implementation, is set for a period of 12 to 36 months. During this time the GCAP is operationalised. To facilitate smooth implementation of the GCAP in Step 3, the GCAP document contains clear guidance on targets, monitoring mechanisms and accountable action owners and stakeholders. For the implementation of individual actions further analysis on funding needs and options as well as savings and revenues will be conducted, and funding sources will be identified and pursued. Actions that are implemented will be monitored with respect to the mid-term targets defined in step 2. Further detail on the monitoring framework that will guide this process is provided in Chapter 6.

3.2.4. Step 4: Green City Reporting

Step 4, Green City Reporting, looks at evaluating the success of the GCAP process as well as formulating lessons learned. Based on the GCAP monitoring throughout Step 3, the City Administration assesses what has been achieved for the state of the environment in Banja Luka and informs the public and relevant stakeholders. Rather than being the final stage of the GCAP process, Step 4 is the beginning of reconsidering state, pressure and response indicators, readdressing and potentially refining the GCAP challenges and developing further GCAP actions.

4. Green City baseline

This chapter provides an overview of emerging environmental issues that the GCAP will contribute towards addressing. It then contextualises the GCAP by presenting the institutional context, city finances and regulatory context before defining the key green city challenges.

4.1. Environmental conditions

In the past decade efforts have been made to place Banja Luka on a more sustainable development trajectory, but related efforts have been *ad hoc* and conducted in an isolated manner. This has contributed towards acute negative environmental impacts of development and urbanisation. A review of publicly available information indicated that the city's environmental challenges, later validated by the Technical Assessment and stakeholder consultation, can be summarised as follows in the sections below.

Air quality: The air in Banja Luka is moderately polluted. This conclusion is based on the fact that three air quality indicators featured in the Indicator Database, which measure concentrations of $PM_{2.5}$, PM_{10}, and NO_x, being marked as 'yellow' according to the GCAP benchmarking methodology, while only one air quality indicator, the annual SO_2 concentration, for the period 2018 and 2019, is benchmarked as 'green'. It should be further emphasised that the annual average values of $PM_{2.5}$ and PM_{10} have a decreasing trend in the period 2016-2018, but slightly increased in 2019 compared to the values from that period [11]. The main causes of this air quality are a) insufficient coverage of urban areas by the district heating system, which has resulted in the existence of a large number of individual home furnaces fuelled by low-quality coal and wood, b) high and increasing use of private motorised vehicles, with poor engine standards and fuel quality. These concerns are common in neighbouring municipalities and cities, with air pollution worsening in the winter owing to specific climate conditions and temperature inversions.

Land pollution: The quality of land and soils is threatened by the expansion of the constructed area, increased use of chemicals in agricultural production and issues related to water quality [15].

Water pollution: The water quality in Banja Luka fluctuates, as evidenced by Biochemical Oxygen Demand (BOD) in rivers and lakes. For some previous years, this indicator is benchmarked as 'green' (for example in 2019, 2016, 2014, and 2011), while in other previous years this indicator is marked as 'yellow' [2] in relation to the international benchmark. Water quality in Banja Luka is threatened by discharge of untreated wastewater into surface watercourses, lack of coverage of sewage network over urban areas, illegally built septic pits, release of industrial wastewater into surface water drains without treatment and in the sewage system without pre-treatment, inadequate inspection and lack of legal enforcement of pollution control, indicating inadequate water quality protection in the city area. In common with Banja Luka, connection to public sewage systems and provision of wastewater treatment facilities in the wider area is generally low.

Green spaces and biodiversity: The city's green areas, both urban and rural, are under threat due to shortcomings in implementation of the Spatial Plan of Banja Luka and the Strategy for Nature Protection of Republika Srpska, and lack of attention to protection of endangered species of plants at a local level [28].

Waste management: In Banja Luka waste generation was 326 kg per capita per year in 2016 [12]. The level of municipal waste collection in the urban area of Banja Luka in 2015 was 100% [12]. Only 2% of municipal solid waste was sorted and recycled in Banja Luka in 2017 [12]. Landfilling is still the main option for disposal of municipal waste. The remaining life of Banja Luka's landfill is nine years [9]. More generally, due to limited disposal capacities and low public awareness on adequate waste management, there is a significant number of illegal dumpsites [15].

Climate change risks and vulnerabilities: There is a relatively limited understanding in Banja Luka about the exact nature and extent of related vulnerabilities, and little appears to have been done to implement various proposals that have been made to address vulnerability to natural disasters. A number of steps have been undertaken. Drainage facilities, wastewater treatment, and business and community awareness are amongst the areas that have been evaluated and related provisions made in existing plans and policies at both RS and City levels [21].

These challenges are amongst those that were assessed in the GCAP development process and are detailed later in this chapter.

4.2. Institutional framework

An overview of the structure of Banja Luka's City Administration is featured in Figure 4-1. It is anticipated that all mentioned organisational units will have a role in GCAP implementation.

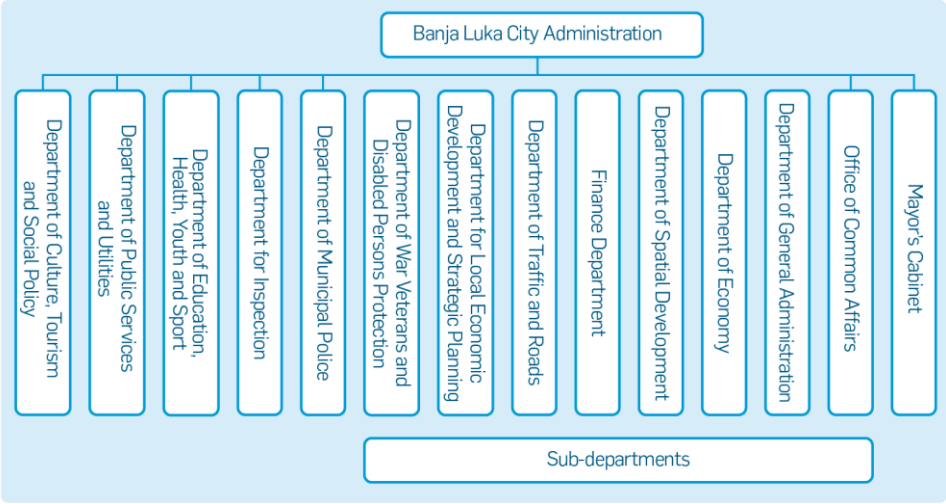


Figure 4-1 - Overview of Banja Luka City Administration

4.3. City budget and funding needs

Table 4-1, which provides a summary of Banja Luka's finances for 2018 (actual) and 2019 (forecast), gives an insight into the City's capacity to provide financial support to GCAP actions. The forecast increase in revenues is lower than the 2% that was expected annually, and there had previously also been the expectation that operational expenditures would decrease. Refinancing was also expected to result in a decrease in debt repayments, which would have facilitated further City investment, including in business zones. Article 59 of the Law on Borrowing, Debt and Guarantees of RS (for local government units) defines a limitation of long-term indebtedness of 18% of the amount of ordinary income earned in the previous fiscal year in relation to annual repayments. The calculation for the purposes of this document was made on the basis of planned repayments in 2020 (EUR 6.2 million) and tax and non-tax revenues in 2018 (pending the adoption of the 2019 performance report). In accordance with the aforementioned, and solely for the purposes of this document, the legal capacity for new long-term annual repayments would be approximately EUR 4.0 million. The amount of the loan would depend on the length of repayment. The real possibility of borrowing depends on the ability to generate income for regular repayments.

In terms of spending from the budget, in 2018, the surplus of revenues was EUR 4.1 million, while in 2017 it was EUR 4.6 million. Taking into account the above trends in the result of the final surplus (the fact that its exact amount and structure are known only after the end of the period), solely for the purposes of this document, we will be guided by an average surplus of EUR 4.3 million euros as a starting point for budgetary investments. However, the structure of the future period surplus will indicate what amount is really available (free) for further investments. Namely, the surplus in 2018 is partly a result of surplus income over expenditures (potential for further investment), and also partly a result of unspent earmarked funds from the previous period, and unspent and planned (current and capital) expenditures and expenditures that diminish the free potential from surplus. Execution of the budget in 2019 will show what amount of free deficit is, or what is its structure (potential).

The GCAP actions have been developed in the context of funding availability, as outlined in Chapter 7, but the funding needs of the City are considerable. As indicated earlier, there is a lack of funding for waste separation and treatment, wastewater service implementation is being constrained by the cost of introducing a wastewater treatment plant, the regional landfill is nearing capacity and water bodies are contaminated with raw sewage. There are still infrastructure rehabilitation requirements associated with damage caused by the 2014 flood, and numerous projects in all urban sectors have been prepared but cannot be implemented owing to the availability of funding. In order to realise its green city ambitions, it will therefore be vital for Banja Luka to secure funding from external sources, including from Entity government, International Financial Institutions (IFIs), foreign donor governments and the private sector.

Table 4-1 - Overview of Banja Luka City Administration's finances, 2018 and 2019 budget, with currency in 000s EUR and BAM

Item	2018 Actual (EUR)	2018 Actual (BAM)	2019 Budget forecast (EUR) and revision XII 2019	2019 Budget forecast (BAM) and revision XII 2019	Expected change	Context
Budget revenues	64,010	125,460	65,999	129,083	+3%	Budget incomes are mostly related to tax incomes (approximately 57% of total incomes for 2019) and non-tax incomes (38.9% of total incomes in 2019) and both have an upward trend compared to 2018. The largest source (67.2%) of tax incomes is the indirect taxes of the Indirect Taxation Authority, and they also represent the largest individual income (38%) of total incomes. The largest source (76%) of non-tax incomes is fees, taxes and incomes from the provision of public services, accounting for 29.6% of total incomes.
Budget expenditures	47,169	92,451	51,408	100,545	+8.75%	Current expenditures are the largest, accounting for 98% of expenditures. Expenditures for personal remuneration of employees account for 39%, and expenditures for the use of goods and services account for 29.7% in current expenditures. The biggest cumulative increase over 2018 is in these costs.
Net expenditures for non-financial assets	-12,187	-23,887	-14,415	-28,195	+18%	Expenditure for non-financial assets amounts to EUR 15.5 million and relates mostly to expenditure on manufactured fixed assets (buildings and structures). There were no significant changes to the receipts compared to 2018.
Budget surplus/deficit	4,655	9,124	176	343	-96.3%	The surplus is still expected; however, it is expected that it will be lower compared to 2018, and in principle as a result of developments in the current budget and movements in net expenditures for non-financial assets.
Net financing	-465	-911	-176	-343	-62.4%	The positive effect on the decrease in net financial assets (decrease in outflows) is to a large extent the expected distribution of surpluses from previous years in the amount of EUR 6.1million. One of the factors in the calculation of net financial assets is net borrowing (receipts of EUR 32 million - refinancing of existing debt from credit facilities amount to EUR 30 million. and EUR 35 million in repayment expenditure, of which EUR 33.9 is repayment of the principal of the country's borrowings). The effect can be expected to be lower interest costs, lower instalments, and the release of funds to invest in new public works
Difference in financing	4,190	8,212	0	0	TBC	To be determined

4.4. Regulatory framework

A review of international and domestic level policies, plans, strategies and legislation was undertaken in order to develop a comprehensive understanding of the GCAP's policy context. The key points of relevance are outlined below.

International policies, plans, programmes and strategies: Environmental sustainability ambition is strong across key themes of climate change, energy, water, waste, air quality and biodiversity, as well as soils, landscape, heritage, noise and health, which are now embedded across a wide range of policies, plans and legislation.

Domestic policies, plans, programmes and strategies: Key environmental sustainability topics of energy, waste, water, air quality and nature protection, as well as agricultural and rural areas development, are well represented in policies, plans and legislation of the RS Government. Issues related to climate change, landscape and heritage are not covered by specific strategic documents..

City strategic and planning documents: Sectoral coverage (roads, tourism, housing, economic development) is good, but coverage of key environmental sustainability themes is focused on energy, waste, air quality and nature protection. Water, climate change, landscape, heritage and health tend to be limited to sub-sections of existing plans and strategies. Two key documents are:

- Banja Luka Development Strategy, which has core sustainability themes of lower carbon energy and transport, stewardship of natural resources, protection of natural areas and biodiversity, and also a focus on cultural and historical heritage, sustainable tourism and improved overall quality of life for both urban and rural residents.
- Banja Luka Spatial Plan, which provides a strong strategic direction and presents a number of sustainability issues that are to be addressed in detail within the Urban Plan for Banja Luka, which is under development.

4.5. Green City challenges

The green city challenges introduced in this section have been assessed in the context of the Green City baseline, which was developed using the State-Pressure-Response model, as described in Chapter 3. This model enables the assessment of the negative impacts of human activities (Pressure indicators) on environmental assets (State indicators) and identifies associated gaps in the policy framework (Response indicators). The data collected in relation to these indicators were presented in an Indicator Database. In order to assess State, data were collected relating to water resources, air quality, green space, mitigation of GHG emissions, soils, biodiversity and ecosystems, and adaptation and resilience to natural disaster risk. Pressures were presented as data relating to the transport, industry, energy, buildings, land use, water and solid waste sectors. The data for response indicators, measures that seek to improve the city's environment, were largely qualitative and derived from the Regulatory Framework Report.

A series of problem trees, which are diagrams representing identified causal linkages between state, pressures and response indicators using the EBRD's benchmarking methodology, were used to inform the identification of green city challenges in Banja Luka, whilst also taking into account socio-economic impacts. A process of technical and stakeholder-based prioritisation was then conducted. This analysis identified the key green city challenges in Banja Luka for each of the GCAP environmental topics, as prioritised by stakeholders:

1. Water resources;
2. Air quality;
3. Green space;
4. Mitigation of GHG emissions;
5. Soils;
6. Biodiversity and ecosystems; and
7. Adaptation and resilience to natural disaster risk.

The sub-sections that follow set out, **in order of stakeholder priority**, the results of the analysis of indicators, the values for which are listed in corresponding tables in Appendix B. They each provide a brief summary of green city challenges in relation to the relevant environmental topic.

4.5.1. Water resources

The quality of water resources fluctuates from year to year, and the assessment of the quality of water resources is based on the concentration of Biochemical Oxygen Demand (BOD) in rivers. In 2019, 2016, 2014, and 2011, BOD concentrations in rivers were at a satisfactory level according to the GCAP benchmarking methodology used to assess the status of water resources. However, during other years (except for 2018, for which data are not available),

BOD concentrations in rivers were not satisfactory and indicated a deterioration in the quality of water resources in those particular years (2017, 2015, 2013, 2012, 2010, 2009, and 2008) [2]. Inadequate river water quality in Banja Luka in the mentioned years (which has been benchmarked as 'yellow') is directly linked to there being insufficient sanitation facilities and municipal wastewater treatment in the city, so that virtually all city wastewater is directly discharged to surface water bodies. This forms the key challenge for the City of Banja Luka. There are plans for a new sewerage system and wastewater treatment plant to be constructed but implementation is not yet underway. In terms of availability of resource, water supply and consumption in Banja Luka are within acceptable limits but volumes of non-revenue water (water that does not reach the customer), indicate that the existing water supply infrastructure needs to be enhanced to avoid water losses[12].There are again existing plans in place to improve the water supply network, including in the Spatial Plan of Banja Luka, Development Strategy of the City of Banja Luka, and Plan of Capital Investments 2018-2020, but they have either not been implemented or are not considered sufficient to address the extent of the challenge faced.

4.5.2. Air quality

There is one core ($PM_{2.5}$) and three optional (PM_{10}, SO_2, NO_X) state indicators for air quality. Three indicators ($PM_{2.5}$, PM_{10}, and NO_x) are within the reference 'yellow' benchmark thresholds, indicating that air pollution is moderate, but concentrations for all of them increased in 2019, while in the 2016-2018 the concentration values of these pollutants had a negative trend, i.e. decreased from year to year. Improvements have been observed when it comes to SO_2 concentration values, especially in the period relating to 2018 and 2019 [1]. During these two years, SO_2 concentrations have decreased significantly, and this is due to the fuel switch from Heavy Fuel Oil (HFO) to biomass within the Banja Luka district heating system. Based on the values of the indicators analysed, it can be concluded that the air in Banja Luka is moderately polluted, with some fluctuations during the year (for example, higher concentrations of these pollutants are observed each year during the winter period). Concentrations of the said air pollutants are highest in the centre of Banja Luka. Pressure indicators show that the relatively high average age of the car fleet, car ownership rate, limited provision of cycle paths, and proportion of houses connected to the district heating system are the main contributors to air pollution [5, 6, 12, 20]. The links are, however, difficult to establish owing to a lack of reliable data. As with measures to enhance water quality, there are planned measures to improve air quality, but implementation challenges in the transport and energy sectors, along with the insufficient level of ambition of planned responses, need to be addressed. This has been recognised and is reflected in strategies including the Strategy of Development of Local Roads and Streets for Banja Luka, the Transport Strategy of RS, Action Plan of Energy Efficiency of RS, the Sustainable Energy Action Plan (SEAP) and Action Plan of Energy Efficiency of the City of Banja Luka.

4.5.3. Green space

The core state indicator, open green space area per 100, 000 inhabitants, is benchmarked as 'green', indicating that urban area of Banja Luka has sufficient open green spaces. However, their structure is unfavourable, as the proportion of public green spaces is relatively low [17]. The optional indicator, share of greenspace areas (non-built-up areas) within urban limits [27], is also benchmarked as 'green,' which confirms the satisfactory condition regarding green spaces in the urban area. Responses are considered inadequate given that none of the standard response indicators are represented in Banja Luka's strategic spatial planning documents. The main concern is the lack of a current Urban Plan. As indicated previously, the last urban plan was adopted in 1975, from which very few of the proposed measures have been implemented. The New Spatial Plan for the City of Banja Luka (2014) is too high-level to feature the required measures, which include zoning regulations, regulation of density, and promotion of Transit-Oriented Development (TOD) and mixed-use development.

4.5.4. Mitigation of GHG emissions

The state indicator of per capita CO_2 emissions is below the benchmarking threshold ('green')[4],but it remains advisable that the same policies and measures discussed in the air quality section are also applied to mitigate GHG emissions as there is considerable overlap in terms of pressure and response indicators. The main pressures are the average age of the city's vehicle fleet (14 years), car ownership rate and the share of the population with access to heating / cooling, with two thirds of the population seemingly using coal, wood and other fuels for heating [9]. This is difficult to determine, however, as there are no data available

[4] Indicator is calculated based on emission data from the Energy Efficiency Action Plan for the City of Banja Luka 2016 - 2019 and estimated population in 2015.

for a number of related pressure indicators. The increasingly high modal share of private motorised vehicles also needs to be reduced in favour of more sustainable modes. Over reliance on landfill disposal and a lack of alternative, low carbon solid waste management and disposal provision also contribute to the challenge of mitigating GHG emissions from solid waste disposal [29]. In terms of responses, local strategies contain measures to address drivers of GHG emissions in the energy, transport and solid waste management sectors, but barriers to implementation are being faced.

4.5.5. Soils

The existing data regarding soils are limited and what are available focus on very specific parameters, specifically concentrations of cadmium and zinc [15], the quality of which is not sufficient for the data to be considered adequate or conclusive. One of the optional state indicators, concentration of zinc in soil, has been reported on and benchmarked as 'yellow', as concentrations were relatively high when they were measured at three locations in the city in 2015 (the district heating plant, Park Mladen Stojanović, and Plaža Abacija). Otherwise, the sampling from November and December 2019 showed a very high concentration of PCBs in the Incel industrial zone, which represents one of the old industrial sites in the urban area of Banja Luka. Generally, the lack of systematic and continuous soil quality monitoring, a limitation that needs to be addressed, makes it difficult to make a precise correlation between the state indicator and the related pressure and response indicators, although there is an indication that industry and water pressures could have the largest negative impact on soils, with the transport, waste and energy sectors also having a negative impact. The only response that can be confirmed as relevant and quantifiable is related to industrial wastewater, a very small proportion of which is treated according to applicable standards [11].The lack of policy responses regarding municipal solid waste disposal and industrial heavy metals emissions are also areas that needs to be addressed.

4.5.6. Biodiversity and ecosystems

Analysis of this challenge area has been hampered due to the lack of monitoring data on abundance of species. An alternative indicator on forest area change, calculated by using CORINE land cover change, was therefore used and revealed a significant increase in forests in Banja Luka between 2012 and 2018 [26]. This data limitation makes monitoring the impacts of different sectors (industry, transport, waste management and energy) and of other green city challenges on biodiversity and ecosystems problematic. The pressure indicators suggest that the limited treatment of wastewater to existing standards, and low population density are having a negative impact on biodiversity and ecosystems. Responses to these issues, along with responses relating to the disposal of solid waste, are insufficient to address the potential negative impacts on biodiversity and ecosystems.

4.5.7. Adaptation and resilience to natural disaster risks

Adaptation is mainly characterised by the level of resilience of infrastructure to natural disasters, but associated indicators are limited with data providing an insight into socio-economic risk, such as potential damage to main infrastructure, industrial facilities and agricultural areas, lacking. The state of adaptation and resilience to natural disasters has, however, been benchmarked as 'green' based on the optional indicator of percentage of households at risk of natural disaster, which is based on flood risk data for a return period of 20 years [4]. This provides only a partial and potentially misleading impression of Banja Luka's preparedness for climate change and natural disasters. Data regarding pressure indicators are also limited, but in terms of those that do exist resilience to floods is benchmarked as 'yellow' (low resilience to floods) as 2.92% of housing units[5] were flooded in May 2014 [21]. Some linked response indicators, which relate to drainage facilities, wastewater treatment, and business and community awareness, have been evaluated and introduced into existing plans and policies, both at RS and City levels, such as the Strategy of Integrated Water Management, City Development Strategy, and plan of Capital Investments 2018-2020. The implementation of these plans is in progress; however, new measures need to be proposed, including to improve the resilience of electricity networks in the case of disasters, which is currently benchmarked as 'red.'

4.6. Summary

Table 4-2 summarises benchmark indicators for state, pressure and response in Banja Luka by indicator type and sector. Table 4-3 provides a summary of identified green city challenges by prioritised environmental topic. In conclusion, water resources, air quality, green space, mitigation of GHG emission and soils

[5] The number of flooded housing units is generally equivalent to a return period of 500 years.

quality have been identified as the highest priority environmental challenges for the city.

The analysis of green city challenges informed development of the green city vision, objectives, actions and targets that are introduced in Chapter 5.

Table 4-2 - Averaged benchmark flags for state, pressure and response indicators by indicator type, topic and sector

Indicator type / sector		Summary of benchmark flags			
State indicators	***Quality of environmental assets***				
	Air	Yellow			
	Water bodies	Yellow	Green	Yellow	Green
	Drinking water	Green			
	Water use	Green			
	Soil	Green	Yellow		
	Availability of resources				
	Green space	Green	Red		
	Biodiversity and ecosystems	Green			
	Climate change risks				
	Mitigation of GHG emissions	Green			
	Adaptation &resilience to natural disasters	Green			
Pressure indicators	Transport	Red	Yellow	Green	
	Buildings	Red			
	Industries	Red			
	Energy	Red			
	Water	Yellow	Red	Green	
	Solid waste	Green	Yellow	Red	
	Land use	Green	Red		
Response indicators	Transport	Yellow			
	Buildings	Yellow			
	Industries	Red	Yellow		
	Energy	Red	Yellow		
	Water	Red	Yellow		
	Solid waste	Red	Yellow		
	Land use	Red			

Table 4-3 - Summary of priority green city challenges

Prioritised environmental topic	Priority green city challenges
1. Water resources	▪ Inadequate wastewater collection (coverage) and treatment provision. ▪ Inadequate public water supply network provision – moderately high losses and coverage. ▪ Water quality in local water bodies fluctuates (it is good in some years and inadequate in others).
2. Air quality	▪ Moderately polluted air with fluctuations throughout the year and reduced SO_2 concentrations. ▪ Increasing fossil fuelled private road transport. ▪ Limited options for non-motorised users. ▪ Low percentage of households connected to district heating and use of coal for heating purposes.
3. Green space	▪ Limited public green spaces. ▪ Low level of urbanisation (urban sprawl).
4. Mitigation of GHG emissions	▪ Increasing number of fossil fuelled private vehicles in road transport. ▪ Limited provision for non-motorised users. ▪ High building energy consumption. ▪ Low percentage of households connected to district heating and use of coal for heating purposes.
5. Soils	▪ Low level of treatment of industrial and municipal wastewater. ▪ Non-sanitary MSW disposal and unregulated / controlled urban development. ▪ Road vehicle emissions containing lead and other heavy metal emissions.
6. Biodiversity and ecosystems	▪ Lack of monitoring of biodiversity. ▪ Low level of urbanisation (urban sprawl). ▪ Lack of treatment of industrial and municipal wastewater. ▪ Non-sanitary MSW disposal and unregulated / uncontrolled urban development.
7. Adaptation and resilience to natural disaster risks	▪ Insufficient flood risk management and extreme events. ▪ Thermal comfort. ▪ Urban planning. ▪ Water resource efficiency.

5. Green City Action Plan

This chapter summarises the results of Step 2 of the GCAP process, 'Green City Action Plan Development'. It features the GCAP visions and strategic objectives, as well as mid-term and long-term targets. It outlines policy gaps and issues as well as priority areas, in terms of the city's overall improving environmental performance, which are ultimately addressed by prioritised short-term actions.

5.1. GCAP vision and strategic objectives

Responding to the identified green city challenges, a green city vision has been developed for Banja Luka. The city-wide vision statement takes into consideration the identified green city challenges and blends these with the broader aspiration of how the city wants to develop in the future, shaping the green ideals and aspirations. The vision statement also takes into consideration the wider regulatory agenda identified with the political framework reporting, as well as feedback from city officials and stakeholders at GCAP workshops. This will help to create ownership and backing for the GCAP from across the City Administration.

"Banja Luka aims to be an exemplar of innovative, smart and sustainable utility and transport infrastructure, supported by an efficient land use system and increased resilience to climate change and other natural disasters. With a healthy and vibrant built environment, a network of green and blue infrastructure will protect and enhance water resources, soil quality and biodiversity, maintaining Banja Luka's status as a 'city of greenery'."

The city vision sets the broad direction for Banja Luka's green transformation. The GCAP framework is a tool that guides the city through this process by breaking it down into the four elements of

- Environmental topic visions,
- Strategic environmental objectives,
- Mid- and long-term targets, and
- Short-term actions.

Visions for each of the environmental topic areas were identified and translated into environmental strategic objectives, which were based on the key challenges identified in the green city baseline. Each strategic objective has a set of corresponding mid-term and long-term targets which are based on the state and pressure indicators underlying the challenges which are addressed by the respective strategic objectives. Most targets are set based on the indicator database and where possible aligned with the targets set in Banja Luka's development strategy. The *proportion of city area regulated by the urban plan* under the environmental topic of green space, the *proportion of protected natural areas* under biodiversity, and the *annual average value of material damages in economy, infrastructure, public and private buildings from natural and other disasters* under adaptation and resilience inform expectations. Due to their local importance in the context of Banja Luka, they have been added to the initial set of indicators suggested by the GCAP methodology and hence will need to be added to the indicator database and considered in the GCAP monitoring process. Policy gaps / issues as well as action priority areas help set the broad direction for the GCAP which is refined by the development and prioritisation of short-term actions and policies. Short-term actions (policies and investments) are the vehicles for achieving environmental strategic objectives and, when implemented, therefore contribute towards meeting mid-term and long-term targets.

Table 5-1 overleaf combines the results of the green city baseline (Key Green City Challenges, Policy gap(s)/ issues and Action priority areas) with the GCAP framework of visions, strategic objectives as well as mid-term and long-term targets for each of the environmental topic areas. Where data regarding recent performance have been sourced (and presented in the Indicator Database) these are provided in a footnote to give additional context to the targets set.

Table 5-1 - Prioritised environmental topic visions, strategic objectives, targets policy gaps and action priority areas

Prioritised Environmental Topic	Priority Green City Challenges	Vision, strategic objectives, targets	Policy gap(s) / issue(s)	Action priority areas
1. Water resources	• Inadequate wastewater collection (coverage) and treatment provision • Inadequate public water supply network provision – moderately high losses and coverage • Water quality in local water bodies fluctuates (it is good in some years and inadequate in others) Disposal of MSW in non-sanitary ways (open dumps, water bodies, etc.)	***Water resources vision statement:*** "Banja Luka will maintain high quality water supply, and improve wastewater treatment and collection accessible to everyone" ***Strategic Objective: WR1 Improve wastewater treatment and collection*** **Indicator** / **MT* Target** / **LT* Target** Percentage of residential and commercial wastewater that is treated according to applicable national standards[6] / >70% / >80% ***Strategic Objective: WR2 Improve integration of water supply and wastewater treatment/collection with drainage and land use planning and management*** **Indicator** / **MT Target** / **LT Target** Biochemical oxygen demand in rivers[7] / <2mg/L / <2mg/L Non-revenue water[8] / <30% / <30% Percentage of industrial wastewater that is treated according to applicable national standards[9] / >40% / >60%	• Projects only in the planning stage. • Uncertainty regarding availability of associated required investment resources. • Water savings are not encouraged. • Unsatisfactory level of industrial wastewater treatment. • Uncontrolled dumping of solid waste.	• Water: wastewater collection and treatment. • Water: potable supply network. • Solid waste: collection and disposal. • Industry: potable water consumption efficiency, industrial wastewater treatment.
2. Air quality	• Moderately polluted air with fluctuations throughout the year and reduced SO_2 concentrations . • Increasing number of fossil fuelled private vehicles in road transport. • Limited options for non-motorised users. • Low percentage of households connected to district heating. • Use of coal for heating purposes.	***Air quality vision statement:*** "Banja Luka will have clean, healthy air quality throughout the city and all EU ambient air quality objectives will be met" ***Strategic objective: AQ1 Improve ambient air quality*** **Indicator** / **MT Target** / **LT Target** Average annual concentration of $PM_{2.5}$[10] / <15µg/m^3 / <14µg/m^3 Average annual concentration of SO_2[11] / <10µg/m^3 / <8µg/m^3 Share of commuting trips by private motorised transport / <40% / <35% Share of passenger vehicles run by electricity or gas / >1% / >3% Consumption of energy from fossil fuels for heating in residential buildings / 8% reduction from 2017 level / 13% reduction from 2017 level Consumption of energy from fossil fuels for heating in non-residential buildings / 8% reduction from 2017 level / 13% reduction from 2017 level Share of population with access to district heating[12] / >26% / >30%	• Lack of integration of transport planning within city level development and land use planning. • Lack of adoption of existing and emerging low emission transport infrastructure and system technologies. • Inadequate urban development planning and control. • Inadequate planning and provision for low polluting energy supply. • Poor control of air emissions and implementation of energy efficiency measures in industry.	• Transport: fossil fuelled road transport. • Transport: lack of provision for NMU movement. • Buildings energy: fossil energy consumption. • Industry: air emissions, energy efficiency.
3. Green space	• Limited public green spaces. • Low level of urbanisation (urban sprawl).	***Green space vision statement:*** "Banja Luka will be a compact city with a sustainable and efficient system of land uses and a connected network of green spaces to maintain its status as 'city of greenery'" ***Strategic objective: GS1 Enhance extent, quality and diversity of green spaces and other green infrastructure*** **Indicator** / **MT Target** / **LT Target** Public green space area ratio per capita[13] / >4m^2 / >5m^2 ***Strategic objective: GS2 Reduce urban sprawl***	• Lack of regulation and control of urban development. • Lack of integration of land use planning, transport planning and utility infrastructure planning.	• Land use: urban planning and green infrastructure provision. • Water: surface and ground water quality. • Industry: emissions to water, air and land. • Solid waste: collection and disposal.

[6] In 2016, the most recent year for which data is available, performance in relation to this indicator was 0.6%.
[7] In 2019, this indicator value was 1.77mg/L, while in 2017 the indicator value was3.24mg/L.
[8] In 2016, this indicator value was 36.83%.
[9] In 2016, this indicator value was 2%.
[10] In 2019, this indicator value was 17.50µg/m^3.
[11] In 2018, the value of this indicator was 8.66 µg / m^3 and in 2019 8.19 µg / m^3. These values are significantly lower than in the period leading up to 2018 (in 2017, these values were 23.87 µg / m^3). Concentrations of this parameter have decreased since biomass boilers were put into operation within the district heating system instead of the Heavy Fuel Oil (HFO) boilers used in the previous period.
[12] In 2017, this indicator value was 35%.
[13] In 2019, this indicator value was 3 m^2.

Prioritised Environmental Topic	Priority Green City Challenges	Vision, strategic objectives, targets			Policy gap(s) / issue(s)	Action priority areas
		Indicator	**MT Target**	**LT Target**		
		Population density on urban land[14]	5% increase from 2013 level	10% increase from 2013 level		
		Proportion of City area regulated by Urban Plan	15%	15%		
4. Mitigation of GHG emissions	• Increasing number of fossil fuelled private vehicles in road transport. • Limited options for non-motorised users. • High building energy consumption. • Low percentage of households connected to district heating • Use of coal for heating purposes. • Reliance on solid waste landfill disposal.	***Mitigation of GHG emissions vision statement:*** "Banja Luka will be an exemplar of innovative, smart, affordable, reliable zero/low carbon transport and buildings across all sectors"			• Poor public transport infrastructure services and infrastructure. • Limited promotion of smart transport technology. • Lack of integration of land use planning, transport planning and utility infrastructure planning. • Inadequate urban development planning and control. • Inadequate planning and provision for low polluting energy supply. • Lack of low carbon solid waste management and disposal provision.	• Transport: fossil fuelled road transport. • Transport: lack of provision for NMU movement. • Buildings, industry, energy: fossil energy consumption • Solid waste: diverting waste from landfill, reducing landfill emissions, improving resource recovery. • Industry: air emissions
		Strategic objective: GH1 Reduce GHG emissions				
		Indicator	**MT Target**	**LT Target**		
		Annual CO_2 equivalent emissions per capita[15]	16% decrease from 2017 level	26% decrease from 2017 level		
		Share of trips by private motorised transport	<50%	<30%		
		Share of passenger vehicles run by electricity or gas	>1%	>3%		
		Consumption of energy from fossil fuels for heating in residential buildings	8% reduction from 2017 level	13% reduction from 2017 level		
		Consumption of energy from fossil fuels for heating in non-residential buildings	8% reduction from 2017 level	13% reduction from 2017 level		
		Proportion of total energy derived from RES as a share of total city energy consumption	60%	>60%		
5. Soils	• Low level of treatment of industrial and municipal wastewater. • Non-sanitary MSW disposal and unregulated / uncontrolled urban development. • Road vehicle emissions containing lead and other heavy metal emissions.	***Soils vision statement:*** "Banja Luka will prevent land contamination and maintain and enhance soil quality across the city"			• Limited policy response in relation to Municipal Solid Waste (MSW) disposal and industrial heavy metals emissions may cause soil quality issues. • Lack of planning and management of construction activity to reduce soil degradation and maintain soil quality. • Uncontrolled dumping of solid waste. • Lack of systematic and continuous monitoring of soil quality.	• Solid waste: MSW disposal and uncontrolled dumping. • Industry: wastewater and solid waste emissions control. • Land use: planning of construction.
		Strategic objective: SL1 Protect and enhance soil quality across the city				
		Indicator	**MT Target**	**LT Target**		
		Total solid waste generation per capita[16]	<300kg	<300kg		
		Percentage of MSW which is disposed of in open dumps or bodies of water or is burnt	<8%	<5%		
		Proportion of MSW that is sorted and recycled[17]	>14%	>22%		
		Share of industrial waste recycled as a share of total industrial waste produced	60%	80%		
6. Biodiversity and ecosystems	• Lack of monitoring of biodiversity. • Low level of urbanisation (urban sprawl). • Lack of treatment of industrial and municipal wastewater. • Non-sanitary MSW disposal and unregulated / uncontrolled urban development.	***Vision statement:*** "Banja Luka will establish a connected network of green and blue infrastructure that links natural assets such as urban parks, the River Vrbas and surrounding environment in order to preserve or enhance local biodiversity"			• Lack of regulation and control of urban development. • Lack of regulation and treatment of industrial and other emissions and waste • Uncontrolled dumping of solid waste.	• Land use: urban planning and green infrastructure provision. • Water: surface and ground water quality. • Industry: emissions to water, air and land. • Solid waste: collection and disposal.
		Strategic objective: BE1 Encourage development of green infrastructure across the city as an interconnected network of built environment and natural assets to preserve biodiversity, enhance recreational purposes and minimise risk to natural disasters				
		Indicator	**MT Target**	**LT Target**		
		Public green space area ratio per capita[18]	>4m^2	>5m^2		

[14] In 2013, the population density was 877.43 residents per km^2.
[15] In 2015, CO2 equivalent emissions were 3.36 tonnes per year per capita.
[16] In 2016, this indicator value was 326.42kg per capita.
[17] In 2016, this indicator value was 2%.
[18] In 2019, this indicator value was 3 m^2.

<table>
<tr><th>Prioritised Environmental Topic</th><th>Priority Green City Challenges</th><th>Vision, strategic objectives, targets</th><th>Policy gap(s) / issue(s)</th><th>Action priority areas</th></tr>
<tr><td></td><td></td><td>
Strategic objective: BE2 Protect, maintain and enhance natural environmental assets across the city
<table>
<tr><th>Indicator</th><th>MT Target</th><th>LT Target</th></tr>
<tr><td>Proportion of protected natural areas</td><td>8% increase compared to 2017 level</td><td>13% increase compared to 2017 level</td></tr>
<tr><td>Abundance of all bird species, annual change</td><td><2%</td><td>0%</td></tr>
<tr><td>% decline in forest area[19]</td><td><0%</td><td><0%</td></tr>
</table>
</td><td></td><td>

Lack of air quality monitoring.
Lack of monitoring of invasive species which negatively impact the biodiversity.

</td></tr>
<tr><td>7. Adaptation and resilience to natural disaster risks</td><td>

Insufficient flood risk management and extreme events.
Thermal comfort.
Urban planning.
Water resource efficiency.

</td><td>
Vision statement:[20]
“Banja Luka will increase resilience to climate variability and climate change, and in so doing secure sustainable development gains”
Strategic objective: AR1 Promote safe and resilient infrastructure, housing and urban development
<table>
<tr><th>Indicator</th><th>MT Target</th><th>LT Target</th></tr>
<tr><td>Annual average value of material damages in economy, infrastructure, public and private buildings from natural and other disasters (floods, earthquakes, fires)</td><td>15% decrease in the period 2017-2025 from period 2013-2017</td><td>20% decrease in the period 2025 - 2030 from period 2013-2017</td></tr>
<tr><td>Percentage of households at risk of flooding[21]</td><td>30% decrease compared to 2017</td><td>>30% decrease compared to 2017</td></tr>
</table>
</td><td>

No city level climate resilience and adaptation strategy and action plan.
Not currently an active supporter of associated networks or initiatives (100 Resilient Cities, C40 Cities or Making Cities Resilient).
Climate resilience and adaptation not routinely and robustly considered in urban planning and design.
The cost of climate change and climate change adaptation not identified.

</td><td>

Establishment of a public institution to drive action climate change resilience and adaptation, build adaptive capacity and raise awareness.
Active membership of resilient city networks and initiatives.
Quantitative assessment of climate change risk to the city.
Development of a costed city level climate resilience and adaptation strategy and action plan.
Mainstreaming of climate change resilience and adaptation into urban policy, planning, design and procurement.

</td></tr>
</table>

[19] In 2018, this indicator value was 8.22%.
[20] In line with the 2013 Climate Change Adaptation and Low-Emission Development Strategy for Bosnia and Herzegovina - https://pardee.du.edu/sites/default/files/climatechangeadapt.pdf.
[21] In 2013, this indicator value was 0.29%.

5.2. Addressing environmental challenges: action priority areas

Table 5-2 - Key action priority areas by environmental challenge topic and sector

Challenge topic / Sector	1 Water resources	2 Air quality	3 Green space	4 Mitigation of GHG emissions	5 Soils	6 Biodiversity and ecosystems	7 Adaptation and resilience
Transport		*Fossil fuelled road transport* *NMU provision*		*Fossil fuelled vehicles* *NMU provision*			*Insufficient flood risk management and extreme events*
Energy, buildings		*Fossil energy consumption*		*Fossil energy consumption* *Biomass production for energy generation*	*Biomass production for energy generation*	*Biomass production for energy generation*	*Insufficient flood risk management and extreme events* *Thermal comfort* *Water resource efficiency*
Industry	*Potable water consumption efficiency, Water emissions*	Air emissions Energy efficiency	*Emissions to water, air and land*	*Air emissions*	*Water and land emissions*	*Air, water and land emissions*	*Insufficient flood risk management and extreme events* *Water resource efficiency*
Water	*Wastewater collection and treatment* *Potable water supply network*		*Surface water quality* *Ground water quality*			*Surface water quality* *Ground water quality*	*Water resource*
Solid waste	*Collection* *Disposal*	*Collection* *Disposal*	*Collection* *Disposal*	*Disposal*	*Collection* *Disposal*	*Disposal* *Collection*	
Land use			*Urban planning* *Green infrastructure*		*Urban planning* *Construction*	*Urban planning* *Green infrastructure* *Biodiversity*	*Insufficient flood risk management and extreme events* *Thermal comfort* *Urban planning*

Action priority areas set the broad direction for addressing environmental challenges through policies and investments within urban sectors. The table above acts as a map to show how environmental challenges captured under the topics of air quality, water resources, green space, mitigation of GHG emissions, soils, biodiversity and adaptation and resilience are addressed with a variety of policy / action priority areas across the sectors of land-use, transport, water, energy and buildings, industry and solid waste. This information is used to guide the development of policy options and actions presented in sections below. The priority action areas presented in Table 5.2 align with the corresponding column in Table 5.1. In the following sections short-term actions are presented for each of the sectors.

5.2.1. Green City Actions

This section presents a suite of **58 Green City Actions (GCAs).** The actions have been prioritised using the three-step prioritisation process outlined in Chapter 2, including a technical assessment of environmental, economic and social benefits, a stakeholder prioritisation as well as a political prioritisation.

A total of 32 actions are identified as 'priority actions' with a further 26 'additional actions' presented in Appendix C.

The GCAs are the primary vehicle for Banja Luka's green city transformation. Responding directly to the strategic objectives, they contribute to the achievement of mid and long-term targets. The GCAs were developed specifically for Banja Luka based on interactive consultation with Banja Luka City Administration and other local stakeholders. While strategic objectives are in relation to environmental topics, the actions are developed in relation to sectors covering:

- Transport;
- Buildings, energy;
- Industry;
- Water;
- Solid waste;
- Land use; and
- Adaptation and resilience.

Actions within this GCAP are broadly categorised into investment actions or policy actions. The action also has a secondary categorisation, the options for which are presented opposite.

Table 5-3 - Action classification descriptions

	Improving information base, modelling: monitoring and analysis of information on the state of the environment in Banja Luka as well as the city's urban sectors.
	Developing policy, plan, legislation, regulations: prerequisite framework to guide urban governance in the city's green transformation including standards, guidelines and regulations as well as legislation, which will be implemented by Banja Luka City Administration.
	Capital investment: feasibility, planning, design, piloting: detailed studies including initial designs of Green City Actions as well as preliminary phases of piloting which will provide front end feasibility and planning, to assess in further detail the viability of subsequent/follow on actions and will act as a lead into major capital investment.
	Capital investment: implementation – improving existing: actions which involve direct investment in existing infrastructure, assets (for example, rolling stock) and technologies (for example, web applications). This includes upgrading of infrastructure as applicable.
	Capital investment: implementation – new: actions which involve direct investment in new infrastructure, assets (for example, new wastewater treatment plant) and technologies (for example, web applications).
	Awareness raising: public awareness initiatives which include public information campaigns, community projects and engagement with local businesses to deliver local improvements to the environment.
	Training, capacity building: Capacity building initiatives relate to actions which enable the City Administration and other formal actors to improve access to information, to build skills and knowledge and to improve decision making and management processes.

The structure of each of the sections that follow in this chapter, which are organised according to the sectors listed in section 5.2.1, is detailed below.

Firstly, a summary is presented of priority challenges and policy gaps for the sector, which the set of GCAs has been designed to address.

Secondly, short-term actions are presented in tabular format, in relation to the GCAP framework, identifying their contribution to strategic objectives. Key information on each action is stated, including implementation timeframe, cost estimates and action owner. Priority actions are clearly indicated and are grouped at the top of each table, followed by the additional actions.

Thirdly, a programme is presented for the sector indicating the action programme sequencing, as well as linkages between actions. The sector programmes focus on the GCAP short term implementation phase from 2021 to 2026. It is worth noting that a six-year period is presented for sector programmes, as it is likely that 2021 will be used a transition year for the City to fully absorb the plan into its five-year development plan.

Finally, detailed action proformas for each priority and additional action are presented, with the former in the main body of the document (this chapter) and the latter in Appendix C. Each action proforma contains the following information:

- Sector and Action Reference Number;
- Primary Action Classification as Policy or Investment;
- Secondary Action Classification (see Table 5-3);
- Action title;
- Action description;
- Revenue generation potential associated with action;
- Action owner and key stakeholders;
- Action CAPEX and OPEX in Euro (EUR) and Bosnian Convertible Mark (BAM);
- Notes on cost estimates;
- Action implementation start and end year;
- Action funding options;
- Action link to indicators - listing which key state and pressure indicators from the indicator database the respective action links to and addresses, along with whether each is currently 'red,' 'amber' or 'green.' Indicators listed only include those which have been presented in the technical assessment report and outlined in Appendix B.
- Summary of the action's performance against strategic objectives and the socio-economic impact filters of the technical assessment.

The action's environmental performance summary provides an overview of the extent to which an action contributes towards the achievement of each environmental strategic objective. The strategic objectives are summarised below:

- WR1: Improve wastewater treatment and collection
- WR2: Improve integration of water supply and wastewater treatment/collection with drainage and land use planning and management
- AQ1: Improve ambient air quality
- GS1: Enhance extent, quality and diversity of green spaces and other green infrastructure
- GS2: Reduce urban sprawl
- GH1: Reduce GHG emissions
- SL1: Protect and enhance soil quality across the city
- BE1: Encourage development of green infrastructure across the city as an interconnected network of built environment and natural assets to preserve biodiversity, enhance recreational purposes and minimise risk to natural disasters
- BE2: Protect, maintain and enhance natural assets across the city
- AR1: Promote safe and resilient infrastructure, housing and urban development

The socio-economic performance summary provides an overview of the extent to which an action benefits against the following social and economic criteria:

- EcR: Economic Rate of Return
- EcG: Economic Growth

- Emp: Employment
- EcIn: Economic Inclusion
- PHth: Public Heath
- AcS: Access to Services
- Sfy: Safety
- GEq: Gender Equality

The actions' performance against the strategic objectives as well as socio-economic dimensions of sustainability is indicated through colour coding, according to Table 5-4 below.

