Green Cantonal Action Plan for Sarajevo

Technical Briefing Paper: Vision, Objectives, Policy Options and Actions

European Bank for Reconstruction and Development

May 2019

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Document history

Revision	Purpose description	Origin-ated	Checked	Reviewed	Authorised	Date
Rev 1.4	Draft Paper for discussion with stakeholders	MH, CGL	CGL, SMK, IS, NT, DS, NP	MH	SF	20/05/2019

Client signoff

Client	European Bank for Reconstruction and Development
Project	Green Cantonal Action Plan for Sarajevo
Job number	5183282
Client signature / date	

Contents

Chapter		Page
Abbreviations		4
1.	**Background**	**5**
1.1.	Purpose of this briefing paper	5
1.2.	GCAP process	5
1.3.	Methodology for developing vision, strategic objectives, policy options and actions	6
1.4.	Content of this briefing paper	6
2.	**GCAP vision, topic visions and strategic objectives**	**7**
2.1.	Introduction	7
2.2.	Prioritised green canton challenges and key policy gaps	7
2.3.	Overarching vision for the Green Cantonal Action Plan	7
2.4.	Vision and strategic objectives by environmental topic	7
3.	**GCAP policy options and actions**	**12**
3.1.	From vision and objectives to policy options and actions	12
3.2.	Proposed policy options and actions by priority area	17
3.3.	Prioritisation of policy options and actions	66
3.4.	List of actions requiring investment	68

Tables

Table 2.1: Prioritised environmental topic visions and strategic objectives, policy gaps and policy / action priority areas 8

Table 2.2: Key linkages between environmental challenge topics and policy / action priority areas 11

Table 3.1: Summary of proposed policy options and actions 13

Table 3.3: Policy option / action initial prioritisation 67

Figures

Figure 1.1: Visions, strategic objectives, policy options and actions and the GCAP process 5

Figure 3.1: Land use policy options / actions summary 17

Figure 3.2: Transport policy options / actions summary 26

Figure 3.3: Water policy options / actions summary 44

Figure 3.4: Energy, buildings policy options / actions summary 53

Figure 3.5: Industry policy options / actions summary 59

Figure 3.6: Solid waste policy options / actions summary 62

(to be finalised after workshop)

Abbreviations

Abbreviation	Description
BD	District of Brčko
BiH	Bosnia and Herzegovina
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide equivalent
EBRD	European Bank for Reconstruction and Development
EU	European Union
FBiH	Federation of Bosnia and Herzegovina
GCAP	Green Cantonal Action Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gas(es)
Kg	Kilogram
KM	Bosnia and Herzegovina Convertible Mark
Km^2	Square Kilometres
MoFTER	Ministry of Foreign Trade and Economic Relations
Mt	Mega Tonne
MWh	Megawatt Hour
MWt	Megawatt Thermal
PSR	Pressure-State-Response
RS	Republika Srpska
RYG	Red, Yellow, Green
TOD	Transit-Oriented Development
WHO	World Health Organisation

1. Background

1.1. Purpose of this briefing paper

The purpose of this briefing paper is to re-confirm the key environmental challenges facing the Sarajevo Canton and to present a number of topic-based visions and strategic objectives which respond to those challenges an align with the existing Federal and cantonal level policy direction. The visions and strategic objectives are established for a period of 10-15 years for each green canton priority topic which has been identified. The visions and strategic objectives set the framework for the development of policy options and actions.

The suite of policy options and actions are intended to deliver against the topic-based visions and strategic objectives. The policy options and actions are focused on the short term (delivered in the next five years). At this stage, we also present some initial detail related to proposed policy options and actions including estimated delivery timeframes and indicative estimates of CAPEX ranges. An initial prioritisation of the actions is also provided.