Table 5-4- Prioritisation colour coding

High benefit	Medium benefit	Low benefit	No benefit
3	2	1	0

Transport

5.3. Transport

5.3.1. Priority challenges and policy gaps

Table 5-5 presents the prioritised challenges for transport, which are an output of the technical assessment reporting and further prioritisation through stakeholder engagement.

The highest priority challenge identified in the city is the increasing use of fossil fuelled private road transport, driven by an increasing trend in motorisation and average vehicles per household, the impact of which is compounded by the average age of vehicles in the city. This is followed closely by the limited options for non-motorised users of transport, where facilities currently exist, but additional cycling and pedestrian measures need to be put in place to support a drive for increased use of sustainable modes, healthier living and a desire from the city population to take advantage of the city's flat topography and wide boulevards. In addition, there is a lack of coordination of urban planning and transport planning within the city, which results in limited interchange provision and a lack of integration of transport with key city landmarks and development.

Based on the available transport data for the city, the transport sector challenges in Banja Luka are characterised by use of an older, more polluting car fleet, a lack of dedicated public transit routes and limited options for non-motorised users, including walking and cycling. The average age of the car fleet in the city is 14 years plus and as such has been benchmarked as red. Older cars require a greater degree of maintenance and as such produce more emissions and have adverse health impacts. The limited number of cycle paths in the city is also flagged as red benchmark, reflecting a general lack of bicycle routes (and associated facilities) throughout the city which constrains greater use of this alternative mode of transport, and the possibilities the mode offers for contributing to GHG emission reduction, air and other pollutant reduction benefits, as well as the general health of residents of the city. The lack of cycling facilities is surprising due to the relatively flat topography of the city and the wide rights of way offered on a number of routes in and out of the city, but a general lack of promotion and desire to use the mode drives commuters to fossil fuelled modes.

Table 5-5 - Transport: priority challenges and policy gaps / issues by environmental topic

	Environmental topic		
	2 Air quality	**4 Mitigation of GHG emissions**	**7 Adaptation and resilience**
Key challenges	Moderately polluted air with fluctuations throughout the year and reduced SO_2 concentrations	Increasing fossil fuelled private road transport.	Insufficient flood risk management and extreme events.
	Increasing fossil fuelled private road transport.	Limited options for non-motorised users.	Inadequate urban planning.
	Limited options for non-motorised users.		
Policy gaps / issues	• Lack of integration of transport planning within city level development and land use planning. • Lack of adoption of existing and emerging low emission transport infrastructure and system technologies.	• Poor public transport infrastructure services and infrastructure. • Limited promotion of smart transport technology.	• Quantitative assessment of climate change risk to the city. • Mainstreaming of climate change resilience and adaptation into urban policy, planning, design and procurement.

Priority level shading key:

High priority 1	2	3	4	Low priority 5

In addition to the limited number of cycle routes, the indicator for kilometres of road dedicated exclusively to public transit per 100,000 population is also benchmarked as red, as there is no segregation or prioritisation of routes for buses, despite the fact that the frequency of bus services is benchmarked as green. This would indicate an overall good quality bus service, but stakeholder feedback has confirmed that there are issues with the general operation of bus services, the quality of the vehicles and the cost of journeys, as well as the lack

of technology and innovation. There is also an increasing trend in the rate of motorisation and high rate of vehicle ownership per household. The increasing rate of motorisation and vehicle ownership is generating localised traffic congestion in urban areas of the city, that in turn is impacting on the concentration of air pollutants in the atmosphere.

5.3.2. Short-term actions

14 transport sector actions were developed for Banja Luka in the GCAP process. Seven out of the 14 actions are included within the prioritised list of actions, with the remaining seven included as additional actions.

All transport actions put forward for Banja Luka aim to improve air quality and mitigate GHG emissions. Additionally, some actions will contribute towards enhancing the extent, quality and diversity of green spaces and other green infrastructure in Banja Luka and thereby help to preserve biodiversity, increase recreational opportunities in the city and enhance climate change resilience.

A broad range of complementary priority transport actions have been developed to capitalise upon the numerous opportunities to improve transport in Banja Luka. These actions collectively seek to improve understanding about transport sector activity in the city, manage private car use (with a focus on controlling use of relatively high polluting vehicles) and to improve the viability and attractiveness of alternatives to the private car.

A city-wide data collection programme will be established to fill gaps in knowledge about how people travel in Banja Luka and some of these data will be incorporated in a multi-modal transport model that will be developed to help ascertain the impact of different interventions in the sector.

The actions designed to manage private car use include **traffic demand management and environmental control** measures, such as introducing zones where car parking is restricted, reviewing car parking charging policy, implementing a city centre low emission zone (LEZ), introducing high-occupancy vehicle (HOV) lanes, upgrading traffic signal systems across the city, establishing a car sharing campaign, reviewing street design, and developing related standards, guidelines, plans and policies.

In conjunction with reducing the attractiveness of private car travel in the city centre, **pedestrian and cycling infrastructure improvements** will be made. A city-wide network of cycle lanes, cycle parking infrastructure and pedestrian way finding signage will be introduced, and the city centre pedestrian zone expanded. Promotional campaigns for walking and cycling will also be delivered to promote and complement these infrastructure improvements and the city's car sharing initiative.

The **bus service offering will be improved across Banja Luka** by upgrading existing infrastructure, such as bus stop infrastructure and information systems at bus stations and stops, and by introducing new infrastructure, including bus priority lanes and park and ride facilities. The efficiency improvements that will result will be enhanced by the bus operational reforms that will also be implemented, notably a new city bus operator model and integrated public transport ticketing.

A **Sustainable Urban Mobility Plan** (SUMP) that consolidates these actions and other measures will also be developed.

Table 5-6 presents the short-term transport actions set against the topic-based strategic objectives and Figure 5-1 summarises the transport action programme. The additional actions are featured in Appendix C.

Table 5-6 -Transport: short term actions and link to strategic objectives

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives				
					Air quality	GHG emissions	Green space	Biodiversity, ecosystems	Adaptation, Resilience
					AQ1	GH1	GS1	BE1	AR1
PRIORITY ACTIONS									
TR01	**Develop car parking and management policies and strategies** • Implement restricted car zone policy • Car parking rationalisation, management, technology and charging strategy	2021-2025	50,000 10,000	BLCA* – Department for Traffic and Roads					
TR05	**Expand and enhance cycling infrastructure** • Implement city-wide cycle lanes • Implement city-wide cycle parking network	2022-2025	4,300,000 215,000	BLCA – Department for Traffic and Roads					
TR07	**Promotional campaigns for car sharing, walking and cycling** • Implement city level car sharing campaign and promotion • Implement city level cycling promotional campaign • Implement city level walking promotional campaign	2021-2022	50,000 15,000	BLCA – Department for Traffic and Roads					
TR08	**Upgrading of bus stop infrastructure and technology** • Upgrading of bus stop infrastructure • Implement real time passenger information systems at bus station and stops	2022-2031	3,000,000 150,000	BLCA – Department for Traffic and Roads					
TR09	**Implement bus network infrastructure** • Implement corridor-based priority bus lanes • Implement park and ride facilities	2022-2026	6,000,000 300,000	BLCA – Department for Traffic and Roads					
TR10	**Implement pedestrian priority infrastructure** • Implement city-wide pedestrian way finding signage network • Implement expanded city centre pedestrian zone	2022-2026	2,000,000 100,000	BLCA – Department for Traffic and Roads					
TR13	**Implement bus operational reforms** • Implement new city bus operator model • Implement integrated public transport ticketing	2022-2031	22,500,000 410,000	BLCA – Department for Traffic and Roads					
ADDITIONAL ACTIONS									
TR02	**Develop low transport emission policies** • Implement low / zero emission public transport services policy • Implement city centre low emissions zone policy	2021-2022	60,000 15,000	BLCA – Department for Traffic and Roads					

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives				
					Air quality	GHG emissions	Green space	Biodiversity, ecosystems	Adaptation, Resilience
					AQ1	GH1	GS1	BE1	AR1
TR03	**Refresh of the Sustainable Urban Mobility Plan (SUMP) for Banja Luka**	2021-2022	20,000 5,000	BLCA – Department for Traffic and Roads					
TR04	**Develop City-wide data collection programme and multi-modal transport model** • Implement city wide permanent traffic data collection system • Implement city wide multi-modal transport demand model	2021-2023	2,150,000 67,500	BLCA – Department for Traffic and Roads					
TR06	**Initiative for developing standards and guidelines for travel planning, parking and street design** • Implement standard workplace travel plan policy and guidelines • Implement parking standards for all new developments • Implement Design Guidelines for Streets Manual	2021-2022	500,000 30,000	RS Ministry of Transport and Communications					
TR11	**Traffic management and control: HOV lanes, City-wide traffic system upgrade and control centre** • Implement city centre low emission charging zone • Implement parking rationalisation and technology strategy • Implement corridor based high occupancy vehicle (HOV) lanes • Implement city-wide traffic signal system upgrade and control centre	2022-2030	3,500,000 500,000	BLCA – Department for Traffic and Roads					
TR12	**Implement low emission vehicles and supporting infrastructure** • Implement public/on-street electric vehicle charging point network • Replacement of the city vehicle fleet to low emission vehicles	2022-2026	1,820,000 90,000	BLCA – Department for Traffic and Roads					
TR14	**Develop rapid transit system corridor feasibility study**	2021-2022	500,000 0	BLCA – Department for Traffic and Roads					

* BLCA: Banja Luka City Administration

Colour coding of Action link to strategic objective

Strong contribution	Medium contribution	Low contribution	No contribution
3	2	1	0

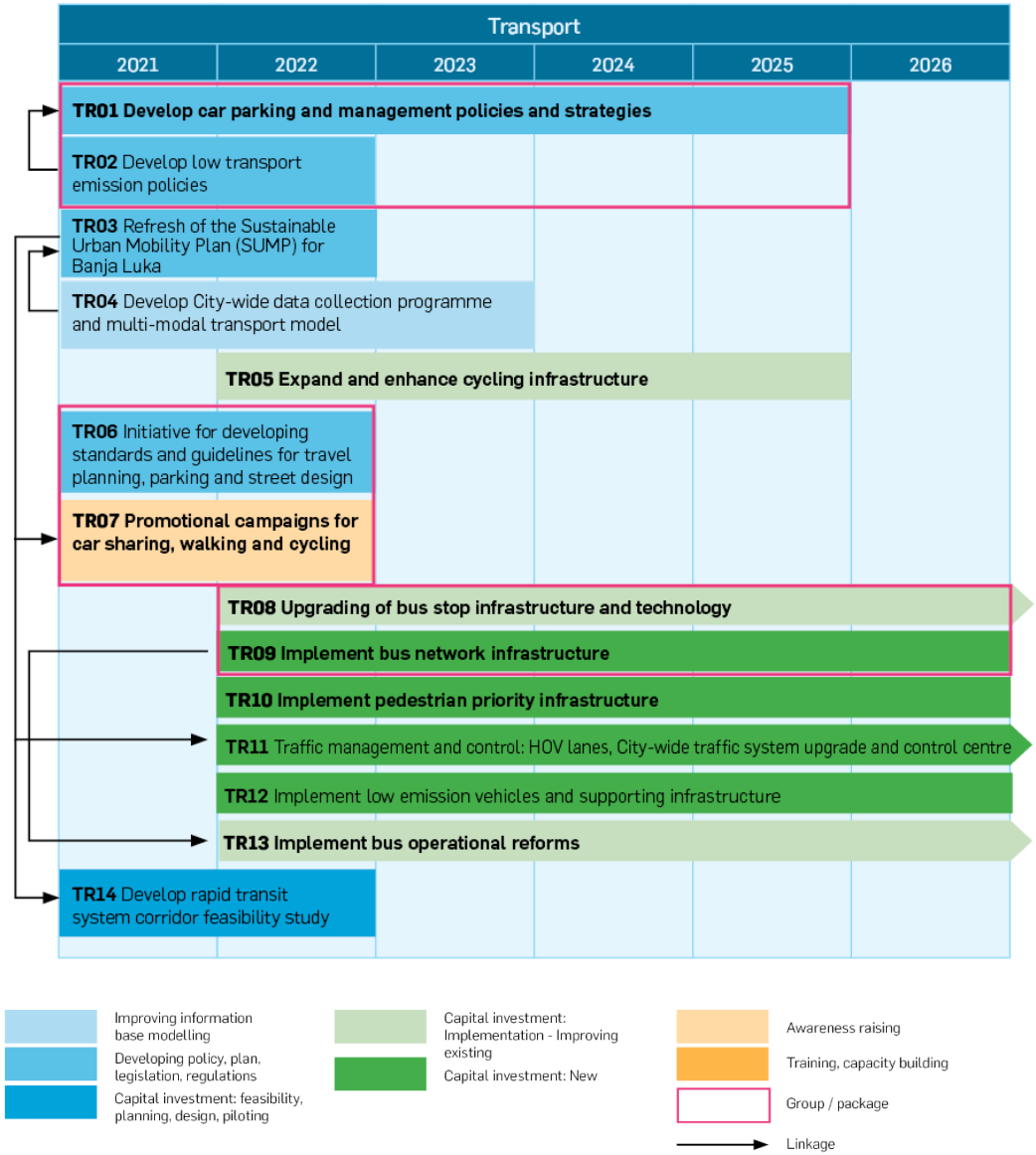


Figure 5-1 - Transport actions programme

TRANSPORT ACTION: TR01	
Primary action classification: Policy **Secondary action classification:** Developing policy, plan, legislation, regulations	**Action Title:** Develop car parking and management policies and strategies

Restricted car zone policy

A restricted car zone policy is designed to promote area-wide car-free zones in Banja Luka city centre - a distinction between parking in residential areas and parking in commercial and central urban areas should be considered. There needs to be a regulatory change in enforcing car-free zones. Car free zones can take the form of full and permanent restriction of certain streets and thoroughfares. The restricted car zone policy should consider the following:

- Identification of the geographic boundary of the zone;
- Permanent restriction of all cars except individual permit holders living within the car-free zone;
- Time-bound restriction, i.e. a defined period of a weekday, for all cars except individual permit holders living within the car-free zone; and
- Designate a particular day of a week or a month as "car-free day."

The Municipality will need to take certain prior measure before the policy is adopted, which includes carrying out a positive campaign to inform the public about the benefits of this policy, ensuring that buy-in from the public and other civil society stakeholders is attained, carry out a more detailed study to identify a zone in the city centre that will not disrupt the regular traffic flow and other commercial activities in the city centre develop a strategy for implementation including the means of enforcement and other supporting infrastructure that will be needed.

Car parking rationalisation, management, technology and charging strategy

Improved enforcement and increased parking charges can encourage more use of public transport. Increased revenue generation from existing parking facilities can be ringfenced and explicitly used for the development of alternative modes, i.e. infrastructure improvements, incentives, subsidies. To optimise the supply to meet demand and to ensure efficient management of parking spaces in central and commercial areas of the city, Banja Luka Municipality will be needed to develop a parking rationalisation and management strategy, which also considers new and emerging parking technologies, as well as a review of the existing fares structure. The objective of the strategy will be to optimise the utilisation of parking spaces, optimise and review parking locations, improve the parking management system through further use of technology, review the parking management arrangements; and review the parking fare structure. This proposal is to develop a strategy only. The implementation of the strategy (notably any upgrades to infrastructure or technology) will need to be considered once the Municipality adopts the strategy.

Revenue generating: No

Owner: Banja Luka City Administration – Department of Traffic and Roads						**Stakeholders:** Public transport operators, private transport operators, local businesses, NGOs	
Capex	EUR 50,000	BAM 98,000	**Annual Opex**	EUR 10,000	BAM 19,600	**Implementation Start/End Year**	2021-2025

Notes on cost estimates: The CAPEX for the restricted car zone policy is EUR 200,00 for two local FTEs. The CAPEX for parking rationalisation strategy of EUR 30,000 is an estimated amount to develop the strategy, which equates to three local FTEs for development of the documentation. The OPEX for both assumes 0.5 FTEs (EUR 5,000 per year) to monitor impact and implementation. A total cost for each of EUR 5,000. This cost assumes no input from international experts or consultancy firms, local experts.

Action link to indicators										**Action perfor-mance**											
	State	1	1.1	1.2	1.3	8					Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions															
	Pressure	11	11.2	11.3	12						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

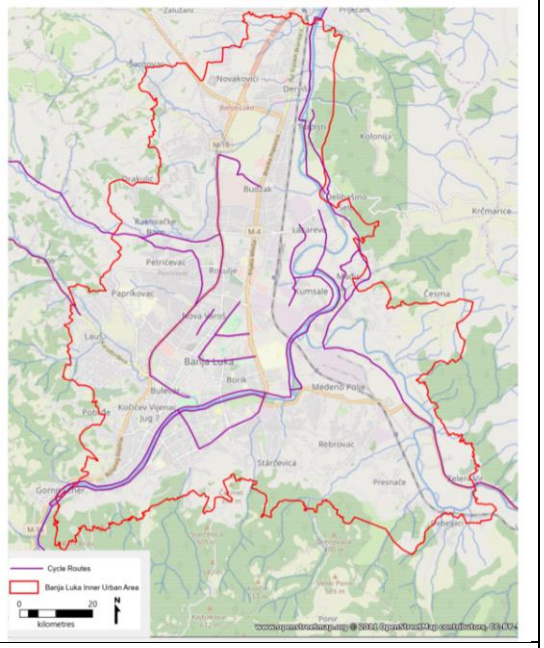
TRANSPORT ACTION: TR05

Primary action classification: Investment
Secondary action classification: Capital investment: implementation – improving existing

Action title: Expand and enhance cycling infrastructure

Implement city-wide Cycle Lanes

The proposal is to implement segregated cycle lanes throughout the city, although where this is not feasible, cycle tracks/paths should be considered. The routes will interface with critical sites such as the city centre bus station, train station, city centre attractions and workplace locations. The city currently has approximately 15km of cycle lanes. It is proposed that approximately 80km of fully segregated cycle lanes are introduced within the city. Potential routes for cycle lanes would include the banks of Vrbas river between Karanovac and Prijecani, Slatinska Street, Zdravka Dejanovica Street, Petra Velikog Street, Vladislava Skarica Street, Rade Radica Street, Krajiskih brigada Street, Despota Stefana Lazarevica Street, Njegoseva Street, Kralja Aleksandra I Karadjordjevica Street, New route of Regional Road R405, Dunavska Street, Karadjordjeva Street through Pavlovac, Bulevar Cara Dusana and Trznicka Streets, Dr Mladena Stojanovica Street, Dragise Vasica Street, Aleja Svetog Save Street, Olimpijskih pobjednika Street, Cara Lazara Street and Bulevar Desanke Maksimovic Street. The map opposite presents a plan of the indicative location of the cycle lanes.



Implement city-wide public cycle parking network

An improved city-wide network of cycle routes needs to be supported by the installation of new cycle parking infrastructure. In line with international good practice, cycle facilities should be planned, designed and installed based on the principles of visibility, accessibility, safety and security, maintenance and monitoring, availability and capacity, connectivity and attractiveness. In the specific context of Banja Luka, new areas for cycle parking need to be located adjacent to the main cycle route network and strategically located throughout the city – preferably close to areas where there are significant concentrations of tourists, commuters and students. In terms of parking space numbers, this is generally determined through local standards or regulations, as there is a significant variety in the number of spaces which can be provided within cities. For Banja Luka, it is proposed that 30-50 public cycle parking spaces are provided per km of cycle route, which equates to approximately 3,000 to 5,000 cycle spaces in the city. This excludes any spaces which are privately installed, such as businesses and universities. Locations for the cycle parking would include Zaluzani, Lazarevo, Sargovac, Petricevac, Nova Varos, Motike, Laus, Pavlovac, Obilicevo, SrpskeToplice, Karanovac, Starcevica, Vrbanja, Cesma, Trapisti and Prijecani. In conjunction with this type of infrastructure, it would also be possible to bring in private companies to provide funds in return for advertising and naming rights.

Revenue generating: No

Owner: Banja Luka City Administration – Department of Traffic and Roads

Stakeholders: Business Owners, Universities, NGOs

Capex	EUR 4,300,000	BAM 8,428,000	Annual Opex	EUR 215,000	BAM 421,400	Implementation Start/End Year	2022-2025

Notes on cost estimates: The CAPEX is estimated at EUR 50 per metre of cycle lane, which is non-segregated. 80km of lanes are proposed. CAPEX for parking is 5,000 Sheffield stands at EUR 60 per stand. OPEX for cycle lanes assumed as 5% of CAPEX for annual repair and maintenance. OPEX for cycle parking assumed as 5% of CAPEX for annual repair and maintenance.

Action link to indicators										Action performance											
	State	1	1.1	1.2	1.3	6	6.1	7	8		Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Green space		Biodiversity and ecosystems	Mitigation of GHG emissions												
	Pressure	11	11.2	11.3	11.5	12					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR07																						
Primary action classification: Investment **Secondary action classification:** Awareness raising										**Action title:** Promotional campaigns for ride sharing, care sharing, walking and cycling												
Implement city level ride sharing and car sharing promotional campaign Car sharing schemes allow the rental of vehicles for a short period of time instead of owning a car. Major schemes offer rental platforms through online applications and allow for non-fixed locations and pre-booking. The proposal is to introduce a campaign to promote such a scheme. Components of the promotional campaign can include the introduce the scheme and promotion it through various media outlets such as distributing leaflets, TV and radio advertisement and on-street billboards, promotion in corporate offices to encourage sharing rides to and from the office with colleagues, the introduction of incentive programs in the workplace for employee car-sharing scheme, the developing car clubs where members can gain access to a car on a short-term rental basis and charge by the hour or by a day and neighbourhood-based car clubs can reduce the need for owning a car. **Implement city level cycling and cycle sharing promotional campaign** The objective of the promotional campaign is to promote a green and healthier lifestyle for its citizens and visitors through promoting active take up and benefits of cycling, as well as cycle sharing within the city. There are several actions which will need to be undertaken to encourage more cycling in the city which include city/government/workplace incentive schemes to buy cycles, promotion of cycling through various media outlets such as distributing leaflets, TV and radio advertisement and on-street billboards, running of promotional campaigns in the workplace to encourage cycle to work option, citywide cycling month, car-free days on certain streets in the city to promote cycling, road safety awareness advice for cyclists, cycling pocket guides and the establishment of cycling groups. The promotional campaign should be integrated into other demand management initiatives and the overarching improvement of cycling infrastructure. **Implement city level walking promotional campaign** In conjunction with other non-motorised development campaigns, the objective of this measure will be to promote a strong policy and initiatives to promote the walking in the city actively. They could include a citywide walking month, walk to school day/week, car-free days on certain streets in the city, restricted car access (routes/streets/zones/timings), pedestrian safety awareness advice, walking pocket guides, walking technology applications and establishment of walking groups.																					
Revenue generating: No																						
Owner: Banja Luka City Administration – Department of Traffic and Roads									**Stakeholders:** Business Owners, Universities, NGOs												
Capex	EUR 50,000	BAM 98,000	**Annual Opex**	EUR 15,000	BAM 29,400	**Implementation Start/End Year**	2021-2022															
Notes on cost estimates: The CAPEX has been estimated for all three promotional campaigns, which is inclusive of engagement with stakeholders and marketing. Campaigns to be undertaken using the expertise of locally based staff. The annual OPEX is estimated for annual promotion (once the full campaign material has been developed). Estimated cost of time and materials is EUR 5,000 per annum.																						

Action link to indicators	State	1	1.1	1.2	1.3	6	6.1	7	8	**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Green space		Biodiversity and ecosystems	Mitigation of GHG emissions												
	Pressure	11	11.2	11.3	11.5	12					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR08	
Primary action classification: Investment	**Action title:** Upgrading of bus stop infrastructure and technology
Secondary action classification: Capital investment: implementation – improving existing	

Upgrading of bus stop infrastructure

The bus network and quality of the supporting bus stop infrastructure has a critical contribution in enhancing the overall public transport infrastructure quality in the city, which should support increasing public transport take up and promoting better overall accessibility to vital city amenities. Well planned, designed and maintained bus stops promote inclusive bus services, so reducing social isolation, increasing the number who can use these services. Any new bus stop infrastructure in Banja Luka should be planned and designed in accordance with international good practice, which should consider security and lighting, posts and flags, surface markings, passenger shelters and seating, power requirements, information provision, pedestrian footways, height and type of kerb, waiting areas and approach and exit pathways. The planning and design of bus stops will need to be based on a framework of street/road types, where different layouts of bus stops are implemented depending on the classification of road. In the specific context of Banja Luka, the current bus stop infrastructure needs upgrading, with a current lack of covered bus stops across the city. There are approximately 600 bus stops in the city (Strategy of Development of Local Roads and Streets for Banja Luka). The stops which would be upgraded would be located on the busiest routes and which attract the highest levels of demand. It is proposed that the upgrading of the infrastructure would be undertaken in a phased approach. The upgrading of bus stop infrastructure provides revenue opportunities including advertising.

Implement real time passenger information systems at bus station and stops

Real time passenger information is an automated system for supplying users of public transport with information about the nature and state of a public transport service, through visual, voice or other media. The system uses real time information, derived from automatic vehicle location systems, which changes continuously because of actual events and is typically used during the course of a journey, primarily how close the bus service is running to time and when it is due at a bus stop. Real time information is an advance on schedule-only information, which recognises the fact that public transport services do not always operate exactly according to the published timetable. In terms of information provision, this can be presented to passengers in different ways, including mobile phone applications, platform and bus stops electronic signage and automated public address systems. In the specific context of Banja Luka, it is proposed that a roll out of real time passenger information systems should be implemented at the main bus station, supported by a phased roll out, targeting bus stops on the most heavily utilised bus routes. Up to 200 bus stops would include the installation of RTPI. The system should be installed in conjunction with the general renewal and upgrade of the bus stop infrastructure and the provision of citywide journey planning applications.

For both bus stop infrastructure and RTPI, this will be undertaken in two phases. Phase 1 (2021-2025) is to implement approximately half of the bus stop upgrades (200 stops) within the city, which would also include half (100) of the RTPI implementation.

Revenue generating: Yes

Owner: Banja Luka City Administration – Department of Traffic and Roads	**Stakeholders:** Public Transport Operators, Business Owners, RS Roads

Capex	EUR 3,000,000	BAM 5,880,000	**Annual Opex**	EUR 150,000	BAM 294,000	**Implementation Start/End Year**	Phase 1: 2022-2026 Phase 2: 2026-2031

Notes on cost estimates: CAPEX estimated for bus stops based on 400 bus shelters at EUR 5,000 each. CAPEX for RTPI calculated for 200 RTPI displays at EUR 4,000 per display. The displays would also require the support of a CMS which would cost approximately EUR 200,000 to implement. The OPEX for bus stops assumed as 5% of CAPEX for annual repair and maintenance. OPEX for RTPI assumed as 5% of CAPEX for annual repair and maintenance.

Action link to indicators	State	1	1.1	1.2	1.3	8				**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions															
	Pressure	11	11.2	12							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR09

Primary action classification: Investment
Secondary action classification: Capital investment: implementation – new

Action title: Implement bus network infrastructure

Implement corridor-based priority bus lanes

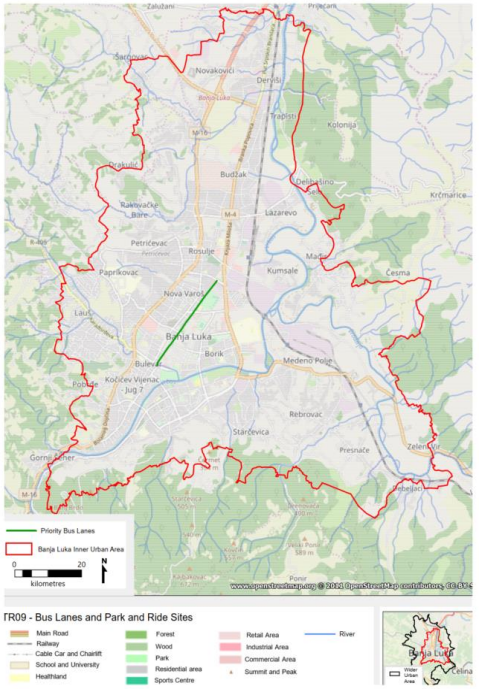
Buses operating on the roads in Banja Luka currently share road space with the general traffic. There are currently no means of prioritising the bus movements on the road network. As a result, buses do not currently offer any additional comparative travel time advantages against the other modes of transport. Prioritising public transport on the roads will help to improve travel time reliability, which is a positive incentive for users to switch from car to public transport. The city needs to consider the introduction of dedicated bus lanes along the busiest and corridors. The bus lanes will allow buses to avoid sharing road space with other vehicles at peak commuting times and thus reduce travel time, although most bus lanes permit use by taxis, motorcycles and bicycles. The bus lane proposals can be enhanced through the provision of bus priority measures at junctions. The following key considerations when implementing a bus priority scheme there needs to be bus lanes demarked by paint on the road, installation of CCTV to enforce appropriate usage and installation of sufficient road signs to inform road users about the hours of operations of the bus lanes. There are two main roads in the city which have been provisionally identified as potential routes for priority bus lanes which are Kralja Petra I Karadjordjevica and Dr Mladena Stojanovica. Further feasibility work would need to be implemented to refine the proposals, but it is envisaged that up to 10km of bus priority lanes could be implemented in Banja Luka. Indicative locations for the bus priority lanes are shown in the plan opposite.

Implement park and ride facilities

Park and ride facilities are car parking areas which provide public transport connections to allow commuters and other people heading to city centres to leave their vehicles and transfer to a bus, rail system, carpool or bike share scheme for the remainder of the journey. The vehicle is left in the parking area and retrieved when the owner returns.

Park and rides are generally located on the outer edges of large cities. Park and ride locations can also be integrated with other transport nodes, including rail stations, to enhance overall inter-modal connectivity. There are also opportunities to link the sites with non-motorised modes, such as cycles routes. They present opportunities to utilise low emission buses, with services operated by private bus operators and connect into wider integrated ticketing solutions. The park and ride facility would need to offer lower overall price for travelling to the city centre over private vehicle commuting coupled with parking.

In the specific context of Banja Luka, it is proposed that two park and ride sites could be implemented initially, which would be located in areas of the city which attract the highest number of long-distance car commuters into the city centre. They would remove private vehicle trips from arterial routes and consolidate them onto low emission bus vehicle journeys.



Revenue generating: Yes

Owner: Banja Luka City Administration – Department of Traffic and Roads

Stakeholders: Public Transport Operators, Traffic Police, RS Roads

Capex	EUR 6,000,000	BAM 11,760,000	Annual Opex	EUR 300,000	BAM 588,000	Implementation Start/End Year	2022-2026

Notes on cost estimates: CAPEX of EUR 200,000 per km (based on 10km of lanes) for bus priority. CAPEX of 2 x 1,000 space sites priced at EUR 2,000,000 per site for park and ride. OPEX estimated as 5% of CAPEX for bus priority lanes. OPEX for park and ride estimated as 5% of CAPEX. % of OPEX related to staffing costs.

Action link to indicators										Action performance	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	State	1	1.1	1.2	1.3	8															
		Air				Mitigation of GHG emissions															
	Pressure	11	11.2	11.3	12						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR10

Primary action classification: Investment
Secondary action classification: Capital investment: implementation – new

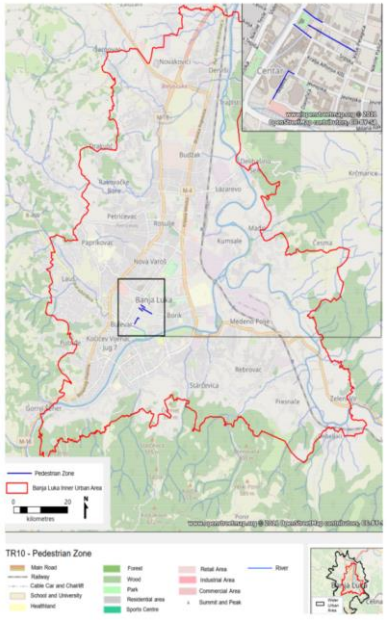
Action title: Implement pedestrian priority infrastructure

Implement city-wide pedestrian way finding signage network

Banja Luka is a relatively flat city which makes it ideal for walking. The implementation of a citywide pedestrian way finding network would help to encourage and promote walking, provide enhanced connectivity between city locations in terms of accessibility and visibility and would deliver a consistent approach to walking and way finding information throughout the city. The way finding network could also be integrated with other pedestrian focussed infrastructure improvements such as improved pedestrian crossings with lower curbing for mobility impaired access, wider footpaths and provision of all-weather pedestrian access/surface improvements. The way finding network would need to be facilitated through clear and consistent signage and floor markings as applicable. The signage would support way finding principles including heads up mapping, accessibility, walking times, walking directions, building locations, finder mapping, integrated transport nodes and street naming. In the specific context of Banja Luka, to ensure that any potential way finding signage is appropriate and user friendly, it would be recommended that initially a small area of the city would be selected for piloting, where the network signage can be tested and feedback from users collated to enhance the product. The pilot would be undertaken in an appropriate location within the city centre, which should have high levels of pedestrian footfall and key points of interest. Once piloted, there would be a wider rollout of the network markings and signage – which would ideally emerge from a wider city level pedestrian and way finding strategy. It is envisaged that the signage network could be supported by up to 100 maps and signs.

Implement expanded city centre pedestrian zone

The aim of this type of scheme is to provide better accessibility and mobility for pedestrians, to enhance the quality and volume of business/commercial activity in the area and/or to improve the attractiveness of the local environment - in terms of air pollution, noise and safety. There needs to be careful consideration of the impact of traffic displacement to surrounding areas and what impact it could have on business/commercial activities, notably drive by trade and delivery logistics. In the specific context of Banja Luka, it is proposed that an expansion of the existing city centre pedestrian area is implemented. The pedestrian area be focussed on Gajeva Street, part of Srpska Street, part of Jevrejska Street, part of Bana Lazarevica Street and new city square (from Detail Plan of Central Urban Area of Banja Luka). The area to be covered would be approximately 9,000m^2. Indicative zones for the street which have been identified are shown in the plan opposite.



Revenue generating: No

Owner: Banja Luka City Administration – Department of Traffic and Roads

Stakeholders: City Traders, Public Transport Operators, Private Transport Operators, Emergency Services

Capex	EUR 2,000,000	BAM 3,920,000	Annual Opex	EUR 100,000	BAM 196,000	Implementation Start/End Year	2022-2026

Notes on cost estimates: The CAPEX estimate for pedestrian signage is based on 50 signs implemented at a cost of EUR 5,000 each, plus professional fees for planning and design. CAPEX for the pedestrian zone would cover an area of approximately 9,000m^2. The cost of the pedestrian zone would be EUR 1.5m.OPEX estimates for both are 5% of CAPEX.

Action link to indicators										Action performance											
	State	1	1.1	1.2	1.3	6	6.1	7	8		Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Green space		Biodiversity and ecosystems	Mitigation of GHG emissions												
	Pressure	11	11.2	11.3	12						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR13	
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – improving existing	**Action title:** Implement bus operational reforms

New city bus operator model

Banja Luka currently has seven bus operators in the city. The operators run bus services on all existing routes within the city. Presently, there is a high degree of inefficiency and a poor service quality in the bus service provision, including poor quality vehicles and an inefficient and expensive fare structure. Current fares are 1.80 BAM for a one-way ticket, which is expensive when compared to other countries in the region. Options for contract types could include gross cost or net cost. With gross cost contracts, the tendering authority pays an operator to provide services, retaining the passenger revenue and often specifying the routes and the types of vehicles. With net cost contracts, the operator takes on both the income risk and the cost risk but retains all passenger revenue. There is also the option of brining elements of the bus transport operation under the control of the public sector. The action to update the city bus operator model would, as a minimum, cover the exploration of different and alterative operator models, including public and private; new commercial and contractual arrangements; establishment of clear and measurable operating KPIs and SLAs; refinement and rationalisation of bus routes; development of updated, distance-based fare structure; procurement standards related to vehicle quality; procurement standards related to vehicle emissions and purchase new low emission vehicles.

Upgrade of the public bus fleet with low emission vehicles

The action is to deliver low emission buses as part of any replenishment or upgrade of the existing bus fleet. This would be a contractual requirement of any new bus operator model within the city and would need to be supported with an appropriate tendering process. Operators will be asked to replace their existing bus fleet with more fuel-efficient low emission vehicles. This is in alignment with TR02 Develop the low / zero emission transport policy. Key requirements of the action would include all new bus fleet vehicles purchased to be low emission – minimum Euro 6; 50% of the bus fleet to be replaced by the low-emission vehicle in the next five years (50 buses) and the remaining 50% of the vehicles should be low emission in the next 5-10 years (50 buses).

Integrated public transport ticketing

Integrated ticketing allows a passenger to transfer between different transport modes or buses operated by different service providers with a single ticket, which is valid for a complete journey. Such a system promotes a seamless journey by the users and can increase the attractiveness of public transport. The integrated ticketing encourages people to use public transport by simplifying switching between transport modes and by improving the efficiency of services. At present seven bus operators operate bus services within Banja Luka city area. The revenue collection of all these services can be integrated through the introduction of a single ticketing system. Several alternatives can be considered in implementing this system

- A flat fare across the city. It is suitable for a small city. Otherwise, an average fare would be costly for short travel and very cost effective for long distance travel.
- Define multiple zones, centred around the city centre, and vary ticket price by zone.
- Distance based travel through electronic ticket which can be used across all services.

The integrated ticketing is very efficient by intruding electronic ticketing technologies such as smart card or magnetic stripe cards. The single electronic ticket is widely used in many European cities and elsewhere in the world. A good communication backbone is needed for the implementation of such a system. Also, the transaction will have to adhere to the national electronic money regulation. A study in London showed a 16% increase of patronage and a 20% increase in mileage in public bus services due to the integrated ticketing. Implementing an integrated ticketing system will require buy-in from the operators. A revenue share agreement will need to be in place between the operators and the Municipality for successful implementation.

With reference to all of the above actions, the following indicative sequencing of steps for implementation is set out below:

2022 - 2024 – tender and establish the new bus operator model

2024 – 2026 – Rollout of first tranche of low emission buses

2027 – 2029 – Rollout of second tranche of low emission buses

2024 – 2025 – Tender for integrated public ticketing system

2026 – 2028 – Rollout of integrated public ticketing system

TRANSPORT ACTION: TR13																						
Revenue generating: Yes																						
Owner: Banja Luka City Administration – Department of Traffic and Roads										**Stakeholders: Public transport operators** Public transport operators												
Capex	EUR 22,500,000	BAM 44,100,000		**Annual Opex**		EUR 410,000		BAM 803,600		**Implementation Start/End Year**		2022-2031										
Notes on cost estimates: CAPEX for the bus operator model is an estimated amount through lump sum consultancy fees of EUR 500,000. CAPEX for bus fleet renewal is based on the replacement of 50 buses at a unit cost of EUR 400,000 per bus. CAPEX for the integrated ticketing is based on the investment cost needed for the smart ticketing infrastructure e.g. fares machines, intelligent fare collection systems. OPEX for the bus operator model is based on 2 FTEs in the city administration to work alongside bus operators to administer and monitor the service contract. No OPEX for bus fleet renewal, as this is expected to be delivered through a new bus operator model. OPEX for the integrated ticketing is calculated as 20% of CAPEX.																						
Action link to indicators	State	1	1.1	1.2	1.3	8				**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions																
	Pressure	11	11.2	11.3	12						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																				

Energy & Buildings

5.4. Energy and buildings

5.4.1. Priority challenges and policy gaps

Table 5-7 shows the prioritised challenges for the energy and building sectors, which are an output of the technical assessment reporting and further prioritisation through stakeholder engagement.

The highest priority challenge identified in the city is the low percentage of households connected to district heating, closely followed with use of coal for heating purposes. This situation has a negative impact on both air quality and GHG emissions reduction as the broader energy consumption picture implies that mainly coal and wood are used by households not connected to the district heat network (DHN). High building energy consumption is also of relatively high priority. Electricity consumption by households is high and this has direct bearing on potential measures to reduce GHG emissions.

In addition, relative shortcomings in thermal comfort within buildings is one of the priority challenges, partly as this may hamper the effectiveness of energy efficiency measures but also due to potential reduced resilience to climate change. The lack of planning and development control also exacerbates vulnerability to climate change risks as well as presenting a challenge for addressing air quality and GHG emissions reduction in relation to building use and development of less polluting, lower carbon energy generation measures.

Table 5-7 - Energy, buildings: priority challenges and policy gaps / issues by environmental topic

	Environmental topic		
	2 Air quality	**4 Mitigation of GHG emissions**	**7 Adaptation and resilience**
Key challenges	Moderately polluted air with fluctuations throughout the year and reduced SO_2 concentrations.	High building energy consumption.	Thermal comfort.
	Low percentage of households connected to district heating	Low percentage of households connected to district heating	Urban planning.
	Use of coal for heating purposes.	Use of coal for heating purposes.	
Policy gaps / issues	• Inadequate planning and provision for low polluting energy supply. • Poor control of air emissions and implementation of energy efficiency measures in industry.	• Inadequate planning and provision for low polluting energy supply. • Inadequate urban development planning and control.	• No city level climate resilience and adaptation strategy and action plan. • Climate resilience and adaptation not routinely and robustly considered in urban planning and design.

Priority level shading key:

High priority				Low priority
1	2	3	4	5

5.4.2. Short-term actions

13 actions were developed for Banja Luka's energy and buildings sector in the GCAP process, five of which have been identified as priority actions.

A key focus of the actions is to **rehabilitate and expand the district heat network** to address the main challenge facing the sector. This action will involve pipework replacement and expansion and substation automation and will be complemented by activities including a metering and monitoring programme,

which will be part of the same action. The development of a lower temperature secondary network with increased scope for incorporating heat recovery and renewable heat as fuel sources, in response to the current high use of coal for heating purposes, will also be considered as part of this action.

The addition of the new biomass boilers in the DHN will assist significantly with reducing the DHN GHG emissions by displacing HFO boiler operation. Future expansion of low carbon energy in the DHN should also consider heat pumps, which provide improved air quality and facilitate wider development of low carbon infrastructure.

Two of the prioritised actions are to conduct studies to enhance the evidence base for subsequent actions in the sector, thereby addressing the current inadequate planning response in the city. The first of these studies, and the most holistic, is the **development and adoption of an Energy Efficiency Action Plan** for the city, which will assess energy efficiency and propose a series of targeted energy efficiency improvement measures based on the findings. The second is a detailed **thermal supply network metering and monitoring** study, which will inform the rehabilitation of the district heat network to reduce water and thermal losses with outputs including a GIS network model.

The two other actions are to **implement residential energy efficiency** improvements. The first of these is targeted at building users / home-owners who will be offered access to a range of energy saving measures that have the potential to reduce energy bills, such as wall, pipe and loft insulation, draught proofing of windows and low energy light bulbs. The second seeks to reduce the load on the DHN and free-up capacity for other areas. This will be done by using modern materials to over-clad existing buildings, a relatively simple approach that is quick to implement, to enhance thermal efficiency and improve resistance to rain penetration.

Table 5-8 shows the short-term energy and building actions set against the topic-based strategic objectives and Figure 5-2 summarises the energy and buildings action programme. The additional actions are featured in Appendix C.

Table 5-8 - Energy, buildings: short-term actions and link to strategic objectives

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives			
					Air quality	GHG emissions	Adaptation, Resilience	Soils
					AQ1	GH1	AR1	SL1
PRIORITY ACTIONS								
EN01	**Development and adoption of the Energy Efficiency Action Plan of the City of Banja Luka for the period 2021-2023** • Assessment of the state of energy efficiency in the local self-government unit • Energy efficiency improvement measures	2021-2022	75,000 15,000	Banja Luka City Administration				
EN04	**Improved home energy efficiency – building users taking steps to reduce energy use** • Range of measures offered to tenants and building owners to reduce their bills, such as wall insulation, new windows draught proofing, loft insulation, improving roof coverings, fitting thermostatic radiator valves, hot water cylinder jackets, pipe insulation, cavity wall insulation, low energy light bulbs, etc.	2021-2028	10,000,000 50,000	Residents and Property Owners/Tenants, City Administration (As Programme / Grant Scheme Coordinator)				
EN05	**Improved insulation in residential and public spaces in order to decrease the load of the heat network and free capacities for other areas** • Use modern materials for rapid and simple over-cladding of existing buildings for improved thermal efficiency and improved resistance to rain penetration.	2021-2031	19,500,000 0	Residents and Property Owners/Tenants, Public Institutions, City Administration (As Programme / Grant Scheme Coordinator)				
EN06	**Rehabilitation of district heat network to reduce water losses and improve thermal efficiency - thermal supply network metering and monitoring: Detailed Study** • Reinforcement of monitoring facilities • Develop a GIS network model Study will enable development of separate investment programme of network rehabilitation.	2022-2023	120,000 0	The Company (Joint ownership, main shareholder being City of Banja Luka)				
EN07	**Rehabilitation of district heat network to reduce water losses and to improve thermal efficiency – Pipework replacement, substation automation, network expansion: Detailed Study** • Metering and monitoring programme • Pipework rehabilitation and replacement programme • Potentially develop lower temperature secondary network with increased scope for incorporating heat recovery and	2022-2023	120,000 0	The Company (Joint ownership owners/operators of DHN, main shareholder being City of Banja Luka)				

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives			
					Air quality	GHG emissions	Adaptation, Resilience	Soils
					AQ1	GH1	AR1	SL1
	renewable heat as new heat sources							
ADDITIONAL ACTIONS								
EN02	**Training and capacity building in energy performance assessments, building certifications and compliance tests** • Green building certification assessments and compliance at the design stage	2021-2025	300,000 0	RS Ministry of Spatial Planning, Construction and Ecology and Environmental Protection (supported by the City Administration) and RS Fund for environmental protection and energy efficiency				
EN03	**Develop building energy consumption database and energy reporting for building owners and utility providers** • Set up a data specialist team in the City Administration for energy data collection, collation, analysis and regular updates. • Develop an energy reporting programme and update annually	2021-2026	300,000 60,000	RS Ministry of Spatial Planning, Construction and Ecology and Environmental Protection (supported by the City Administration)				
EN08	**Study to assess active management and improvement of the district heat network energy and fuel sources, and assessment of other energy supplies and infrastructure capacities in the City** • Analyse the sustainability of biomass supply • Perform an additional analysis of biomass supply in case of the expansion of the DH system • Propose best solutions for supplied biomass management • Review of other energy and fuel streams, and the associated distribution infrastructure	2021-2022	60,000 20,000	An Independent assessor, appointed by the City.				
EN09	**District heat network – new low carbon heat sources: Assessment Study** • Conduct assessment study to determine the potential for additional low carbon energy sources that can be integrated into the district heat energy network**, i**ncluding a life cost benefits analysis	2021-2022	300,000 0	The Company (Joint ownership owners/operators of DHN, main shareholder being City of Banja Luka)				

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives			
					Air quality	GHG emissions	Adaptation, Resilience	Soils
					AQ1	GH1	AR1	SL1
EN10	**Study on biogas generation for CHP and sustainable bus fleet** • Assess the opportunity for introducing biogas production at existing and new water treatment works • Assess the opportunity for introducing biogas production from organic and other waste streams • Assess the opportunity for introducing biogas fuelled public buses	2021-2022	50,000 0	Water Utility Company, Public Utility Čistoća AD Banja Luka, Regional Landfill "DEP-OT", City of Banja Luka, The Company (Joint ownership owners/operators of DHN, main shareholder being City of Banja Luka)				
EN11	**Deployment of solar PV energy** • Assess the comparative benefits of and existing hurdles to the deployment of small- and large-scale solar PV • Support the deployment of Solar PV	2021-2023	5,800,000 146,000	Building Owners (supported by the City Administration)				
EN12	**Implement solar thermal hot water (STHW) systems: 200-unit trial** • Installation of small domestic sized packaged STHW units to the roof of residential buildings to allow for continued hot water production. • Climate reports	2021-2024	400,000 20,000	Building Owners(supported by the City Administration)				
EN13	**Development and implementation of a LED Public Lighting Programme** A) Assessment, Programme Development B) Deployment Programme	2021-2022 2021-2024	6,035,000 0	City Administration				

Colour coding of Action link to strategic objective

Strong contribution	Medium contribution	Low contribution	No contribution
3	2	1	0

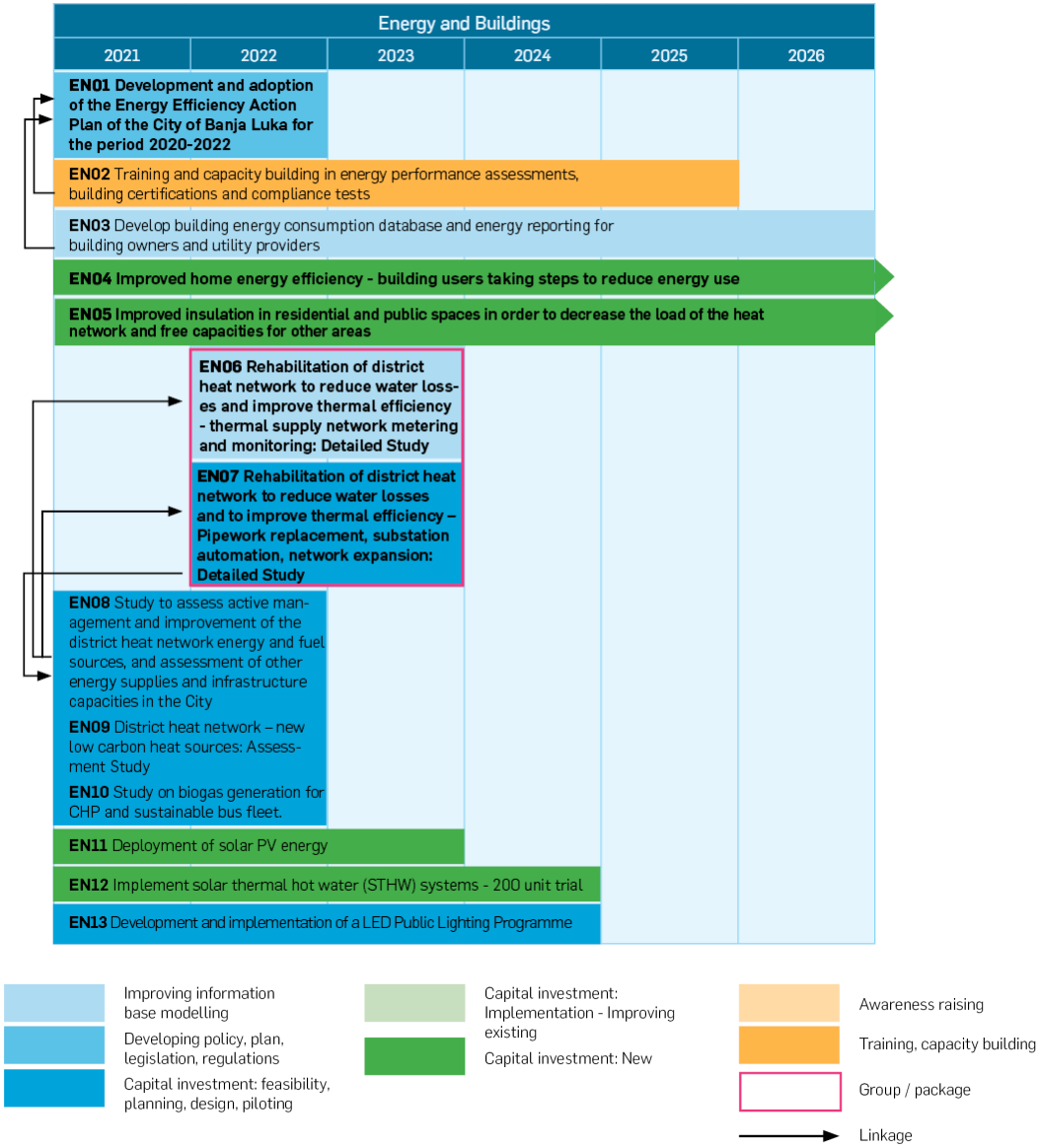


Figure 5-2 - Energy, buildings actions programme

ENERGY AND BUILDINGS ACTION: EN01

Primary action classification: Policy
Secondary action classification: Developing policy, plan, legislation, regulations

Action title: Development and adoption of the Energy Efficiency Action Plan of the City of Banja Luka for the period 2021-2023

According to the Law on Energy Efficiency of RS (Official Gazette of RS, No. 59/13) local self-government units with more than 20.000 inhabitants shall adopt its Energy Efficiency Action Plan that is aligned with the Energy Efficiency Action Plan of RS.
The Action Plans of the local self-government units shall be adopted for a period of three years and shall include:

a) assessment of the state of energy efficiency in the local self-government unit during the period immediately prior to the adoption of the Action Plan,
b) energy efficiency improvement measures in the local self-government unit, including activities on the renovation and maintenance of facilities used by the local self-government unit, its administrative offices, as well as public enterprises and public institutions established by the local self-government unit, activities to improve utilities (public lighting, thermal energy supply, water supply, waste management, etc.) and transport, in order to improve energy efficiency, and other activities to be carried out in the local self-government unit relating to the improvement of energy efficiency,
c) time frame and manner of implementation of these measures, and
d) funding and sources of funding required for the implementation of the measures defined by the Action Plan of the local self-government unit.

The Energy Efficiency Action Plan of the City of Banja Luka for the period 2016 to 2019 was drafted and adopted on 23 June 2016 By the Assembly of Banja Luka. This Action Plan is aligned with the Energy Efficiency Action Plan of RS for the period 2016-2018.
As the Energy Efficiency Action Plan of the City of Banja Luka is adopted for a period of three years, the current will be ending in 2019, it will be necessary to draft and adopt a new one for the period 2021-2023. The new plan shall be aligned with the new Energy Efficiency Action Plan of RS, whilst building on the existing energy efficiency work undertaken in Banja Luka.

Revenue generating: No

Owner: Banja Luka City Administration

Stakeholders: Banja Luka City Administration, public transport company, public utilities companies, Ministry of Spatial Planning, Construction and Ecology and Environmental Protection and Energy Efficiency Fund of the Republika Srpska.

Capex	EUR 75,000	BAM 147,000	**Annual Opex**	EUR 15,000	BAM 29,400	**Implementation Start/End Year**	2021-2022

Notes on cost estimates: Estimate of CAPEX is to develop plan, coordinate stakeholders, train staff, disseminate information, set up monitoring procedures. The OPEX estimate is allocated for ongoing monitoring, review and dissemination of progress of the EEAP. Ongoing coordination and delivery of plan expected within existing City Administration working scope. Where additional focus is deemed beneficial for the delivery of the plan, additional staffing resources may be required.

Action link to indicators										**Action performance**											
	State	1	1.1	1.2	1.3	8	9.2				Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience														
	Pressure	14	14.1	15	16	22	23				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings			Industries	Energy															

| ENERGY AND BUILDINGS ACTION: EN04 | | |

ENERGY AND BUILDINGS ACTION: EN05	
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – new	**Action title:** Improved insulation in residential and public spaces in order to decrease the load of the heat network and free capacities for other areas

Modern materials allow relatively rapid over-cladding of existing buildings. This brings two benefits: improved thermal efficiency and improved resistance to rain penetration. Thick insulation panels can be fixed to the exterior, then sealed with a thin flexible render system which is waterproof. This seals in any existing thermal mass to regulate internal temperatures and reduces the building's energy demands. Windows could be included at the same time or left till a later date. Typical studies show that heat loss through walls can be as much as windows, but sealing the walls has the advantage of sealing gaps around windows and other construction junctions, thus improving air tightness as well. Where replacing existing windows is cost prohibitive, secondary glazing can provide some of the benefits of full double glazing, at considerably lower cost. Also, this measure considers the improvement of roof coverings, which have an impact on energy losses, which indirectly leads to decreased energy consumption with a direct impact on air pollution.

It is important that any buildings that are to be over-clad are assessed to determine the preferred method of cladding, and the interaction of the cladding with the building, beyond the thermal benefit should be fully considered. It is recommended that the insulation programme is split into four main phases as follows:
Phase1 2021: Programme scoping, mapping and establishing priority buildings and preferred methods of insulation. This is to incorporate a review of existing deployed insulation projects.
Phase2 2022-2024: Deployment of insulation to a range of different buildings types and via the different preferred methods of installation, construction methods and materials. Assessment and review of completed insulation projects. Refinement of next phase priority buildings and insulation techniques to inform the next phase.
Phase3 2025-2027: Deployment of insulation to a range of different buildings types and via the different preferred methods of installation as identified in Phase2. Assessment and review of completed insulation projects. Refinement of next phase priority buildings and insulation techniques to inform the next phase.
Phase4 2028-2031: Deployment of insulation to a range of different buildings types and via the different preferred methods of installation as identified in Phase3. Assessment and review of completed insulation projects. Refinement of next phase priority buildings and insulation techniques to inform subsequent insulation programmes.

Revenue generating: Yes

Owner: Residents and Property Owners/Tenants, Public Institutions, City Administration (As Programme / Grant Scheme Coordinator)			**Stakeholders:** City Administration, and Residents – grant scheme				
Capex	EUR 19,500,000	BAM 38,220,000	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2021-2031 Ph1: 2021-2022; Ph2: 2022-2024; Ph3: 2025-2027; Ph4: 2028-2031

Notes on cost estimates: CAPEX: Indicative estimate of EUR 120 per m^2 of wall area, which will vary considerably (e.g. 80-180/m^2) dependent on building type, type and thickness of insulation used, other associated preparatory works, cost of local labour, finish applied, and scale of refurbishment exercise. 2,500 dwellings based on average of EUR 120 / m^2 floor area and average of 65m^2 floor area per dwelling. For OPEX, once installed, OPEX would be no more or potentially reduced from existing building maintenance OPEX.

Action link to indicators	State	1	1.1	1.2	1.3	8	9.2			**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience														
	Pressure	14	14.1	15	15.1	15.2					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings																			

ENERGY AND BUILDINGS ACTION: EN06

Primary action classification: Investment

Secondary action classification: Improving information base, modelling

Action title: Rehabilitation of district heat network to reduce water losses and improve thermal efficiency - thermal supply network metering and monitoring: Detailed Study

According to the document *Rehabilitation and Modernization of the District Heating (DH) System in the City of Banja Luka – Focus on Energy Efficiency, Rapid Response Plan, 2016*, the current district energy network covers an area of 10.7 km^2 in the city and has a primary network of around 45km and around 110km of secondary network (Ref SEAP). The network experiences high losses of both water and heat, neither of which can be properly quantified due to the lack of metering (hydraulic and thermal) across the network.

The *Second National Communication on Climate Change* contains measures and priority actions for reducing CO_2 emissions from the DH sector for the period 2010-2025, which include:

- increasing the capacities of the existing DH system.
- improving the efficiency of the systems by optimising their operations.
- expansion of heating networks.

It is understood that some work has been conducted to start assessing the network status. A key focus area is the introduction of metering and leak detection across the network. This should start with the primary supplies and main trunk pipework and progress to include metering at all the substations, prioritising the largest (estimated) loads first. Policy targets to install heat metering for all users by 2020 have been established; a review of progress towards these targets is recommended at an early stage. It is recommended that any proposed investment is fully coordinated with the existing programme.

The reinforcement of monitoring facilities is the primary objective, as this will best inform targeted investment for remedial rehabilitation works and contribute towards future operational strategy and policy action plans. The resolution of major network issues will not only save energy, creating a more efficient and effective network, but will also result in increased network capacity to supply existing and new users.

To facilitate future monitoring and analysis, it is recommended that a GIS network model is developed. This will support ongoing analysis and also enable the transfer of network characteristics to dedicated district energy modelling software if required to help optimise future operation.

This accurate monitoring of flow and thermal energy throughout the network will enable the development of a targeted package of network rehabilitation, whilst also informing the requirements for future expansion of both the network and thermal supplies. Metering can also contribute to more accurate billing and firming up of future revenue streams, which will in turn support the continued rehabilitation programme.

Revenue generating: No

Owner: The Company (Joint ownership, main shareholder being City of Banja Luka)

Stakeholders: The Company, customers, current and future heat suppliers

Capex	EUR 120,000	BAM 235,200	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2022-2023

Notes on cost estimates: Indicative cost for detailed study. Cost range estimates provided for metering and refurbishment works. These would be refined as an output of the detailed study. All study costs attributed to CAPEX, no OPEX costs assigned. Phase 2 cost indications are Phase 2: EUR 100,000-500,000 / Phase 2 BAM 196,000-980,000.

Action link to indicators	State	1	1.1	1.2	1.3	8			
		Air				Mitigation of GHG emissions			
	Pressure	14	14.1	15	15.1	15.3	16	22	26
		Buildings					Industries	Energy	Water

Action perfor-mance	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

ENERGY AND BUILDINGS ACTION: EN07	
Primary action classification: Investment **Secondary action classification:** Capital investment: feasibility, planning, design, piloting	**Action title:** Rehabilitation of district heat network to reduce water losses and to improve thermal efficiency – Pipework replacement, substation automation, network expansion: Detailed Study

The existing pipework is known to experience high losses of water and heat. Following from a successful metering and monitoring programme a programme of pipework rehabilitation and replacement will be required. The metering will provide accurate insight into the priority areas of work. The results of the recent drone-based thermal survey will also be assessed to help to identify key areas/network sections in need of rehabilitation. In parallel to the pipework replacement programme it is recommended that the substations are automated, enabling the correct controls and flow conditions at the substations to provide an appropriate return temperature to the primary network. This will allow the network to operate more efficiently and effectively and enable greater thermal capacity to be obtained from the pipework.
Any pipework replacement programme will need to consider other planned works in the network and the ongoing provision of heat, especially to vulnerable users. This may restrict the more significant works to the off-heating summer period and may require the provision of temporary heating plant to service dedicated areas of the network. Such factors should be considered in terms of delivery timescales, coordination with other aligned infrastructure works and any potential impact on capital and operational expenditure.
Rehabilitation works are planned as part of the Climate Technology Centre and Network (CTCN) Study and Action Plan conducted in 2016. Any proposed investment will need to be coordinated with the existing action plan.
As part of the rehabilitation works, there may be opportunity to develop lower temperature secondary networks that would have increased scope for incorporating heat recovery and renewable heat as new heat sources.
As regards to the expansion of the DH network and services, the potential new consumers include previously disconnected users and new customers within the existing zones of heat distribution. Expansion, which would include disconnected users, is recommended as the first and priority expansion, followed by new customers within the existing zones of DH network, and then by new customers in zones not covered by DH network. In order to connect this third category of new customers it will be necessary to expand the DH network.
In terms of impacts, rehabilitation of the network will substantially reduce losses, improve efficiency and network thermal capacity, resulting in reduced operational costs and reduction in the required thermal heating plant capacity. As a result, more users can be serviced for lower operational cost. Network reliability will also be improved, incentivising larger connection uptake. The reduced load will also result in increased low carbon benefits from the existing biomass heat supplies, as the low carbon contribution will make up a higher proportion of the delivered energy.

Revenue generating: No

Owner: The Company (Joint ownership owners/operators of DHN, main shareholder being City of Banja Luka)				**Stakeholders:** The Company, customers, current and future heat suppliers, Banja Luka University (Assisting with Coordination of energy targets).			
Capex	EUR 120,000	BAM 235,200	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2022-2023

Notes on cost estimates: Expert opinion, indicative cost for detailed review study and programme development.

Action link to indicators	State	1	1.1	1.2	1.3	8				**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions															
	Pressure	14	14.1	15	15.1	15.3	16	22	26		Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings					Industries	Energy	Water												

Industry

5.5. Industry

5.5.1. Priority challenges and policy gaps

The percentage of industrial wastewater that is treated according to applicable national standards is very low. Only one larger industry company has its own water treatment plant, while other small and medium industrial enterprises either discharge their water into the city sewage system, which has no central treatment plant, or discharge directly into the Vrbas River and its tributary creeks. Energy consumption is also determined to be higher than the benchmark value, indicating that industry is either using old inefficient technology or are not employing energy efficiency measures.

Strategic planning documents include responses to these challenges. Measures related to energy efficient industrial machinery (and energy efficient industrial technologies) are included in the Energy Efficiency Action Plan of the Republika Srpska[23]. There is also a measure related to industrial wastewater treatment / reuse / recycling in the Strategy of Integral Water Management in the Republika Srpska[24]. However, implementation challenges have been observed and existing policies are insufficient to address the current issues. In general, the lack of plans and strategies for this sector at the local level points to an inadequacy in the policy response when considered together with the implementation issues highlighted above.

The industry sector has multiple impacts on the environment, including water, air, soil and biodiversity and ecosystems. In Banja Luka key challenges arise due to the lack of basic pollution control technologies and also pollution prevention measures. There is inadequate provision in Banja Luka for treatment of industrial wastewater, control of air emissions and disposal of solid waste. The industrial sector is generally characterised by high energy consumption and, although indicator data are not available, there are indications that industrial water efficiency is also relatively low. Although policy instruments are in place, including regulations, environmental permitting, inspection and fines, there are implementation challenges in addressing issues of pollution prevention, emissions treatment and resource efficiency. Enhancing policy responses regarding treatment / disposal of industrial emissions and waste requires involvement of higher levels of government.

[23] http://www.banjaluka.rs.ba/wp-content/uploads/2017/07/EF_akcioni_plan.pdf
[24] http://www.vladars.net/sr-SP-Cyrl/Vlada/Ministarstva/mps/Documents/STRATEGIJA%20%20TEKST%20RADNA%20VERZIJA.pdf

Table 5-9 - Industry: priority challenges and policy gaps/ issues by environmental topic

	Environmental topic			
	1 Water resources	**2 Air quality**	**5 Soils**	**6 Biodiversity, ecosystems**
Priority challenges	Water quality in local water bodies fluctuates (it is good in some years and inadequate in others). Inadequate wastewater collection (coverage) and treatment provision.	Moderately polluted air with fluctuations throughout the year and reduced SO_2 concentrations.	Low level of treatment of industrial wastewater.	Lack of treatment of industrial wastewater.
Policy gaps / issues	• Water savings are not encouraged. • Unsatisfactory level of industrial wastewater treatment.	• Poor control of air emissions and implementation of energy efficiency measures in industry.	• Industrial heavy metals emissions may cause soil quality issues. • Uncontrolled dumping of solid waste.	• Lack of regulation and treatment of industrial emissions and waste. • Uncontrolled dumping of solid waste.

Priority level shading key:

High priority 1	2	3	4	Low priority 5

Table 5-9 presents the prioritised challenges for industry based on prioritisation of key environmental topics, together with key policy gaps / issues. The highest

priority challenges relate to industrial emissions to water and air which are identified as one of the contributors to deteriorated water quality in Banja Luka in some years and, to a lesser extent, i air quality which is already moderately polluted. Causally linked to these are priority challenges of inadequate treatment of industrial wastewater and disposal of industrial waste, which also present issues in terms of negative effects on soils, biodiversity and ecosystems in addition to water quality.

5.5.2. Short-term actions

One of the three actions developed for the industry sector was prioritised. Table 5-10 overleaf presents the short-term actions set against the strategic objectives developed for the sector.

The first action is focused on building capacities within the City Administration by **developing a training programme and guidelines for environmental permitting** to support energy and material efficiency improvements and cleaner production in the city's industrial sector. This will help City officials to enhance the quality of environmental permitting instruments and their enforcement.

The third action comprises a study that will inform future action, specifically to **support the transition from a linear to circular economy**. This strategic study will map resources to inform a review of how materials can be kept in use for as long as possible and their economic value maximised. The study will then identify both enabling factors and options for urban-industrial symbiosis. The study will be collaborative, engaging both businesses and citizens, to reflect the fact that industrial waste management (along with other GCAP priorities such as wastewater treatment and energy efficiency) are not only under the jurisdiction of the City but also private business owners. This is also the rationale for the second of the three industry actions, **capacity building to implement energy and material efficiency and cleaner production measures.** This will be a comprehensive training programme designed for business owners with the aim of air, water, soil and biodiversity improvements being realised by the implementation of measures promoted by the training.

Figure 5-3 sets out the programme for implementation of these three actions.

Table 5-10 - Industry: short-term actions and link to strategic objectives

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR	Owner	Strategic objectives				
					Water resources	Air quality	GHG emissions	Soils	Biodiversity, ecosystems
					WR2	AQ1	GH1	SL1	BE2
PRIORITY ACTIONS									
IN01	**Capacity building through the City Administration to enhance the quality of environmental permitting instruments to support energy and material efficiency and cleaner production in industry** • Build capacities of City Administration • Develop a comprehensive training programme and guidelines for environmental permitting for those industries/businesses that are under City jurisdiction	2021-2022	25,000 0	Banja Luka City Administration					
ADDITIONAL ACTIONS									
IN02	**Raise capacities of the city industry to implement energy and material efficiency and cleaner production measures** • Develop a comprehensive training programme for industry	2021-2023	100,000 0	Banja Luka City Administration					
IN03	**Incentives for businesses that are advanced in application of ecological standards in the circular economy.** • Development of a strategic study on the City's transition to a circular economy, mapping the resources and identifying enabling factors and options for urban-industrial symbiosis	2022-2023	150,000 0	Banja Luka City Administration					

Colour coding of Action link to strategic objective

Strong contribution	Medium contribution	Low contribution	No contribution
3	2	1	0

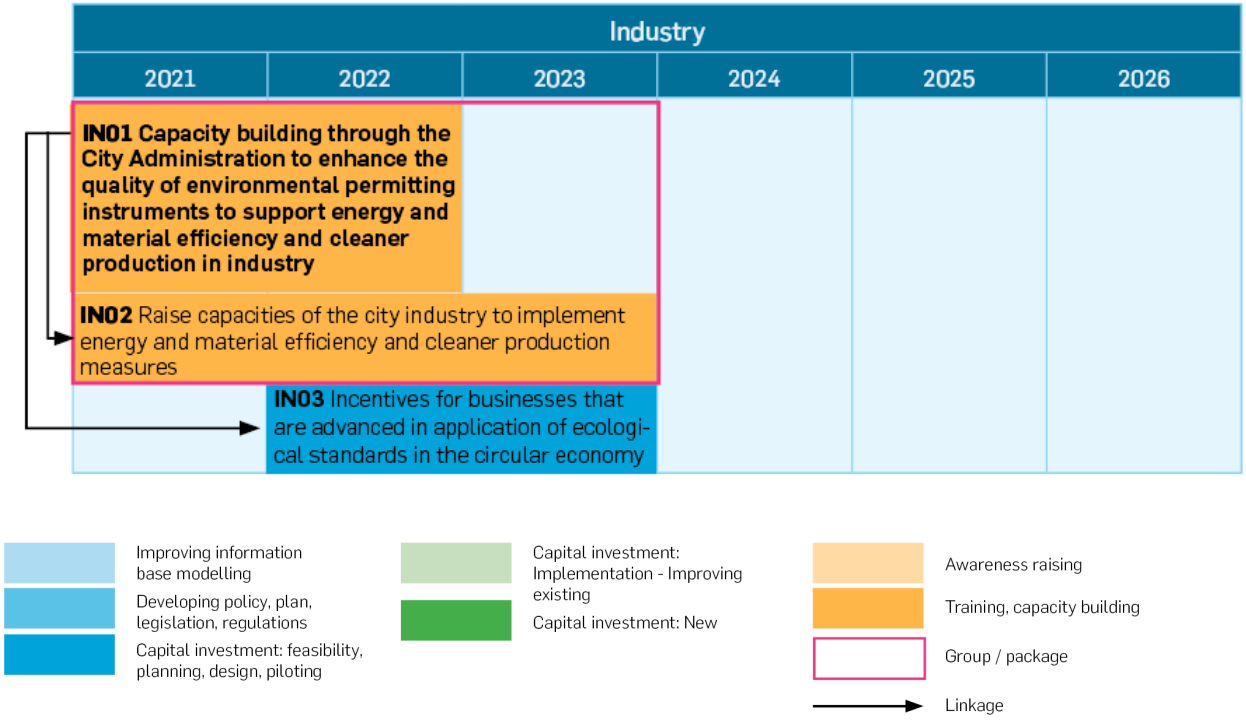


Figure 5-3 - Industry actions programme

| INDUSTRY ACTION: IN01 | | |

Water

5.6. Water resources

5.6.1. Priority challenges and policy gaps

The available data indicate that there are issues with surface water quality in Banja Luka in some years, where the BOD concentration values are not satisfactory and with overall increasing levels of BOD above benchmarked values in the river.

Currently, only a very small percentage of residential, commercial and industrial wastewater in the city is treated according to applicable national standards. Almost all city wastewater is discharged directly to surface watercourses. According to the Spatial Plan of the City of Banja Luka, a new wastewater treatment plant is planned in the northern part of the urban area of Banja Luka.

Current water consumption per capita in Banja Luka is lower than the benchmarked value but has a trend of growth over the last four years. Non-revenue water also shows an increasing trend over the same period and is already moderately high. Although these trends indicate increasing pressure on availability of potable water, water supply in the city is not currently an issue. No awareness campaigns for water saving/reuse are recorded.

Banja Luka is exposed to flooding of the Vrbas River and its tributaries, with a major event in 2014, and vulnerability to flood risk and lack of resilience remains an issue.

In terms of policy responses, measures related to water resources, wastewater collection and treatment systems and adaptation and resilience to natural disasters can be found in the Spatial Plan of the City of Banja Luka, Development Strategy of the City of Banja Luka and Plan of Capital Investments 2018-2020. However, these measures are considered insufficient in relation to the issues to be addressed. The timing of implementation of planned investments and the availability of the associated resources also present key issues. There is also a lack of regulation of wastewater billing.

Table 5-11 presents the prioritised challenges for water resources based on prioritisation of key environmental topics, together with key policy gaps / issues.

Table 5-11 - Water: priority challenges and policy gaps/ issues by environmental topic

	Environmental topic			
	1 Water Resources	**3 Green space**	**6 Biodiversity, Ecosystems**	**7 Adaptation, Resilience**
Priority challenges	Inadequate wastewater collection (coverage) and treatment provision.	Limited public green spaces.	Lack of treatment of industrial and municipal wastewater.	Insufficient flood risk management and extreme events.
	Water quality in local water bodies fluctuates (it is good in some years and inadequate in others).			Water resource efficiency.
	Inadequate water supply network provision – losses and coverage.			
Policy gaps / issues	• Projects only in the planning stage. • Uncertainty regarding availability of associated required investment resources. • Water savings are not encouraged. • Unsatisfactory level of industrial wastewater treatment.	• Lack of regulation and control of urban development. • Lack of integration of land use planning, transport planning and utility infrastructure planning.	• Lack of regulation and control of urban development . • Lack of regulation and treatment of industrial emissions and waste.	• No city level climate resilience and adaptation strategy and action plan • Climate resilience and adaptation not routinely and robustly considered in urban planning and design.

Priority level shading key:

High priority 1	2	3	4	Low priority 5

In general, the water and wastewater sectors show moderate performance. Low water quality in rivers of Banja Luka during some years is directly linked to insufficient sanitation facilities and lack of municipal wastewater treatment, with virtually all city wastewater directly discharged to surface water bodies. This forms the highest priority challenge for Banja Luka.

Inadequate water quality identified during some years directly impacts biodiversity and ecosystems, especially the aquatic ecosystems of the Vrbas River and its tributaries, but also the surrounding ecosystems that are dependent on the Vrbas and its tributaries. It may also impact on human health and the economic resource value of the river.

Consumption of water and discharge of untreated wastewater also have negative impacts on green spaces, where lack of regulation and control of urban development puts pressure on existing infrastructure, or where development occurs without adequate water and sanitation infrastructure.

Insufficient flood risk management and responding to extreme events also represent an important challenge for the city.

5.6.2. Short-term actions

Seven of the 12 actions developed for the water resources sector have been prioritised. These are presented in Table 5-12 alongside their contribution towards the strategic objectives developed for the sector. A programme for their implementation is provided in Figure 5-4. The additional actions are featured in Appendix C.

Three of these seven priority actions have been devised to inform subsequent actions, as cost-effective investment into required infrastructure cannot be done without the provision of enhanced baseline data and adequate planning instruments and tools that will enable improvements in performance, management and planning of the water and wastewater systems. One of these three actions is to **modernise GIS data systems for water supply and wastewater networks, assets and customer management.** This will result in the production of a central GIS inventory database that will be used to identify data gaps regarding asset condition and performance in the sector. This reflects the fact that the prioritisation of key challenges indicated that key actions should be directed to development of water and wastewater infrastructure and wastewater treatment works. The second study is for **wastewater treatment works construction,** the output of which will include a strategy for the treatment and use of sludges and biosolids. The third study will be for **sustainable drainage systems (SuDS) and decentralised sewage treatment facilities**. This will inform subsequent activities in the sector by potentially reducing the investment cost in underground sewers and helping to meet the requirements for flood risk reduction. Another action will build on the findings of this study by **preparing designs for a wastewater treatment plant.** The construction of a large centralised plant is likely to be the most cost-effective solution to the current unsatisfactory level of wastewater treatment.

The wastewater treatment plant will be accompanied by **wastewater network construction,** an action that will see the existing network extended and refurbished to help improve public health as well as the health of the river ecosystem, reduce flood risk and improve the urban environment. The wastewater collection network will also have to be adapted to deliver the wastewater to the treatment works location. The other two actions will focus on **enhancing the existing water supply network**. One will be targeted at maintaining the existing water supply system to reduce water losses, specifically to improve the reliability of water supply to customers and introducing pressure management systems to reduce leakage. The second will be to increase coverage of the network by developing a new water supply network to allow the entire city population to be connected to the public water supply.

Table 5-12 - Water resources: short-term actions and link to strategic objectives

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives				
					Water resources		Air quality	Biodiversity and ecosystems	
					WR1	WR2	AQ1	BE1	BE2
PRIORITY ACTIONS									
WR01	**Modernisation of GIS data systems for water supply and wastewater networks, assets and customer management** • Prepare a GIS central inventory database • Identify data gaps on asset condition and performance	2021-2023	400,000 10,000	The utility company 'Vodovod Banja Luka'					
WR03	**Sustainable Drainage Systems (SuDS) and Decentralised Sewage Treatment Study** • Can help to meet the requirements for flood risk reduction • Potentially reduce the investment cost in underground sewers	2021 - 2023	50,000 0	Banja Luka City Administration					
WR06	**Prepare designs for Wastewater Treatment Plant** • Cost-effective solution: a large centralised plant to treat most of the city wastewater in one location • Construction at locations where the sewage can be efficiently conveyed for treatment	2022 - 2023	300,000 0	The utility company 'Vodovod Banja Luka'					
WR07	**Repair and improve the existing water supply system to reduce water losses** • Improvement of the reliability of water supply to customers • Installation of pressure management systems to reduce leakage	2021-2031	5,000,000 to 30,000,000 100,000 to 600,000	The utility company 'Vodovod Banja Luka'					
WR08	**Develop new water supply network to allow connection of entire city population to the public water supply** • Expand the public water supply network to increase coverage	2023-2030	20,000,000 to 40,000,000 400,000 to 800,000	Banja Luka City Administration					
WR09	**Wastewater network construction: extension, refurbishment and new build** • Provide conveyance of wastewater to a new treatment works • Help improve public health, health of river ecosystem, reduce flood risk and improve the urban environment	2021 - 2031	5,000,000 to 30,000,000 180,000 to 680,000	Banja Luka City Administration The utility company 'Vodovod Banja Luka'.					
WR10	**Wastewater Treatment Works construction**	2023-2027	50,000,000 1,800,000	Banja Luka City Administration					

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives				
					Water resources		Air quality	Biodiversity and ecosystems	
					WR1	WR2	AQ1	BE1	BE2
ADDITIONAL ACTIONS									
WR02	**District metering, asset surveys and modelling of water and wastewater networks** • Install district meters at strategic points in the supply network • Include surveys of water quality	2021-2023	500,000 20,000	The utility company 'Vodovod Banja Luka'					
WR04	**Study into water company investment financing options and capacity building** • Review the setup and business models of the water supply and wastewater company • Develop procurement processes for the letting and supervision of contracting for the investments	2021 - 2022	200,000 0	Banja Luka City Administration					
WR05	**Development of water and wastewater network action plans** • Prepare costed strategies for each district to reduce NRW • Develop a costed plan for the rehabilitation and extension of the wastewater collection network	2021-2023	350,000 0	The utility company 'Vodovod Banja Luka'					
WR11	**Pilot of Sustainable Drainage Systems (SuDS) construction** • Utilise features incorporated to buildings and urban spaces as sustainable drainage system solutions • Re-use of stormwater and effluents for urban irrigation	2023-2031	80,000 to 500,000 10,000 to 60,000	Banja Luka City Administration					
WR12	**Study into Industrial wastewater assessment, regulation and treatment investments** • Formulate regulations regarding industrial discharges to sewers • Review of all industrial discharges in the city	2021-2023	150,000 10,000	Banja Luka City Administration					

Colour coding of Action link to strategic objective

Strong contribution	Medium contribution	Low contribution	No contribution
3	2	1	0

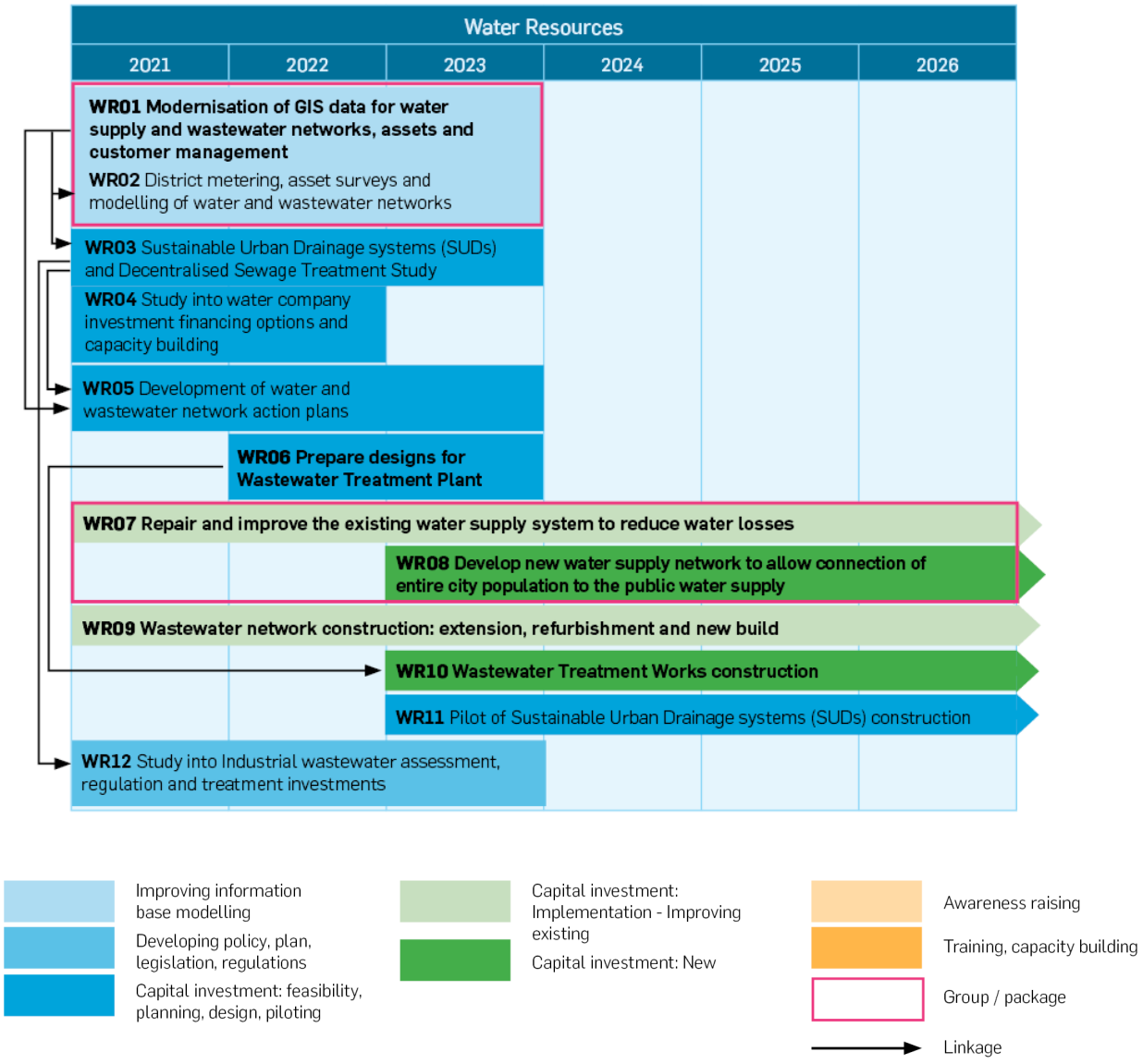


Figure 5-4 - Water actions programme

WATER RESOURCES ACTION: WR01	
Primary action classification: Investment **Secondary action classification:** Improving information base, modelling	**Action title:** Modernisation of GIS data systems for water supply and wastewater networks, assets and customer management

Records of the Banja Luka water utility assets, water and wastewater, are incomplete and not held in a fully structured GIS database system. Records of current and potential customers could also be updated. Coupled with tools for analysing the data and programmes of collecting missing data and information on asset condition and performance it will be much easier to develop feasible and efficient action plans for improving the utility performance and revenues.

Prepare a GIS central inventory database collating existing information. Identifying and assessing condition and performance of each component of the water supply and wastewater systems. Cover water resources (from wells and intakes), conveyance to treatment and disinfection systems, condition of water treatment systems, the distribution network, pump stations and service reservoirs to the connection to commercial or residential customers. Cover wastewater and stormwater sewers, manholes, overflows to the rivers, pumping stations, septic tanks and outfalls to the river.

Link to water supply customer and billing management systems.

Identify data gaps on asset condition and performance. Set up basis of asset management systems for proactive asset maintenance activities. Identify additional information to be collected through surveys and monitoring under WR02.

As 'Vodovod Banja Luka' will have responsibility for both the water supply and the wastewater networks and treatment plants the development of joint water and wastewater asset management systems is recommended. The development of the customer management system will assist in improvement of revenue collection and the ongoing financial viability of the utility company.

System will be developed with the assistance of international experts and using industry standard software. Local staff will be trained to support the initial development and be the long-term operators and maintainers of the system. Consider where possible joining the water GIS and the skills and human resources to develop it with other city management GIS systems such as for Land Use, Transport, energy etc. as part of SMART city management system.

Revenue generating: No

Owner: The utility company 'Vodovod Banja Luka'.				**Stakeholders:** Customers			
Capex	EUR 400,000	BAM 784,000	**Annual Opex**	EUR 10,000	BAM 19,600	**Implementation Start/End Year**	2021-2023

Notes on cost estimates: Estimate of cost of expert labour commissioned through international tenders, plus software costs (EUR tens of thousands) and local staff costs. Also include training and capacity building for local staff.

Action link to indicators										**Action performance**											
	State	2 Waterbodies	2.1								Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	20 Industries	26	27	28.1 Water						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

WATER RESOURCES ACTION: WR03	
Primary action classification: Policy	**Action title:** Sustainable Drainage Systems (SuDS) and Decentralised Sewage Treatment Study
Secondary action classification: Capital investment: feasibility, planning, design, piloting	

The climate of Banja Luka has a reasonable level of rainfall spread quite evenly through the year, thus not presenting a major challenge to water resources management. However, there will still be advantages in being able to utilise green infrastructure as part of the urban fabric of the city and to help to reduce flood risks by attenuating storm water run-off. It is also necessary to reduce cross connections between the foul and the stormwater drainage systems. SuDS solutions utilising features incorporated to buildings and urban spaces can both reduce the impact of localised pluvial flooding during an intense rainfall event and also reduce the peak load passing to the sewer system.
Where possible, stormwater and effluents should be re-used for urban irrigation in preference to use of the fresh water supply. This may be done by the integration of water storage features in the urban landscape. These may be surface water storage, underground tanks or utilising aquifer recharge if appropriate geological conditions exist.
SuDS options should be assessed for the city. These can help to meet the requirements for flood risk reduction and potentially reduce the investment cost in underground sewers. Nature based drainage solutions will also enhance the green landscape of the city and provide secondary benefits in terms of air quality, scenery, microclimate, rainwater re-use, water quality improvement. Normal storm water drainage and SuDS solutions have significant interaction with highway drainage requirements. The regulations and financing related to roads should be considered in proposed works. The drainage systems may also be more efficient if the foul wastewater is treated in smaller district treatment plants, a decentralised model, with package plants treating the wastewater and then re-using the water for toilet flushing and irrigation, especially in combination with nature-based infrastructure solutions. This is normally most efficient for new build districts of the city. The options for this should be considered in the study and its implications for the wastewater network design.
Heat pumps can form a low carbon and efficient means of heating buildings. These can extract heat from low grade heat sources such as sewage, which is normally much warmer than background temperatures. Special sewers with provision of additional channels for heat exchanger pipes can be used to efficiently enable the extraction of spare heat from the sewage. These are best fitted at time of sewers first construction and then linked to district heating schemes. This study should include provision for training and capacity building so that the those responsible for wastewater and water resources planning in the city can learn of the findings and how they may be incorporated to their business. In particular how these findings may incorporate to the Action plans for water and wastewater. Where the possibility for the piloting of SuDS solutions in catchments are identified these may be piloted under WR11 with their impacts on the wider network considered in the WR05 action plans. Decentralised treatment solutions would be designed in WR06 and constructed under WR10. Implementation of SuDs is complex and cross sector, this study should also coordinate with actions under the green spaces, energy, biodiversity and land use, transport and climate change / resilience sectors.

Revenue generating: No

Owner: Banja Luka City Administration	**Stakeholders:** Banja Luka City Administration, Utility Company 'Vodovod Banja Luka', Public Institution "Vode Srpske', Customers/citizens

Capex	EUR 50,000	BAM 98,000	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2021-2023

Notes on cost estimates: Estimate cost of expert labour to prepare studies and advise utility company + local government (EUR 80,000-200,000). Training + capacity building (EUR 20,000-50,000).

Action link to indicators	State	2	2.1							**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Waterbodies																			
	Pressure	20	27	28	28.1	28.2					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries	Water																		

WATER RESOURCES ACTION: WR06

Primary action classification: Investment
Secondary action classification: Capital investment: feasibility, planning, design, piloting

Action title: Prepare designs for Wastewater Treatment Plant

There is currently no wastewater treatment plant in Banja Luka. Based on the findings of the action plan in WR05 one or more treatment plants will need to be designed. Based on the findings of the WR04 study on financing of water and wastewater investments in Banja Luka a procurement strategy of direct contracting or PPP models will be followed and the designs, outline or detailed, prepared as appropriate.
WWTW should be constructed at locations where the sewage can be efficiently conveyed for treatment and sufficient suitable land acquired. This may be a one centralised location or may be a number of smaller works distributed around the city. A site for a centralised treatment works at "Delibasino Selo" has been identified in the development plan but not yet purchased by the water company. It is the far side of the river to most of the city. In addition to the sewers up to 17 Pumping stations would be required around the network and a siphon under the River Vrbas with pumping. The satellite town of Česma will require a separate smaller treatment plant according to the development plan. Alternatively, package treatment plants could be implemented in each district of the city with the effluent being re-used locally or discharged to the river. These treatment plants could form a link in a city-wide circular economy solution.
The WR05 Action plans and WR03 SuDS Study will inform the treatment works design strategy.
The river will need to meet class II upstream and Class III downstream of the city. This will require advanced secondary treatment with nitrification (for low Ammonia) and most likely P nutrient removal. The receiving waters are not thought to be part of a nitrogen sensitive zone and so denitrification N removal is not required.
The WWTWs will generate sludge and biosolids. A strategy should be formulated for the treatment and gainful use of these or for their disposal. Sludge biosolids can form part of a circular industrial economy combined with the waste management strategy and be used in agriculture.
Heat from sewage may be recovered for district heating. Taking the heat from the warm effluent prior to discharge to the river can also improve the ecosystem of the river by maintaining a more natural temperature profile as well as providing energy to the citizens.
Opportunities for the use of the effluent in industrial processes (such as cooling water) or in urban agriculture should be explored during the feasibility stage.
Though the most likely cost-effective solution will be a large centralised plant to treat most of the city wastewater in one location, during the feasibility and planning stage the possibility of utilising a decentralised solution should be explored.
The nature of the design and who will complete it will depend on the procurement model used.

Revenue generating: Yes

Owner: The utility company 'Vodovod Banja Luka'.