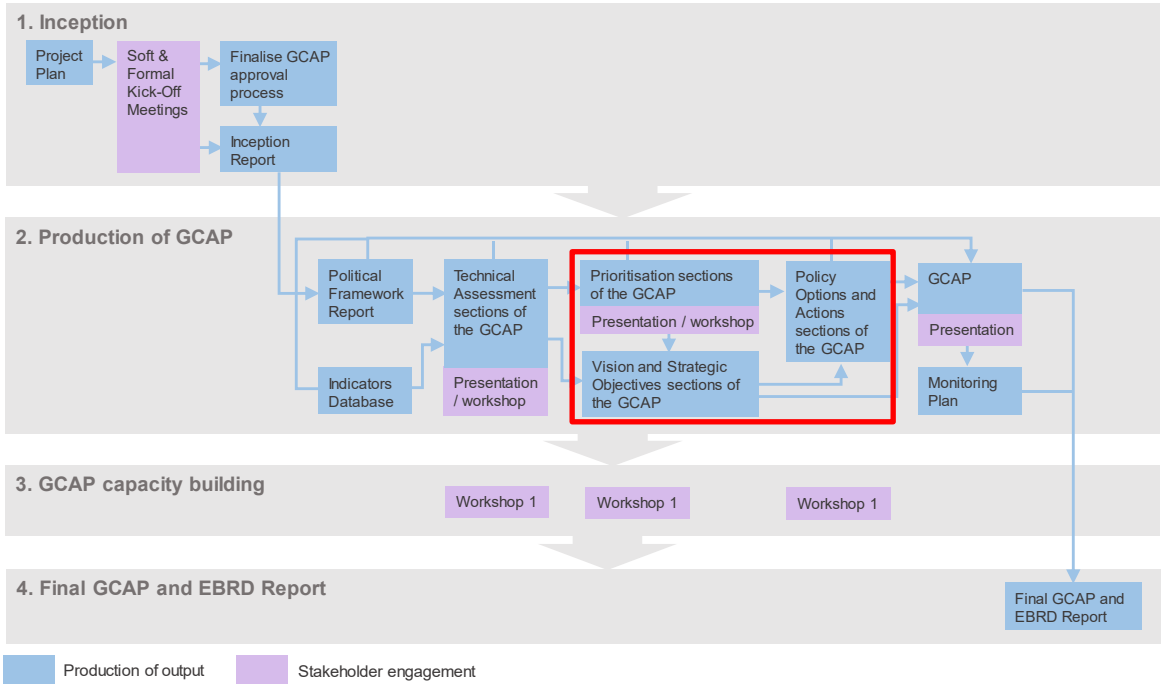
It is important to note that the content of this briefing paper is to initiate and guide dialogue, discussion and debate at the visions, strategic objectives and actions workshop to be held in Sarajevo on 11th June 2019. The information presented in this paper is therefore provided for information and will be subject to update and refinement as part of the GCAP Canton and stakeholder engagement process.

1.2. GCAP process

This chapter presents a summary of the approach used to develop the Sarajevo GCAP vision, strategic objectives, policy options and actions, based on the requirements in the study Terms of Reference and guidance set out in the EBRD GCAP methodology. The key features of the methodology are described in this chapter.

Figure 1.1 below provides an overview of the GCAP process and where the development of visions, strategic objectives, policy options and actions sit within the process (red highlighted box), delineating the sequential dependencies (blue arrows) between the sub-tasks within the four main tasks of the process. The development of this technical briefing paper immediately follows the production of the technical assessment where green city challenges have been identified, based on the collation and analysis of green city indicators, as well as prioritisation through stakeholder engagement.

Figure 1.1: Visions, strategic objectives, policy options and actions and the GCAP process



1.3. Methodology for developing vision, strategic objectives, policy options and actions

1.3.1. Vision and strategic objectives

Responding to the identified green canton challenges, a green vision and topic-based visons have been developed for Sarajevo Canton.

The canton-wide vision statement takes into consideration the identified green challenges and blends this with the broader aspiration of how the canton wants to develop in the future, shaping the green ideals and aspirations. The vision statement takes into consideration the wider policy agenda identified with the political framework reporting, as well as feedback from canton officials and stakeholders at GCAP workshops. This will help to create ownership and backing for the Green Cantonal Action Plan.

The topic visions present a qualitative descriptive of the desire to meet the topic-based challenges, identified through the technical assessment report and through stakeholder-based prioritisation. They also form the framework for developing strategic objectives which in turn shape the generation of policy options and actions.

1.3.2. Policy options and actions

The policy options and actions have been generated to respond directly to the topic visions and strategic objectives which are indented to address the green city challenges. Policy options and actions, as applicable, take into consideration the identified policy issues and gaps as reported in our political framework and the technical assessment reporting. The policy options and actions are captured under the following sector headings:

- Land use;
- Transport;
- Water;
- Energy;
- Industry; and
- Solid waste.