Stakeholders: Banja Luka City Administration, Utility Company 'Vodovod Banja Luka', Customers/citizens

Capex	EUR 300,000	BAM 588,000	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2022-2023

Notes on cost estimates: Estimate of cost of international experts to support local staff prepare and cost the plans and designs and hold stakeholder consultation workshops on the outline and final plans.

Action link to indicators										**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	State	2	2.1																		
		Water bodies																			
	Pressure	20	27								Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries	Water																		

WATER RESOURCES ACTION: WR07																					
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – improving existing										**Action title:** Repair and improve the existing water supply system to reduce water losses											
According to the Development Strategy of Banja Luka, 2018-2027, the current water supply network length is 830km, and total storage in the system (tank space) is 36.6Ml/d. 20% of the water supply network has been recently built, but those older parts of the network experience >50% losses. Overall, non-revenue water (NRW) was reported to be 37% in 2016 (revised to 53% in 2018, of which 44% is physical losses and the rest is unbilled losses[25]). Based on the 2016 value this was classified as a 'yellow' indicator in the GCAP indicators database. Addressing these losses through maintenance actions to repair the existing older parts of water supply network (where losses >50%) is considered to be an action that can be addressed in the short/medium term. This may involve a 'find and fix' leakage management regime, but in many areas will likely require following the water network action plan for mains replacement as developed in WR05 based in the GIS and surveys in WR01 and WR02. Reducing losses from the existing water supply network will reduce the frequency of low-pressure incidents and interruptions to water supply. It will also provide environmental (including carbon) and financial benefits associated with reducing abstraction, treatment and distribution of water. It will also reduce disruption to transport networks through unplanned repairs in critical locations. Given abundant local water resources and sufficient supply capacity demand side management – public programmes to reduce water usage or metering and financial incentives to limit use - are not seen as a priority or necessity. The repair of aging and leaking pipes will also improve the reliability of supply to customers by reducing more serious pipe bursts which may result in interruptions to supply and disruption to transport. Targets for NRW should be to reduce from the 2018 level of 53% to 30% in 5 years and 20% in 15 years. Ultimately an "economic level of leakage" should be targeted that is considered reasonable in terms of overall sustainability (generally in the 10 to 20% range). This action may also include installation of pressure management systems to reduce leakage and strain on the water supply assets.																				
Revenue generating: Yes																					
Owner: The utility company 'Vodovod Banja Luka'.										**Stakeholders:** City Administration, Utility Company 'Vodovod Banja Luka', Customers/citizens											
Capex	EUR 5,000,000 to 30,000,000	BAM 9,800,000 to 58,800,000	**Annual Opex**	EUR 100,000 to 600,000	BAM 196,000 to 1,176,000	**Implementation Start/End Year**	2021-2031														
Notes on cost estimates: CAPEX covers explicit modelling and summing overall years with CAPEX expenditures. Cost of tendering, letting and supervising contracts to contractors who would undertake the work. The 80% of the existing network from where it is suggested the majority of NRW comes from equates to approximately 664km of water main. If 2% of this is replaced per year, this would equate to 13.28km per year. Applying an estimated cost of 200 Euros per m results in an estimated cost of 2.66 million Euros per year on an ongoing basis. However, mains laying costs will vary greatly based on soil conditions, labour and materials costs, and diameter of mains, plus the length of main required is highly uncertain at this stage so this cost represents a very high-level estimate only. For illustration, reconstruction of 11 km of water network in Banja Luka in recent years cost EUR 3,000.000. Estimated CAPEX cost of EUR 30m, with a range down to EUR 5m.The higher estimate is based on the assumptions above. The lower estimate would be expected to have reduced outcomes for NRW reduction. The OPEX is estimated as 2 % of Capex for supervision of contracts and maintenance of additional assets.																					
Action link to indicators	State									**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	26 Water									Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

[25]EBRD Banja Luka water project, 2019.

WATER RESOURCES ACTION: WR08																					
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – new										**Action title:** Develop new water supply network to allow connection of entire city population to the public water supply											
The public water supply system currently serves approximately 63% of the city's population, with 34% using water from local plumbing systems and 3% using their own sources/wells. To expand the public water supply network to serve the 37% of population not currently served by it, it is estimated that an additional approx. 300km of main may be required (37% of the current 830km of main), although this length will be highly dependent on the location of the unconnected population, i.e. whether customers can be connected to existing mains running near their homes or whether they will require new lengths of main to reach them. This action involves increasing public water supply coverage to these customers in accordance with the action plans produced in WR05. Connection of the entire city's population to the public water supply network would ensure that high quality drinking water is available to all, providing health benefits, and will also increase revenue for the water company for both water and wastewater																				
Revenue generating: Yes																					
Owner: Banja Luka City Administration										**Stakeholders:** Banja Luka City Administration, Utility Company 'Vodovod Banja Luka', roads authorities, Customers/citizens, contractors											
Capex	EUR 20,000,000 to 40,000,000	BAM 39,200,000 to 78,400,000		**Annual Opex**	EUR 400,000 to 800,000	BAM 784,000 to 1,568,000		**Implementation Start/End Year**	2023-2030												
Notes on cost estimates: CAPEX covers explicit modelling and summing overall years with CAPEX expenditures. Cost of tendering, letting and supervising contracts to contractors who would undertake the work. Applying an estimate of 200 Euros per m of mains laid to the approximately 300km of additional mains required under this option results in a total estimated cost of 60 million Euros. However, mains laying costs will vary greatly based on soil conditions, labour and materials costs, and diameter of mains, plus the length of main required is highly uncertain at this stage so this cost represents a very high-level estimate only. Total estimated CAPEX cost of EUR 40m, with a range down to EUR 20m. The higher estimate is based on the assumptions above. The lower estimate would be expected to require a cost benefit analysis to target the lowest cost to connect properties only and so achieve close to the target number of connections and revenue increases at minimum cost. The OPEX is estimated as 2% of Capex for supervision of contracts and maintenance of additional assets.																					
Action link to indicators	State										**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	26 Water										Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

WATER RESOURCES ACTION: WR09

Primary action classification: Investment
Secondary action classification: Capital investment: implementation – improving existing

Action title: Wastewater network construction: extension, refurbishment and new build

The starting situation was older combined sewers in the centre of the city with suburban areas served by septic tanks. In more recent decades, separate storm and foul sewers have been installed in some areas. All drains direct to the river. There is no centralised wastewater treatment. Conveyance of wastewater to a new treatment works and reduction of flood risks will improve the urban environment and the health of the river ecosystem enabling many other urban improvements that will support greater economic growth and enhance property values. Human health risks due to contact with wastewater will be reduced. The septic tanks and private treatment systems would not meet modern WFD / UWWTD standards. For a town of the scale of Banja Luka, 185,000 population equivalents, a centralised wastewater treatment system is likely to be most cost effective and most likely to meet required environmental standards. Decentralised wastewater treatment with many smaller package type treatments works in each district of the city are a possible alternative and could help with allowing localised recovery and re-use of wastewater effluent and so reduce demand on the water supply network. A decentralised network would also reduce the required investment in interceptor and collector sewers and pumping stations to convey the sewage to the more distant central works. However, the cost advantages of this would be off-set by the higher costs per unit of treatment of multiple smaller plants, the site acquisition issues and the higher operation and maintenance costs. Also, as Banja Luka has a climate with abundant rainfall spread evenly through the year there are fewer pressing requirements for water resources saving. Fully decentralised solutions have not been considered in the cost estimates below, but these could be looked at in the initial feasibility stages of a comprehensive water and wastewater management review. Based on notes in the spatial and development plans for Banja Luka some 17 pumping stations will be required in the catchment to convey the flows through the different catchments to the treatment works location. Costs for these are included in the overall cost estimate for the Network improvements. In addition, a large pumping station and river crossing will be required if the WWTW is to be located at the "Delibasino Selo" site. Specific cost estimates have been prepared for this. According to the development plan for Banja Luka the catchment of the suburban district of Česma on the far side of the river would be difficult to connect to the centralised treatment works and so a separate small WWTW would be required for that area. Costs for this have not been estimated as a separate item. In some areas the sewers and storm drains are below capacity for storm drainage with spillages and flooding in severe storm conditions. The extent and severity of this is not quantified in available documentation. The digital asset and modelling exercises in WR01 and WR02 can quantify this. A combination of increased sewer capacity, improved sewer overflows and possibly storm water storage tanks in the sewer system will be required to cope with the more severe storms. Sustainable Drainage System features incorporated to buildings and urban spaces can also reduce the load on the sewers and offset some of the requirements for additional investment to be identified in WR05. However, under the more severe storm conditions hard grey engineering solutions are required in addition to green infrastructure to ensure protection against flood risks.

Revenue generating: Yes

Owner: Banja Luka City Administration. The utility company 'Vodovod Banja Luka'.

Stakeholders: Banja Luka City Administration, Utility Company 'Vodovod Banja Luka', Public Institution "Vode Srpske', roads authorities, contractors, customers/citizens.

Capex	EUR 5,000,000 to 30,000,000	BAM 9,800,000 to 58,800,000	**Annual Opex**	EUR 180,000 to 680,000	BAM 352,800 to 1,332,800	**Implementation Start/End Year**	2021-2031

Notes on cost estimates: CAPEX covers explicit modelling and summing overall years with CAPEX expenditures. Cost of tendering, letting and supervising contracts to contractors who would undertake the work. Costs estimate Based on "Compliance Costs of the Urban Wastewater Treatment Directive", European Commission DG Environment, Sept 2010, COWI. For Collection system, assume additional sewerage requirement is roughly estimated at 40,000 pe at EUR 811 per pe, assume 20% materials 80% local contracts and prices 52% of Euro norm for civils contracts. CPI 2008 to 2018 Denmark factor 1.15. Gives cost of EUR 20 million. For the umping station across Vrbas assume 185,000 pe, pump and siphon only, estimated cost EUR 40 per pe at 2008 DK price. Of cost 35% materials at Eurowide prices, 65% local civils at 52% of Eurowide cost (EUROSTAT). CPI 2008 to 2018 Denmark factor 1.15. Total cost of pumping station = EUR 6 million. Gives total cost EUR 26 million plus land acquisition costs. Also need network for Cesma district: cost estimate EUR 4 million. Total estimated CAPEX cost of EUR 30m, with range down to EUR 5m.The higher estimate is based on the assumptions above. The lower estimate would be expected to require prioritising connection of existing sewers to new WWTW site via an interceptor along the river, with other benefits (extended connections, improved flood protection, etc) expected to be reduced. The OPEX is estimated for network and O&M of pump station based on 2% of capital cost (higher CAPEX estimate) of EUR 600,000 plus 5 kWh/pe for electricity at EUR 0.0856/kWh (Eurostat) for 185,000 pe = EUR 80,000. Total OPEX of EUR 680,000 per year but would take many years to rise to this level as the system is built, so anticipated to be less EUR 200,000 until WWTW is commissioned in 2025.

Action link to indicators	State	2	2.1	7	9.2					**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Water bodies		Biodiversity and ecosystems	Adaptation and resilience																
	Pressure	20	27	28.1							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries		Water																	

WATER RESOURCES ACTION: WR10

Primary action classification: Investment
Secondary action classification: Capital investment: implementation – new

Action title: Wastewater Treatment Works construction

Construct WWTW at locations where the sewage can be efficiently conveyed for treatment and sufficient suitable land acquired. This will improve water quality in River, comply with EU UWWTD and WFD, enhance the value of development along river owing to the improved urban environment, and increase biodiversity and ecosystem health.
The river will need to meet class II upstream and Class III downstream of the city. This will require advanced secondary treatment with nitrification (for low Ammonia) and most likely P nutrient removal. The receiving waters are not thought to be part of a nitrogen sensitive zone and so denitrification N removal is not required. A site for the main treatment works "Delibasino Selo" has been identified in the development plan but not yet purchased by the water company. It is the far side of the river to most of the city. In addition to the sewers up to 17 Pumping stations will be required around the network and a siphon under the River Vrbas with pumping. The satellite town of Česma will require a separate smaller treatment plant according to the development plan. The WWTWs will generate sludge and biosolids. A strategy should be formulated for the treatment and gainful use of these or for their disposal. Sludge biosolids can form part of a circular industrial economy combined with the waste management strategy and be used in agriculture. Initially assume WWTW design includes just basic sludge management dewatering and stabilisation ready for transport to land or advanced processing.
Heat from sewage may be recovered for district heating. Taking the heat from the warm effluent prior to discharge to the river can also improve the ecosystem of the river by maintaining a more natural temperature profile as well as providing energy to the citizens. Opportunities for the use of the effluent in industrial processes (such as cooling water) or in urban agriculture should be explored during the feasibility stage. Though the most likely cost-effective solution will be a large centralised plant to treat most of the city wastewater in one location, during the feasibility and planning stage the possibility of utilising a decentralised solution should be explored. Package treatment plants could be implemented in each district of the city with the effluent being re-used locally or discharged to the river. These treatment plants could form a link in a city-wide circular economy solution. Severe storm conditions hard grey engineering solutions are required in addition to green infrastructure to ensure protection against flood risks.

Revenue generating: Yes

Owner: Banja Luka City Administration.

Stakeholders: Banja Luka City Administration, Utility Company 'Vodovod Banja Luka', Public Institution "Vode Srpske', customers/citizens.

Capex	EUR 50,000,000	BAM 98,000,000	**Annual Opex**	EUR 1,800,000	BAM 3,528,000	**Implementation Start/End Year**	2023-2027

Notes on cost estimates: CAPEX covers explicit modelling and summing overall years with CAPEX expenditures. Cost of tendering, letting and supervising contracts to contractors who would undertake the work. Previous baseline estimate: EUR 50 million for new WWTW capacity, about 150,000 pe (20 to 30 MLD) with sewerage and pumping stations to cross Vrbas River (from Banja Luka Development Strategy). Independent calculation (very approximate): Based on "Compliance Costs of the Urban Wastewater Treatment Directive", European Commission DG Environment, Sept 2010, COWI. WWTW, not including Land purchase cost: Assume 185,000 pe, Advanced Secondary treatment, nitrification and P removal, estimated cost EUR 138 per pe at 2008 DK price. Of cost 35% materials at Eurowide prices, 65% local civils at 52% of Eurowide cost (EUROSTAT). CPI 2008 to 2018 Denmark factor 1.15. Total cost of WWTW = EUR 23 million. Gives total cost EUR 23 million plus land acquisition costs. Also need smaller plant for Cesma district: estimated cost EUR5 million. This gives a base estimate of EUR 30 million. However, if there is also requirement for industrial wastewater treatment then the PE of the works could be significantly higher and there would be additional planning and administrative costs. So, a central estimate of EUR 40 million is given for the full WWTW needs of the city. The OPEX estimate is for O&M of WWTW based on 3% of capital cost (EUR 1.2 million) plus 40 kWh/pe for electricity at EUR 0.0856 /kWh (Eurostat) for 185,000 pe (EUR 633,000/ year) = EUR 1.8 million.

Action link to indicators	State	2	9.2						**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Water bodies	Adaptation and resilience																	
	Pressure	20	27	28.1						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries	Water																	

Solid Waste

5.7. Solid waste

5.7.1. Priority challenges and policy gaps

Total annual solid waste generation per capita increased from 298 to 326 kg between 2013 and 2016, moving above the international benchmarked value. Although the share of the population with weekly municipal solid waste (MSW) collection is 100%, there are issues of uncontrolled dumping of solid waste. Waste is disposed of in the regional landfill, which has a remaining life of the current landfill of nine years. Less than 2% of waste is recycled, indicating that separate waste collection is in its infancy. There is high reliance on landfill disposal, with other types of treatment or disposal currently not available.

There are no measures related to disincentivising of littering and non-compliance to sorting systems in plans and strategies at the local and entity level. Although there are certain measures in the Spatial Plan of the City of Banja Luka and Local Solid Waste Management Plan 2009 related to improvement in the sector, they are considered to be insufficient in relation to the issues to be addressed.

Inadequate solid waste management generates pressure on water resources, green spaces, soils and biodiversity and ecosystems in Banja Luka. Non-sanitary MSW disposal and unregulated / controlled urban development are identified as pressures contributing to these challenges.

Over reliance on landfill disposal and a lack of alternative, low carbon solid waste management and disposal provision are the pressures contributing to the challenge of mitigating GHG emissions from solid waste disposal.

Table 5-13 presents the prioritised challenges for solid waste based on prioritisation of key environmental topics, together with key policy gaps / issues.

Table 5-13 - Solid waste: priority challenges and policy gaps / issues by environmental topic

	Environmental topic			
	1 Water resources	**4 Mitigation of GHG emissions**	**5 Soils**	**6 Biodiversity, Ecosystems**
Key challenges	Disposal of MSW in non-sanitary ways (open dumps, water bodies, etc.)	Reliance on solid waste landfill disposal.	Non-sanitary MSW disposal and unregulated / controlled urban development.	Non-sanitary MSW disposal and unregulated / controlled urban development.
Policy gaps / issues	• Uncontrolled dumping of solid waste.	• Lack of low carbon solid waste management and disposal provision.	• Limited policy response in relation to MSW. • Uncontrolled dumping of solid waste.	• Lack of regulation and treatment of industrial emissions and waste. • Uncontrolled dumping of solid waste.

Priority level shading key:

High priority 1	2	3	4	Low priority 5

5.7.2. Short-term actions

All six of the actions developed for Banja Luka's solid waste sector were prioritised. They are listed in Table 5-14 alongside the sectoral strategic objectives that they address, and a programme for their implementation is presented in Figure 5-5.

The prioritisation of key challenges indicated that key actions should include investment in solid waste infrastructure. An action is therefore to **develop waste treatment infrastructure,** and another to **develop waste disposal infrastructure** to improve the landfill gas collection system and organic waste separation for recycling purposes**.** The waste treatment infrastructure will potentially include a Waste-to-Energy facility, but its nature will depend on the outcome of another action, the **feasibility study on waste treatment options**, which will evaluate the best options for the treatment of waste generated, with a

focus on energy recovery from incineration and anaerobic digestion of food and agricultural waste.

Additional planning documents will be developed by the GCAP actions. These are an **Integrated Waste Management Plan,** which will outline an integrated approach for how waste will be collected, stored and treated/ disposed of. The second is an **implementation strategy for a separate collection system for recyclable waste and its implementation,** which will contain details extending to the amount of additional equipment required, for example to store and transport waste**.**

These five measures will be complemented by an **education campaign to increase waste awareness**, which will be targeted at the citizens of Banja Luka and will seek to promote solid waste reduction, reuse, sorting and recycling.

Table 5-14 - Solid waste: short-term actions and link to strategic objectives

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives					
					GHG emissions	Soils	Water Resources		Biodiversity and ecosystems	
					GH1	SL1	WR1	WR2	BE1	BE2
PRIORITY ACTIONS										
SW01	**Development of Integrated Waste Management Plan** • Outline how waste will be collected, stored and treated/ disposed • Should adopt an integrated approach	2021-2023	100,000 5,000	Banja Luka City Administration						
SW02	**Feasibility study on waste treatment options** • Evaluate the best options for the treatment of the waste generated • Focus on energy recovery from incineration and anaerobic digestion of food and agricultural waste	2021-2022	150,000 10,000	Banja Luka City Administration and/or IFI						
SW03	**Development of implementation strategy for separate collection system for recyclable waste and its implementation** • Introduce additional waste bins for the storage of recyclable waste • Assess the quantity of collection trucks and other vehicles	2021 – 2023	200,000 20,000	Banja Luka City Administration						
SW04	**Development of waste treatment infrastructure** • Will potentially include new infrastructure such as Waste-to-energy facility	2021-2030	40,000,000 4,000,000	PPP, Banja Luka City Administration and/ or waste management companies						
SW05	**Development of waste disposal infrastructure** • Improve the landfill gas collection system • Improve organic waste separation for recycling purposes	2021-2030	25,000,000 2,500,000	PPP, Banja Luka City Administration and/ or waste management companies						
SW06	**Increase of waste awareness through education campaigns** • Create dedicated campaigns aimed at educating citizens • Promote of solid waste reduction, reuse, sorting and recycling	2021-2023	80,000 4,000	Banja Luka City Administration, PPP						

Colour coding of Action link to strategic objective

Strong contribution 3	Medium contribution 2	Low contribution 1	No contribution 0

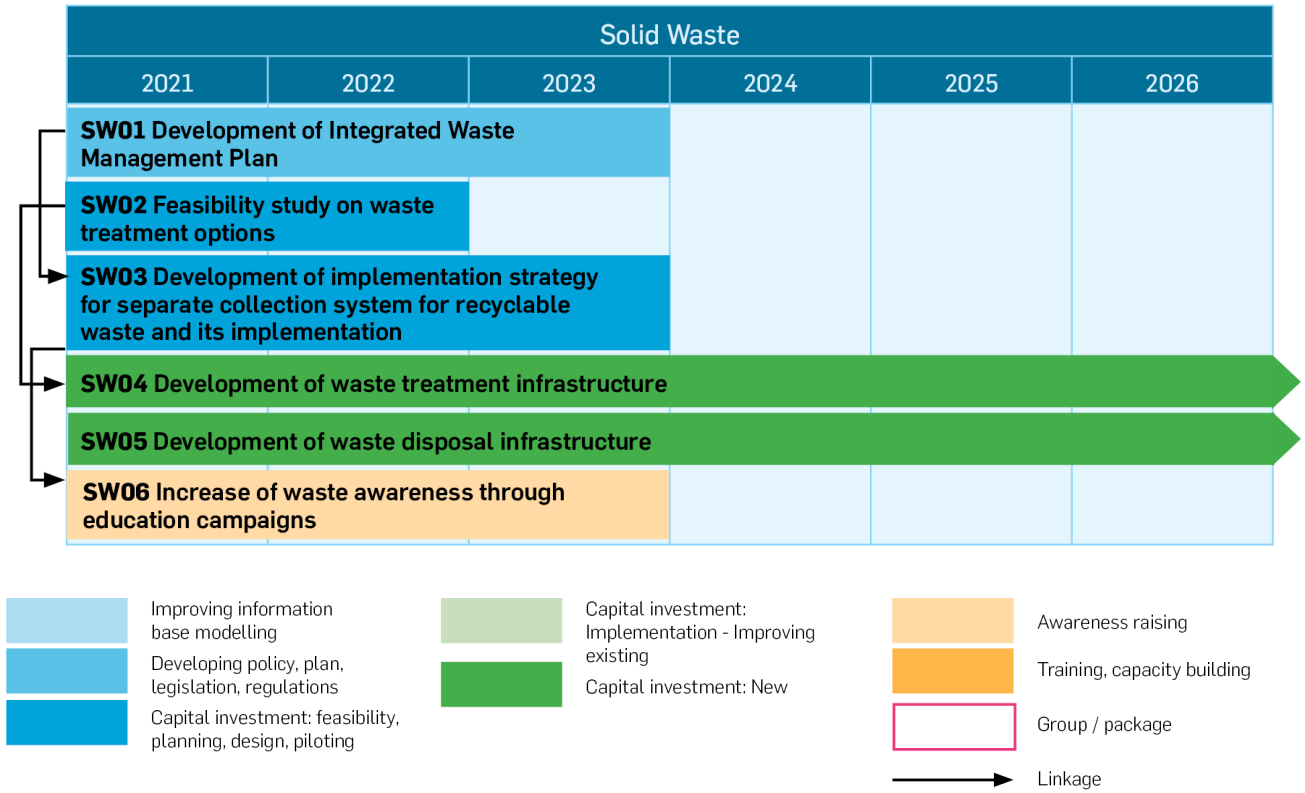


Figure 5-5 - Solid waste actions programme

SOLID WASTE ACTION: SW01																						
Primary action classification: Policy **Secondary action classification:** Developing policy, plan, legislation, regulations										**Action title:** Development of Integrated Waste Management Plan												
The Law on Waste Management of Republika Srpska enforces strategic planning of solid waste management system at local level. The development of waste management plans has also been identified as a short-term goal in the Republika Srpska Waste Management Strategy 2017-2026. The local plan should be in line with the Strategy and should include measures related to MSW, construction and demolition waste, industrial waste and agricultural waste. It should outline how waste will be collected, stored and treated/ disposed of in Banja Luka. The review of the current waste collection system should include analysis of the collection fleet and equipment. The plan should adopt an integrated approach and will rely on the internationally recognised waste hierarchy (avoid, reduce, reuse, recycle, energy recovery, disposal). Goals and targets will be set to track improvements in waste management. It will help to identify where improvements are required and keep track of achievements against waste management targets and objectives. It is assumed that a local consultant will be appointed to develop the Integrated Waste Management Plan and there will be no involvement from international consultants.																					
Revenue generating: No																						
Owner: Banja Luka City Administration									**Stakeholders:** Banja Luka City Administration, waste management companies, government departments												
Capex	EUR 100,000	BAM 196,000			**Annual Opex**	EUR 5,000	BAM 9,800		**Implementation Start/End Year**	2021-2023											
Notes on cost estimates: Capex was estimated based on expert judgement using international benchmarks of developing waste management plans. Opex is estimated as 5% of Capex.																						
Action link to indicators	State	4.1c Soil								**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	18 Industries	20	27 Water	31.1 Solid waste						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

SOLID WASTE ACTION: SW02																						
Primary action classification: Investment **Secondary action classification:** Capital investment: feasibility, planning, design, piloting										**Action title:** Feasibility study on waste treatment options												
The lack of waste treatment infrastructure and an integrated waste management system has been identified as a weakness in the SWOT analysis conducted for the Banja Luka Development Strategy 2018-2027. The development of composting, recycling and Waste-to-Energy facilities has been identified as a 'Responses Indicator' in the GCAP indicators database, and flagged as "yellow", meaning that implementation challenges have been observed. During the Kick-off Workshop for the GCAP in Banja Luka, stakeholders identified the need for a feasibility study on waste to energy options as a key opportunity to improve waste management in the city. First a waste characterisation study should be conducted on representative samples on an annual basis to identify waste fractions that could be recycled or recovered. Solid waste generation has also been identified as a core indicator in the GCAP indicators database: the latest recorded data are related to 2016 and have been benchmarked as "yellow". The MSW sorting and recycling rates have also been identified as a core indicator in the GCAP indicators database: the latest data available are related to 2017 and have been benchmarked as "red", with a very low recycling rate of 2%. Based on the gathered information, it will be possible to develop a feasibility study to evaluate the best options for the treatment of waste generated in Banja Luka. Options to be investigated should focus on energy recovery from incineration and anaerobic digestion of food waste and/ or agricultural waste. The identification of the most suitable treatment facilities to manage waste generated in Banja Luka will reduce the reliance on Ramići's landfill. The development of recycling infrastructure will improve recycling rates, hopefully meeting the "green" benchmark of 25% of MSW recycled as per the GCAP indicator dataset. It is assumed that a local consultant will be appointed to develop the feasibility study on treatment options and there will be no involvement from international consultants.																					
Revenue generating: No																						
Owner: Banja Luka City Administration and/or IFI										**Stakeholders:** Banja Luka City Administration, waste management companies, waste associations												
Capex	EUR 150,000	BAM 294,000		**Annual Opex**	EUR 10,000	BAM 19,600		**Implementation Start/End Year**	2021-2022													
Notes on cost estimates: Capex was estimated based on expert judgement using international benchmarks of developing feasibility studies for waste treatment options. The Opex is estimated as EUR 10,000 for regular review and updating of the feasibility study and to track implementation.																						
Action link to indicators	State	4.1c	8							**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Soil	Mitigation of GHG emissions																			
	Pressure	18	20	27	31.1						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries		Water	Solid waste																	

SOLID WASTE ACTION: SW03																						
Primary action classification: Investment **Secondary action classification:** Capital investment: feasibility, planning, design, piloting										**Action title:** Development of implementation strategy for separate collection system for recyclable waste and its implementation												
Banja Luka currently relies on a single-stream collection system for MSW and almost 100% of collected waste is disposed of in Ramići's landfill. The implementation of source segregation and separate collection of recyclable waste has been identified as a solution for the improvement of Ramići's landfill in the Banja Luka Development Strategy 2018-2027 and the establishment of a separate collection system for packaging waste has been identified as a short-term goal to be implemented within 2017 and 2021 in the Republika Srpska Waste Management Strategy 2017-2026. Various systems can be implemented for the separate collection of recyclable waste. These include the introduction of additional waste bins for the storage of recyclable waste or the use of special coloured sacks to be disposed of in the residual waste bins. The implementation of the most appropriate system depends on the type of plant the waste will be treated in. The quantity of collection trucks and other vehicles should be assessed to determine whether improvements are required. Based on the proposed separate collection system for recyclables, the review of the collection fleet must ensure that vehicles are suitable for the collection of both streams (i.e. recyclable and residual waste and, potentially, organic waste). Benefits from the separate collection of recyclable waste include improvements in recycling and recovery rates, landfill diversion rates and increased void space (remaining capacity) for Ramići's landfill. The following would be included in the strategy component of the action: • Assess the impacts of waste prevention and recycling in terms of environmental, and social impacts alongside to be defined indicators • Provide information on incentive systems and financing options • Present a medium and long-term investment plan																						
Revenue generating: Yes																						
Owner: Banja Luka City Administration										**Stakeholders:** Banja Luka City Administration, waste management companies												
Capex	EUR 200,000		BAM 392,000		**Annual Opex**	EUR 20,000		BAM 39,200		**Implementation Start/End Year**	2021-2023											
Notes on cost estimates: The proposed CAPEX covers the purchase of an initial of number of waste receptacles (Eurobins) to enable citizens to source segregate their recyclable waste and the purchase of one Refuse Collection Vehicle (RCV) only. It is assumed that some of the RCVs currently operated to collect mixed MSW will be used for the collection of source-segregated recyclable waste. Capex was estimated based on expert judgement using international benchmarks of developing implementation strategies for the collection of recyclable waste. The Opex is estimated as 10% of Capex.																						
Action link to indicators	State	4.1c	8							**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Soil	Mitigation of GHG emissions																			
	Pressure	20	27	31.1							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries	Water	Solid waste																		

SOLID WASTE ACTION: SW04																					
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – new										**Action title:** Development of waste treatment infrastructure											
Following the results of the waste treatment and disposal feasibility study and the collection of waste data, it will be possible to develop the proposed infrastructure. This will most likely include potential new infrastructure such as a WtE facility, sorting and/or reprocessing plants. The provision of alternatives to landfill (material recovery facilities, mechanical biological treatment facilities, WtE, etc.) will increase recycling and recovery rates as well as landfill diversion. Consequently, lower GHG emissions will be linked to waste management in Banja Luka and water and soil contamination will be mitigated.																					
Revenue generating: Yes																					
Owner: PPP, Banja Luka City Administration and/ or waste management companies										**Stakeholders:** Banja Luka City Administration, waste management companies											
Capex	EUR 40,000,000	BAM 78,400,000		**Annual Opex**	EUR 4,000,000	BAM 7,840,000		**Implementation Start/End Year**	2021-2030												
Notes on cost estimates: Capex was estimated based on expert judgement and benchmarking using on the following assumptions: - Development of a 10k tonnes per year AD facility; - Development of a 10k tonnes per year MRF facility; and - Development of a 50k tonnes per year WtE facility. Opex is estimated as 10% of Capex.																					
Action link to indicators	State	4.1c	8							**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Soil	Mitigation of GHG emissions																		
	Pressure	18	20	27	31.1						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries		Water	Solid waste																

SOLID WASTE ACTION: SW05																					
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – new										**Action title:** Development of waste disposal infrastructure											
Construction of regional landfill Ramići - Phase II will most likely include the engineering of the current Ramići's landfill, improving its landfill gas collection system, organic waste separation for recycling purposes, energy recovery possibilities and a leachate collection and treatment system. Lower GHG emissions will be linked to landfill gas collection and energy recovery, while a leachate collection and treatment system will result in reduced contamination of water and soil.																					
Revenue generating: Yes																					
Owner: PPP, Banja Luka City Administration and/ or waste management companies										**Stakeholders:** Banja Luka City Administration, waste management companies											
Capex	EUR 25,000,000	BAM 49,000,000		**Annual Opex**	EUR 2,500,000	BAM 4,900,000		**Implementation Start/End Year**	2021-2030												
Notes on cost estimates: Capex was estimated based on expert judgement and benchmarking using the following assumptions: - Landfill capacity of ~200 tonnes per day (75,000 tonnes per year); - Landfill lifetime of 10 years. Opex is estimated as 10% of Capex.																					
Action link to indicators	State	4.1c Soil	8 Mitigation of GHG emissions							**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	18 Industries	20	27 Water	31.1 Solid waste						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

SOLID WASTE ACTION: SW06																					
Primary action classification: Investment **Secondary action classification:** Awareness raising										**Action title:** Increase of waste awareness through education campaigns											
Creation of dedicated campaigns aimed at educating citizens of Banja Luka on the impact of waste management on the environment. Special attention to be paid to waste minimisation measures and source segregation of recyclables, with focus on actions reducing unnecessary packaging. The promotion of solid waste reduction, reuse, sorting and recycling through awareness campaigns represents two 'Responses' indicators in the GCAP indicator database. Both indicators have been flagged as "yellow", meaning that implementation challenges have been observed and existing policies are not sufficient to solve the issue. SIDA in partnership with the World Bank implemented in 018/2019 the programme "Technical Assistance on Solid Waste Management Public Awareness Raising and Education". A set of awareness raising materials including branding of the campaign, visuals, TV and radio adverts have been produced. The City of Banja Luka can opt for using these materials and finance only implementation of the campaign.																				
Revenue generating: No																					
Owner: Banja Luka City Administration, PPP										**Stakeholders:** Banja Luka City Administration, waste associations, governmental departments, schools											
Capex	EUR 80,000		BAM 156,800		**Annual Opex**		EUR 4,000		BAM 7,840	**Implementation Start/End Year**			2021-2023								
Notes on cost estimates: Capex was estimated based on expert judgement and benchmarking of the cost of local awareness campaigns. Opex is estimated as 5% of Capex.																					
Action link to indicators	State	4.1c Soil								**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	18	20	27	31.1						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries		Water	Solid waste																

Land Use

5.8. Land use

5.8.1. Priority challenges and policy gaps

The available data indicate that there are issues with surface water quality in Banja Luka

The available data indicate that population density on urban land in Banja Luka is very low compared to other European cities. Low population density is likely to result in relatively higher costs of construction and maintenance of utility infrastructure, as well as public parks and green infrastructure, in the city. However, 100% of the city population live within 20 minutes, by any mode of transport, of everyday services, which is the result of a widespread road and public transport network.

The average annual growth rate of the built-up area is less than 1%. This is a result of the significant surplus in individual housing and infill within built-up areas, primarily multi-family housing. As with other large cities in Bosnia and Herzegovina, a large proportion (42%) of housing in Banja Luka comprises multi-family housing.

All response indicators related to land use are benchmarked as red. The most important underlying factor for this is the absence of a valid Urban Plan for Banja Luka. The last Urban Development Plan was adopted in 1975. The new Spatial Plan of the City of Banja Luka from 2014 does not include relevant response indicators since, as a higher level strategic spatial planning document, it does not cover these types of planning measures. As a result, density is unregulated, and promotion of transit-oriented development and mixed-use development through zoning regulations / incentives is lacking in the city, especially in the wider urban area of Banja Luka. The map below shows current land use patterns within Banja Luka's inner urban area. Shades of purple indicate the density of Banja Luka's urban fabric.

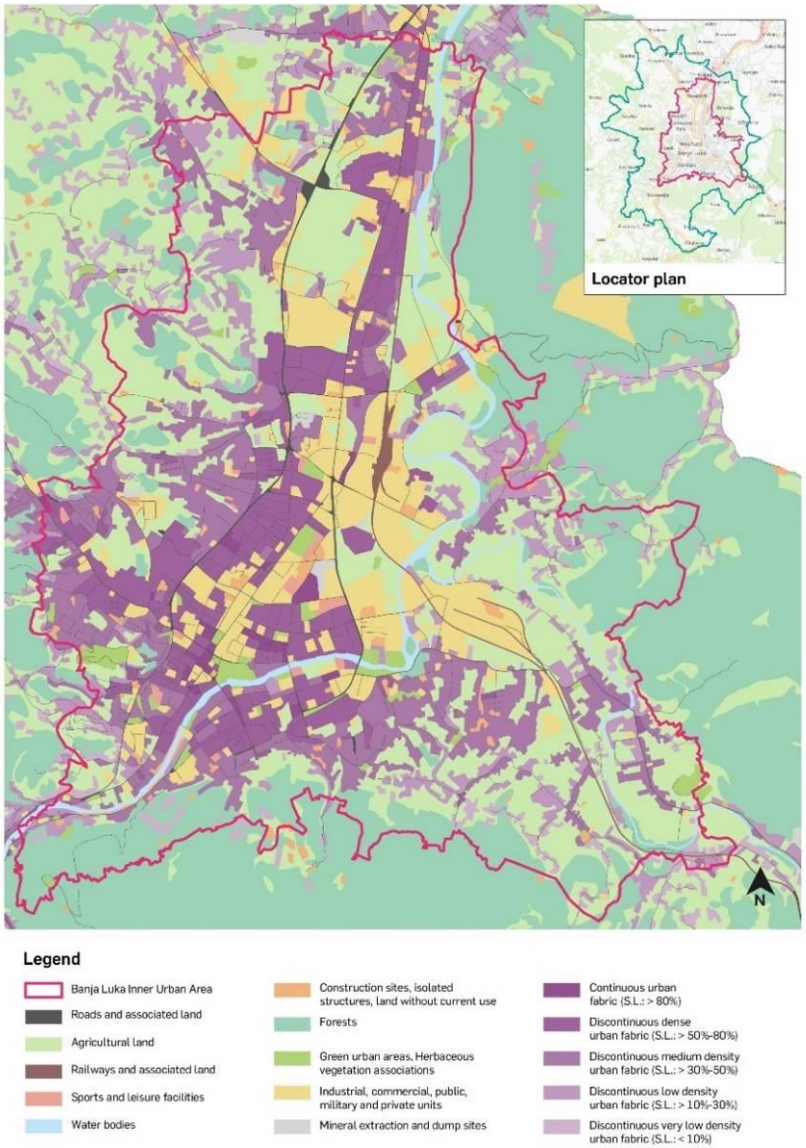


Figure 5-6 - Land use map of the inner urban area of Banja Luka

Table 5-15 presents the prioritised challenges for land use, which are an output of the technical assessment reporting and further prioritisation through stakeholder engagement, together with key related policy gaps / issues. The key priority challenges of moderately polluted air and threat of rising GHG emissions have clear links with policy gaps in terms of lack of integration of land use planning, transport planning and utility infrastructure planning, and inadequate urban development planning and control. These policy gaps / issues are also closely linked to key challenges of limited public green space and urban sprawl., The low level of urbanisation also has negative effects on biodiversity and ecosystems in Banja Luka, particularly in the urban areas.

Table 5-15 - Land use: priority challenges and policy gaps/ issues by environmental topic

	Environmental topic				
	2 Air quality	**3 Green space**	**4 Mitigation of GHG emissions**	**6 Biodiversity, ecosystems**	**7 Adaptation, resilience**
Key challenges	Moderately polluted air with fluctuations throughout the year and reduced SO_2 concentrations. Increasing fossil fuelled private road transport.	Limited public green space in urban area	Increasing fossil fuelled private road transport.	Low level of urbanisation (urban sprawl). Low level of urbanisation (urban sprawl).	Insufficient flood risk management and extreme events.
	Limited options for non-motorised users.	Low level of urbanisation (urban sprawl).	Limited options for non-motorised users.		Thermal comfort. Uncoordinated urban planning.
Policy gaps / issues	• Lack of integration of transport planning within city level development and land use planning. • Inadequate urban development planning and control.	• Lack of integration of land use planning, transport planning and utility infrastructure planning. • Lack of regulation and control of urban development.	• Lack of integration of land use planning, transport planning and utility infrastructure planning. • Inadequate urban development planning and control.	• Lack of regulation and control of urban development.	• No city level resilience strategy and action plan. • Climate resilience not routinely and robustly considered in urban planning and design.

Priority level shading key:

High priority 1	2	3	4	Low priority 5

The lack of integration and coordination in urban planning and design is also a key factor underpinning priority challenges related to climate adaptation and resilience in Banja Luka.

5.8.2. Short-term actions

Four of the eight GCAP actions developed for Banja Luka's land use sector were prioritised. These are listed in Table 5-16 and summarised in Figure 5-7. The additional actions are featured in Appendix C.

In order to address the current lack of regulation, control and integrated planning across the city the first action is to **develop and legally adopt an overarching Sustainable Urban Planning Framework** for the City of Banja Luka. This will integrate land-use planning, transport planning and utility infrastructure planning and focus on stewardship of natural resources, reducing the carbon intensity of the city, heritage, sustainable tourism and quality of life. Information about land-use will be enhanced by the action to **screen and de-risk contaminated land sites.**

The actions recognise that there is much good practice in Banja Luka to be built upon. An action is therefore to **continue effective management and enhancement of public parks and green spaces** where the implementation of best practices will be encouraged, such as the introduction of the Green Flag Award. Public green space has, however, been identified as being relatively limited and so the fourth prioritised action is to **provide new public parks and green infrastructure**. This will be realised by incorporating green infrastructure into new sustainable developments and promoting and developing open space standards for new green infrastructure in wider urban planning policy.

Table 5-16 - Land use: short-term actions and link to strategic objectives

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives						
					Air quality	Green space		GHG Emissions	Biodiversity and ecosystems		Adaptation, resilience
					AQ1	GS1	GS2	GH1	BE1	BE2	AR1
PRIORITY ACTIONS											
LU01	**Develop and legally adopt an overarching Sustainable Urban Planning Framework for the City of Banja Luka** • Focus on lower carbon energy and transport, stewardship of natural resources, protection of natural areas and biodiversity • Focus on heritage, sustainable tourism and improved quality of life of residents	2021-2023	825,000 1,900	Banja Luka City Administration – Spatial Development / Planning Department							
LU03	**Screening and de-risking of contaminated sites** • Development of an inventory and database of local contaminated sites • Development of a remediation plan for clearing former industrial land of hazardous materials	2021-2023	100,000 1,500	Banja Luka City Administration – Utilities Department							
LU05	**The continued effective management and enhancement of public parks and green spaces** • Seek to implement best practices such as the Green Flag Award • Encourage well managed and accessible parks and green spaces	2021-2030	1,200,000 5,000	Banja Luka City Administration – Utilities Department							
LU06	**Provision of new public parks and green infrastructure** • Promote and develop open space standards for new green infrastructure in the urban planning policy Incorporate green infrastructure into new sustainable developments	2021-2030	3,000,000 100,000	Banja Luka City Administration – Utilities Department							
ADDITIONAL ACTIONS											
LU02	**Develop a GIS land use and environmental database for the City of Banja Luka** • Seek the digitisation of city data which will allow	2021 - 2026	110,000 1,500	Banja Luka City Administration							

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives						
					Air quality	Green space		GHG Emissions	Biodiversity and ecosystems		Adaptation, resilience
					AQ1	GS1	GS2	GH1	BE1	BE2	AR1
	data to be processed, analysed and displayed • Facilitate high quality monitoring of basic climate elements and help define the climate trends										
LU04	**Establishment and enforcement of regulated monitoring of development in accordance with planning policy and building regulations** • Deal with breaches of land use planning • Identify where inappropriate development is taking place	2023-2027	300,000 15,000	Banja Luka City Administration – Spatial Development / Planning and Inspection Departments							
LU07	**Develop policy and guidance to encourage Brownfield and Mixed-Use development, and Transit-Oriented Development** • Promotion of Brownfield, Mixed Use and Transit-Oriented Development (TOD) in urban planning policy and land use by the City • Seek environmentally friendly modes of transport between the city centre and recreational zones	2021-2022	100,000 1,000	Banja Luka City Administration – Spatial Development / Planning Department							
LU08	**Enhanced Capacity Building amongst local policy-makers, development managers and regulators** • Plan training courses and workshops	2022-2023	10,000 0	Banja Luka City Administration – Spatial Development / Planning Department							

Colour coding of Action link to strategic objective

Strong contribution	Medium contribution	Low contribution	No contribution
3	2	1	0

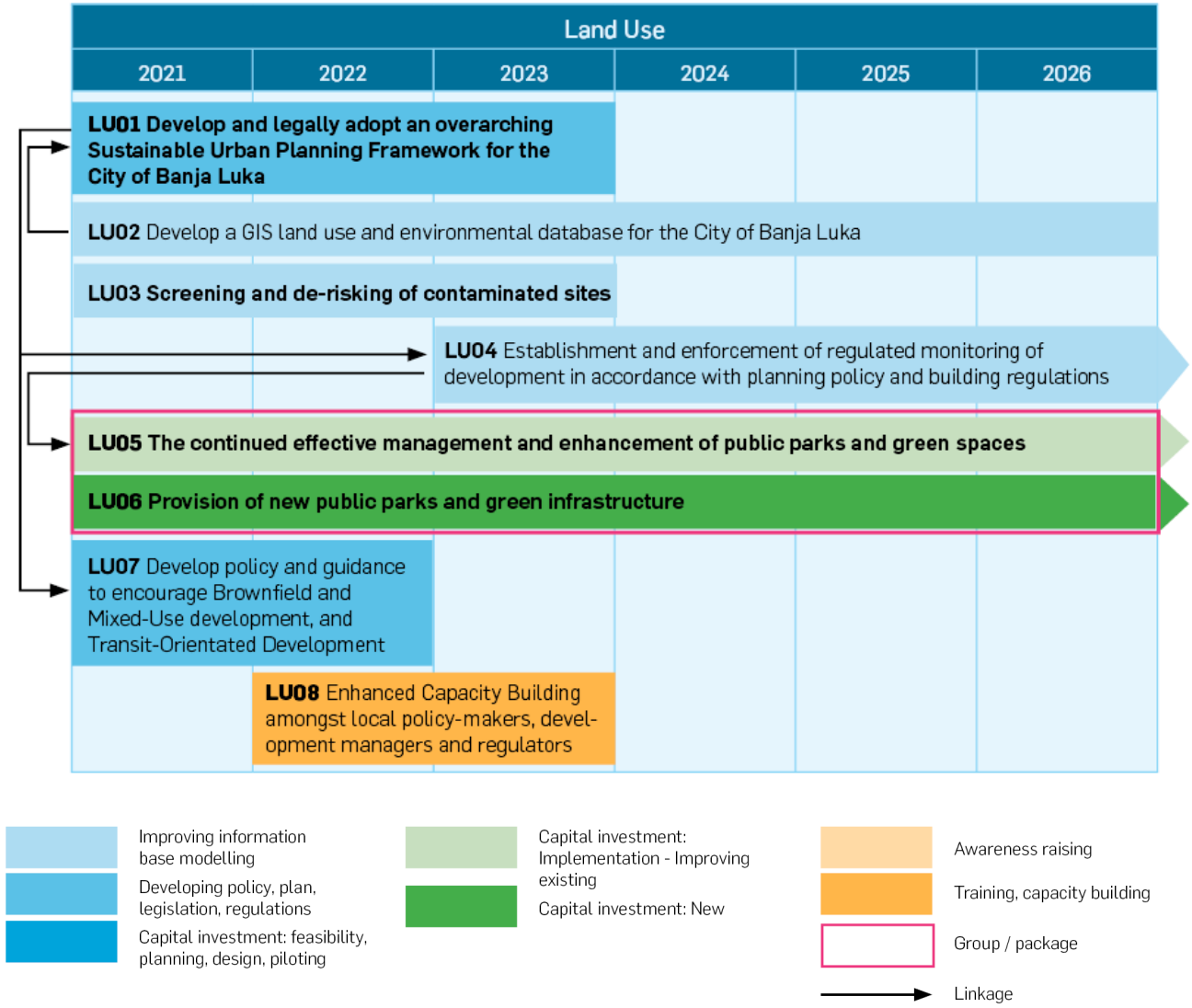


Figure 5-7 - Land use actions programme

LAND USE ACTION: LU01

Primary action classification: Policy
Secondary action classification: Developing policy, plan, legislation, regulations

Action title: Develop and legally adopt an overarching Sustainable Urban Planning Framework for the City of Banja Luka

The Sustainable Urban Planning Framework for the City of Banja Luka includes all strategies, plans and policies guiding and steering urban development in the City of Banja Luka, primarily Urban Plan of Banja Luka (in preparation). Generally, there are constraints related to the existing spatial planning tools and an absence of an up-to-date (new) Urban Plan of Banja Luka. The vision and objectives of the recent City of Banja Luka policies, plans and strategies indicates the emergence of a set of coherent, consistent themes. The Development Strategy 2018-2027 indicates the need for a stronger focus on the core sustainability themes of lower carbon energy and transport, stewardship of natural resources, protection of natural areas and biodiversity is emerging, together with a focus on heritage, sustainable tourism and improved overall quality of life for both urban and rural residents. While the Spatial Plan of the City of Banja Luka (2014) implies a strategic direction for long-term spatial planning that defines the routes of development in the city. However, some key urban planning policy gaps are apparent, most particularly in relation to sustainable solid waste and wastewater management, transport, land use and urban planning, while directly addressing climate change. An overarching planning framework will address these policy gaps.

Spatial planning documents set out a vision and a framework for the future development of the area, addressing needs and opportunities in relation to land use, the economy, transport, community facilities and green infrastructure as well as a basis for conserving and enhancing the natural and historic environment, mitigating and adapting to climate change, and achieving well designed places. New and updated urban planning policy, plans and strategies in the City of Banja Luka will challenge private developers, city administration, communities, assembly members and professionals to work together to ensure that sustainable development is in line with the adopted urban planning framework for the city are brought forward. The detailed spatial planning documentation procedure will be made simpler and easier. It is essential that plans and strategies are in place and kept up to date, with the regularly revision of the Spatial Plan and the Development Strategy of the City of Banja Luka will promote best urban planning practices. A new urban plan for urban area Banja Luka settlement will be adopted. The key missing policy gaps which help the development of the new GCAP will have been identified. These missing core sustainability themes of management of solid waste, wastewater management, urban and transport planning and climate change mitigation/ adaptation will find stronger resonance within the city urban planning policy context in future plans and strategies. Also, this approach will be good example for other local government units in the Republika Srpska.

Revenue generating: No

Owner: Banja Luka City Administration – Spatial Development/Planning Department

Stakeholders: City Administration; Statutory Bodies; General Public; Universities; NGOs, Professional Bodies

Capex	EUR 825,000	BAM 1,617,000	**Annual Opex**	EUR 1,900	BAM 3,724	**Implementation Start/End Year**	2021-2023

Notes on cost estimates: The CAPEX is based on expert judgement and benchmarking based on surface area (ha). OPEX is based on working-days per year for data collection and procedure (primarily public consultation) by the City Administration.

Action link to indicators										**Action performance**										
	State	6	6.1	7	7.2	9.2					Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Green space		Biodiversity and ecosystems		Adaptation and resilience															
	Pressure	11.5	12	28	28.1	28.2	33				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport		Water			Land use														

LAND USE ACTION: LU03																					
Primary action classification: Investment **Secondary action classification:** Improving information base, modelling										**Action title:** Screening and de-risking of contaminated sites											
The sampling from November and December 2019 showed very high concentration of PCBs in the Incel industrial zone, which represents one of the old industrial sites in the urban area of Banja Luka. In this regard, the presence of toxic substances can also be expected in other old industrial sites. The screening element of this action will involve the development of an inventory and database of local contaminated sites, which will support their further remediation and "greening". This will also involve a screening process, mapping of contaminated sites and their ranking in terms of severity of contamination. The second part of the action - de-risking - will result in the development of a remediation plan for clearing former industrial land of hazardous materials to ensure that polluting agents are removed from the sites. This plan will propose the use of the most modern de-risking technologies to neutralise contamination threats, will identify alternative uses for the sites, and will dictate that related work be conducted to international environmental standards.																				
Revenue generating: No																					
Owner: Banja Luka City Administration – Utilities Department									**Stakeholders:** Banja Luka City Administration; Statutory Bodies; Universities; General Public; NGOs; Developers											
Capex	EUR 100,000	BAM 196,000		**Annual Opex**	EUR 1,500	BAM 2,940		**Implementation Start/End Year**	2021-2023												
Notes on cost estimates: The CAPEX is based on expert judgement and benchmarking of similar works. The OPEX is estimated based on working-days per year for data collection and procedure (primarily public consultation) by the City Administration.																					
Action link to indicators	State	6	6.1	4.1c						**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Green space		Soil																	
	Pressure	31.1	33								Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Solid waste	Land use																		

LAND USE ACTION: LU05																						
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – improving existing										**Action title:** The continued effective management and enhancement of public parks and green spaces												
Banja Luka is known as a city of greenery, and has more than 22,000 trees planted in alleys, parks and city districts with two well established public green recreational areas. Generally, the city's green areas, both urban and rural, are under threat due to shortcomings in implementation of the Spatial Plan of the City of Banja Luka and Strategy for Nature Protection of the Republika Srpska, as well as low level of implementation of the previous Urban Plan of Banja Luka. Although the maintenance of existing public parks and green spaces is satisfying, it should make additional efforts in the management and enhancement of public parks and green spaces. It entails development of a more detailed GIS database on green spaces for the wider urban area of Banja Luka, implementation of best practices (such as the Green Flag Award) and refurbishment of most existing public parks and green spaces (around 47 ha). The first priority is Mladen Stojanović park as the largest public park. The management of existing and future public parks and green spaces will provide a benefit to residents and visitors to Banja Luka and help to reduce these assets from falling into disrepair. Enhanced green spaces and corridors will provide positive benefits in line with the GCAP. Best practices such as the Green Flag Award scheme recognise and reward well managed parks and green spaces, setting the benchmark standard for the management of recreational outdoor spaces around the world.																					
Revenue generating: No																						
Owner: Banja Luka City Administration – Utilities Department									**Stakeholders:** Banja Luka City Administration; General Publics; NGOs; Developers													
Capex	EUR 1,200,000	BAM 2,352,000		**Annual Opex**	EUR 5,000	BAM 9,800		**Implementation Start/End Year**	2021-2030													
Notes on cost estimates: Expert judgement for CAPEX based on the existing scale of city green spaces.																						
Action link to indicators	State	6	6.1	7	7.2	9.2				**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Greenspace		Biodiversity and ecosystems		Adaptation and resilience																
	Pressure	28	28.1	28.2	33						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Water			Land use																	

LAND USE ACTION: LU06																						
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – new										**Action title:** Provision of new public parks and green infrastructure												
Harmonisation is required between dynamic urbanisation and a need for environmental protection helping to raise awareness in the City of Banja Luka. Although there are two well established public green recreational areas, overall there is lack of public urban green space for recreational purposes within the urban area of Banja Luka. Illegal construction, coupled with ineffective enforcement action contributes to the loss of green space and agricultural land such as on the Vrbas river banks, harming ecological processes. In the first phase (up to the end of 2021), in accordance with new Urban Plan of Banja Luka, the potential sites for parks need to be identified. Otherwise, some of the potential sites are already planned in the detailed spatial planning documents. The basic conditions for potential sites for parks would be city or public ownership and the possibility of using a substitution for city property as only method of land acquisition, taking into account where green space deficiencies are in the urban area. The second phase (2022-2029) is the development of new public parks and green infrastructure (around 40 ha of new public parks and green infrastructure). The biggest potential for another large park in the inner urban area of Banja Luka represents the site Voćnjak Lauš. Green infrastructure should be incorporated into new sustainable developments based on the standards. Open space standards for new green infrastructure should be promoted and developed in the urban planning policy with the types of space required such as playgrounds, sports pitches, wildlife and natural assets. New green spaces and corridors for the city should be identified and created and should be looked to be linked by tree lines helping to restore, enhance and preserve the landscape identity of the city in line with best practices for parks and green spaces.																					
Revenue generating: No																						
Owner: Banja Luka City Administration – Utilities Department										**Stakeholders:** Banja Luka City Administration; Statutory Bodies; General Publics; NGOs												
Capex	EUR 3,000,000		BAM 5,880,000		**Annual Opex**		EUR 100,000		BAM 196,000	**Implementation Start/End Year**			2021-2030									
Notes on cost estimates: Expert judgement for CAPEX based on the provision of around 40 ha of new public parks and green infrastructure (7.5 EUR per m^2).																						
Action link to indicators	State	6	6.1	7	7.2	9.2				**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Green space		Biodiversity and ecosystems		Adaptation and resilience																
	Pressure	28	28.1	28.2	33						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Water			Land use																	

Adaption & Resilience to Natural Disaster Risks

5.9. Adaptation and resilience to natural disaster risks (cross-cutting)

5.9.1. Priority challenges and policy gaps

Banja Luka is susceptible to seismic activity, flooding and drought, and extreme climate events are becoming more frequent. Data limitations make it difficult to assess the scale of the problem, but it is recognised that the economic impact is considerable with the water and buildings sectors amongst the worst affected. It is therefore necessary for the GCAP to address climate change and natural disaster risk.

A number of climate change adaptation and resilience responses have been integrated into existing plans and policies, both at the RS and the City level, but the implementation of these plans has not progressed and there does not appear to have been a holistic approach adopted to identify and address related challenges. A number of dedicated strategies and plans have been developed at the national level, including the Climate Change Adaptation and Low Emission Development Strategy, which was adopted in 2013, but its implementation has also been limited, largely owing to a lack of institutional capacity to secure finance for and advance adaptation measures, and no equivalent City level strategy exists. This is reflected in Table 5-17, which summarises key challenges and policy gaps for adaptation and resilience. These are an output of the technical assessment report and prioritisation through stakeholder engagement.

A number of relatively ad hoc measures have been formulated, for example under the Law on Protection and Rescue in Emergency Situations ("Official Gazette of the Republika Srpska", No. 121/12} 46/17) and Article 18 of the Decision Organization of the Functioning of Civil Protection in the Field of Protection and Rescue ("Official Gazette of the City of Banja Luka", No: 3/13). These include reviewing and preparing projects for the rehabilitation of critical (vulnerable) points in watercourses, introducing a programme for the regular cleaning of stormwater drainage channels, establishing civil protection units where flood risk is highest and developing plans to be executed when natural disasters occur.

Table 5-17 - Adaptation and resilience: priority challenges and policy gaps

	Environmental topic		
	3 Green space	**6 Biodiversity, ecosystems**	**7 Adaptation and resilience**
Key challenges	Limited public green space in wider urban area	Low level of urbanisation (urban sprawl).	Insufficient flood risk management and extreme events.
	Low level of urbanisation (urban sprawl).		Thermal comfort.
			Uncoordinated urban planning.
			Water resource efficiency.
Policy gaps / issues	• Lack of integration of land use planning, transport planning and utility infrastructure planning. • Lack of regulation and control of urban development	• Lack of regulation and control of urban development.	• No city level climate resilience and adaptation strategy and action plan. • Not currently an active supporter of any associated networks or initiatives (100 Resilient Cities, C40 Cities or Making Cities Resilient). • Climate resilience and adaptation not routinely and robustly considered in urban planning and design. • The cost of climate change and climate change adaptation not identified.

Priority level shading key:

High priority				Low priority
1	2	3	4	5

5.9.2. Short-term actions

Two adaptation and resilience short-term actions have been developed for Banja Luka, both of which have been classified as priority actions.

The first of these is a climate change risk assessment of infrastructure in all sectors, and the second is the development of an action plan, which will be informed by the risk assessment and result in the output of a systematic costed plan for recognising and responding to both current and future risks.

The GCAP actions developed for all sectors have been designed to capitalise upon opportunities to enhance resilience to climate change and natural disasters and to minimise related risks, and these two cross-cutting actions will bring together and extend these measures. In doing so they will address action priority areas including conducting a quantitative assessment of climate change risk to Banja Luka and developing a costed city level climate resilience and adaptation strategy and action plan. They will also contribute towards the mainstreaming of climate change resilience and adaptation into urban policy, planning, design and procurement and the allocation of clear public sector ownership of efforts to drive climate change adaptation and resilience initiatives, build adaptive capacity and raise associated awareness.

Figure 5-8 summarises the adaptation and resilience action programme and Table 5-18 presents the two short-term adaptation and resilience actions against the topic-based strategic objectives.

Table 5-18 - Adaptation and resilience: short term actions and link to strategic objectives

Ref	Short-Term Action	Timing	CAPEX (EUR) OPEX (EUR)	Owner	Strategic objectives				
					Green space	Water resources	Biodiversity, ecosystems		Adaptation, resilience
					GS1	WR2	BE1	BE2	AR1
PRIORITY ACTIONS									
AR01	Conduct a Climate Change and Natural Disaster Risk Assessment of Banja Luka's infrastructure	2021-2022	500,000 0	Banja Luka City Administration – Department of Utilities					
AR02	Develop an Action Plan on Climate Change Adaptation and Natural Disaster Resilience	2022-2023	500,000 0	Banja Luka City Administration - Civil Protection and Firefighting Section					

Colour coding of action link to strategic objective

Strong contribution	Medium contribution	Low contribution	No contribution
3	2	1	0

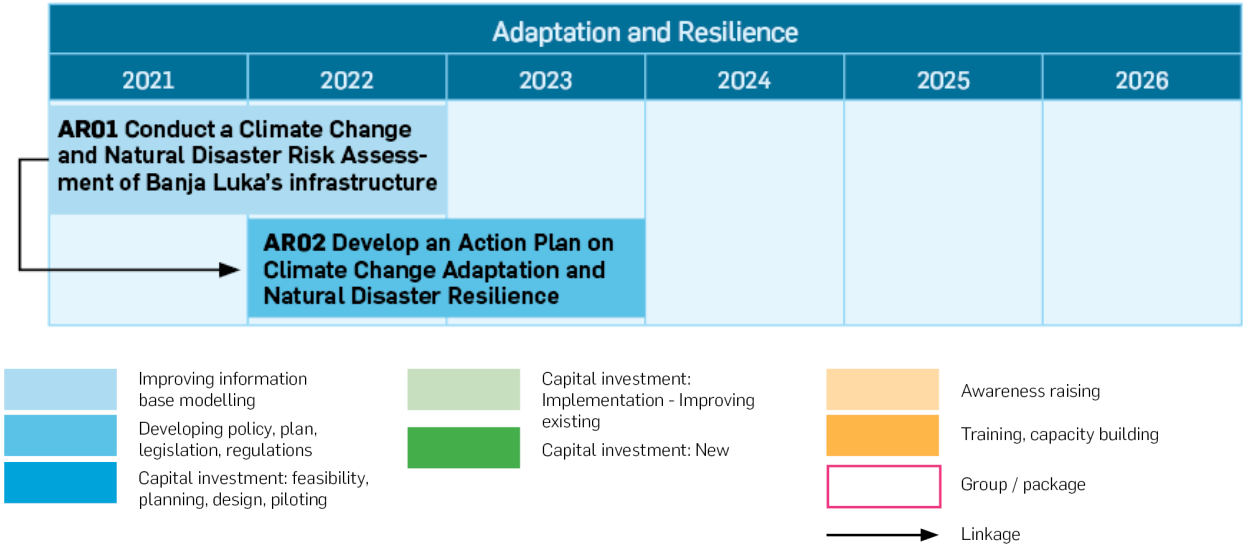


Figure 5-8 - Adaptation and resilience actions programme

ADAPTATION AND RESILIENCE ACTION: AR01																								
Primary action classification: Investment **Secondary action classification:** Improving information base, modelling										**Action title:** Conduct a Climate Change and Natural Disaster Risk Assessment of Banja Luka's infrastructure														
Climate Change Risk Assessments (CCRAs) detail the main priorities for climate change adaptation based on a thorough review of available evidence. This CCRA for Banja Luka will be cross-sector (covering the energy, buildings, transport, land use, water, waste and industry sectors) and contain a vulnerability assessment detailing existing resilience within each sector to a range of climate risks. This review will go beyond the typical remit of a CCRA by incorporating an assessment of wider natural disaster risks facing Banja Luka, for example regarding seismic events, fire and strong winds. This will be based on a targeted desk-based review of available data and evidence of the impact of climatic events and wider natural disasters on Banja Luka's infrastructure and services and will be complemented by a description of the policy context and actions already in place to tackle identified risks. In keeping with good CCRA practice, this assessment will then identify a set of thresholds that define likely 'trigger' points for action. The thresholds will in turn be used to determine critical points beyond which damage or changes to levels of service will occur. Quantitative data associated with the identified climate and other natural disaster risks will then need to be reviewed to enable a link to be made between different risks (e.g. flooding, droughts and fire) and economic impacts and stakeholder consultation conducted to gain a more holistic and in-depth understanding of vulnerabilities. These data, along with evidence of potential risks, will feed into the vulnerability assessment, which will review climate change projections in the context of the current condition of infrastructure, which will in turn further affect vulnerability. The findings will inform the development of a list of potential actions that could enhance the city's resilience and build its adaptive capacity. These will be accompanied by a summary of the constraints of the assessment, along with advice regarding related uncertainty and its impact on the analysis.																							
Revenue generating: No																								
Owner: Banja Luka City Administration – Department of Utilities										**Stakeholders:** IFIs/ donors, wider City Administration, RS Government, planning authorities, emergency services, NGOs														
Capex	EUR 500,000	BAM 980,000			**Annual Opex**	EUR 0	BAM 0			**Implementation Start/End Year**	2021-2022													
Notes on cost estimates: CAPEX is based on benchmarked knowledge of the cost of similar consultancy studies commissioned through international tenders, including international and local expert costs and the technical process involved in conducting the study. It also includes an element of training and capacity building for local staff.																								
Action link to indicators	State	6	6.1	7.2	9.2					**Action Perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1			
		Green space		Biodiversity and ecosystems	Adaptation and resilience																			
	Pressure	28	28.1	28.2							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq					
		Water																						

ADAPTATION AND RESILIENCE ACTION: AR02

Primary action classification: Policy
Secondary action classification: Developing policy, plan, legislation, regulations

Action title: Develop an Action Plan on Climate Change Adaptation and Natural Disaster Resilience

This action plan will provide Banja Luka with a systematic plan for recognising and responding to both current and future climate and natural risks. It will be evidence-based, building on the findings of the Climate Change and Natural Disaster Risk Assessment developed in AR01, and will ensure that Banja Luka is aware of the measures needed to respond to the risks identified, going beyond proposing the incremental investments proposed across the GCAP actions. It will appraise and refine the list of potential actions that could enhance Banja Luka's resilience and adaptive capacity. These could include land use planning, flood and erosion control (e.g. protection around the Vrbas river), designing and renovating buildings, structural resilience upgrades, infrastructure resilience (e.g. back-up power supply, gas safety, water supply safety and contamination control) and managing natural resources (including renewable energy use). It will also cover wider civil protection measures and disaster risk management measures (e.g. standards and capacity building) as appropriate and including with reference to the 2014 Masterplan that incorporated a number of related actions.

The scope of the Action Plan will be agreed with key stakeholders and consider factors such as:

- Impacts in terms of reduced sensitivity and exposure to climate change and other natural disaster risks or increased adaptive capacity;
- Capacity to address key vulnerabilities identified;
- Costs;
- Benefits (including in terms of avoided costs of reconstruction, avoided disruptions, lower risks for users and contributions towards wider environmental, social and economic objectives;
- Barriers to implementation;
- Risks;
- Implementation partners;
- Potential funding sources and mechanisms; and
- Implementation timescales.

The Action Plan will also include a proposed approach to monitoring and evaluating the impacts of the plan.

Revenue generating: No

Owner: Banja Luka City Administration - Civil Protection and Firefighting Section

Stakeholders: IFIs/ donors, wider City Administration, RS Government, planning authorities, emergency services, NGOs

Capex	EUR 500,000	BAM 980,000	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2022-2023

Notes on cost estimates: CAPEX is based on benchmarked knowledge of the cost of similar consultancy studies commissioned through international tenders, including international and local expert costs and the technical process involved in conducting the study. It also includes an element of training and capacity building for local staff.

Action link to indicators										**Action Performance**											
	State	6	6.1	7.2	9.2						Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Green space		Biodiversity and ecosystems	Adaptation and resilience																
	Pressure	28	28.1	28.2							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Water																			

6. Green city monitoring, reporting and verification

The GCAP will be monitored in terms of the implementation of GCAP actions and the impact of the GCAP (both regarding individual actions and the GCAP as a whole). The City Administration will be responsible for designing, implementing and reviewing an associated Monitoring, Reporting and Verification (MRV) approach in the next step of the GCAP process. An indicative process is outlined in this chapter, along with details about associated governance arrangements and stakeholder involvement.

6.1. Scope and purpose of monitoring

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

- **The implementation status of each GCAP action**: This should be recorded as 'No Action,' 'In Preparation,' 'Implementation Underway,' or 'Completed,' with an explanatory note provided. Where there has been 'No Action' the note should include a justification, and actions 'In Preparation' and where 'Implementation [is] Underway' should be accompanied by a short summary of progress. 'Implementation Underway' and 'Completed' actions should also be accompanied by a note summarising any social, economic and environmental impacts;
- **Any changes to the Implementation Plan for each GCAP action**: Details regarding the budget, scope and implementation programme of each action should be collected; and
- **GCAP indicators that will be used to determine the impact of each GCAP action:** Chapter 5 featured the select number of indicators that can be monitored to determine the impact of each GCAP action. It is anticipated these will largely comprise indicators used to assess Banja Luka's green city baseline although the City Administration has already identified a number of others that will be used[26].

[26] It is not necessary to collect data for updating all indicators in the indicator database. However, this would be good practice and would provide an understanding of the environmental situation in Banja Luka, as well as the associated pressures and responses. This would be a valuable instrument for the decision-making process and for the periodic review of the challenges, objectives, measures and target values of the GCAP.

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

- The likelihood of the GCAP vision, objectives and targets being achieved;
- Lessons learnt (what has gone well and where there is room for improvement);
- The need to take any corrective action, for example the revision of an element(s) of the GCAP Implementation Plan;
- Cost-effectiveness of investments;
- The effectiveness of the monitoring process; and
- Whether there should be a refresh of the GCAP.

6.2. Reporting format and frequency

The EBRD has established reporting requirements that apply to all GCAPs. These require the submission of two reports:

1. A report summarising the implementation status of actions included in GCAPs, which should adopt the format of the template in Table 6-1 ('Progress Monitoring Plan' (PMP)). It was populated at the end of the GCAP development process and will be updated within a year of the GCAP being adopted, and then at least annually thereafter;
2. A report summarising the status and likelihood of achieving GCAP visions, objectives and targets. This will take the form of an 'Impact Monitoring Plan' (IMP) (see Table 6-2) which, like the PMP, was completed at the end of the GCAP development process and will be updated after three years and five years to report on the environmental, social and economic impacts of the GCAP. It will be populated by drawing on the relevant indicator data in the Indicator Database.

In addition to these two reports, the Indicator Database will continue to be used to collate and present data collected alongside global benchmark values. A screenshot of the database is shown in Table 6-3. Any additional reporting requirements will be set by the GCAP Co-ordinator, which is likely to be the Chief Advisor to the Mayor, in Step 3 of the GCAP process ('Green City

Implementation').The City Administration will submit these reports to the EBRD, circulate them internally to inform internal decision-making, and communicate them with other stakeholders as appropriate.

Table 6-1 - The Progress Monitoring Plan (PMP) reporting template

City	Country	Sector	Action Ref No.	GCAP Actions	Strategic Objectives	Related Indictors / Targets	Primary Action Classifi-cation	Secondary Action Classifi-cation	Action Owner	Implemen-tation Timeframe	CAPEX (EUR)	CAPEX (BAM)	Mid-term CAPEX (EUR)	Mid-term CAPEX (BAM)	Yearly OPEX (EUR)	Yearly OPEX (BAM)	Responsible Department	Responsible MRV Expert	Implemen-tation Partners	Status Implemen-tation	Budget	Budget spent to date	Note	Date Edited

Table 6-2 - The Impact Monitoring Plan (IMP) reporting template

GCAP Environmental Topic Area	Indicator Code	Indicator	Type of Indicator	Colour code IDB	Latest Value in IDB at GCAP adoption	Unit	Data Source / Contact Detail	GCAP MT Target Value	MT Target (value only)	GCAP LT Target Value	LT target value (value only)	Related GCAP Actions
Air quality	1		State									
Air quality	1.1		State									
Air quality	1.2		State									
Water bodies	2.1		State									
Transport	10		Pressure									
Transport	10.3		Pressure									
…	…	…	…	…	…	…	…	…	…	…	…	…

Responsible Data Collection Officer	Value					MT Target Achieved
	2021	2022	2023	2024	**2025**	

Value										LT Target Achieved
2026	2027	2028	2029	2030	2031	2032	2033	2034	**2035**	

Table 6-3 - A screenshot of the existing Indicator Database for Banja Luka

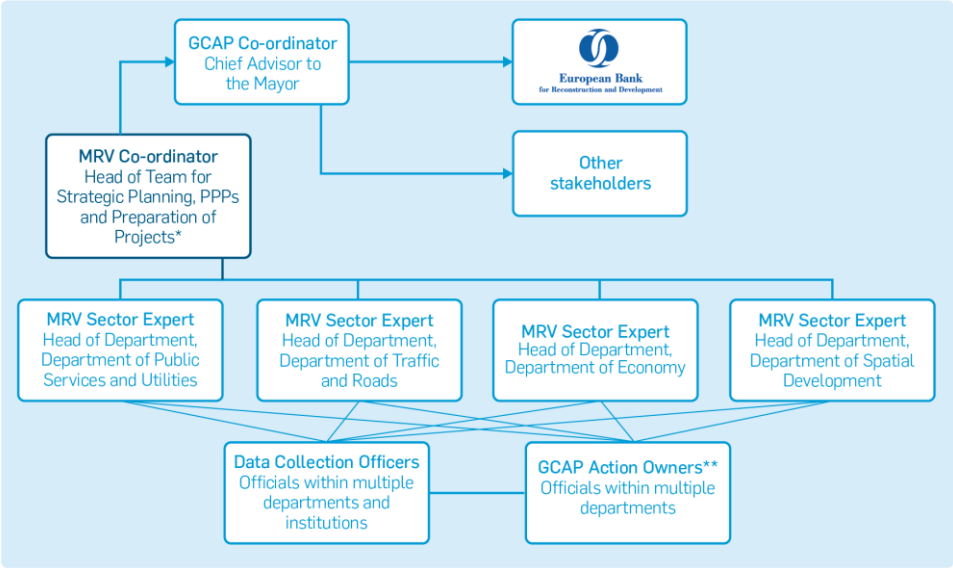
ID	P/S/R	Type / Sector	Topic / Source	Indicator	Unit	Classification	Green Benchmark	Yellow Benchmark	Red Benchmark	National Standard	Data availability (0/1)	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Lastest year with available data	Indicator value (latest available)	Indicator flag	Sparkline	Trend	Implications	Policy relevance	Responsible Authority	Related indicators	Source of data (provide link if possible)	Notes
1	State	Quality of Environmental Assets	Air	Average annual concentration of PM2.5	µg/m3	Core	10	10 - 20	20		1					18.02	17.87	16.70	16.07	15.00	17.50	2019	17.50			Down-ward			City of Banja Luka /Hydrometeorological Institute RS		Data from Reports from the Hidrometeorological Institute of RS http://rhmzrs.com	
1.1	State	Quality of Environmental Assets	Air	Average annual concentration of PM10	µg/m3	Optional	20	20 - 50	50		1	38.14	31.14	31.62	30.18	30.88	34.43	39.45	38.67	27.33	28.85	2019	28.85			Fluctu-ating			City of Banja Luka /Hydrometeorological Institute RS		Data for 2010 and 2011 taken from Local Environmental Action Plan (LEAP) 2016-2021 Data from 2012-2019 taken from Reports from the Hidrometeorological Institute of RS http://rhmzrs.com	
1.2	State	Quality of Environmental Assets	Air	Average daily concentration of SO2	µg/m3	Optional	20	20 - 50	50		1	33.68	28.01	26.16	25.36	23.90	24.10	27.28	23.87	8.66	8.19	2019	8.19			Fluctu-ating			City of Banja Luka /Hydrometeorological Institute RS		Data for 2010 and 2011 taken from Local Environmental Action Plan (LEAP) 2016-2021 Data from 2012-2019 taken from Reports from the Hidrometeorological Institute of RS http://rhmzrs.com	
1.3	State	Quality of Environmental Assets	Air	Average daily concentration of NOx	µg/m3	Optional	40	40 - 80	80		1	47.69	40.15	44.38	44.45	49.92			49.87		53.21	2019	53.21			Fluctu-ating			City of Banja Luka /Hydrometeorological Institute RS		Local Environmental Action Plan (LEAP) 2016-2021 for data from 2010 to 2014 http://www.banjaluka.rs.ba/wp-content/uploads/2017/11/leap.pdf For data from 2017 source is (p164) Situational Analysis Part 3	

6.3. MRV process and governance

It is anticipated that a designated City Administration official will be responsible for ensuring the timely monitoring of the GCAP and submission of related reports. This co-ordination role is likely to be adopted by someone in the Department for Local Economic Development and Strategic Planning, potentially the Head of Team for Strategic Planning, Public-Private Partnerships and Preparation of Projects. They will be tasked with delegating the data collection, analysis and reporting tasks to senior-level officials from across the City Administration, as summarised in Figure 6-1.

This 'MRV Co-ordinator' role will involve the delivery of the following activities:

1. Liaise with the GCAP Co-ordinator, the Chief Advisor to the Mayor, to confirm the data collection requirements (including frequency and quality) for assessing the implementation and impact of GCAP actions, as well as associated timescales and budget, and ultimately of the GCAP as a whole. This should include a review of the targets and constituent indicators that each GCAP action will contribute towards achieving, as well as the objectives that each target addresses, which are presented in Chapter 5. This step will also be used to support the identification of synergies with other city, and wider domestic, processes and protocols as well as of the specific stakeholders responsible for each (see also Section 6.5);
2. Identify and assign an official ('MRV Sector Expert') within each of the departments responsible for the implementation of a GCAP action(s) (see Table 6-4) to monitor and report on the action(s) – it is likely that this would be a head of department and in most instances, if not all, be the same official responsible for the implementation of the relevant GCAP action ('GCAP Action Owner') from the relevant department within the City Administration. The selected officials will be responsible for Monitoring, Reporting and Verifying data relating to a) the implementation progress of each action, b)the budget, scope and implementation programme of each action, and c) the impact of each action in relation to the relevant targets;
3. Identify and designate an official ('Data Collection Officer') with responsibility for the collection and review of data to inform each GCAP indicator;
4. Establish formal communication channels between the MRV Sectoral Experts and the relevant Data Collection Officers;
5. Communicate regularly with officials designated MRV responsibilities to ensure that they are suitably informed, trained and otherwise supported to conduct their role effectively, efficiently and in a transparent and consistent manner. This will include the development and dissemination of guidance to facilitate appropriate and consistent Monitoring, Reporting and Verification that meets the requirements of the GCAP methodology. This communication should also be conducted to ensure that the tasks of the MRV Sector Experts and Data Collection Officers are being executed to the specified quality, time and budget, as set by the MRV Co-ordinator;
6. Set and enforce deadlines for regular reports relating to each GCAP action and indicator;
7. Assimilate inputs from MRV Sector Experts to report on each GCAP action, as well as on the progress and impact of the GCAP as a whole, and cascade the findings to the GCAP Co-ordinator, the Chief Advisor to the Mayor. The Chief Advisor to the Mayor will in turn share findings with other stakeholders, notably internal and external actors who are responsible for making decisions based on the findings.



* In the Department of Local Economic Development and Strategic Planning

** If different from the designated MRV Co-ordinator and MRV Sector Experts

Figure 6-1 - An overview of key actors and governance arrangements in the MRV process

Table 6-4 - City Administration departments and sections responsible for Monitoring, Reporting and Verifying the implementation of each GCAP sector

GCAP sector	Department responsible for MRV
Transport	Department of Traffic and Roads
Buildings and energy	Department of Public Services and Utilities
Industries	Department of Economy
Water	Department of Public Services and Utilities
Solid waste	Department of Public Services and Utilities
Land use	Department of Spatial Development
Adaptation and Resilience	Civil Protection and Firefighting Section

The MRV Sector Experts, as appointed by the MRV Co-ordinator to take responsibility for the Monitoring, Reporting and Verification of actions in specific GCAP sectors, will be required to:

1. Acquire an in-depth understanding of the targets and indicators relevant to their GCAP action(s) and about how the data to inform each is derived and validated. This will require consultation with the MRV Co-ordinator and relevant Data Collection Officers;
2. Communicate regularly with the official responsible for the implementation of each GCAP action ('GCAP Action Owner'), and if different, also the official responsible for reviewing, and if necessary, revise the budget, scope and planning of each action;
3. Familiarise themselves with the required method and frequency of data collection for each data item. In terms of the monitoring of the implementation of GCAP actions, data collection will in all instances be continuous throughout the implementation period. But there will be more variation in the frequency of the data collection for each indicator. Examples are provided in Table 6-5 in the context of a specific GCAP action;

4. Liaise with Data Collection Officers to ensure that any factors that might compromise the quality or availability of data to meet deadlines set by the MRV Co-ordinator are identified in time to identify an alternative approach;
5. Adopt responsibility for the validation of all data in relation to each GCAP action, reviewing data received to ensure that it is complete, consistent and otherwise robust;
6. Analyse and assimilate the inputs of Data Collection Officers and GCAP Action Owners to report on the progress and impact of each GCAP action, and report on the findings; and
7. Cascade the results to the MRV Co-ordinator.

Table 6-5 - Indicative monitoring scheme for the example GCAP action TR05 (Expand and enhance cycling infrastructure)

Indicator	Data collection frequency	Data collection method	Responsible department
Average annual concentration of $PM_{2.5}$	Continuous	Stationary (active sampling) automated hydrometeorological monitoring stations that monitor $PM_{2.5}$ concentrations daily	Department of Public Services and Utilities, Banja Luka Administration / Hydrometeorological Institute of RS
Average annual concentration of SO_2	Continuous	Stationary (active sampling) automated hydrometeorological monitoring stations that monitor SO_2 concentrations daily	Department of Public Services and Utilities, Banja Luka Administration / Hydrometeorological Institute of RS
Annual CO_2 equivalent emissions per capita	Annual	Calculated by following IPCC guidelines and using emissions values from the Energy Efficiency Action Plan of the City of Banja Luka (2016) to analyse activity data from a range of sources including government departments, utility companies and other public and private sector enterprises.	RS Institute of Statistics
Share of commuting trips by private motorised transport	Annual	Surveys to be initiated by TR04 (Develop city-wide data collection programme and multi-modal transport model)	Department of Traffic and Roads, Banja Luka Administration
Share of trips by private motorised transport	Annual	Surveys to be initiated by TR04 (Develop city-wide data collection programme and multi-modal transport model)	Department of Traffic and Roads, Banja Luka Administration
Kilometres of bicycle path per 100,000 population	Annual	Infrastructure asset inventory/ database/ annual Evaluation Report of the Implementation of the Strategy of Development of Local Roads and Streets in the City of Banja Luka 2017-2022 and census data	Department of Traffic and Roads, Banja Luka Administration

6.4. Data availability and collection

The technical assessment that was conducted to establish Banja Luka's environmental baseline revealed a number of challenges that will need to be addressed in order to effectively monitor the impact of the GCAP. These include:

- Gaps in data collection and reporting;
- Limited capacity within the City Administration to collect the required data;
- Lack of data collection equipment and other physical infrastructure necessary for the required Monitoring, Reporting and Verification within the City Administration; and
- Lack of a tradition of Monitoring, Reporting and Verifying related data within the City Administration departments that will be assigned GCAP MRV responsibilities.

Gaps in data collection and reporting have been referred to throughout this report along with the impact that they have had on the City Administration's ability to understand the state of the environment in Banja Luka, the impact of different sectors on the environment and the likely effectiveness of different responses. There is limited activity data available for the transport sector. This includes a lack of data regarding transport modal share, trip numbers and average trip length. It is understood that the EEAP from 2016 does covers CO_2 emissions from transport, but this is likely to have been calculated based on a high-level estimation of fuel consumption. Transport surveys that have been conducted to inform the development of the Urban Plan of Banja Luka and those that have been proposed as actions within this GCAP will enable a more accurate calculation of CO_2 emissions from transport in future. This is important as the transport sector is one of the main contributors to GHG emissions in cities. In terms of environmental topics, the availability of data to assess the state of biodiversity and ecosystems is particularly limited as data is not available for the core or optional indicators owing to a lack of monitoring. In the GCAP development process, alternative approaches have been adopted to compensate for these gaps as best as possible. In order to understand biodiversity and ecosystems, for example, an additional indicator was devised ('Change in forest areas') and problem trees were constructed to demonstrate the links between overall environmental parameters that affect biodiversity and ecosystems as a whole and how specific responses may improve this. This is, however, only a temporary solution and it will be essential to extend data collection regimes to fill such gaps. This will in some cases require the more regular collection of data. The ability to understand other environmental topics is, for example, constrained owing to a lack of up-to-date data – in terms of adaptation and resilience to natural disasters no data are available for core indicators and the only optional indicator that data are collected for was last monitored in 2013, so the data are already six years out of date. The data sources listed in the Indicator Database reveal that data for many indicators were only collected on an ad hoc basis, for example to inform the LEAP for the period 2016-2021 and the 2014 Spatial Plan of the City of Banja Luka.

Gaps in data reporting can constrain analysis as much as gaps in data collection. The core indicator for assessing soil quality, for example, is 'number of contaminated sites,' but no details are available regarding the level, type and extent of contamination at each contaminated site, which can make it difficult to determine appropriate responses. It is not always possible to ascertain the impact of different pressures and responses on the state of the environment even when data do exist, but related complexities make investment in establishing a robust MRV process even more prudent.

The current status of MRV in Banja Luka will limit the quality of MRV in the short-term. But by adopting an immediate focus on enhancing data collection and institutionalising related protocols the city can establish a credible MRV regime that can play an integral role in decision-making within a couple of years. The next steps should be as follows:

1. **Identify data collection requirements:** This will involve reviewing the gaps in data availability and quality as highlighted by the GCAP, Indicator Database and problem trees;
2. **Create a data collection plan:** This should describe exactly what data need to be collected, how, where from, how often and by whom. It should also detail how the data need to be recorded as well as the purpose of collecting each data item. The plan should take into account the short-term GCAP actions that will enhance data collection. These are intended to be implemented in 2020 and 2021 by both the City Administration and private enterprises, including utility companies. These include:
    - TR04 - Develop city-wide data collection programme and multi-modal transport model;
    - EN03 - Develop building energy consumption database and energy reporting for building owners and utility providers;

- EN06 - Rehabilitation of district heat network to reduce water and thermal losses - thermal supply network metering and monitoring;
- EN 08 - Study to assess active management and improvement of the district heat network energy and fuel sources, and assessment of other energy supplies and infrastructure capacities in the city;
- WR01 - Modernisation of GIS data systems for water supply and wastewater networks, assets and customer management;
- WR02 - District metering, asset surveys and modelling of water and wastewater networks; and
- LU02 - Develop a GIS land use and environmental database for the City of Banja Luka.

1. **Develop an MRV implementation plan:** The large number of data collection and reporting limitations identified by this GCAP, and the diversity of the associated requirements, makes it likely that the implementation of the data collection plan and establishment of an enabling framework will need to be phased with improvements made in increments. This Implementation Plan should therefore contain a prioritisation of data collection requirements and information about associated costs, potential funding sources and mechanisms and implementation programme;
2. **Secure funding for the proposed MRV:** Additional funding will be needed to cover the cost of items including surveys, City Administration staff time, the purchase of monitoring equipment, and related capacity building activities. This funding is likely to be secured from a combination of sources including from the city, for example by integrating MRV measures into municipal budgets, sub-national government via ministries, various city linked utilities and enterprises and wider public and private sector domestic sources, as well as IFIs and donors;
3. **Build related capacities:** Investment needs to be made in capacity building of officials within the City Administration to support Banja Luka's ability to conduct MRV to an adequate level of rigour, and to embed MRV into institutions with related responsibilities. The capabilities needed for MRV include a range of managerial and technical skills, including in relation to: the design, implementation and operation of MRV systems; data collection and management (encompassing factors including technical and technological monitoring infrastructure and documentation procedures), and; relevant methodologies (for example to calculate GHG emissions). They also extend to institutional capacity, as outlined below;
4. **Institutionalise MRV procedures:** Institutional arrangements (for example in relation to MRV leadership, co-ordination and information sharing mechanisms), processes, mandates and data sharing protocols need to be established to ensure that MRV is efficient and achieves its objectives. There must be clarity around MRV requirements and responsibilities with roles clearly designated, defined and communicated – including regarding leadership and co-ordination functions, and potentially along the lines of the process outlined in Section 6.3. These could be enshrined in formalised agreements. Most of the required changes can be realised by making relatively small adjustments to existing roles and processes, but some new systems are likely to need to be set up, such as a centralised system for storing data.

6.5. Role of stakeholders

The City Administration will own the MRV process, but internal and external stakeholders will also need to contribute. The stakeholders who are either responsible or accountable for elements of the GCAP MRV process, or have or will be consulted, are listed in Table 6-6.

Table 6-6 - Local stakeholders who are either accountable, responsible or have and will continue to be consulted in relation to the MRV process

Definitions:

Accountable – Answerable for the Monitoring, Reporting and Verification of GCAP action(s), the accountable stakeholder must approve and explicitly sign off on the activities of any responsible stakeholder(s)

Responsible – These stakeholders will conduct and lead elements of MRV by following rules and regulations defined by another higher (often 'accountable') stakeholder

Consulted – Opinion or contributions are sought on the MRV through two-way communication

Sector	Banja Luka City Administration Departments / Offices								RS Ministries	Utility companies[27]	Private enterprises	NGOs and community groups	Local academia
	Mayor's Office	Civil Protection and Firefighting	Local Economic Development and Strategic Planning	Spatial Development	Traffic and Roads	Economy	Inspection	Public Services and Utilities					
Transport	Consulted	Consulted	Accountable	Consulted	Responsible	-	Consulted	-	Consulted	-	Consulted	Consulted	Consulted
Energy and buildings	Consulted	-	Accountable	Responsible	Consulted	Consulted	Consulted	Responsible	Consulted	Consulted	Consulted	Consulted	Consulted
Industry	Consulted	-	Accountable and responsible	-	-	Consulted	Consulted	-	Consulted	-	Consulted	Consulted	Consulted
Water resource	Consulted	Consulted	Accountable	Consulted	-	-	Consulted	Responsible	Consulted	Consulted	-	Consulted	Consulted
Solid waste	Consulted	-	Accountable	Responsible	-	-	Consulted	Responsible	Consulted	Consulted	Consulted	Consulted	Consulted
Land use	Consulted	Consulted	Accountable	Responsible	-	-	Consulted	Responsible	Consulted	-	-	Consulted	Consulted
Adaptation and Resilience	Consulted	Responsible	Accountable	Consulted	Consulted	-	Consulted	Consulted	Consulted	Consulted	-	Consulted	Consulted

[27] Notably the public water supply utility 'Vodovod' JSC Banja Luka, the district heating utility 'Ekotoplane' Ltd Banja Luka, the regional solid waste management utility/ Public Company "DEP-OT" Ltd Banja Luka, and the city solid waste management utility 'Čistoća' JSC Banja Luka.

7. GCAP costs and funding options

This chapter of the GCAP presents estimated CAPEX and OPEX costs, as well as high level commentary on possible funding sources for **priority actions** that require investment.

Priority GCAP actions are primarily for upgrading, rehabilitating or renovating existing city assets or the development of new city assets. City assets can be developments in the built environment of Banja Luka, as well new technological interventions, together with protection and/or enhancement of environmental assets such as areas of green space and water bodies. The actions also involve awareness and outreach, capacity building of key stakeholders in issues related to planning, management and conservation/enhancement of the city environmental assets. Similarly, the actions which may require financing include the development of strategies, policies and plans, which, in turn, will help eliminate barriers and create a favourable environment for more investments to flow in GCAP measures. Often such capacity building, awareness and policy, legislative or regulatory measures are prerequisites that support individual or groups of capital investment measures.

7.1. GCAP costs

7.1.1. CAPEX and OPEX estimates of priority actions

Table 7-1 lists the CAPEX and OPEX costs of GCAP priority actions by sector. The additional actions, including details regarding their costs, are presented in Appendix C. It is neither possible nor appropriate to provide very detailed cost estimates of each action at this stage, and so the figures in the rest of this chapter should be treated as preliminary indicative estimates. In a number of cases, this is owing to the need for actions to be elaborated, and the legal and regulatory investment framework reviewed in more depth, before more detailed financial estimates can be generated. The technological options available to deliver a number of priority actions, for example, sometimes vary widely, which has implications for CAPEX, OPEX and revenues (e.g. biogas production and use, with different options for the use of the biogas needing to first be identified via a dedicated study).

The cost estimates have been derived by drawing on knowledge of similar domestic and international projects, the professional judgement of both local and international sector experts, and local expert knowledge of appropriate adjustments that need to be made, for example regarding the cost of local materials and labour. It should be noted that all costs have been discussed in detail with the City Administration, with feedback from the City incorporated into final costs estimates as applicable. The CAPEX and OPEX estimates of priority actions are presented, by sector, in Table 7.1. Mid-term CAPEX estimates have been generated based on a linear extrapolation from the start year of implementation to 2025, based on cumulative total CAPEX pro-rated annually over the full implementation duration. Table 7-2 contains notes that indicate how CAPEX and OPEX estimates were derived for each GCAP action, but all were also subject to a plausibility check that involved consulting literature, commercial project developers and project specialists.

The CAPEX cost estimates are exclusive of delivery risk, optimism bias and climate change adaptation costs.

Where cost ranges have been presented in Chapter 5, the highest cost estimate is presented. For example, action WR07 Repair and improve the existing water supply system to reduce water losses has a cost range of EUR 5m to 30m. In Table 7.2 therefore, a cost of EUR 30m has been inserted.

A conversion rate of 1.96 has been used to convert costs in EUR to BAM.[28]

[28] This was the exchange rate for July 2020 as stated by InforEuro, which provides the EC's official monthly accounting rates for the Euro. Available at https://ec.europa.eu/budget/graphs/inforeuro.html.

7.1.2. Climate change adaptation costs

Banja Luka is vulnerable to climate change impacts, in particular an increasing frequency and magnitude of flooding and droughts but has only made limited efforts to adapt to these threats and their negative impacts. It is therefore prudent for related considerations to be mainstreamed into all GCAP measures, and to use the opportunity to enhance resilience to other natural disasters, such as earthquakes, at the same time. This would not increase the cost of all GCAP actions - investment in new capital infrastructure assets need not be higher, for example, if they are planned, designed, built and operated to account for the climate change that may occur over the life of the asset. There is, however, a cost associated with dedicated measures, such as strengthening riverbanks, and retrofitting, which is more expensive than making assets climate resilient at the outset, thereby highlighting the cost-effectiveness of considering climate resilience in relation to all GCAP actions from the initial stages.

It is difficult to determine the additional costs to proposed investments, but the main costs are likely to be incurred in the transport and buildings, energy sectors, which, along with the water sector (where related activities are the responsibility of the public water supply utility 'Vodovod' JSC Banja Luka), appear to be the most vulnerable of the sectors in Banja Luka to climate change impacts.

7.1.3. Financial viability of GCAP priority actions

An initial high-level financial assessment was conducted to provide a preliminary indication of the impact of the GCAP on the City budget and of how the various actions could be financed. This assessment mainly consisted of:

- An analysis of the City budget to understand the constraints on financing by the City of the various actions;
- High level estimates (for actions with revenues) of simple payback periods and potential Internal Rates of Return (IRRs);
- Consideration of which entity/entities may be involved in the financing of each action;
- An assessment of the financing of the City share of investments, and
- Construction of five scenarios and an assessment of their impacts on the City budget.

This analysis was used to estimate the maximum GCAP related annual debt servicing the City was deemed to be able to sustain (EUR 4.7 million, BAM 9.2 million) and the maximum GCAP related additional spending that could be sustained (EUR 4.3 million, BAM 8.4 million). It revealed that it should be possible to finance the majority of GCAP actions (priority and additional), should Banja Luka wish to do so, albeit with some concessional financing.[29] The next sub-section looks at how this financing can be provided.

[29] A number of underlying assumptions need to be checked, including via discussion with the main stakeholders. Factors that need to be confirmed include the nature of financial constraints in Banja Luka, willingness of various actors to finance and/ or co-finance GCAP actions, and CAPEX, OPEX and revenue generation assumptions made for each action.

Table 7-1 - Priority GCAP actions: CAPEX and OPEX costs by sector (EUR and BAM)

Sector	Total CAPEX (EUR)	Total CAPEX (BAM)	Mid-term CAPEX (EUR)	Mid-term CAPEX (BAM)	Annual OPEX (EUR)	Annual OPEX (BAM)	Number of priority actions
Transport	37,900,000	74,284,000	27,400,000	53,704,000	1,200,000	2,352,000	7
Energy, buildings	29,815,000	58,280,600	17,565,000	34,270,600	65,000	127,400	5
Industries	25,000	49,000	25,000	49,000	0	0	1
Solid waste	150,750,000	295,470,000	61,770,000	121,069,200	3,890,000	7,624,400	6
Water resource	65,530,000	128,438,800	33,030,000	64,738,800	6,539,000	12,816,440	7
Land use	5,125,000	10,045,000	3,325,000	6,517,000	108,400	212,464	4
Adaptation and resilience	1,000,000	1,960,000	1,000,000	1,960,000	0	0	2
Total	**290,145,000**	**568,527,400**	**144,115,000**	**282,308,600**	**11,802,400**	**23,132,704**	**32**

7.2. Funding options

The actions are based on the needs of the city, but their implementation should not and will not be the sole responsibility of Banja Luka. In some instances, proposed actions are outside the jurisdiction of Banja Luka City Administration and, more widely, GCAP actions are more likely to be implemented and effective if linked to other ongoing actions, including state and local initiatives, and by leveraging external resources, including from International Financial Institutions (IFIs) including Development Finance Institutions (DFIs), Local Financial Institutions (LFIs) and the private sector.

In line with local planning rules, Banja Luka City Administration will include priority GCAP actions in its triennial development programmes and other mid-term development plans and capital investment plans, subject to the availability of associated internal and external funding. The priority GCAP actions have been developed with funding viability in mind, and Table 7-2 lists the CAPEX and OPEX cost of each priority GCAP action along with any potential for them to generate revenue as well as the source of funding that could be used to finance each action.

There are a number of entities that may take responsibility for funding of part or all of some of the proposed actions, and a financial assessment was conducted to determine the share of each priority action cost that the City and other potential funding sources could be expected to finance.[30] The sources of funding featured in Table 7-2 are:

- City (grant, budget and/or debt);
- City related company;
- Other private sector (companies, residential sector); and
- Other (e.g. ministries).

These funding sources are set out below.

[30] It was not possible to test these assumptions with the various parties involved during GCAP development, but it is advised that this is done to address risks associated with the analysis, notably uncertainty regarding the interest of various parties in investing in the priority actions.

7.2.1. City funding – including debt and grants

An assessment was conducted on how the City share of the priority actions financing could be funded, using grant, debt finance and the budget. In cases of actions that will not generate revenues, it was assumed that the City share of the financing would be funded from the City **budget** and through **grants**. It has been proposed that grants are primarily used to finance policy actions, which could appear more attractive to donors. IFIs, such as the EBRD, are likely to be the main source of financing for fully grant-funded or blended grant co-financing for actions that do not generate savings (e.g. plan development, studies, data collection and monitoring and technical assistance). IFI involvement can help to ensure that projects delivered are appropriate and of a high standard and can eliminate barriers for cost-effective projects to follow. There is a diverse range of grants available from IFIs, including funding dedicated to addressing specific environmental challenges such as climate change.

For actions that will generate revenues, it was generally assumed that the City's share of the financing would be funded through the **budget** and with **debt** funded by IFIs. An exception is in the case of Public Private Partnerships (PPPs), where the City may be responsible for a relatively low share of the action implementation, which may be organisational and supported through a Technical Assistance (TA) grant from the IFI, as part of a larger deal where the IFI provides bank loans through the implementing PPP parties. Banja Luka can secure bank loans to finance some GCAP actions, or elements of various actions, but it is recommended that IFIs are approached to secure capital. IFIs are institutions that operate on market principles and invest in projects that can have a development impact but that would otherwise struggle to attract capital, often owing to their relatively high-risk profile.

The analysis of the City Administration budget, which was summarised in Section 4.3, revealed that there is the legal space for the City of Banja Luka to add approximately EUR 4.0 million from loan sources of new annual long-term repayments to the City budget (whether such a charge will occur depends on the strategic decisions of the City and the incomes to secure a proper repayment). In terms of surplus of revenues, as a potential for investments from the budget, in 2018 the surplus of revenues was EUR 4.1 million (BAM 8 million), while in 2017 it was EUR 4.6 million (BAM 9 million). According to these figures, Banja Luka could afford to spend an additional EUR 4.3 million (BAM 8.4 million) on the GCAP annually. However, it is important to note that this amount is subject to reductions, since the actual potential is only the amount that is not budgeted in

next year's budget for previously planned and / or unspent earmarked investments and expenditures. This is an estimate solely for the purposes of this document, taking into account the notes and conclusions described in section 4.3. In any case, the real opportunity for new financing and the capacity for additional debt (repayments) depends on the actual movement of incomes and expenditures, as well as previously planned and new projects from the City strategic documents.

7.2.2. City related company funding - public service providers and enterprises

Public service providers, such as public transport operators and public utility companies, maintain infrastructure for public services and often also provide the services that use the infrastructure. In Banja Luka these companies include the public water supply utility 'Vodovod' JSC Banja Luka, the district heating utility 'Ekotoplane' Ltd Banja Luka, the regional solid waste management utility/Public Company "DEP-OT" Ltd Banja Luka, and the city solid waste management utility 'Čistoća' JSC Banja Luka. In line with their remits, such city-linked utilities and enterprises will be required to make financial contributions towards, and in some cases cover the entire cost of, a number of the priority actions.

7.2.3. Private sector funding – Public Private Partnerships (PPPs) / Build, Operate, Transfer (BOT)

Banja Luka City Administration should seek opportunities for private sector participation, both directly and via the formation of partnerships. Table 7-2 presents opportunities for doing so, specifically by securing the support of an advertising agency to contribute towards the financial cost of developing and delivering promotional campaigns for sustainable modes of transport (TR07) and by establishing PPPs, which are sometimes referred to as BOT locally[31]) to enhance bus network infrastructure (TR08 and TR09) and implement bus operational reforms (TR13). Other actions could be funded through this type of arrangement, but the City would need significant support in utilising this type of funding.

7.2.4. Funding of the Government of Republika Srpska

Republika Srpska which has its own executive and legislature, is another potential source of funding for GCAP actions. It is proposed that the RS Ministry of Finance, Ministry of Energy and Mining, and Ministry of Spatial Planning, Construction and Ecology could in particular provide access to finance for actions in the land use and industry sectors.

[31] BOT is only one form of PPP, and is an arrangement where a private entity funds, designs, builds, operates and owns public infrastructure over a relatively long period in order to recoup costs and make a return, before transferring ownership to the government.

Table 7-2- Costs (EUR and BAM) and funding options for priority GCAP actions

Action Reference and Title	Action Classification		Timescales	Total CAPEX estimate		Mid-term CAPEX estimate		Annual OPEX estimate		Revenue generating (Y/N)	Overall funding source				City funding source			Notes on potential sources of funding[32]
	Primary	Secondary		EUR	BAM	EUR	BAM	EUR	BAM		City	City related company funding	Private sector funding	RS Ministry	Grant	Budget	Debt	
TRANSPORT																		
TR01 Develop car parking and management policies and strategies	Policy	Developing policy, plan, legislation, regulations	2021-2025	50,000	98,000	50,000	98,000	10,000	19,600	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
TR05 Expand and enhance cycling infrastructure	Investment	Capital investment: implementation – improving existing	2022-2025	4,300,000	8,428,000	4,300,000	8,428,000	215,000	421,400	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
TR07 Promotional campaigns for ride sharing, car sharing, walking and cycling	Investment	Awareness raising	2021-2022	50,000	98,000	50,000	98,000	15,000	29,400	N	✓		✓		✓	✓		The action could be 90% funded by the City through a combination of City budget and grant financing. Grant financing would form 90% of the funding for the action. The action is not expected to generate a revenue stream.
TR08 Upgrading of bus stop infrastructure and technology	Investment	Capital investment: implementation – improving existing	Phase 1: 2022 - 2026 Phase 2: 2026 – 2031	3,000,000	5,880,000	1,500,000	2,940,000	150,000	294,000	Y	✓	✓	✓			✓	✓	Some funding could be provided through the City, focussed on using the City budget but also debt financing to be considered. Significant funding to be leveraged from the private sector, with a specific focus on advertising opportunities (which can generate revenue streams). Funding models to consider investment from public transport operators.
TR09 Implement bus network infrastructure	Investment	Capital investment: implementation – new	2022-2026	6,000,000	11,760,000	6,000,000	11,760,000	300,000	588,000	Y	✓	✓	✓			✓	✓	Some funding could be provided through the City, focussed on using the City budget but also debt financing to be considered. Significant funding to be leveraged from the private sector, with a specific focus on advertising opportunities (which can generate revenue streams). Funding models to consider investment from public transport operators. Revenue generation to come through fares from park and ride services / facilities.
TR10 Implement pedestrian priority infrastructure	Investment	Capital investment: implementation – new	2022-2026	2,000,000	3,920,000	2,000,000	3,920,000	100,000	196,000	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
TR13 Implement bus operational reforms	Investment	Capital investment: implementation – improving existing	2022-2031	22,500,000	44,100,000	13,500,000	26,460,000	410,000	803,600	Y	✓	✓	✓			✓	✓	Funding could be split between the City, private bus operators and the private funding. The City component could be 75% funded through debt financing. Revenue generation should come from farebox and advertising revenue.
ENERGY AND BUILDINGS																		
EN01 Development and adoption of the Energy Efficiency Action Plan of the City of Banja Luka for the period 2021-2023	Policy	Developing policy, plan, legislation, regulations	2021 - 2022	75,000	147,000	75,000	147,000	15,000	29,400	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
EN04 Improved home energy efficiency – building users	Investment	Capital investment: implementation	2022 - 2028	10,000,000	19,600,000	7,500,000	14,700,000	50,000	98,000	Y	✓			✓	✓			90% of the funding could come from the RS Ministry level. The remainder of the action could be 10% funded by the City through grant

[32]Percentage estimates for the breakdown of sources of funding (overall and City) are indicative only and should be further refined based on more detailed feasibility study.

Action Reference and Title	Action Classification		Timescales	Total CAPEX estimate		Mid-term CAPEX estimate		Annual OPEX estimate		Revenue generating (Y/N)	Overall funding source				City funding source			Notes on potential sources of funding[32]
	Primary	Secondary		EUR	BAM	EUR	BAM	EUR	BAM		City	City related company funding	Private sector funding	RS Ministry	Grant	Budget	Debt	
taking steps to reduce energy use		– new																financing.
EN05 Improved insulation in residential and public spaces in order to decrease the load of the heat network and free capacities for other areas.	Investment	Capital investment: implementation – new	2021 - 2031	19,500,000	38,220,000	9,750,000	19,110,000	0	0	Y	✓			✓	✓			90% of the funding could come from the RS Ministry level. The remainder of the action could be 10% funded by the City through grant financing.
EN06 Rehabilitation of district heat network to reduce water losses and improve thermal efficiency - thermal supply network metering and monitoring: Detailed Study	Investment	Improving information base, modelling	2022 - 2023	120,000	78,400	120,000	78,400	0	0	N		✓						100% of this action could be funded through DHN main shareholder being City of Banja Luka. The action is not expected to generate a revenue stream.
EN07 Rehabilitation of district heat network to reduce water losses and to improve thermal efficiency – Pipework replacement, substation automation, network expansion: Detailed Study	Investment	Capital investment: feasibility, planning, design, piloting	2022 - 2023	120,000	235,200	120,000	235,200	0	0	N		✓						100% of this action could be funded through DHN main shareholder being City of Banja Luka. The action is not expected to generate a revenue stream.
INDUSTRY																		
IN01 Capacity building through the City Administration to enhance the quality of environmental permitting instruments to support energy and material efficiency and cleaner production in industry	Policy	Training, capacity building	2021 - 2022	25,000	49,000	25,000	49,000	0	0	N	✓			✓	✓	✓		50% of the action could be funded by the City, with 90% of that funding coming from grant financing, with the remaining 10% from the City budget. The remaining 50% of funding could come from the RS Ministry of Energy and Mining. The action is not expected to generate a revenue stream.
WATER RESOURCES																		
WR01 Modernisation of GIS data systems for water supply and wastewater networks, assets and customer management	Investment	Improving information base, modelling	2021-2023	400,000	784,000	400,000	784,000	10,000	19,600	N	✓	✓			✓	✓		90% of the funding could come from the 'Vodovod Banja Luka' – the City water utility company. The remainder of the action could be 10% funded by the City through a combination of City budget and grant financing – with the majority expected to come from grant funding. The action is not expected to generate a revenue stream.
WR03 Sustainable Drainage systems (SuDS) and Decentralised Sewage Treatment Study	Policy	Capital investment: feasibility, planning, design, piloting	2021 - 2023	50,000	98,000	50,000	98,000	0	0	N	✓	✓			✓	✓		The action could be 50% funded by the City through a combination of City budget and grant financing. 50% of the funding could come from the 'Vodovod Banja Luka' – the City water utility company. The action is not expected to generate a revenue stream.
WR06 Prepare designs for Wastewater Treatment Plant	Investment	Capital investment: feasibility, planning, design, piloting	2022 - 2023	300,000	588,000	300,000	588,000	0	0	Y	✓	✓			✓	✓		The action could be 50% funded by the City through a combination of City budget and grant financing – with the majority coming from grant funding. 50% of the funding could come from the 'Vodovod Banja Luka' – the City water utility company. The action is not expected to

Action Reference and Title	Action Classification		Timescales	Total CAPEX estimate		Mid-term CAPEX estimate		Annual OPEX estimate		Revenue generating (Y/N)	Overall funding source				City funding source			Notes on potential sources of funding[32]
	Primary	Secondary		EUR	BAM	EUR	BAM	EUR	BAM		City	City related company funding	Private sector funding	RS Ministry	Grant	Budget	Debt	
																		generate a revenue stream.
WR07 Repair and improve the existing water supply system to reduce water losses	Investment	Capital investment: implementation – improving existing	2021 - 2025	30,000,000	58,800,000	15,000,000	29,400,000	600,000	1,176,000	Y	✓	✓				✓	✓	The action could be 50% funded by the City through a combination of City budget and grant financing – with 75% of the City funding potentially coming from debt financing. 50% of the funding to come from the 'Vodovod Banja Luka' – the City water utility company.
WR08 Develop new water supply network to allow connection of entire city population to the public water supply	Investment	Capital investment: implementation – new	2023 - 2030	40,000,000	78,400,000	20,000	39,200	800,000	1,568,000	Y	✓	✓				✓	✓	The action could be 25% funded by the City through a combination of City budget and grant financing – with 75% of the City funding possibly coming from debt financing. 75% of the funding could come from the 'Vodovod Banja Luka' – the City water utility company.
WR09 Wastewater network construction: extension, refurbishment and new build	Investment	Capital investment: implementation – improving existing	2021-2031	30,000,000	58,800,000	16,000,000	31,360,000	680,000	1,332,800	Y	✓	✓				✓	✓	The action could be 25% funded by the City through a combination of City budget and grant financing – with 75% of the City funding coming from debt financing. 75% of the funding could come from the 'Vodovod Banja Luka' – the City water utility company.
WR10 Wastewater Treatment Works construction	Investment	Capital investment: implementation – new	2023 - 2027	50,000,000	98,000,000	30,000,000	58,800,000	1,800,000	3,528,000	Y	✓	✓				✓	✓	The action could be 25% funded by the City through a combination of City budget and grant financing – with 75% of the City funding coming from debt financing. 75% of the funding could come from the 'Vodovod Banja Luka' – the City water utility company.
SOLID WASTE																		
SW01 Development of Integrated Waste Management Plan	Policy	Developing policy, plan, legislation, regulations	2021 - 2023	100,000	196,000	100,000	196,000	5,000	9,800	N	✓	✓			✓	✓		50% of the action could be funded from the City and 50% could come from Vodovoda.d. The City funding should be primarily generated from grant financing. The action is not expected to generate a revenue stream.
SW02 Feasibility study on waste treatment options	Investment	Capital investment: feasibility, planning, design, piloting	2021 - 2022	150,000	294,000	150,000	294,000	10,000	19,600	N	✓	✓			✓	✓		50% of the action could be funded from the City and 50% could come from Vodovoda.d. The City funding should primarily be generated from grant financing. The action is not expected to generate a revenue stream.
SW03 Development of implementation strategy for separate collection system for recyclable waste and its implementation	Investment	Capital investment: feasibility, planning, design, piloting	2021 – 2023	200,000	392,000	200,000	392,000	20,000	39,200	Y	✓	✓			✓			10% of the action could be funded from the City and 90% could come from Vodovoda.d. The City funding is to be primarily generated from grant financing. Donor funding to be considered for technical support.
SW04 Development of waste treatment infrastructure	Investment	Capital investment: implementation – new	2021 - 2030	40,000,000	78,400,000	20,000,000	39,200,000	4,000,000	7,840,000	Y	✓	✓				✓	75%	The action could be 50% funded by the City through a combination of City budget and grant financing. 50% of the funding could come from private waste management companies.
SW05 Development of waste disposal infrastructure	Investment	Capital investment: implementation – new	2021 - 2030	25,000,000	49,000,000	12,500,000	24,500,000	2,500,000	4,900,000	Y	✓	✓			✓	✓	40%	The action could be 50% funded by the City through a combination of City budget, grant and debt financing. 50% of the funding could come from private waste management companies.
SW06 Increase of waste awareness through education campaigns	Investment	Awareness raising	2021 - 2023	80,000	156,800	80,000	156,800	4,000	7,840	N	✓	✓			✓	✓		50% of the action could be funded from the City and 50% could come from Vodovoda.d. The City funding is to be split between the City budget and grant funding. Donor funding to be considered for technical support.

Action Reference and Title	Action Classification		Timescales	Total CAPEX estimate		Mid-term CAPEX estimate		Annual OPEX estimate		Revenue generating (Y/N)	Overall funding source				City funding source			Notes on potential sources of funding[32]
	Primary	Secondary		EUR	BAM	EUR	BAM	EUR	BAM		City	City related company funding	Private sector funding	RS Ministry	Grant	Budget	Debt	
LAND USE																		
LU01 Develop and legally adopt an overarching Sustainable Urban Planning Framework for the City of Banja Luka	Policy	Developing policy, plan, legislation, regulations	2021-2023	825,000	1,617,000	825,000	1,617,000	1,900	3,724	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
LU03 Screening and de-risking of contaminated sites	Investment	Improving information base, modelling	2021-2023	100,000	196,000	100,000	196,000	1,500	2,940	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
LU05 The continued effective management and enhancement of public parks and green spaces	Investment	Capital investment: implementation – improving existing	2021-2030	1,200,000	2,352,000	600,000	1,176,000	5,000	9,800	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
LU06 Provision of new public parks and green infrastructure	Investment	Capital investment: implementation – new	2021-2030	3,000,000	5,880,000	1,800,000	3,528,000	100,000	196,000	N	✓			✓	✓	✓		The action could be funded largely through the City via a combination of combination of City budget and grant financing. Additional supporting funding should be sourced via RS Ministries. The action is not expected to generate a revenue stream.
ADAPTATION AND RESILIENCE																		
AR01 Conduct a Climate Change and Natural Disaster Risk Assessment of Banja Luka's infrastructure	Investment	Improving information base, modelling	2021 – 2022	500,000	980,000	500,000	980,000	0	0	N	✓				✓	✓		The City Administration and national Government usually rely on donor technical assistance for funding similar technical studies, although some public funds could be made available either for co-financing or an in-kind contribution
AR02 Develop an Action Plan on Climate Change Adaptation and Natural Disaster Resilience	Policy	Developing policy, plan, legislation, regulations	2022 - 2023	500,000	980,000	500,000	980,000	0	0	N	✓				✓	✓		The City Administration and national Government usually rely on donor technical assistance for funding similar technical studies, although some public funds could be made available either for co-financing or an in-kind contribution
Total Costs				**290,145,000**	**568,527,400**	**144,115,000**	**282,308,600**	**11,802,400**	**23,132,704**									

8. Next steps

8.1. The GCAP and its status

This GCAP is a document that will be used by the City of Banja Luka to communicate its green city ambitions and as a roadmap for realising those ambitions. It outlines high-level aspirations and presents corresponding action priorities for the city in the short-term, medium-term and long-term.

The environmental, economic and social improvements that Banja Luka can experience by implementing the GCAP are reflected in the objectives and targets that will be used to measure the GCAP's progress. However, to realise the transformation potential of the Plan the momentum generated during its development will need to be maintained.

The GCAP has been adopted by the City Administration and it will now be used as the basis for inclusion in Banja Luka's capital investment programmes, triennial development programmes and other mid-term and long-term development plans. This will be crucial for building political support. A concerted effort will be made to help to ensure that this first stage of the Green City Implementation period, Step 3 of the GCAP process, begins in late 2020. This will mark the start of the 60 to 72-month implementation period, over which time a series of GCAP actions will be delivered using a holistic and carefully structured approach that is fully aligned with, and embedded in, its wider framework.

8.2. GCAP implementation planning

The City Administration will need to decide which of the GCAP actions to implement. This will require further analysis of each proposal, including with regards to the funding needs and their potential to generate revenue, as well as the pursuit of the funding sources proposed in this Plan. Feasibility studies, which are objective assessments of the practicality of proposed interventions, will need to be conducted as part of this process.

In the course of GCAP development we have come across numerous examples of how the implementation and operationalisation of well-conceived measures has been compromised, and in some instances abandoned, owing to factors including insufficient political support, supporting actions, institutional framework, capacity, affordability, stakeholder engagement and data. We have sought to reflect related lessons learnt in the GCAP development process. Targeted capacity building activities have been conducted, for example, and packages of actions and supporting links between measures have been identified, as have action costs and potential funding sources. Stakeholder engagement activities, which have involved key decision-makers, have also been designed and conducted to build political support for the GCAP's targets and actions. The risks associated with operationalising the Plan must, however, be identified and rigorously reviewed at the beginning of Step 3 and mitigation measures for each designed and adopted. The effectiveness of these mitigation measures will be apparent in Step 4, Green City Reporting, where the implementation progress of GCAP actions and their impact will be analysed.

8.3. GCAP reporting

The Green City Reporting will identify what has been achieved and how, along with successes and opportunities for improvement in each period. The process that will be used to guide this process will be discussed and refined at the outset, but an indicative approach formulated during GCAP development, outlined in Chapter 6, will be used as a starting point. Green City Reporting is the fourth and final Step of the GCAP process, but the GCAP process is iterative and GCAP challenges, objectives, actions and targets will need to be periodically revisited to identify changes in State, Pressure and Response indicators that could require a revised approach to be adopted and the GCAP to be updated. The effectiveness of this process will depend on continued political support and clear and consistent ownership by a committed individual within the City Administration.

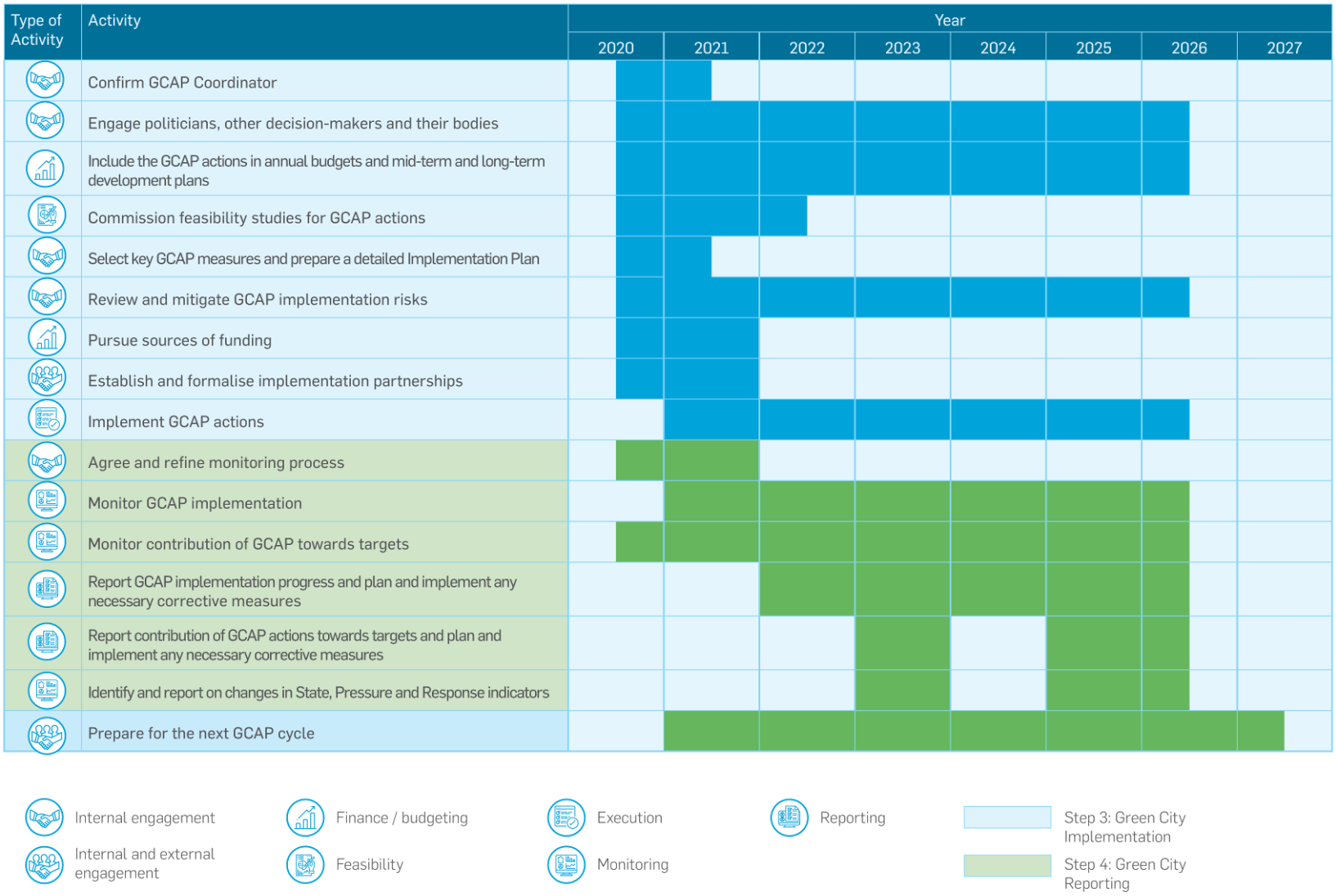


Figure 8-1 - Programme of activities for the Banja Luka GCAP steps 3 and 4

APPENDICES

Appendix A. Bibliography (List of sources)

1 – Reports of Hydrometeorological Institute of Republika Srpska (https://rhmzrs.com/zivotna-sredina/kvalitet-vazduha/izvjestaj/godisnji-pregledi/; https://rhmzrs.com/zivotna-sredina/kvalitet-vazduha/izvjestaj/mjesecni-izvjestaji/)
2 – Data provided by the Public Institution “Vode Srpske” (http://www.banjaluka.rs.ba/wp-content/uploads/2017/11/leap.pdf)
3 – Management Plan for the Sava River Basin of Republika Srpska 2017-2021
4 – Zoning policy for floodplains in the Vrbas River Basin
5 – Data provided by the Ministry of Transport and Communications of Republika Srpska
6 – Data provided by the Institute for Statistics of Republika Srpska
7 – Statistical Yearbook of Republika Srpska 2019 and Cities and Municipalities of Republika Srpska 2019
8 – Statistical Bulletin for Industry of Republika Srpska 2017
9 – Census data in Bosnia and Herzegovina 2013
10 – Data provided by Dependent Company “Elektrokrajina” a.d.
11 – Strategy for Integrated Water Management of the Republika Srpska 2015 - 2024
12 – Development Strategy of the City of Banja Luka for the period 2018 -2027
13 – Spatial Plan of the City of Banja Luka
14 – Urban Plan of Banja Luka 2008-2020 (draft)
15 – Local Environmental Action Plan of the City of Banja Luka (LEAP) 2016-2021
16 – Data provided by Public Company “Vodovoda” a.d. Banja Luka
17 – Study "Banja Luka – the City of Greenery " (draft)
18 – Energy Efficiency Action Plan for the City of Banja Luka 2016-2019
19 – Strategy for development of local roads and streets of the City of Banja Luka 2017-2022
20 – Strategy for the Development of the SME and Entrepreneurship Sector for the City of Banja Luka 2010-2015
21 – Assessment of the threat of natural and other disasters in the City of Banja Luka (amendment of the Assessment, 2015)
22 – Data provided by the Department of Civil Protection and Professional Territorial Firefight Units, Banja Luka City Administration
23 – Rural Development Strategy of the City of Banja Luka 2010-2015
24 – Data provided by the Public Company “Čistoće” a.d. Banja Luka
25 – Data Provided by the Public Company "DEP-OT"d.o.o.
26 – Geospatial database data from “CORINE Land Cover” (https://land.copernicus.eu/pan-european/corine-land-cover)
27 - Geospatial database data from “Urban Atlas 2012” (https://land.copernicus.eu/local/urban-atlas/urban-atlas-2012)
28 – Local Plan for Nature Protection of the City of Banja Luka
29 – Waste data collected from the Consultant through previous projects

Appendix B. State, pressure and response indicator tables

Table B-1 - Indicators relevant to the GCAP and future monitoring

ID	Pressure/ State	Topic/Sector	Indicator
1	State	Air quality	Average annual concentration of $PM_{2.5}$
1.1	State	Air quality	Average annual concentration of PM_{10}
1.2	State	Air quality	Average daily concentration of SO_2
1.3	State	Air quality	Average daily concentration of NOx
2	State	Water bodies	Biochemical Oxygen Demand BOD in rivers and lakes
2.1	State	Water bodies	Ammonium (NH4) concentration in rivers and lakes
4.1c	State	Soil	Concentration of zinc in soil
6	State	Green space	Open unbuilt space area ratio per 100,000 inhabitants
6.1	State	Green space	Share of green space areas within urban limits
6.2	State	Green space	Public green space areas ratio per 100,000 inhabitants
Added as target	State	Green space	Proportion of City area regulated by Urban Plan
7	State	Biodiversity & ecosystems	Abundance of bird species
7.2	State	Biodiversity & ecosystems	Forest area change
Added as target	State	Biodiversity & ecosystems	Proportion of protected natural areas
8	State	Mitigation of GHG emissions	Annual CO_2 equivalent emissions per capita
9.2	State	Adaptation resilience to natural disaster risk	Percentage of households at risk
Added as target	State	Adaptation resilience to natural disaster risk	Annual average value of material damages in economy, infrastructure, public and private buildings from natural and other disasters (floods, earthquakes, fires)
10	Pressure	Transport	Average age of car fleet
10.3	Pressure	Transport	Share of passenger vehicles run by electricity or gas
11	Pressure	Transport	Transport modal share
11.2	Pressure	Transport	Motorisation rate
11.3	Pressure	Transport	Average number of vehicles, cars and motorbikes per household
11.5	Pressure	Transport	Kilometres of bicycle path / 100k population
12	Pressure	Transport	Average travel speed during peak hours
14	Pressure	Buildings	Electricity consumption in buildings
14.1	Pressure	Buildings	Electricity consumption in residential building
15	Pressure	Buildings	Heating cooling consumption in buildings fossil fuels residential buildings
15.1	Pressure	Buildings	Heating cooling consumption in residential buildings fossil fuels
15.2	Pressure	Buildings	Heating cooling consumption in non-residential buildings fossil fuels
16	Pressure	Industries	Electricity consumption in industries per unit of industrial GDP
18	Pressure	Industries	Heavy metals Pb emission intensity of manufacturing industries
18.1	Pressure	Industries	Fossil fuel combustion in industrial processes per unit of industrial GDP
19	Pressure	Industries	Share of industrial waste recycled as a share of total industrial waste produced
20	Pressure	Industries	Percentage of industrial wastewater that is treated according to applicable national standards
23	Pressure	Energy	Proportion of total energy derived from RES as a share of total city energy consumption in TJ
22	Pressure	Energy	Share of population with access to heating cooling
25.2	Pressure	Water	Unit of water consumed in power plants per unit of primary energy generated

ID	Pressure/ State	Topic/Sector	Indicator
25.3	Pressure	Water	Industrial water consumption as percent of total urban water consumption
26	Pressure	Water	Non-revenue water
27	Pressure	Water	Percentage of residential and commercial wastewater that is treated according to applicable national standards
28	Pressure	Water	Percentage of dwellings damaged by the most intense flooding in the last 10 years
28.1	Pressure	Water	Annual number of storm water or sewerage overflows per 100km of network length
28.2	Pressure	Water	Awareness and preparedness to natural disasters
29	Pressure	Solid Waste	Total solid waste generation per capita
31	Pressure	Solid Waste	Proportion of MSW that is sorted and recycled
31.1	Pressure	Solid Waste	Percentage of MSW which is disposed of in open dumps, controlled dumps or bodies of water or is burnt
33	Pressure	Land use	Population density on urban land

Table B-2 - Indicators contributing to water resources challenges (values)

State indicator		Value and benchmark
Biochemical Oxygen Demand BOD in rivers and lakes		3.24 mg/L in 2017 and 1.77 mg/L in 2019
Sector	**Pressure indicator**	**Response indicators**
Water	Power plants water consumption(NA)	Water saving and reuse encouraged through awareness campaigns
	Industrial water consumption / total urban consumption(NA)	Metering and billing for water is regulated
	Non-revenue water (37%)	Coverage and efficiency of water supply is improved through planning and investment
	Percentage of municipal (residential and commercial)wastewater treated according to national standards (1%)	Access to wastewater collection and treatment is improved through planning and investment
		Wastewater billing is regulated
Industries	Percentage of industrial wastewater treated according to applicable national standards (2%)	Industrial wastewater treatment promoted, enforced through fiscal incentives and regulations
Solid waste	Percentage of MSW disposed in non-sanitary way (open dumps, water bodies, etc.) (NA)	Littering and non-compliance to sorting systems is dis-incentivised

Table B-3 - Indicators contributing to air quality challenges (values)

State indicator		Value and benchmark
Average annual concentration PM_{10}		28.86µg/m^3
Average annual concentration of $PM_{2.5}$		17.50 µg/m^3
Average daily concentration SO_2		8.19 µg/m^3
Average daily concentration of NOx		53.21 µg/m^3
Sector	**Pressure indicator**	**Response indicators**
Transport	Average age car fleet (14.10 years)	High-polluting vehicles are regulated. Energy efficient vehicles are incentivised through fiscal instruments
	Transport modal share (NA)	Extension and improvement of public and non-motorised transport is planned
	Average travel speed during peak hours (NA)	Traffic demand is managed congestion charges smart technologies
	Motorisation rate (0.34)	Extension and improvement of public non-motorised transport is promoted through information and awareness
	Average number of vehicles per household (0.83)	Traffic demand is managed
	Kilometres of bicycle path / 100k population (7.66)	Extension and improvement of public and non-motorised transport
	Share of total passenger vehicle run on electricity or gas (NA)	Public and non-motorised transport is promoted
Buildings	Heat cooling consumption in buildings (NA)	Public and private investment in energy efficiency Green building promoted through standards and fiscal incentives Metering and billing for personal energy use regulated
	Consumption of energy from fossil fuels for heating in residential buildings (NA)	
	Consumption of energy from fossil fuels for heating in non-residential buildings (NA)	
Industries	Fossil fuel consumption per unit of industrial GDP (NA)	Energy efficient equipment regulated and incentivised through fiscal instruments
		Energy efficient equipment regulated and incentivised through fiscal instruments

		Energy efficient technologies supported through private investment
Energy	Proportion of energy derived from RES (NA)	RES in private buildings to be incentivised through fiscal instruments RES developed and supported through public and private investment RES incentivised through awareness campaigns
	Share of population with access to district heating (35%)	
Solid waste	*Percentage of MSW disposed in non-sanitary way (open dumps, water bodies, etc.) (NA)*	Littering and non-compliance to sorting systems is dis-incentivised

Table B-4 - Indicators contributing to green space challenges (values)

State indicator		**Value and benchmark**
Open green space area ratio per 100,000 inhabitants		16.6 m^2/capita
Share of non-built-up areas within urban limits		70.92 %
Public green space area ratio per 100,000 inhabitants		3 m^2/capita
Sector	**Pressure indicator**	**Response indicators**
Land use	Population density on urban land (877.43 residents/km^2)	Density regulated Mixed use development promoted through zoning regulation

Table B-5 - Indicators contributing to mitigation of GHG emissions challenges (values)

State indicator		**Value and benchmark**
Annual CO_2 equivalent emissions per capita		3.36 Tonne / year / capita
Sector	**Pressure indicator**	**Response indicators**
Transport	Average age car fleet (14.10 years)	High-polluting vehicles are regulated. Energy efficient vehicles are incentivised through fiscal instruments
	Transport modal share (NA)	Extension and improvement of public and non-motorised transport is planned
	Average travel speed during peak hours (NA)	Traffic demand is managed congestion charges smart technologies
	Motorisation rate (0.34)	Extension and improvement of public non-motorised transport is promoted through information and awareness
	Average number of vehicles per household (0.83)	Traffic demand is managed
	Kilometres of bicycle path / 100k population (7.66)	Extension and improvement of public and non-motorised transport Public and non-motorised transport is promoted
	Share of passenger vehicles run by electricity or gas (NA)	
Buildings	Electricity consumption in buildings (71.33 kWh/m^2)	Public and private investment in energy efficiency Green building promoted through standards and fiscal incentives Metering and billing for personal energy use regulated
	Heat cooling consumption in buildings (NA)	
	Consumption of energy from fossil fuels for heating in residential buildings (NA)	
	Consumption of energy from fossil fuels for heating in non-residential buildings (NA)	
	Electricity consumption in residential buildings (43.95 kWh/m^2)	
Industries	Electricity consumption per unit in industrial GDP (0.48 kWh / 2010 USD)	Energy efficient equipment regulated and incentivised through fiscal instruments
	Fossil fuel consumption per unit of industrial GDP (NA)	Energy efficient equipment regulated and incentivised through fiscal instruments Energy efficient technologies supported through private investment

Energy	Proportion of energy derived from RES (NA)	RES in private buildings to be incentivised through fiscal instruments RES developed and supported through public and private investment RES incentivised through awareness campaigns
Solid waste	Percentage of MSW disposed in non-sanitary way (open dumps, water bodies, etc.) (NA)	Littering and non-compliance to sorting systems is dis-incentivised

Table B-6 - Indicators contributing to soils challenges (values)

State indicator		Value and benchmark
Concentration of zinc in soil		226.73 mg/kg
Sector	**Pressure indicator**	**Response indicators**
Water	Percentage of wastewater treated according to applicable national standards (2%)	
Industries	Heavy metals, Pb (lead) emission intensity from industry (NA)	Material efficiency of new built industrial facilities and waste recycling is regulated
	Share of industrial waste recycled as a share of total industrial waste produced (NA)	Industrial wastewater treatment, reuse or recycling promoted, enforced through fiscal incentives and regulations
Solid waste	Percentage of MSW disposed in non-sanitary way (open dumps, water bodies, etc.) (NA)	Littering and non-compliance to sorting systems is dis-incentivised
	Proportion of MSW that is sorted and recycled (2%)	
	Total solid waste generation per capita (326.42 kg/year/capita)	

Table B-7 - Indicators contributing to biodiversity and ecosystems challenges (values)

State indicator		Value and benchmark
Forest area change		8.22 %
Abundance of all bird species, annual change		N/A
Open green space area ratio per 100,000 inhabitants		16.6 m^2/capita
Share of green space areas within urban limits		70.92 %
Sector	**Pressure indicator**	**Response indicators**
Water	Percentage of municipal wastewater treated according to national standards (0.6%) [this value is 1% in other tables]	Access to wastewater collection and treatment is improved through planning and investment Wastewater billing is regulated
Land use	Population density on urban land (877.43 residents/km^2)	Density regulations Mixed-use development promoted through zoning regulations
Industries	Percentage of wastewater treated according to applicable national standards (2%)	Industrial wastewater treatment promoted, enforced through fiscal incentives and fines
Solid waste	Percentage of MSW disposed in non-sanitary way (open dumps, water bodies, etc.) (NA)	Littering and non-compliance to sorting systems is dis-incentivised

Table B-8 - Indicators contributing to adaptation and resilience to natural disasters challenges (values)

State indicator		Value and benchmark
Percentage of households at risk		0.29%
Sector	**Pressure indicator**	**Response indicators**
Water	Annual number of storm water / sewerage overflows / 100km network (NA)	Drainage facilities to be developed through plans and investment
	Awareness & preparedness to natural disasters (NA)	Business and community resilience encouraged through awareness campaigns
	Percentage of dwellings damaged by most intense flooding in the last 10 years (2.92%)	Drainage facilities to be developed through plans and investment

Appendix C. Additional actions

The actions presented in this appendix are additional to those presented in detail in Chapter 5. The actions, although not identified through the technical, stakeholder and political prioritisation process as being the highest priority, are still presented as part of this GCAP as they were generated by the GCAP team to respond to identified environmental challenges and as such can but added to the prioritised list as deemed necessary by the city.

A total of 26 additional actions are presented in this appendix and they cover the following sectors:

- Transport – 7 actions.
- Energy and buildings – 8 actions.
- Land use - 4 actions.
- Water resource – 5 actions.
- Industry – 2 actions.

C.1.1. Transport actions

The two additional transport actions involve replacing the city vehicle fleet with low emission vehicles and introducing supporting infrastructure, such as a network of on-street electric vehicle charging points and conducting a Feasibility Study for developing a rapid transit system corridor in Banja Luka.

C.1.2. Energy and buildings actions

The additional energy and buildings actions related to enhancing the evidence base, for example by developing a building energy consumption database and energy reporting for building owners and utility providers and assessing the active management and improvement of the district heat network, fuel sources, other energy supplies and infrastructure capacities. The actions also include assessments of the potential for deploying solar PV energy, introducing relatively low carbon heat sources to the district heat network, and opportunities for generating and using biogas in the water, waste and transport sectors. An action to deliver capacity building relating to energy performance assessments, building certifications and compliance tests was also developed.

C.1.3. Land use actions

There is an additional action to enhance capacity building amongst local policy-makers, development managers and regulators, and a further two involve the creation and enforcement of land use guidance, policy and associated tools, including regarding the regulation and monitoring of development, brownfield and mixed-use development, and TOD. In addition, there is a measure related to the development of a GIS database on land use and environment for the City of Banja Luka.

C.1.4. Water resource actions

The four additional water actions are all various forms of studies. The first is an action to increase data availability and involves conducting district metering, asset surveys and modelling water and wastewater networks. The others are a study into water company investment financing options (with a capacity building element), a study into industrial wastewater assessment, regulation and treatment investments, a pilot for SUDS construction, and the development of water and wastewater network action plans.

C.1.5. Industry actions

The two additional industry actions are focussed on raising capacity, with a specific focus on the implementation of energy and material efficiency and cleaner production measures.

The costs of additional GCAP actions and associated funding options are listed in Table C-1. This table is followed by a detailed proforma for each additional action.

The CAPEX cost estimates are exclusive of delivery risk, optimism bias and climate change adaptation costs.

A conversion rate of 1.96 has been used to convert costs in EUR to BAM. Refer to Chapter 7 for the conversion source.

Table C -1 - Additional GCAP actions: CAPEX and OPEX costs (EUR and BAM) and funding options

Action Reference and Title	Action Classification		Timescales	Total CAPEX estimate		Mid-term CAPEX estimate		Annual OPEX estimate		Revenue generating (Y/N)	Overall funding source				City funding source			Notes on potential sources of funding[33]
	Primary	Secondary		EUR	BAM	EUR	BAM	EUR	BAM		City	City related company funding	Private sector funding	RS Ministry	Grant	Budget	Debt	
TRANSPORT																		
TR02 Develop low transport emission policies	Policy	Developing policy, plan, legislation, regulations	2021-2022	60,000	117,600	60,000	117,600	15,000	29,400	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. Grant financing could form 90% of the funding for the action. The action is not expected to generate a revenue stream.
TR03 Refresh of the Sustainable Urban Mobility Plan (SUMP) for Banja Luka	Policy	Developing policy, plan, legislation, regulations	2021-2022	20,000	39,200	20,000	39,200	5,000	9,800	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
TR04 Develop City-wide data collection programme and multi-modal transport model	Investment	Improving information base, modelling	2021-2023	2,150,000	4,214,000	2,150,000	4,214,000	67,500	132,300	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. Grant financing could form 90% of the funding for the action. The action is not expected to generate a revenue stream.
TR06 Initiative for developing standards and guidelines for travel planning, parking and street design	Policy	Developing policy, plan, legislation, regulations	2021-2022	500,000	980,000	500,000	980,000	30,000	58,800	N				✓	✓	✓		The action could be 100% funded by the relevant ministries through a combination of ministry budget and grant financing. Grant financing could form 90% of the funding for the action. The action is not expected to generate a revenue stream.
TR11 Traffic management and control: HOV lanes, City-wide traffic system upgrade and control centre	Investment	Capital investment: implementation – new	2022-2030	3,500,000	6,860,000	585,000	1,146,600	500,000	980,000	Y	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. There is the option of considering private sector operation of the traffic control centre. Revenue generation should come from enhanced traffic management in the shape of fines and control measures.
TR12 Implement low emission vehicles and supporting infrastructure	Investment	Capital investment: implementation – new	2022-2026	1,820,000	3,567,200	1,820,000	3,567,200	90,000	176,400	N	✓	✓	✓			✓	✓	The funding of this action could be split equally three ways, between the City, City related company, and other private sector via a PPP arrangement. The component that the City could finance would largely (approximately 70%) be from concessional debt financing (DFI) with the remainder of the City share being covered by the City budget. The action is not expected to generate a revenue stream.
TR14 Develop rapid transit system corridor feasibility study	Investment	Capital investment: feasibility, planning, design, piloting	2021-2022	500,000	980,000	500,000	980,000	0	0	N	✓				✓	✓		This action could be entirely funded by the City, half from the City budget and half from grant financing. The action is not expected to generate a revenue stream.
ENERGY AND BUILDINGS																		
EN02 Training and capacity building in energy performance assessments, building certifications and compliance tests	Investment	Training, capacity building	2021-2025	300,000	588,000	300,000	588,000	0	0	N	✓				✓	✓		This action could be entirely funded by the City, half from the City budget and half from grant financing. The action is not expected to generate a revenue stream.
EN03 Develop building energy consumption database and energy reporting for building owners and utility providers	Investment	Improving information base, modelling	2021-2026	300,000	588,000	300,000	588,000	60,000	117,600	N	✓				✓	✓		This action could be entirely funded by the City, half from the City budget and half from grant financing. The action is not expected to generate a revenue stream.
EN08	Investment	Capital	2021-2022	60,000	117,600	60,000	117,600	20,000	39,200	N		✓						This action could be entirely funded by Toplanaa.d.

[33] Percentage estimates for the breakdown of sources of funding (overall and City) are indicative only and should be further refined based on more detailed feasibility study.

Action Reference and Title	Action Classification		Timescales	Total CAPEX estimate		Mid-term CAPEX estimate		Annual OPEX estimate		Revenue generating (Y/N)	Overall funding source				City funding source			Notes on potential sources of funding[33]
	Primary	Secondary		EUR	BAM	EUR	BAM	EUR	BAM		City	City related company funding	Private sector funding	RS Ministry	Grant	Budget	Debt	
Study to assess active management and improvement of the district heat network energy and fuel sources, and assessment of other energy supplies and infrastructure capacities in the City		investment: feasibility, planning, design, piloting																Banja Luka. The action is not expected to generate a revenue stream
EN09 District heat network – new low carbon heat sources: Assessment Study	Investment	Capital investment: feasibility, planning, design, piloting	2021-2022	300,000	588,000	300,000	588,000	0	0	N		✓						The entire cost of implementing this action could be covered by a City related company. The action is not expected to generate a revenue stream .
EN10 Study on biogas generation for CHP and sustainable bus fleet.	Investment	Capital investment: feasibility, planning, design, piloting	2021-2022	50,000	98,000	50,000	98,000	0	0	N	✓	✓			✓	✓		The cost of this action could be equally shared between the City and a City related company. The share funded by the City would largely come from a grant (approximately 90%) with the remaining 10% being funded from the City budget. The action is not expected to generate a revenue stream.
EN11 Deployment of solar PV Energy	Investment	Capital investment: implementation – new	2021-2023	5,800,000	11,368,000	5,800,000	11,368,000	146,000	286,160	Y	✓		✓	✓	✓	✓		The City could contribute towards the cost of implementing this action to 10%. The share of this 10% that would largely be covered by a grant is 90%, with the remaining 10% potentially being funded from the City budget. The majority of the cost could, however, be borne by the private sector (45%) via a PPP arrangement, and by the RS government (45%), likely through a form of debt financing. The revenue generation potential relates to electricity generated by the solar panels.
EN12 Implement solar thermal hot water (STHW) systems: 200-unit trial	Investment	Capital investment: implementation - new	2021-2024	400,000	784,000	400,000	784,000	20,000	39,200	N	✓		✓	✓	✓	✓		The City could contribute towards the cost of implementing this action (10%), the share of which would largely be covered by a grant (90%) with the remaining 10% potentially being funded from the City budget. The majority of the cost could, however, be borne by the private sector (45%) via a PPP arrangement, and by the RS government (45%), likely through a form of debt financing.
EN13 Development and implementation of a LED Public Lighting Programme A) Assessment, Programme Development B) Deployment Programme	Investment	Capital investment: feasibility, planning, design, piloting	2021-2024	6,035,000	11,828,600	35,000	68,600	0	0	N	✓	✓			✓	✓		The cost of this action could be equally shared between the City and a City related company. The action (B) will provide significant electricity savings and therefore operational cost savings equivalent to around 40-60% of the current energy consumption for public lighting could be expected.
INDUSTRY																		
IN02 Raise capacities of the City industry to implement energy and material efficiency and cleaner production measures	Investment	Training, capacity building	2021-2023	100,000	196,000	100,000	196,000	0	0	N	✓			✓	✓	✓		50% of the action could be funded by the City, with 90% of that funding potentially coming from grant financing, with the remaining 10% from the City budget. The remaining 50% of funding should come from the RS Ministry of Energy and Mining. The action is not expected to generate a revenue stream.
IN03 Incentives for businesses that are advanced in application of ecological standards in the circular economy.	Investment	Capital investment: feasibility, planning, design, piloting	2022-2023	150,000	294,000	150,000	294,000	0	0	N	✓			✓	✓	✓		50% of the action could be funded by the City, with 90% of that funding coming from grant financing, with the remaining 10% from the City budget. The remaining 50% of funding should come from the RS Ministry of Finance. The action is not expected to generate a revenue stream.
WATER RESOURCES																		

Action Reference and Title	Action Classification		Timescales	Total CAPEX estimate		Mid-term CAPEX estimate		Annual OPEX estimate		Revenue generating (Y/N)	Overall funding source				City funding source			Notes on potential sources of funding[33]
	Primary	Secondary		EUR	BAM	EUR	BAM	EUR	BAM		City	City related company funding	Private sector funding	RS Ministry	Grant	Budget	Debt	
WR02 District metering, asset surveys and modelling of water and wastewater networks	Investment	Improving information base, modelling	2021-2023	500,000	980,000	500,000	980,000	20,000	39,200	N	✓	✓			✓	✓		Most of the cost of implementing this action (90%) could be covered by Vodovoda.d., with the remaining 10% funded by the City, half of which would come from the City budget and the other half by a grant. The action is not expected to generate a revenue stream.
WR04 Study into water company investment financing options and capacity building	Investment	Capital investment: feasibility, planning, design, piloting	2021-2022	200,000	392,000	200,000	392,000	0	0	N	✓	✓			✓	✓		This action could be part funded by Vodovoda.d. and part funded by the City, with an equal share of the costs (50%) borne by each. The funding from the City could largely be from a grant (90%) with the remaining 10% coming from the City budget. The action is not expected to generate a revenue stream.
WR05 Development of water and wastewater network action plans	Investment	Capital investment: feasibility, planning, design, piloting	2021-2023	350,000	686,000	350,000	686,000	0	0	N	✓	✓			✓	✓		This action could be part funded by Vodovoda.d. and part funded by the City, with an equal share of the costs (50%) borne by each. The funding from the City should largely be from a grant (90%) with the remaining 10% coming from the City budget. The action is not expected to generate a revenue stream.
WR11 Pilot of Sustainable Urban Drainage systems (SuDS) construction	Investment	Capital investment: feasibility, planning, design, piloting	2023-2031	500,000	980,000	250,000	490,000	60,000	117,600	N	✓	✓			✓	✓	70%	This action could be part funded by Vodovoda.d. and part funded by the City, with an equal share of the costs (50%) borne by each. The funding from the City could largely (70%) be covered by debt financing (DFI), with 20% funded from the City budget and the remaining 10%, which could cover the TA element of this action, from a grant (90%). The action is not expected to generate a revenue stream.
WR12 Study into Industrial wastewater assessment, regulation and treatment investments	Policy	Developing policy, plan, legislation, regulations	2021-2023	150,000	294,000	150,000	294,000	10,000	19,600	N	✓	✓			✓	✓		Most of the cost of implementing this action (75%) could be covered by Vodovoda.d., with the remaining 25% funded by the City, half of which would come from the City budget and the other half by a grant. The action is not expected to generate a revenue stream.
LAND USE																		
LU02 Develop a GIS land use and environmental database for the City of Banja Luka	Investment	Improving information base, modelling	2021-2026	110,000	215,600	110,000	215,600	1,500	2,940	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. The action is not expected to generate a revenue stream.
LU04 Enforcement and establishment of regulated monitoring of development in accordance with planning policy and building regulations	Investment	Improving information base, modelling	2023-2027	300,000	588,000	240,000	470,400	15,000	29,400	N	✓				✓	✓		The action could be 100% funded by the City through a combination of City budget and grant financing. Grant financing should comprise 90% of the funding for the action. The action is not expected to generate a revenue stream
LU07 Develop policy and guidance to encourage Brownfield and Mixed-Use development, and Transit-Oriented Development	Policy	Developing policy, plan, legislation, regulations	2021-2022	100,000	196,000	100,000	196,000	1,000	1,960	N	✓				✓	✓		The study element of this action is being conducted and already financed. The remaining component could be 100% funded by the City, half from the City budget and the other half from grant financing. The action is not expected to generate a revenue stream .
LU08 Enhanced Capacity Building amongst local policy-makers, development managers; and regulators	Investment	Training, capacity building	2021-2023	10,000	19,600	10,000	19,600	0	0	N	✓				✓	✓		This action could be entirely funded by the City, half from the City budget and half from grant financing. The action is not expected to generate a revenue stream.
Total Costs				**24,265,000**	**47,559,400**	**15,040,000**	**29,478,400**	**1,061,000**	**2,079,560**									

TRANSPORT ACTION: TR02

Primary action classification: Policy
Secondary action classification: Developing policy, plan, legislation, regulations

Action title: Develop low transport emission policies

Implement low emission public transport services policy

There are seven bus companies in Banja Luka operating public transport on 22 City and 30 suburban lines. The bus fleet is made up of diesel driven vehicles. The diesel-fuelled buses represent the primary source of PM_{10} and $PM_{2.5}$emissions. The policy is to set a regulatory framework whereby the operators will be required to replace their existing diesel driven bus fleet with more fuel-efficient low emission vehicles. Alternatives fuels could include hybrid; biodiesel; biogas CNG; electric; LPG; hydrogen. The policy element will, however, have a high cost-implication on the operators. Hence, the step to bus fleet renewal is recommended. The policy will include:

- All new bus fleet vehicles purchased to be low emission – minimum Euro 6
- 50% of the bus fleet to be replaced by the low-emission vehicle in the next five years
- Remaining 50% of the vehicles should be low emission in the next 5-10 years

Implement City centre low emissions zone policy

The policy is to encourage the use of low-emission vehicles in the central areas of the City. The policy will include identification of appropriate geographical scope for Low Emission Zone (LEZ) and targeted vehicle categories. There will need to be a regulatory change in enforcing the low emission zone. The low emission zone vehicle categories will need to follow the national standard and current EU guidelines. The policy should be informed by a detailed assessment of alternatives and developed on the most appropriate option for Banja Luka. This could include:

- Complete restriction of any form of fossil fuel driven vehicles within a designated area
- Complete restriction of fossil fuel driven vehicles, except hybrid vehicles, within a designated area
- Fossil fuel driven vehicles are penalised through fines for accessing the low emission zone

Implement low emission vehicle incentivisation policy

Interest in the use of low emission vehicles (including EVs) for road transport is increasing. The policy will focus on supporting measures at the City level which would incentivise a wider take up of low emission vehicles. It is noted that the incentivisation policy will need to be supported through close cooperation with external organisations and authorities.

- Strengthening of low emission and EV regulations
- Implementation of low emission or EV pilot projects
- Consumer incentives including purchase grants, registration tax, domestic infrastructure incentives.
- Establishment of an innovation department within the Municipality traffic and transport which focusses on driving forward policies and proposals related low emission vehicles

Revenue generating: No

Owner: Banja Luka City Administration – Department of Traffic and Roads

Stakeholders: Public transport operators, private transport operators, local businesses, NGOs

Capex	EUR 60,000	BAM 117,600	**Annual Opex**	EUR15,000	BAM 29,400	**Implementation Start/End Year**	2021-2022

Notes on cost estimates: Each CAPEX estimate assumes the input from two local FTE at a cost of EUR 20,000 per policy – so a total of EUR 60,000 to develop all three policies. Annual OPEX assumes a 0.5 FTE at EUR 5,000 per year for policy review, update and implementation monitoring. This cost assumes no input from international experts or consultancy firms, local experts.

Action link to indicators										**Action performance**											
	State	1	1.1	1.2	1.3	8					Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions															
	Pressure	10	10.3	11	11.2	11.3	12				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR03																							
Primary action classification: Policy **Secondary action classification:** Developing policy, plan, legislation, regulations										**Action title:** Refresh of the Sustainable Urban Mobility Plan (SUMP) for Banja Luka													
The Sustainable Urban Mobility Plan concept considers the functional urban area and foresees that plans are developed in cooperation across different policy areas and sectors, across different levels of government and administration and in cooperation with citizens and other stakeholders. The focus of the SUMP is the development of integrated, sustainable transport options and solutions which contribute to clear objectives and targets. The SUMP would contain the following components: • Goals and objectives: improve the accessibility of urban areas and providing high-quality and sustainable mobility and transport, with a focus on the City and not the region • A long-term vision and clear implementation plan: should include a delivery plan for short-term implementation of the strategy, specifying the timing for implementation, responsibilities and funding. • An assessment of current and future performance: establish a robust baseline against which future progress can be measured. • The balanced and integrated development of all modes: this will include public transport, walking and cycling, inter-modality, urban road safety, road transport, urban logistics, mobility management and intelligent transport systems. • Participatory approach: should involve the relevant actors - citizens, as well as representatives of civil society and economic actors. • Monitoring and evaluation: regular monitoring of performance against agreed targets and objectives is required. In the context of Banja Luka, the SUMP would link back to the development of an Integrated Transport Master Plan for the City and other plans and strategies which promote carbon reductions in the City.																						
Revenue generating: No																							
Owner: Banja Luka City Administration – Department of Traffic and Roads									**Stakeholders:** Public transport operators, private transport operators, local businesses, NGO													
Capex	EUR 20,000	BAM 39,200	**Annual Opex**	EUR 5,000	BAM 9,800	**Implementation Start/End Year**	2021-2022																
Notes on cost estimates: The CAPEX estimate is based on updating the content of the existing SUMP which has already been generated by the city. The cost would cover two local FTE staff. No international consultancy input into the update of the SUMP would be provided. Annual OPEX assumes a 0.5 FTE at EUR 5,000 per year for regular review, monitoring and implementation.																							
Action link to indicators	State	1	1.1	1.2	1.3	6	6.1	8		**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Green space		Mitigation of GHG emissions															
	Pressure	10	10.3	11	11.2	11.5	12				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																					

TRANSPORT ACTION: TR04

Primary action classification: Investment
Secondary action classification: Improving information base, modelling

Action title: Develop City-wide data collection programme and multi-modal transport model

Implement City wide permanent traffic data collection system

A routine monitoring and robust data collection system can make evidence-based decision-making more efficient. The action is to implement a permanent traffic and transport data collection system and process in Banja Luka, which can be linked to a central data repository. The full data collection system could include the following devices and components:

- Inductive loops buried under the road to record traffic flows
- Automatic Number Plate Recognition (ANPR) cameras to monitor vehicular movements and CCTV cameras mounted to monitor behaviour
- Annual collection and surveying of public transport and taxi ridership
- Origin and destination surveys and travel to work surveys
- Utilisation of GPS mobile phone data and appropriate utilisation of data from existing applications.

Civil works will be needed to install the above collection equipment's. The location of the equipment should be on the key corridors that cover not only the intra-urban traffic movements but also the inter-urban and through movements. This will include some local roads, but also roads under the responsibility of RS Roads. Any data collected as part of this action would need to be in accordance with the local laws on citizens privacy protection. There is no statutory obligation to collect local street and road data, although having access to continually monitored traffic count data helps to understand daily, monthly and annual trends in traffic flow. Some of the traffic counters would need to be located on trunk roads, which falls under the responsibility of the public enterprise "RS Roads". The corridors which have been identified as the preliminary candidates for permanent data collection include Rade Radica (M4), Bulevarvojvode Stepe Stepanovica (M4), Bulevar vojvode Petra Bojovica (M4), Bulevar Srpske vojske (M4), Knjaza Milosa (M4), Branka Popovica (M4), Ivana Gorana Kovacica, Krajiskih Brigada (M16), Omladinska (M16), Bolanog Dojcina (M16), Manjackih ustanika (M16), Karadordjeva (R405), Kozarska, Radoja Domanovica, Gavrila Principa, Krfska, Bulevar Desanke Maksimovic and Dr. Mladena Stojanovica. The development of this action, including timescales, should be considered in the context of the updating of the urban plan, which is currently underway.

Implement City wide multi-modal transport demand model

There is currently no multi-modal transport model available for Banja Luka. A robust City-wide transport model will help to forecast, simulate, assess and evaluate traffic and transport proposals for use in wider City planning and evidence-based decision-making. There are a number of industry standard modelling platforms available to develop a multi-modal model. The City boundary should form the core model area. The City should be segmented into a number of internal zones by taking the locations of trip generators into account such as residential, commercial and industrial areas. The visitor and transit traffic through the City should be captured by larger external zones. The model should be a multi-modal model by incorporating all the motorised and non-motorised transport modes in the City. The development of this action, including timescales, should be considered in the context of the updating of the urban plan, which is currently underway.

Revenue generating: No

Owner: Banja Luka City Administration – Department of Traffic and Roads

Stakeholders: Public transport operators, private transport operators, taxi operators, emergency services, planning authorities, RS roads

Capex	EUR 2,150,000	BAM 4,214,000	**Annual Opex**	EUR 67,500	BAM 132,300	**Implementation Start/End Year**	2021-2023

Notes on cost estimates: The cost of the traffic model is estimated as EUR 1,000,000. This would include the services of a recognised international consultancy firm to develop the model, including the undertaking of surveys. The cost of the data collection programme is EUR 1,150,000. 50 junctions x EUR 20,000 = EUR 1m. ANPR 50 x EUR 500 per unit = EUR 25,000. CCTV 50 x 500 per unit = EUR 25,000. Surveys EUR 100,000. The annual OPEX estimate for the model is one FTE @ EUR 10,000 for regular model maintenance and updating. For the repair and maintenance of equipment we have assumed 5% of CAPEX for the data collection programme.

Action link to indicators	State	1	1.1	1.2	1.3	8				**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions															
	Pressure	11	11.2	12							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR06

Primary action classification: Policy

Secondary action classification: Developing policy, plan, legislation, regulations

Action title: Initiative for developing standards and guidelines for travel planning, parking and street design

Implement standard workplace travel plan policy and guidelines

This policy and guideline would require all new developments which are expected to employ more than 100 people to have a workplace travel plan put in place, which is likely to require an update to the planning process guidelines. The number of 100 people is in line with international good practice. Developments targeted for workplace travel plans may include office and commercial buildings, industrial, warehousing and wholesaling, retail, leisure, medical or educational facilities. The guidelines would cover threshold guidance, recommended content, recommended measures, existing mode share, target setting for car, public transport, walking, cycling and parking and full integration with the planning system.

Implement parking standards for all new developments

Planning policies should aim to balance land uses within an area so people can be encouraged to minimise journey lengths for employment, shopping, leisure and education. For these types of developments local parking standards should be developed which take account of the accessibility of the development, the type, mix and use of the development, the availability of and opportunities for public transport, local car ownership levels and an overall need to reduce the use of high-emission vehicles. The parking standards should set out the appropriate provision of parking within any new developments and prioritise integration of key developments (which attract a lot of trips) with public transport and NMT facilities to minimise the use of the car for accessing these developments as much as possible. In the case of residential parking standards, efforts should be made to encourage low car ownership lifestyles within the City, through the provision of alternative options including car clubs and cycle parking, and with strong integration to wider choice of transport such as bus and light rail. In addition to the parking standards identifying appropriate volumes of parking, they should additionally guide the quality of parking provision so that it is convenient, safe and secure, with appropriate parking charges that do not undermine the vitality of town centres.

Implement Design Guidelines for Streets Manual

The development of design guidelines for streets offers an opportunity to challenge established working practices and standards that fail to produce good-quality outcomes, and stimulates professionals to think differently about streets, and the roles they play in creating successful neighbourhoods. The guidelines will be developed to inform design, construction, adoption and maintenance of streets and will ensure designs help to build and strengthen the communities they service, meet the needs of all users (achieving inclusive design where people are at the heart of the design process), form part of a well-connected network, are attractive, are cost-effective to construct and maintain and are safe. A guideline document of this nature can provide design principles which identify clear layout and connectivity requirements of streets, and how to develop quality places. They can then provide much greater detail addressing issues relating to street user's needs, street geometry, parking, traffic signs and markings, street furniture and lighting and information on materials, adoption and maintenance. Such guidance ensures a consistency and rigour to street design in line with best practice and overarching objectives for the City and establishes key principles for delivering streets for the people now and in the future. All components of this action would benefit from supporting capacity building and implementation support.

Revenue generating: No

Owner: RS Ministry of Transport and Communications

Stakeholders: Banja Luka City Administration – Department of Traffic and Roads, Business Owners

Capex	EUR 500,000	BAM 980,000	**Annual Opex**	EUR 30,000	BAM 58,800	**Implementation Start/End Year**	2021-2022

Notes on cost estimates: The CAPEX estimates for all components of this action cover professional fees for development of the policy, guidelines, standards and design guidelines. The OPEX estimate (for each policy) assumes a 0.5 FTE (EUR 5,000 per year) to ensure that the policy, standards and design guidelines are being implemented accordingly and as necessary updates/refinements applied. In addition, a EUR 5,000 annual cost is included to cover the cost of regular capacity building.

Action link to indicators	State	1	1.1	1.2	1.3	6	6.1	7	8
		Air				Green space	Biodiversity and ecosystems		Mitigation of GHG emissions
	Pressure	10	10.3	11	11.2	11.3	11.5	12	
		Transport							

Action performance	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

TRANSPORT ACTION: TR11																								
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – new											**Action title:** Traffic management and control: HOV lanes, City-wide traffic system upgrade and control centre													
Corridor based high occupancy vehicle (HOV) lanes High Occupancy Vehicle (HOV) lanes are designed to discourage single or low occupancy car use by providing priority to vehicles with more than a minimum number of occupants (usually two or three) and to buses. They encourage car sharing or public transport use, or both, by allowing users to reduce their journey times relative to single-occupant vehicles, particularly when the general-purpose lanes are congested. This in turn reduces the number of cars on the network and this reduction in the demand for road space can reduce overall congestion, fuel consumption and have beneficial environmental impacts. HOV lanes, also known as carpool lanes or diamond lanes, are adopted in many European cities. In Banja Luka, candidate routes, at least as pilots, should be considered which include Kralja Petra I Karadjordjevića and Dr Mladena Stojanovica. **City-wide traffic signal system upgrade and control centre** Technology such adaptive signal control, where vehicles are detected as they approach a signalised junction well in advance of the stop line, can be used to adapt the phasing of the traffic light signals in accordance with the flow of traffic, thus minimising unnecessary red phases and allowing the traffic to flow most efficiently. This could include industry recognised systems such as SCOOT or MOVA. Traffic control centres are used as centralised facilities to manage traffic flow and safety on the road network. The control centres are generally linked into a network of CCTV cameras installed within a City road network, located in areas of high population density and traffic flow. The CCTV cameras feed images back to the traffic control centre where they are viewed into visual system (PCs or fed to a wall-mounted array of monitors) in front of operational staff. The system is used to monitor congestion and manage incidents. The control centre can also be linked to the operation of traffic signals, where traffic signal timings can be adjusted to smooth overall flow and reduce queuing. The system can also be used to inform travel media and support the City response to incidents. In Banja Luka, there is a need to upgrade some of the traffic intersections of strategic routes to incorporate adaptive signal control technology to better manage traffic flow and queuing. This would need to be supported through the development of a traffic control centre, which would monitor traffic flows and incidents on key strategic routes and at key intersections.																								
Revenue generating: Yes																								
Owner: Banja Luka City Administration – Department of Traffic and Roads										**Stakeholders:** Traffic Police, Local Businesses, Public Transport Operators, Private Transport Operators, RS Roads													
Capex	EUR 3,500,000	BAM 6,860,000		**Annual Opex**	EUR 500,000	BAM 980,000		**Implementation Start/End Year**	2022-2030															
Notes on cost estimates: A CAPEX of EUR 750,000 for 1.5km of HOV lanes is an international benchmark for cost estimation. The proposal is for 2km of HOVs in the City with a CAPEX estimate of 900,000 based on benchmarks. EUR 600,000 needed for design and consultancy fees. CAPEX for traffic control system and control centre based on benchmarked cost needed for traffic control centre infrastructure e.g. control centre, traffic monitoring loops and signal upgrades.																								
Action link to indicators	State	1	1.1	1.2	1.3	8				**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1			
		Air				Mitigation of GHG emissions																		
	Pressure	11	11.2	12							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq					
		Transport																						

TRANSPORT ACTION: TR12

Primary action classification: Investment
Secondary action classification: Capital investment: implementation – new

Action title: Implement low emission vehicles and supporting infrastructure

Public/on-street electric vehicle charging point network

Investment in on-street electric vehicle charging infrastructure is needed to encourage uptake of EVs in any City. The infrastructure would need the careful planning and implementation of a network of EV charging points throughout the City, which would need to be positioned initially in areas of visibility to a) encourage uptake, b) to promote the technology, c) support different demand/route assignment. This would build on the six electric vehicle charging points installed in the City in 2018. Prior to implementation of any infrastructure, a full strategy and feasibility study should be undertaken to assess the primary location and distribution of the charging points, as well as the power requirements and potential sources of funding. The implementation should consider different types of charging point, which generally include rapid, fast, and slow. In Banja Luka, the initial implementation of a public EV charging network would provide the infrastructure needed to support a wider take up of EVs throughout the City. The network of chargers would initially be focussed on areas of the City which have high levels of visibility and demand. The scheme would require a phased roll out based on demand and uptake, but the initial scheme would include the installation of up to 50 charging points throughout the City, based on a mixture of rapid and fast chargers.

The charging points would need to be considered as part of a wider assessment of the ability of the distribution system to supply proposed EV charging demand, including options for smoothing charging loads if the distribution system is of insufficient capacity in places.

Replacement of the City vehicle fleet to low emission vehicles

There is a drive and desire within Banja Luka to promote a shift from traditional gasoline powered vehicles to alternative, cleaner fuel sources, such as hybrid, electric and possibly hydrogen. The promotion and use of cleaner fuels in mentioned in a number of the RS and City level plans and strategies, but presently, no consolidated RS or City level strategy exists which sets out the roadmap or action plan for low emission roll out/adoption. To drive forward and promote active take up of low emission vehicles by the general public and City commuters, it is proposed that the City administration and other City stakeholders including public authorities, look to replace a proportion of their existing gasoline-based vehicle fleets with low emission, preferably electric vehicles. Depending on the total size of the City vehicle fleet, it is proposed that up to 20 vehicles are replaced with low emission alternatives.

Revenue generating: No

Owner: Banja Luka City Administration – Department of Traffic and Roads

Stakeholders: Electricity Company, Emergency Services, Business Owners, RS Roads, Public Transport Operators, Private Transport Operators, Traffic Police

Capex	EUR 1,820,000	BAM 3,567,200	**Annual Opex**	EUR 90,000	BAM 146,400	**Implementation Start/End Year**	2022-2026

Notes on cost estimates: CAPEX for the EV charging network is based on 50 charging points with a mixture of rapid (20) EUR 20,000 and fast EUR 4,000 (30) chargers, plus design and consultancy fees for planning and feasibility work of 300,000. CAPEX for the renewal of the City fleet assumes the replacement of approximately 20 City owned gasoline vehicles with electric vehicles. An average EV cost of EUR 50,000 has been assumed. OPEX for both estimated as 5% of CAPEX.

Action link to indicators										**Action performance**											
	State	1	1.1	1.2	1.3	8					Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions															
	Pressure	10.3	11	11.2	12						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport																			

TRANSPORT ACTION: TR14																									
Primary action classification: Investment **Secondary action classification:** Capital investment: feasibility, planning, design, piloting										**Action title:** Develop rapid transit system corridor feasibility study															
Tram is a form of urban rail public transport system that runs on a track that can be used on a shared space with other vehicles. Light Rail Transit (LRT), on the other hand, are slightly faster and quicker than tram and often run on an exclusive right of way. Tram or LRT can carry up to 6,000 to 15,000 passenger per hour per direction. Both tram and LRT are run on the electric engine. This system will have considerably less impact on the environment than the existing bus system in Banja Luka. With the increase in public transport demand, there may be a need to increase the capacity of the system. The strategy is to carry out a feasibility study an LRT, Tram or possibly BRT system on critical corridors in Banja Luka. The feasibility study will need to include the following sets of assessment: • Current and future public transport demand; • System specification suitable to meet the demand; • Potential routes inside the City that is well integrated with the land use plan; • Preliminary design of the potential routes; • Economic and financial feasibility of such a system; • Potentials social, financial and environmental risks; • Potential financial mechanism for implementation; and • Phased action plan for implementation.																									
Revenue generating: No																									
Owner: Banja Luka City Administration – Department of Traffic and Roads										**Stakeholders:** Public transport operators, RS Roads															
Capex	EUR 500,000	BAM 980,000		**Annual Opex**	EUR 0	BAM 0		**Implementation Start/End Year**	2021-2022																
Notes on cost estimates: EUR 500,000 is an estimated amount to undertake a comprehensive tram feasibility study, through a lump sum consultancy fee. This would include public engagement and consultation. This is based on benchmarked experience of undertaking detailed feasibility studies of a similar type, using international expertise blended with local staff.																									
Action link to indicators	State	1	1.1	1.2	1.3	8				**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1				
		Air				Mitigation of GHG emissions																			
	Pressure	10	10.3	11	11.2	11.3	12				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq						
		Transport																							

ENERGY, BUILDINGS ACTION: EN02	
Primary action classification: Investment **Secondary action classification:** Training, capacity building	**Action title:** Training and capacity building in energy performance assessments, building certifications and compliance tests

Building certification assessments and compliance should be considered at the design stage to reduce average energy consumption in domestic and non-domestic buildings. Certifications like BREEAM, CEEQUAL assess an asset's environmental, social and economic sustainability performance. Other green building standards like LEED, NABERS, GBI can also be considered. A minimum mandatory rating should be achieved by all new-build residential apartment blocks and office spaces. Incentivising design and construction of low energy use green buildings is necessary to increase the share of green buildings in Banja Luka. In addition, training needs to be addressed for the City administration which needs to undertake the management within the City administration buildings and propose additional energy efficiency measures.

Training should also be addressed for the Universities' professors, and this will help them to improve Universities curricula on energy efficiency issues by introducing new topics and coordinating student research and activities in this field.

Educational activities with the aim to raise awareness on energy efficiency can be performed also through eco-sections within schools. An example pupil environmental awareness system that has international widespread adoption is eco-schools, other systems are also in place and it may be possible to adopt an existing system within Banja Luka.

Revenue generating: No

Owner: RS Ministry of Spatial Planning, Construction and Ecology and Environmental Protection (supported by the City Administration)	**Stakeholders:** City Administration, Residents, Office employers and employees, Universities, Schools

Capex	EUR 300,000	BAM 588,000	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2021-2025

Notes on cost estimates: Expert opinion based indicative costs. Actual costs will vary depending upon level of existing expertise and depth / breadth / ambition of the programme. The cost presented in this action is a worst-case scenario cost.

Action link to indicators										**Action performance**											
	State	1	1.1	1.2	1.3	8	9.2				Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience														
	Pressure	14	14.1	15	15.1	15.2	16				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings					Industries														

ENERGY, BUILDINGS ACTION: EN03	
Primary action classification: Investment **Secondary action classification:** Improving information base, modelling	**Action title:** Develop building energy consumption database and energy reporting for building owners and utility providers

Banja Luka's current City plan doesn't sufficiently consider or address the lack of building stock data and building energy use. Considerable data gaps exist in building stock data, building stock characteristics of residential buildings (residential building stock data mainly found in Episcope 2014). Little/ no publicly available data have been found on non-residential building stock (last non-residential building data census 1995). Quality data are required to monitor building energy use and design a reliable strategy for energy efficiency improvements, energy performance improvements and building renovation. EU building stock databases like EUROSTAT, research projects such as TABULA, INSPIRE, Episcope are good references for data collection, analysis and update. Energy data reporting mechanism should involve the utility provider who collates these data from the utility bills. A data specialist team needs to be set up in the City Administration for energy data collection, collation, analysis and regular updates. The City Administration could initiate an energy reporting programme which is consistently updated every year.
This action will facilitate the monitoring of building energy use and the design of a reliable strategy for energy efficiency improvements, energy performance improvements and building renovation. The updating of data will also help measure the success of energy efficiency improvement policies and actions.

Revenue generating: No

Owner: RS Ministry of Spatial Planning, Construction and Ecology and Environmental Protection (supported by the City Administration)	**Stakeholders:** City Administration, Building Owners and Occupiers, Facility Managers

Capex	EUR 300,000	BAM 588,000	**Annual Opex**	EUR 60,000	BAM 117,600	**Implementation Start/End Year**	2021-2026														

Notes on cost estimates: The CAPEX is based on expert opinion and past experience of developing databases of this nature and scale. This includes new metering for buildings and other relevant users.

Action link to indicators	State	1	1.1	1.2	1.3	8	9.2			**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience														
	Pressure	14	14.1	15	15.1	15.2	22				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings					Energy														

ENERGY, BUILDINGS ACTION: EN08

Primary action classification: Investment	**Action title:** Study to assess active management and improvement of the district heat network energy and fuel sources, and assessment of other energy supplies and infrastructure capacities in the City
Secondary action classification: Capital investment: feasibility, planning, design, piloting	

The existing DH system in Banja Luka has recently been upgraded to incorporate 49MW of new biomass boilers. Biomass locally produced is not only used by this DH system, but also by the DH systems in Prijedor and Gradiška. In addition to the heat boilers on biomass, forestry products are used by the local wood processing industry which is a strategic sector in the economy of the RS. According to the existing estimations (Forest Sector in BiH, Preparation of IPARD Forest and Fisheries Sector Reviews in BiH (FAO, 2015), wood biomass for energy production currently available in RS amounts to approximately 1.15 million tons per year (or 3.57 million m3 per year). Before incorporating the biomass boilers within the DH system in Banja Luka, analyses on the sustainability of biomass supply was conducted. According to the analyses the supply of biomass for the DH system in Banja Luka can be sustainable both short-term and long-term. However, according to these analyses it is essential that the biomass supply is not limited to one supplier only in order to mitigate possible risks. These analyses were developed taking into consideration the foreseen consumption of biomass.

As biomass is a limited resource and other stakeholders use the local forestry products, it is necessary to analyse again the sustainability of biomass supply by taking into consideration effective consumption of biomass during previous heating season. It is necessary to perform an additional analysis of biomass supply in case of the expansion of the DH system, as well as improvements in biomass production.

In addition to the analysis of biomass supply it is necessary to propose best solutions for supplied biomass management.

It is also recommended that a review of other energy and fuel streams, and the associated distribution infrastructure, is conducted, as the decarbonisation of the City's energy systems will need to consider these factors. This action will therefore facilitate the sustainable management of local resources and supply chains, maximising local resource efficiency and securing the benefits of using local resources to reduce carbon emissions.

Revenue generating: No

Owner: An Independent assessor, appointed by the City.					**Stakeholders:** The Company, current and future biomass supplier		
Capex	EUR 60,000	BAM 117,600	**Annual Opex**	EUR 20,000	BAM 39,200	**Implementation Start/End Year**	2021-2022

Notes on cost estimates: The CAPEX of 30,000 allocated to undertake a biomass resource and sustainability assessment study, focussing on current consumption, production, potential expansion of consumption of biomass from other parties, and impact of sustaining and expanding biomass heating capacity in the City. Includes liaising with other biomass resource stakeholders., 30,000 allocated to undertake an assessment / compile a summary of all main energy flows into and out of the City, including high level capacity assessment of distribution systems (thermal, electrical, piped fuel (where present). The OPEX estimate is for 1 FTE to oversee, and to coordinate with other existing and new stakeholders.

Action link to indicators	State	1	1.1	1.2	1.3	8	9.2			**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience														
	Pressure	14	14.1	15	15.1	15.3	16	22			Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings					Industries	Energy													

ENERGY, BUILDINGS ACTION: EN09	
Primary action classification: Investment **Secondary action classification:** Capital investment: feasibility, planning, design, piloting	**Action title:** District heat network – new low carbon heat sources: Assessment Study

Conduct assessment study to determine the potential for additional low carbon energy sources that can be integrated into the district heat energy network. To include a whole life cost benefits analysis.

Existing Low Carbon Sustainable Supply

The existing DHN has recently been upgraded to incorporate 49MW of new biomass boilers, providing substantial environmental benefits over the existing Heavy Fuel Oil (HFO) boilers both in terms of net carbon emissions and regarding air borne pollutants, whilst utilising a local renewable fuel source. It is understood that the HFO boilers have been retained for peak load and backup purposes, three 12MWth boilers being installed in the main energy centre providing 36MWth, and two additional boilers being installed at smaller energy centres located at Starčevica and Kosmos providing 10MWth and 6MWth of heat output respectively.

The use of biomass boilers is a substantial improvement upon the HFO boilers in terms of carbon emissions and the potential for a sustainable fuel supply, however timber must be grown at an adequate rate to ensure there is sufficient fuel and also to balance out the carbon that is emitted when the biomass is burnt in the boilers. Improving the sustainability of the biomass fuel supply chain will help to maximise the benefits of the existing biomass boilers. There are also a range of alternative low carbon thermal supplies that can be assessed, which do not rely on consuming local natural resources. Also, to consider is that a proportion of the timber consumed in biomass boilers can potentially be used for low carbon building fabrication, where it would lock up, rather than release its embodied carbon.

DHN Expansion Potential

According to the UNEP District Heating Feasibility Study Executive Summary there is the potential of almost 96MW of additional heat load that could be met by future DHN expansion. The recently installed biomass boilers in the central energy centre represent a capacity of around one third of peak load. Applying the same factor to the identified future load provides around an additional 32MW of base load. To ensure that this additional load is met in a sustainable manner that complies with EU standards and existing Banja Luka objectives and BiH national policy, low carbon and low airborne emission heat sources will be required.

In addition to expanding the existing heat network, there may be opportunity for the development of additional smaller local thermal networks that operate at lower temperature than the main network, which in turn can enable the inclusion of heat recovery from potential waste heat sources and the integration with cooling loads. It may be feasible to also integrate the local networks with the main network in future.

Geothermal

It is reported that Banja Luka potentially has access to geothermal heat, in the region of 100°C, that could be harnessed. It is unclear as to whether this potential resource is located within close proximity to the main heat network. An Icelandic company, Mannvit, undertook a study to ascertain the potential geothermal resource (2012) and determined that there is a potential resource of 50-100MWth. If the findings of this study confirmed a reliable geothermal resource in the relevant City region, then it is recommended that this option is assessed against alternative low carbon energy resources as a potential future heat supply.

Geothermal projects tend to be relatively high in capital expenditure. An advantage of a successfully harnessed geothermal resource is the relatively low operational costs, which are largely linked to injection and extraction of water from the boreholes. A disadvantage can be the dependency on the correct interaction with the associated geological structures and the continued hydraulic connectivity of the injection and extraction wells.

Water Source Heat Pumps (WSHP)

The City is Banja Luka is situated on a relatively large river, the Vrbas. This offers good potential for large scale WSHPs which would extract heat from the river water via heat exchange, returning the river water in a non-consumptive manner. Large scale heat pumps have been successfully deployed in this manner in conjunction with existing DHN infrastructure and would typically operate with an efficiency or Coefficient of Performance (CoP) in the region of 300%. That is for one unit of electricity used to operate the heat pump, three units of heat are provided.

Combined Heat and Power (CHP)

A third option for new low carbon heat supplies is the adoption of either conventional gas fired CHP, biogas CHP or Fuel Cell CHP. Where fuel cells would initially be fuelled by natural gas (reformed to hydrogen during operation) but potentially fuelled directly by hydrogen in the future. The conventional gas fired options would be reliant upon the proposed new southern

<table>
<tr><th colspan="20">ENERGY, BUILDINGS ACTION: EN09</th></tr>
<tr><td colspan="20">natural gas transmission network. Biogas would need to be generated locally, such as via AD from sewage treatment works. Fuel Cells have the advantage of high electrical and heat efficiencies and very low air-borne emissions, the key disadvantages being relatively high capital cost and greater sensitivity to the gas supply composition.</td></tr>
<tr><td colspan="20">Revenue generating: No</td></tr>
<tr><td colspan="10">Owner: The Company (Joint ownership owners/operators of DHN, main shareholder being City of Banja Luka)</td><td colspan="10">Stakeholders: The Company, customers, current and future heat suppliers, Banja Luka University (Assisting with Coordination of energy targets).</td></tr>
<tr><td>Capex</td><td colspan="2">EUR 300,000</td><td colspan="2">BAM 588,000</td><td colspan="3">Annual Opex</td><td colspan="2">EUR 0</td><td colspan="2">BAM 0</td><td colspan="4">Implementation Start/End Year</td><td colspan="2">2021-2022</td></tr>
<tr><td colspan="20">Notes on cost estimates: EUR200,000 allocated for comprehensive study. EUR 100,000 for monitoring of thermal properties of natural resources (e.g. river and ground temperature monitoring) and ground investigations (boreholes, thermal and hydraulic testing, and monitoring). Costs may be able to be reduced via a coordinated research approach with the University. Advise that the study is conducted as soon as is practicable as the results may alter some of the specification and focus areas for the DHN refurbishment programme. The OPEX is covered within the CAPEX for the surveys/monitoring.</td></tr>
<tr><td rowspan="4">Action link to indicators</td><td>State</td><td>1</td><td>1.1</td><td>1.2</td><td>1.3</td><td>8</td><td>9.2</td><td></td><td></td><td rowspan="4">Action performance</td><td>Action link to strategic objectives</td><td>WR1</td><td>WR2</td><td>AQ1</td><td>GS1</td><td>GS2</td><td>GH1</td><td>SL1</td><td>BE1</td><td>BE2</td><td>AR1</td></tr>
<tr><td></td><td colspan="4">Air</td><td colspan="2">Mitigation of GHG emissions</td><td>Adaptation and resilience</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Pressure</td><td>14</td><td>14.1</td><td>15</td><td>15.1</td><td>15.3</td><td>16</td><td>22</td><td></td><td>Socio-economic benefits</td><td>EcR</td><td>EcG</td><td>Emp</td><td>EcIn</td><td>PHth</td><td>AcS</td><td>Sfy</td><td>GEq</td><td></td><td></td></tr>
<tr><td></td><td colspan="5">Buildings</td><td>Industries</td><td>Energy</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
</table>

ENERGY, BUILDINGS ACTION: EN10

Primary action classification: Investment

Secondary action classification: Capital investment: feasibility, planning, design, piloting

Action title: Study on biogas generation for CHP and sustainable bus fleet.

The purpose of this study would be to inform decision-making regarding potential deployment of biogas generating plant, biogas cleaning and storage and biogas fuelled CHP and/or public buses. The following study components are envisaged:

- Assess the opportunity for introducing biogas production at existing and new water treatment works;
- Assess the opportunity for introducing biogas production from organic and other waste streams; and
- Assess the opportunity for introducing biogas fuelled public buses.

Biogas can be generated via the treatment of wastewater / sewage using anaerobic digestion (AD), or by the treatment of organic and other waste. The biogas can then either be used in combined heat and power engines or cleaned and used as a fuel for large vehicles such as public buses. The widespread adoption of biogas fuelled buses has been successfully deployed in several Scandinavian countries. Hybrid biogas – electric buses have also been developed.

Biogas Production An assessment is required to determine the opportunity for introducing biogas production, and consumption, at existing wastewater treatment works. The inclusion of biogas production to be assessed for any proposed future water treatment works.

In addition, organic waste is a significant problem for Banja Luka due to large quantities of organic waste from different sources (animal, agricultural, grass mowing, food industry). There are large quantities of this type of waste disposed of at the regional landfill. Organic waste could be treated in an appropriate way with the aim to produce biogas, where the residue may then be suitable for fertiliser It is necessary to assess the opportunity of the production of biogas from organic and other waste and to analyse the possibility of its use.

Biogas Bus Fleet The adoption of biogas fuelled buses to be assessed. Many models are available from leading manufacturers and this is an established form of low carbon public transport. The inclusion of biogas-electric hybrids enables a staged transition to the future adoption of pure electric and possibly hydrogen fuelled bus fleet.

Biogas fuelled CHP Assess use of biogas for combined heat and power production via CHP engines. This may be preferred to biogas for transport in some circumstances and should be compared accordingly.

Heat Recovery via Heat Pumps Wastewater treatment works also offer the potential for integration with water source heat pumps that would recover heat from the outflow water from the treatment works. If the treatment works were within reasonable proximity to the heat network, they could act as an additional district heat source, where they were not, the heat could be used to supply local buildings not connected to the DHN.

Revenue generating: No

Owner: Water Utility Company, Public Utility Čistoća AD Banja Luka, Regional Landfill "DEP-OT", City of Banja Luka, The Company (Joint ownership owners/operators of DHN, main shareholder being City of Banja Luka)

Stakeholders: The Companies, customers, current and future heat suppliers, Banja University (Assisting with Coordination of energy targets).

Capex	EUR 50,000	BAM 98,000	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2021-2022

Notes on cost estimates: CAPEX is based on indicative study costs based on benchmarking of comparable studies.

Action link to indicators	State	1	1.1	1.2	1.3	4.1	8	9.2		**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Soil	Mitigation of GHG emissions	Adaptation and resilience														
	Pressure	23 Energy									Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

ENERGY, BUILDINGS ACTION: EN11

Primary action classification: Investment
Secondary action classification: Capital investment: implementation – new

Action title: Deployment of solar PV energy

1. Assess the comparative benefits of and existing hurdles to the deployment of small- and large-scale solar PV in the City of Banja Luka and the surrounding area.
2. Support the deployment of Solar PV in Banja Luka.

The cost of solar PV has reduced significantly in the last decade and continues to do so. At the same time the efficiency of solar PV panels has increased substantially. This results in more electrical generating capacity being able to be installed in a smaller area and at lower cost. Banja Luka has a good solar resource which makes this renewable technology attractive as a key contributor of a future low carbon energy system.

A benefit of Solar PV over Solar Thermal technologies is that the generated electricity can be used to generate hot water (via an immersion heater in a hot water tank) and any surplus electricity generated can be used directly for other household purposes and exported to the electricity distribution system for consumption by others, including for EV charging. Whereas distributed solar thermal cannot usually be exported and used by others, which leads to constraints on the amount of generated energy that can actually be utilised.

Resource According to the Energy Strategy of Republika Srpska up to 2030, the Republika Srpska has a significant potential for using solar energy.

'Solar energy is free and practically available everywhere. Preliminary analyses show that the Republika Srpska has a significant potential for using solar energy and it is necessary to make a local atlas of the solar radiation. The lowest solar potential is available in the northern regions (1.25 to 1.3 MWh/m^2 of total solar irradiation). The solar resource is highest in the south of the country (1.50 to 1.55 MWh/m^2). Solar PV generates electricity which can also be used for heating purposes. Solar systems are not in wider use because although they generate 'free' energy when in operation they require a high initial capital cost'.

A high-level desktop assessment shows significant south facing hill sides to the north west of the City, some areas of which may be suitable for solar farms. There is a high proportion of low-rise building stock in the City, meaning that there is a relatively high ratio of available roof space per person, which can be utilised for solar energy technologies.

An assessment of the potential to install solar PV on public buildings and civil engineering structures to be undertaken.

Revenue generating: Yes

Owner: Building Owners (supported by the City Administration)

Stakeholders: The City of Banja Luka, Banja University (Assisting with Coordination of energy targets).

Capex	EUR 5,800,000	BAM 11,368,000	**Annual Opex**	EUR 146,000	BAM 286,160	**Implementation Start/End Year**	2021-2023

Notes on cost estimates: CAPEX - *Residential – Rooftop*. All data related to this opportunity from a PV solar rooftop installer. 1000 systems of 2kW each, at 1400 EUR/kW.

Costs may vary depending on quality of components selected and ease of installation. Lower CAPEX generally leading to lower performance and increased failure rates.

Ground Mounted - Deployment of ten 0.25MW ground mounted arrays as initial trial. Smaller systems selected due to subsidy available. CAPEX assumed 1200 EUR/Kw OPEX - *Residential – Rooftop* - Local O&M estimate based on local labour costs at 2% of CAPEX per annum. Refer to end note. *Ground Mounted* Indicative O&M of 3% of CAPEX per annum assumed - dependent on technology, accessibility, environment deployed in and scale. Cleaning, replacing of failed components, general electrical maintenance etc

OPEX dependent on quality of components used, lower CAPEX generally leading to higher OPEX to cover replacement of failed parts. Whole life costs should be used for economic evaluation during procurement.

Action link to indicators	State	1	1.1	1.2	1.3	8	9.2			**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience															
	Pressure	23 Energy									Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

ENERGY, BUILDINGS ACTION: EN12																						
Primary action classification: Investment **Secondary action classification:** Capital investment: implementation – new										**Action title:** Implement solar thermal hot water (STHW) systems: 200-unit trial												
Installation of small domestic sized packaged STHW units to the roof of residential buildings. This will allow continued hot water production and improve access to hot water (DHW) in poor areas. It will also reduce local fuel/ electricity loads for DHW and reduce DHW energy loads. Climate reports for the area suggest favourable conditions. This will avoid the use of more costly electrical heating. Roof mounted units can be set up where building services and geometry allow to provide a relatively low-cost solution. Buildings with flat roofs and easy access to the piped services should be targeted first to test the application.																						
Revenue generating: Yes																						
Owner: Building Owners (supported by the Banja Luka City Administration)										**Stakeholders:** City Administration, and Residents – grant scheme												
Capex	EUR 400,000	BAM 784,000			**Annual Opex**		EUR 20,000	BAM 39,200		**Implementation Start/End Year**							2021-2024					
Notes on cost estimates: CAPEX: Indicative average cost per residential single dwelling solar thermal hot water system of EUR 2000 for simpler system and volume rollout assumed. 200 units. OPEX cover the maintenance and replacement of failed components																						
Action link to indicators	State	1	1.1	1.2	1.3	8	9.2			**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience															
	Pressure	14	14.1	15	22	23					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings			Energy																	

ENERGY AND BUILDINGS ACTION: EN13

Primary action classification: Investment
Secondary action classification: Capital investment: feasibility, planning, design, piloting

Action title: Development and implementation of a LED Public Lighting Programme

According to the Law on Energy Efficiency of RS (Official Gazette of RS, No. 59/13) local self-government units with more than 20.000 inhabitants shall adopt its Energy Efficiency Action Plan that is aligned with the Energy Efficiency Action Plan of RS.

The Action Plans of the local self-government units shall be adopted for a period of three years and shall include:

a) assessment of the state of energy efficiency in the local self-government unit during the period immediately prior to the adoption of the Action Plan,
b) energy efficiency improvement measures in the local self-government unit, including activities on the renovation and maintenance of facilities used by the local self-government unit, its administrative offices, as well as public enterprises and public institutions established by the local self-government unit, activities to improve utilities (public lighting, thermal energy supply, water supply, waste management, etc.) and transport, in order to improve energy efficiency, and other activities to be carried out in the local self-government unit relating to the improvement of energy efficiency,
c) time frame and manner of implementation of these measures, and
d) funding and sources of funding required for the implementation of the measures defined by the Action Plan of the local self-government unit.

LED lighting can provide significant savings over conventional street lighting, the savings are dependent on existing lighting and operational profiles and are often suggested to be in the region of 50%, achieved via lower energy consumption and longer bulb life. Many modern LED lighting systems also enable the control of light intensity, where bulb brightness may be turned down in the early hours of the morning when few people require the benefits of the lights, bringing greater energy savings. It is noted that due to its increased brightness, LED street lighting can, if not installed in a considered manner, have negative impact on some occupants of buildings close to the lighting, so lighting design should consider appropriate shading so as not to cause excessive light pollution for sensitive receptors.

It is recommended that the City replaces at least 50% of the existing public lighting with LED based lighting between the period 2020 and 2027. With a 95% roll out of LED lighting being completed by 2033 and a full conversion to LED lighting by around 2038. This should be included in the wider Energy Efficiency Action plan and is also recommended that a dedicated and separately managed LED Public Lighting programme is developed.

The first stage of the programme development is to undertake an assessment, develop a programme and identify necessary training. The following areas should be considered:

- Cataloguing and reviewing the existing lighting stock,
- Technology and supplier review for the conversion equipment,
- Establishing the preferred routes of / methods for conversion to LED lighting, and associated additional lighting control benefits and system requirements
- Assessing obstacles to the conversion, and identifying methods of mitigation
- Establishing a prioritised programme, based on ease of delivery, cost effectiveness and achievable savings.
- Establishing training requirements for the conversion process, so that local labour can conduct the majority of the associated works.

The Action is broken down into two stages: (A) being the development of the programme, which will include drawing on existing studies and setting out and coordinating an efficient deployment. And (B) the actual deployment programme. Indicative costs for a large-scale deployment programme (B) have been included. These are based on a typical average cost of EUR300 for a deployed LED street-light and 20,000 units being deployed.

Revenue generating: No

Owner: Banja Luka City Administration	**Stakeholders:** Banja Luka City Administration, public transport company, public utilities companies, Ministry of Spatial Planning, Construction of RS and Ecology and Environmental Protection and Energy Efficiency

Capex	A - EUR 35,000 B - EUR 6,000,000	A - BAM 68,600 B - BAM 11,760,000	**Annual Opex**	0	0	**Implementation Start/End Year**	A – 2021-2022 B – 2022-2024

Notes on cost estimates: Estimate of CAPEX is to undertake assessment and to develop a detailed six-year programme, and coordinate stakeholders.

Action link to indicators	State	1	1.1	1.2	1.3	8	9.2			**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Mitigation of GHG emissions	Adaptation and resilience														
	Pressure	14	14.1	15	16	22	23				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Buildings			Industries	Energy															

INDUSTRY ACTION: IN02																								
Primary action classification: Investment **Secondary action classification:** Training, capacity building										**Action title:** Raise capacities of the city industry to implement energy and material efficiency and cleaner production measures														
The city industry is the holder of environmental permits and is responsible for prevention and control of emissions to the environment. Traditionally, the industry/business is control oriented and has no knowledge on best available techniques, pollution prevention, resource efficiency and cleaner production options. The policy action IN01 should be coupled with a comprehensive training programme for industry under responsibility of the City Administration that will build their capacities for effective and efficient development, application, adaptation, scaling up and mainstreaming of resource efficiency and cleaner production concepts, methods, policies, practices and technologies. The programme should include both in-class and on-the-job training for industry under responsibility of the city administration with the ultimate aim of developing implementable options for resource efficiency and cleaner production in each industry. The programme can be developed in cooperation with the Chamber of Commerce of Republika Srpska – regional office in Banja Luka and National Cleaner Production Programme in BiH (http://ncpp.ba/).																								
Revenue generating: No																								
Owner: Banja Luka City Administration									**Stakeholders:** City Administration Banja Luka – Department of Inspections, Companies including economic entities; educational and other public institutions; non-governmental sector.														
Capex	EUR 100,000	BAM 196,000			**Annual Opex**	EUR 0	BAM 0		**Implementation Start/End Year**	2021-2023														
Notes on cost estimates: Expert judgement based on local understanding of this type of capacity building.																								
Action link to indicators	State	1	1.1	1.2	1.3	2	4.1c	8		**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1			
		Air				Water bodies	Soil	Mitigation of GHG emissions																	
	Pressure	16	18	18.1	20	25.3					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq					
		Industries				Water																			

INDUSTRY ACTION: IN03																						
Primary action classification: Investment **Secondary action classification:** Capital investment: feasibility, planning, design, piloting										**Action title:** Incentives for businesses that are advanced in application of ecological standards in the circular economy.												
According to the recent EU policies on circular economy, cities need to prioritise a systematic transition from the linear paradigm of production and consumption to a circular model, keeping materials in use for as long as possible and maximising their economic value. Given that the City Administration has the primary responsibility for waste management at the local level, they have a unique opportunity to map resources and collaborate with businesses and citizens to create urban-industrial symbiosis or knowledge exchange programmes. The action involves development of a strategic study on the City's transition to a circular economy, mapping the resources and identifying enabling factors and options for urban-industrial symbiosis.																						
Revenue generating: No																						
Owner: Banja Luka City Administration									**Stakeholders:** City Administration Banja Luka – Department of Inspections, Companies including economic entities; educational and other public institutions; non-governmental sector.												
Capex	EUR 150,000	BAM 294,000			**Annual Opex**		EUR 0	BAM 0		**Implementation Start/End Year**	2022-2023											
Notes on cost estimates: Expert judgement based on local understanding and benchmarking of completing a study of this nature.																						
Action link to indicators	State	1	1.1	1.2	1.3	2	4.1c	8		**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1	
		Air				Water bodies	Soil	Mitigation of GHG emissions														
	Pressure	16	18	18.1	20	25.3					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq			
		Industries				Water																

WATER RESOURCES ACTION: WR02

Primary action classification: Investment
Secondary action classification: Improving information base, modelling

Action title: District metering, asset surveys and modelling of water and wastewater networks

Proper understanding of the water supply network performance can only be achieved with proper datasets describing the assets, their condition and how they operate. Data collection and analysis using computer models of water and wastewater assets, linked to the GIS database systems developed in WR01 will facilitate this. The knowledge developed through this action will support the development of action plans for investments in WR05. This action will collect missing data on assets, enhance understanding about the performance of systems, improve customer management and revenues planning, and provide the basis for the development of effective and costed action plans.

Actions:

Install district meters at strategic points in the supply network: Use data from these together with modelling tools to estimate levels of leakage and other non-revenue water (NRW) use from illegal connections. Where water supply asset data identified as missing in WR01 undertake surveys of the water supply network. Where data is missing on the wastewater network undertake surveys of manholes, structures and equipment to describe and assess condition and performance of assets. Add data to systems in WR01.

Based on the GIS developed in WR01 and the metering data collected utilise water supply network modelling tools to understand the flow of water through the system, the supply demand balance overall and by district and identify areas of highest water loss or poor asset conditions. Undertake targeted surveys of leakage (using sonic surveys and other techniques to locate leakage points). Develop the facility in the models to estimate the effect of different pressure management strategies on leakage reductions and extension of asset life. Include surveys of water quality. If water quality issues are identified, then include water quality modelling in the supply models to work out the best strategies for meeting water quality targets in the supply system. As required develop and apply network modelling tools of water supply and wastewater networks to support supply demand forecasting and development of action plans for investment in water and wastewater networks and specification of wastewater treatment requirements.

The wastewater modelling can be used to identify where using storage in the system, or de-centralised treatment may reduce the requirements for larger new interceptor sewers and reduce investment costs. Sampling of wastewater in sewers and in the river and testing for a wide range of water quality parameters (both sanatory and industrial chemical pollution) can be used to identify and trace hazardous discharges from current or historic sources. There is particular concern about polycyclic aromatic hydrocarbons (pyralen), total oil hydrocarbons and heavy metals (cadmium, nickel, copper, lead and mercury) are entering the environment. The industrial sources of these can be regulated to require pre-treatment or switches to cleaner production techniques. The river should be sampled for water quality to identify both sewer sources of pollution and possible sources from surface runoff or contaminated groundwater seepage. Develop a simple river water quality model to calculate the impact of different sewerage and wastewater treatment options on the ability of the river to meet its water quality objectives. This can be just a simple mass balance plus decay model to understand the scale of the issues.

The digital planning and design tools can be adapted during the operational phase to be part of a digital asset management system and possibly linked to future SMART cities systems.

Revenue generating: No

Owner: The utility company 'Vodovod Banja Luka'

Stakeholders: Customers

Capex	EUR 500,000	BAM 980,000	Annual Opex	EUR 20,000	BAM 39,200	Implementation Start/End Year	2021-2023

Notes on cost estimates: The estimate of cost of expert labour to support tendering of local or regional contractors to undertake surveys with support of experienced international contractors. Modelling studies by international experts supporting local staff, plus equipment (EUR 50,000), modelling software (EUR 30,000) and local support. More leakage surveys coverage would greatly increase cost. Training and capacity building for local staff. The maintenance of customer management systems would be a routine expense for the water utility and is not included here.

Action link to indicators										Action performance	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	State	2																			
		Water bodies																			
	Pressure	20	26	27	28.1						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries	Water																		

WATER RESOURCES ACTION: WR04

Primary action classification: Investment
Secondary action classification: Capital investment: feasibility, planning, design, piloting

Action title: Study into water company investment financing options and capacity building

There is a water company that bills and collects revenue for water and levies are applied to water bills for wastewater. This will not be enough to finance the investment for a new wastewater treatment works and sewerage, so economic reform of the water company is most likely required.
Financing of the construction of the WWTW may be on a loan basis or by PPP letting some form of design, build, operate contract or a concession. Studies would be required to identify most effective financing approach in the situation of Banja Luka.
The funding of the sewer improvements and integration with SuDS solutions should be considered in the context of the strategic urban environment development plan, coordinated with circular economy and SMART cities solutions.
The study should review the setup and business models of the water supply and wastewater company, how they interact with the City government, industrial enterprises, property owners and customers. Regulatory and financial structures should be analysed. Current tariffs and revenues should be detailed and analysis of willingness to pay by domestic and commercial customers in relation to expanded water supply services and to the addition of proper sewerage and wastewater treatment.
The outcome of the study would be plans for the financing of the investments identified in the action plans. Procurement processes for the letting and supervision of contracting for the investments should be developed. Training and capacity building would also be provided to develop the human resources to manage the implementation of the action plan. Overall, this action will therefore result in the better understanding of the most efficient options for financing and procuring the different components and will link these with other infrastructure improvements in the City. Capacity building will also be conducted for the human resources to implement water and wastewater action plans utilising identified financing mechanisms.

Revenue generating: No

Owner: Banja Luka City Administration

Stakeholders: Banja Luka City Administration, Utility Company 'Vodovod Banja Luka', Public Institution "Vode Srpske'

Capex	EUR 200,000	BAM 392,000	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2021-2022

Notes on cost estimates: The CAPEX is based on an estimate of cost of international experts to support local staff to develop the plans and facilities for financing and procurement, provide training and hold stakeholder consultation workshops.

Action link to indicators										**Action perfor-mance**											
	State	2 Water bodies									Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	20 Industries	26	27 Water							Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

WATER RESOURCES ACTION: WR05	
Primary action classification: Investment **Secondary action classification:** Capital investment: feasibility, planning, design, piloting	**Action title:** Development of water and wastewater network action plans

Develop Water Supply and Wastewater action plans: Using the digital systems developed in WR01 and surveys in WR02 prepare projections for supply demand balance for the water and wastewater systems.

For water supply, prepare costed strategies for each district to reduce NRW, improve resilience, reliability of supply, water quality and revenue based on extending system to new customers, asset repairs, replacement and pressure management introduced in a phased programme over coming 5 years that fit with the vision statements for the next 10 to 15 years and account for economic development and climate change scenarios. Include planning for long term asset management with appropriate inventories and proactive asset replacement planning to design resilient systems. Consider development of SMART digital asset management systems based on IoT smart monitoring of asset conditions. Understand how these will interact with other City-wide SMART systems.

For wastewater develop a costed plan for the rehabilitation and extension of the wastewater collection and stormwater network to convey sewage to the site of the new wastewater treatment plant(s) and effectively meet targets for separation of foul sewage from the stormwater system and for reduction of urban flooding risk from the sewers. Digital tools such as drainage modelling, based on the GIS system, may be used in the planning, design and testing of solutions. Plan investments to be delivered in a phased programme over coming 5 years that fit with the vision statements for the next 10 to 15 years.

Consider the findings of studies on SuDS drainage and decentralised treatment options in WR03 when planning the balance between catchment solutions (SuDS), localised treatment and reuse and centralised sewerage solutions to achieve objectives for wastewater collection, flood protection and other multiple benefits.

Use the supply demand projections for wastewater to estimate the sizing requirements for wastewater treatment and finalise siting of plants in one or more locations.

The Actions plans will include full assessments of the economic costs and benefits and the social and environmental impacts of each of the options.

Basis for plan:

The utility company ‘Vodovod Banja Luka’ provides public water supply to c. 30,000 domestic customers and c. 5,000 commercial customers. A further c.18,000 domestic customers (decreasing year-on-year) obtain water from local plumbing systems (2016 figures obtained from the Development Strategy of Banja Luka, 2018-2027). Public water supply is estimated to be currently provided to 63% of the population, with 3% obtaining water from their own sources/wells (assumed to continue).

The City’s population has grown at a rate of 0.5% per annum over the four years to 2016. It is reasonable to assume that this growth rate will continue. Potential future non-household consumption is more uncertain - for the purposes of this report it has been estimated to remain the same.

The current total 122.5Ml/d water production capacity is abstracted from three main sources: 2% (approx. 1.5Ml/d) from the ‘Subotica’ source, 27.5% (34.6Ml/d) from eight groundwater wells ('Novoselija' source) and 71% (86.4Ml/d) from the Vrbas River. It is reported that there is potential to expand the Vrbas River abstraction by another 34.6Ml/d. In 2016, 74.8Ml/d was produced and distributed, and 47.1Ml/d was charged to customers, resulting in 37% NRW.

Factoring up the billed volumes from 2016 to allow for the additional 34% of the population to be connected suggests that total demand might be in the region of 47.1Ml/d + 25.4Ml/d = 72.5Ml/d. If NRW remains at 37%, this would equate to an additional 26.8Ml/d of demand, totalling 99.4Ml/d. Capacity already exists to supply this volume of water so additional water resources and water supply treatment are not required for the foreseeable future.

Under Article 9 of the Water Framework Directive the control and management of water quantity in all water sectors is a legal requirement in order to promote the sustainable use of water resources and to enhance the aquatic environment. Improved water use efficiency is viewed as an essential pre-requisite to achieving these aims. Therefore, it is recommended that NRW is reduced, despite the fact that there appears to be capacity to supply the City’s population at current rates of NRW.

The existing per capita consumption (pcc) estimate of customers in Banja Luka is 199l/h/d. Whilst the pcc of 199l/h/d is high relative to other European countries, the hydrological position of Banja Luka in an area of plentiful water supply and low drought risk, suggests that demand management measures such as customer metering (unless for billing purposes) and education of customers about water efficiency are not priority areas for investment relative to improvements to the supply network, therefore have not been identified as policy options under this GCAP.

The wastewater system of the City is underdeveloped: the wastewater collection network currently covers approximately 60 per cent of inhabitants of the City with many individual households connected to septic tanks, where many of these tanks are sub-standard. The City has no centralised wastewater treatment plant and the wastewater collected is discharged

WATER RESOURCES ACTION: WR05																					
into the rivers Vrbanja and Vrbas untreated. Septic waste collection is poorly managed with little arriving at designated sanitary landfill sites. Whilst the lack of formal wastewater treatment of sewage is not unusual for the country it causes environmental and social harm and needs to be addressed. The scale and impact of this harm is unknown and may be exacerbated with increased water and wastewater connections. The collectors that are currently in use date back to 1912, and they are in urgent need of rehabilitation. The wastewater system has not followed the expansion of the water supply network and totals 397 km. Wastewater generation from water supply is generally around 80% of supply returned to sewers. If per capita use includes a lot of leakage which is going to groundwater, then the amount reaching the sewers will be less. Interaction with other plans: In January 2019 EBRD put out calls for “Banja Luka Water Project - Technical, Financial and Environmental Due Diligence” which was to look at the water and wastewater investment requirements of Banja Luka. The results of this study should feed into subsequent work under the GCAP and may reduce the investment in the study required under the GCAP. In summary, this action will identify water and wastewater network investment requirements, conduct supply and demand forecasting for water and wastewater for revenue planning and treatment capacity requirements, and assess and ensure the resilience of the supply system to current and future levels of demand and supply availability under different scenarios of climate change and drought risk, which will help to ensure that existing and future operations are environmentally and financially resilient.																				
Revenue generating: No																					
Owner: The utility company ‘Vodovod Banja Luka’.										**Stakeholders:** Customers											
Capex	EUR 350,000		BAM 686,000			**Annual Opex**	EUR 0		BAM 0	**Implementation Start/End Year**			2021-2023								
Notes on cost estimates: The CAPEX is an estimate of cost of international experts to support local staff to develop the action plans and hold stakeholder consultation workshops on the outline and final plans.																					
Action link to indicators	State	2 Water bodies								**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Pressure	20 Industries	26	27	28.1 Water						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

WATER RESOURCES ACTION: WR11

Primary action classification: Investment

Secondary action classification: Capital investment: feasibility, planning, design, piloting

Action title: Pilot of Sustainable Drainage Systems (SuDS) construction

The climate of Banja Luka has a reasonable level of rainfall spread quite evenly through the year, thus not presenting a major challenge to water resources management. However, there will still be advantages in being able to utilise green infrastructure as part of the urban fabric of the City and to help to reduce flood risks by attenuating storm water run-off.
SuDS solutions utilising features incorporated to buildings and urban spaces can both reduce the impact of localised pluvial flooding during an intense rainfall event and also reduce the peak load passing to the sewer system.
Where possible, stormwater and effluents should be re-used for urban irrigation in preference to use of the fresh water supply. This may be done by the integration of water storage features in the urban landscape. These may be surface water storage, underground tanks or utilising aquifer recharge if appropriate geological conditions exist.
SuDS options should be assessed for the city. These can help to meet the requirements for flood risk reduction and potentially reduce the investment cost in underground sewers. Nature based drainage solutions will also enhance the green landscape of the city and provide secondary benefits in terms of air quality, scenery, microclimate, rainwater re-use, water quality improvement, etc.
Normal storm water drainage and SuDS solutions have significant interaction with highway drainage requirements. The regulations and financing related to roads should be considered in proposed works.
This action will pilot the implementation and construction of SuDS schemes in the city at locations selected during the analysis of SuDS options in WR03.
Initial pilots of simple public space SuDs could start in 2022. Integrating more advanced decentralised wastewater reuse and flood prevention schemes will take longer to plan and need to integrate with other schemes in the period 2024 to 2030. The budget for such work may be reassigned from WW network or WWTW or other city development budgets if appropriate.

Revenue generating: No

Owner: Banja Luka City Administration.

Stakeholders: Banja Luka City Administration, Utility Company 'Vodovod Banja Luka', Public Institution "Vode Srpske', Customers/citizens

Capex	EUR 80,000 – 500,000	BAM 156,800 – 980,000	**Annual Opex**	EUR 10,000 – 60,000	BAM 19,600 – 117,600
Implementation Start/End Year	2023 - 2031				

Notes on cost estimates: The CAPEX estimate covers Cost of tendering, letting and supervising contracts to contractors who would undertake the work. Costs difficult to estimate at present as could be just some small pilots or more widespread as part of the wastewater network and treatment solutions under an approach of catchment-based solutions and decentralised treatment as identified in WR05. OPEX is estimated as 3% of CAPEX for maintenance and operation of SuDS systems.

Action link to indicators										**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	State	2																			
		Water bodies																			
	Pressure	20	27	28	28.1						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Industries	Water																		

WATER RESOURCES ACTION: WR12

Primary action classification: Policy
Secondary action classification: Developing policy, plan, legislation, regulations

Action title: Study into Industrial wastewater assessment, regulation and treatment investments

It is understood that industrial WWTW do exist in some places but are likely to need maintenance and updates. In future the sewer system should pick up industrial effluent and send to treat effluent further together with the domestic waste in the WWTW.
Industrial effluent may require pre-treatment before discharge to sewer to remove high strength waste, toxic or hazardous material, untreatable components or oils and fats, etc. Industrial sites, petrol stations, etc. to have oil traps before runoff to storm sewers also. These should be financed by the responsible enterprises.
Awareness raising and training in the assessment of cleaner production options by audits of enterprises in comparison to Best available Technology (BAT) solutions to identify the opportunities to prevent the discharge of toxic waste at source in the industrial processes rather than by treatment.
Opportunities should be identified for efficiency through water saving combined with energy saving and solid waste generation savings in industries.
If not already in force then regulations regarding industrial discharges to sewers will need to be formulated, enacted and enforced. These should include a review of all industrial discharges in the City and implementation of assessment, monitoring and reporting of discharges quantity and quality. Enterprises will need to pay for the loads they are placing on the sewer system and WWTW. Capacity building, training and support to enterprises in finding most effective cleaner production vs onsite treatment options.
There is overlap with the IN01 and IN02 actions on industrial permitting and clearer production. This water resources action would focus on those aspects specific to the technical, financial and legal mechanisms of industrial discharge permitting and cleaner production and how this affects the water utilities. Or may be merged into one overall study.

Revenue generating: No

Owner: Banja Luka City Administration

Stakeholders: Banja Luka City Administration, City enterprises, water company, sewerage company

Capex	EUR 150,000	BAM 294,000	**Annual Opex**	EUR 10,000	BAM 19,600	**Implementation Start/End Year**	2021-2023

Notes on cost estimates: The CAPEX estimate is based on the of cost of international experts to support local staff to develop the regulations undertake pilot cleaner production audits and hold stakeholder consultation workshops. All costs related to the construction of facilities in enterprises for the management of discharges are to be borne by the enterprises themselves. OPEX is for supervision and enforcement of industrial treatment requirements: 0.5 to 1 FTE.

Action link to indicators										**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	State	2 Water bodies																			
	Pressure	20 Industries	27	28	28.1 Water						Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

LAND USE ACTION: LU02

Primary action classification: Investment
Secondary action classification: Improving information base, modelling

Action title: Develop a GIS land use and environmental database for the City of Banja Luka

There is a lack of an integrated detailed GIS database on land use and the environment for the whole territory of the City of Banja Luka. Unfortunately, GIS database of Spatial plan of City of Banja Luka is generalised and partially obsolete, especially in the fields of land use and environment. A Geographic Information System (GIS) land use and environmental database of the City of Banja Luka should be developed, as a useful tool for spatial planning, research, analysis and monitoring. The City Administration should seek the digitisation of city data which will allow data to be processed, analysed and displayed quickly for various spatial planning purposes. A GIS based land use and environmental database should comprise a number of layers with different spatial information content. The system should consist of land use types, green infrastructure, transport, hydrology, contaminated land, polluters, utilities, public facilities, protected ecological sites. The GIS system will facilitate high quality monitoring of basic climate elements and help define the climate trends. The digitisation process and development of the GIS system could be a common activity of the city administration departments in cooperation with universities, statutory bodies, utility companies and NGOs. It should be incorporated into the urban planning policy functions of developing future Spatial Plan, Urban Plan and the Development Strategy in the City of Banja Luka, as well as local environmental documents (LEAP, Air Quality Plan, Waste Management Plan, Nature Protection Plan). The GIS system after development could later be made available online for public accessibility.

The development of a GIS system will facilitate better cooperation among institutions and provide and integrated database on land use and the environment. Once data has been digitised it can be used for many purposes and be processed very quickly and can be used by multiple people at once. It will become an effective holistic tool for spatial planning in the City of Banja Luka, facilitating evaluation, research activities and analysis as selected layers can be overlain and help with analysis of spatial development features, multicriterial analysis or reveal unexpected correlations. This system will be more accessible to more users, allowing for easier search and orientation, and could allow for greater cost savings for the City Administration.

Revenue generating: No

Owner: Banja Luka City Administration

Stakeholders: City Administration; Statutory Bodies; General Public; Universities; NGOs

Capex	EUR 110,000	BAM 215,600	**Annual Opex**	EUR 1,500	BAM 2,940	**Implementation Start/End Year**	2021-2026

Notes on cost estimates: The CAPEX is estimated as a percentage (30%) of the cost of developing the Spatial Plan. The OPEX estimate is based on working-days per year for the updating GIS database by the City Administration and the maintenance of Web GIS platform.

Action link to indicators										**Action performance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	State	6	6.1	7	7.2	9.2															
		Green space		Biodiversity and ecosystems		Adaptation and resilience															
	Pressure	11.5	12	28	28.1	28.2	33				Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport		Water			Land use															

LAND USE ACTION: LU04																						
Primary action classification: Investment **Secondary action classification:** Improving information base, modelling										**Action title:** Establishment and enforcement of regulated monitoring of development in accordance with planning policy and building regulations												
There is a lack of upholding and inconsistent monitoring of development in accordance with spatial planning policies and legislation in the City of Banja Luka. Spatial planning enforcement deals with breaches of land use planning, including where building work requiring planning permission is undertaken without such permission or are not complied with in accordance with spatial planning legislation or plans. Establishing a regulated process of monitoring development will also help the City Administration of Banja Luka to identify where inappropriate development is taking place, enables efficient enforcement to be undertaken. Effective spatial planning enforcement is important to tackle breaches of planning control which would otherwise have unacceptable impact on the environment or amenity of Banja Luka, to maintain the integrity of the decision-making process and help ensure that public acceptance of the decision-making process is maintained. Monitoring of developments will help for the City Administration of Banja Luka to identify where deficiencies in provision such as green space or public transport are located and seek to rectify and implement this through effecting spatial planning including future spatial planning documents. Successful implementation will lead to the reduction in illegal and informal development not in accordance with spatial planning legislation and policies and building regulations. Efficient monitoring can have the added benefit of creating a better understanding of deficiencies in provision such as green space and public transport.																					
Revenue generating: No																						
Owner: Banja Luka City Administration – Spatial Development/Planning and Inspection Departments										**Stakeholders:** Banja Luka City Administration; Statutory Bodies; NGOs; Developers												
Capex	EUR 300,000	BAM 588,000		**Annual Opex**		EUR 15,000	BAM 29,400		**Implementation Start/End Year**	2023-2027												
Notes on cost estimates: The CAPEX is estimated based on expert judgement and benchmarks of implementation. OPEX - expert judgement based on working-days per year for the field work and fuel costs by the City Administration.																						
Action link to indicators	State	6	6.1	7	7.2	9.2				**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Green space		Biodiversity and ecosystems		Adaptation and resilience																
	Pressure	11.5	28	28.1	28.2	33					Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport	Water			Land use																

LAND USE ACTION: LU07

Primary action classification: Policy
Secondary action classification: Developing policy, plan, legislation, regulations

Action title: Develop policy and guidance to encourage Brownfield and Mixed-Use development, and Transit-Oriented Development

To facilitate sustainable development in Banja Luka and reduce urban sprawl, the City will promote Brownfield, Mixed Use and Transit-Oriented Development (TOD) in urban planning policy and land use. TOD seeks to optimise and maximise land use with close access to public transport promoting a mix of residential, commercial, retail and leisure opportunities. Therefore, TOD should become an integral part of Banja Luka's urban development. Environmentally friendly modes of transport between the City centre and recreational zones should be sought including greater integration of the central business district to the train station. Opportunities for infilling of urban area at appropriate density targets include the reactivation of brownfield sites. The City Administration should restrict and resist urban sprawl and development which is not promoting of this urban planning policy. Establishing of car free spaces and reduction of car parks for the purpose of other developments or new public spaces promote sustainable transport modes. Policies on the implementation of green transport infrastructure in new buildings and major developments include cycle storage and electric vehicle charging points. To facilitate and achieve successful TOD and urban development will require greater synergy of all strategic and action plans in progress and between institutions in the City Administration.
Feasibility studies and pilot projects in the City of Banja Luka which promote better urban planning and the objectives of the GCAP should be carried out. The feasibility studies and pilots will help to identify projects for further development.

Revenue generating: No

Owner: Banja Luka City Administration – Spatial Development/Planning Department

Stakeholders: Banja Luka City Administration; Statutory Bodies; General Publics; NGOs

Capex	EUR 100,000	BAM 196,000	**Annual Opex**	EUR 1,000	BAM 1,960	**Implementation Start/End Year**	2021-2022

Notes on cost estimates: CAPEX based on the development of comparable policies. OPEX - expert judgement based on working-days per year for data collection and procedure (primarily public consultation) by the City Administration.

Action link to indicators	State	1	1.1	1.2	1.3	6	6.1	7	7.2	8	9.2
		Air				Green space		Biodiversity and ecosystems		Mitigation of GHG emissions	Adaptation and resilience
	Pressure	11.5	28	28.1	28.2	11.5					
		Transport	Water			Land use					

Action performance	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
	Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		

LAND USE ACTION: LU08																								
Primary action classification: Investment **Secondary action classification:** Training, capacity building													**Action title:** Enhanced Capacity Building amongst local policy-makers, development managers and regulators												
To support capacity building, planning training courses and workshops will help to increase capabilities for urban planning and sustainable development in Banja Luka. This will result in better planning and more informed decisions being made by the City of Banja Luka. The training will promote continuous professional development for City administrators working within urban planning. The training will help promote acceptance and ownership of urban planning responsibility by City administrators.																								
Revenue generating: No																								
Owner: Banja Luka City Administration – Spatial Development/Planning Department													**Stakeholders:** Banja Luka City Administration; Statutory Bodies; Universities; NGOs; Professional Bodies												
Capex	EUR 10,000	BAM 19,600	**Annual Opex**	EUR 0	BAM 0	**Implementation Start/End Year**	2021-2023																	
Notes on cost estimates: Expert judgement for CAPEX based on local capacity building in urban planning.																								
Action link to indicators	State	1	1.1	1.2	1.3	6	6.1	7	7.2	8	9.2		**Action perfor-mance**	Action link to strategic objectives	WR1	WR2	AQ1	GS1	GS2	GH1	SL1	BE1	BE2	AR1
		Air				Greenspace		Biodiversity and ecosystems		Mitigation of GHG emissions	Adaptation and resilience													
	Pressure	11.5	28	28.1	28.2	33								Socio-economic benefits	EcR	EcG	Emp	EcIn	PHth	AcS	Sfy	GEq		
		Transport	Water			Land use																		

Appendix D. List of plans and strategies

Table D-1 – List of plans and strategies

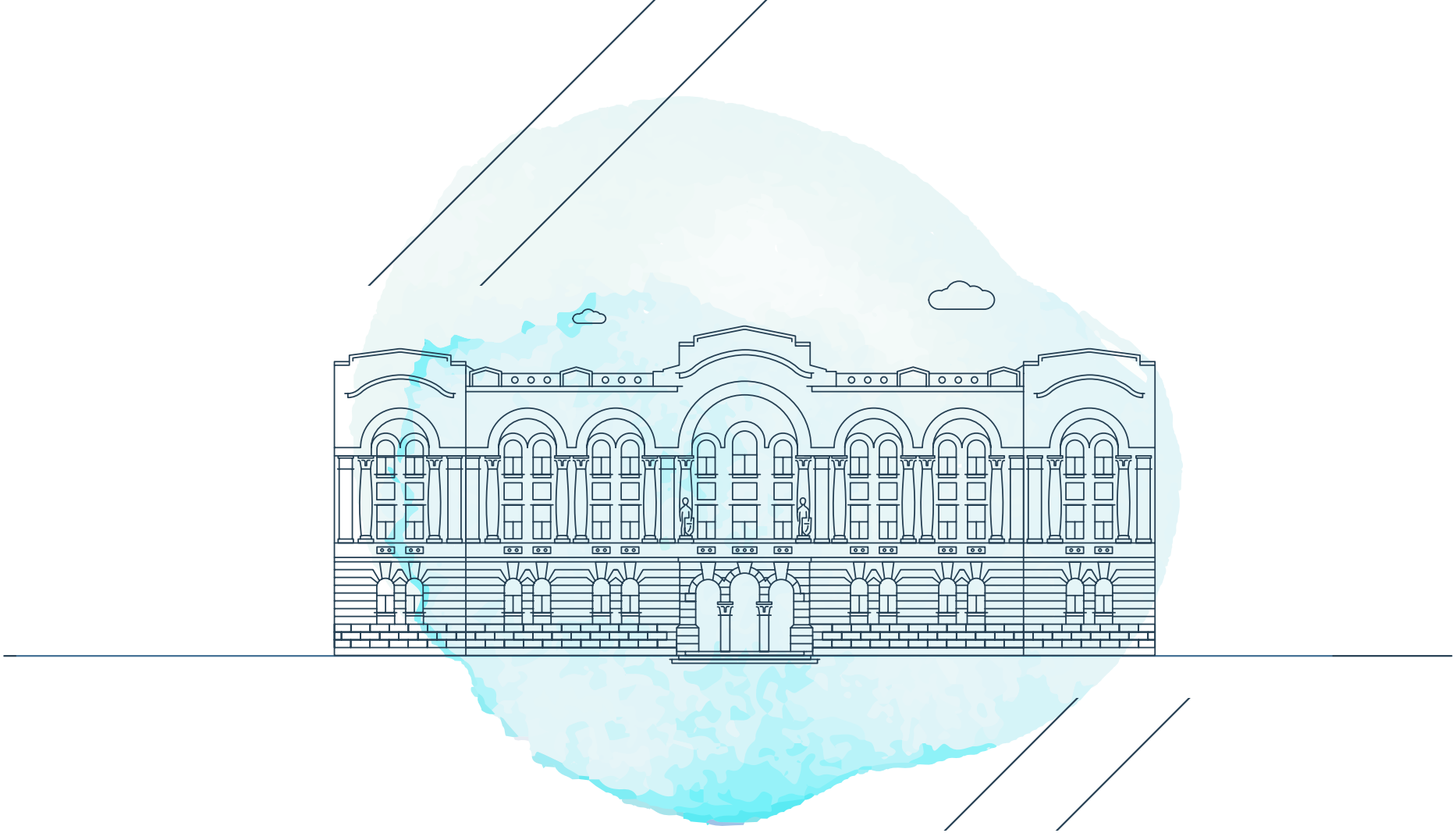
Document title	Year/Period
International and EU	
Convention on Biodiversity	2010
Bern Convention	1979
Ramsar Convention	1975
Bonn Convention	1983
EU Biodiversity Strategy to 2020	2011
Habitats Directive (92/43/EEC)	1992
Birds Directive (2009/147/EC)	2009
Water Framework Directive (2000/60/EC)	2000
Freshwater Fish Directive (2006/44/EC)	2006
Groundwater Directive (2006/118/EC)	2006
Air Quality Directive (2008/50/EC)	2008
Ambient Air Quality and Cleaner Air for Europe Directive (2008/50/EC)	2008
Clean Air Programme for Europe,	2013
EU Thematic Strategy on Air Pollution	2005
National Emissions Ceilings Directive (2001/81/EC)	2001
United Nations Framework Convention on Climate Change, Kyoto Protocol, Paris Agreement	From 1994
Seventh Environment Action Programme	2013-2020

Document title	Year/Period
Renewable Energy Directive (2009/28/EC)	2009
Energy Efficiency Directive (2012/27/EU)	2012
EU Energy Community Treaty	2006
EU Strategy on Adaptation to Climate Change	2013
Roadmap to a Single European Transport Area	2011
Floods Directive (2007/60/EC)	2007
Bathing Water Directive (2006/7/EC)	2006
EU Thematic Strategy for Soil Protection	2006
European Landscape Convention	2004
Convention for the Protection of the Architectural Heritage of Europe	1985
European Convention on the Protection of the Archaeological Heritage	1992
World Heritage Convention	1972
A Sustainable Europe for a Better World: A European Union Strategy for Sustainable Development	2001
Aarhus Convention	2001
WHO Guidelines for Community Noise	1999
WHO Night Noise Guidelines for Europe	2009
WHO Health Effects of Transport-Related Air Pollution	2005
WHO Charter on Transport, Environment and Health – Regional publications – European Series, No. 89	1999
Environmental Noise Directive (2002/49/EC)	2002
WHO Age Friendly Cities Guide	2007

Document title	Year/Period
Waste Framework Directive (1975/442/EEC)	1975
Documents at level of Bosnia and Herzegovina	
Framework Transport Strategy	2016
Strategic Plan for Rural Development (2018–2021)	2018
Climate Change Adaptation and Low-Emission Development Strategy for Bosnia and Herzegovina	2013
Third National Communication and Second Biennial Update Report on Greenhouse Gas Emissions under the United Nations Framework Convention on Climate Change	2016
Documents at level of Republika Srpska	
Strategy of Air Protection with Action Plan for Air Quality Management of Republika Srpska	2007
Strategy of Waste Management of Republika Srpska	2017-2026
Strategy of Nature Protection of Republika Srpska	2008
Strategy of Integral Water Management in Republika Srpska until 2024	To 2024
Management Plan of Sava river area basin (District) in Republika Srpska	2017-2021
Strategy of Forestry Development in Republika Srpska	2011-2021
Strategical Plan of Agriculture and Rural Areas Development in Republika Srpska	2016-2020
Strategy for Transportation of Republika Srpska	2016-2030
Strategy for Development of Public Roads in the Republika Srpska	2016-2025
Strategy for Safety of Traffic on Roads of the Republika Srpska	2013-2022
Strategy of Energy Sector in the Republika Srpska	To 2035
Energy Efficiency Action Plan for Republika Srpska	To 2018

Document title	Year/Period
Documents at Level of the City of Banja Luka	
Development Strategy of the City of Banja Luka 2018-2027	2018
Action Plan with projects for 2018	2018
Action Plan with projects for 2017	2017
Plan of Capital Investments 2018-2020	2018
Plan of Capital Investments 2015-2017	2015
Action Plan for Employment	2017
Action Plan for Employment	2018
Energy Efficiency Action Plan 2016-2019	2016
Local Environmental Action Plan (LEAP) 2016-2021	2016
Strategy of Development of Tourism in the City of Banja Luka 2013-2020	2013
Strategy of Non-profit Social Housing 2015-2020	2015
Strategy of Development of Local Roads and Streets in the City of Banja Luka 2017-2022	2017
Strategy of Development of the Small and Medium Enterprises and Entrepreneurship 2010-2015	2010
Strategy for Rural Development for the City of Banja Luka 2010-2015	2010
Study “Rural Integral Development in the area of the Vrbas Canyon and Manjača Plateau”	Pre 2007
Study ″Integral Rural Development in the Area of the North-West City of Banja Luka″	Pre 2007
Spatial Plan of the City of Banja Luka	2014
Sustainable Energy Action Plan (SEAP) of the City of Banja Luka	2010
Strategy of Road Traffic Safety of the City of Banja Luka 2016-2025	2016

Document title	Year/Period
Local Solid Waste Management Plan	2009
Air Quality Action Plan for areas where air quality limit values have been exceeded	2012
Local Nature Protection Plan of the City of Banja Luka	2016



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