1.4. Content of this briefing paper

The remainder of this briefing paper is structured as follows:

Chapter 2 – GCAP vision and strategic objectives: this chapter re-confirms the prioritised environmental challenges identified through the technical assessment reporting and stakeholder engagement process and sets out topic-based visions and strategic objectives, which guide the generation of green canton policies and actions; and

Chapter 3 – GCAP policy options and actions: sector-based priority areas are identified, which form the framework for developing an initial proposed set of policy options and actions. They are generated through the identification of existing instruments and procedures which can be enhanced, as well as selection of new policy options and actions. Policy options and actions are designed to address topic visions and strategic objectives. The policy options and actions are prioritised through a filtering process which reflects the priority challenges identified in previous steps and socio-economic priorities, as well expected benefits and costs. Investment actions are presented in a separate table.

2. GCAP vision, topic visions and strategic objectives

2.1. Introduction

This chapter of the paper presents the green canton challenges and policy gaps/issues as identified with the technical assessment reporting and links them to an overarching vision for the canton, as well as environmental topic-based visions and strategic objectives. The strategic objectives map directly against policy action priority areas. The following information is contained in this chapter:

- A recap of the key Sarajevo Canton prioritised environmental topic areas and challenges (Table 2.1);
- An overarching vision for the Green Cantonal Action Plan;
- Vision statements for each of the prioritised environmental topic areas (Table 2.2); and
- Strategic objectives which link to the topic visions and form the framework for the development of actions (Table 2.2).

2.2. Prioritised green canton challenges and key policy gaps

The technical assessment reporting presented an evidence based, data led identification of green canton challenges, which was supplemented by a stakeholder led prioritisation of the challenges identified in the technical assessment. The prioritised green canton topics, challenges and policy gaps and issued are set out in Table 2.1

2.3. Overarching vision for the Green Cantonal Action Plan

The overarching vision statement for the GCAP will be finalised after the workshop

2.4. Vision and strategic objectives by environmental topic

Based on the identification and prioritisation of environmental topic challenges, a series of environmental topic visions have been developed, which are intended to respond to the identified challenges and shape the generation of measurable strategic objectives, which set the framework for the development of policy options and actions. The vision statements for each of the prioritised environmental topic areas are presented in Table 2.2, where they are aligned with green canton topic challenges. A single vision is presented for each topic area and strategic objectives are also presented. A total of 26 strategic objectives have been generated.

Table 2.1: Prioritised environmental topic visions and strategic objectives, policy gaps and policy / action priority areas

Environmental Topic	Key Green Canton Challenges	Vision, strategic objectives	Policy gap(s) / issue(s)	Policy / action priority areas
1. Air quality	• Air quality in Sarajevo Canton is generally poor and this is exacerbated during winter months. • Key pressures include fossil fuelled private road transport, lack of public and non-motorised transport infrastructure, aged car fleet, high electrical and heat energy consumption in residential buildings and small share of population with access to district heating/cooling. • Increased use of fossil fuels and non-renewable options as energy sources for heating and cooking in individual households. • Some industry types such as quarries and construction may potentially be contributing to particulate matter concentrations. • Outdated industrial machinery could be exacerbating poor air quality in Sarajevo Canton. • Urban fabric and massing, particularly high-rise buildings in relation to urban ventilation corridors	***Air quality vision statement:*** "Sarajevo Canton will have healthy and clean air quality, with low emissions from transport, buildings and industries, meeting EU ambient air quality objectives and WHO standards" ***Strategic objectives:*** AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies AQ04 Ensure industry emissions are aligned with EU and Federal/Cantonal standards AQ05 Increase use of non-fossil fuels and renewable energy sources for heating and cooking AQ06 Improve energy efficiency of buildings and utility infrastructure	• Absence of smart and sustainable transport strategy for the Canton. • Lack of integration of transport planning with land use planning. • Lack of incentives for cleaner production. • Lack of measures to discourage use of private car and encourage non-motorised transport. • Absence of cleaner energy development plan for heating, lighting and cooking. • Lack of energy efficiency policies and measures for buildings and industries.	• Transport: fossil fuelled road transport. • Transport: lack of provision for NMU movement. • Buildings energy: fossil energy consumption. • Industry: air emissions and energy efficiency • Land use – urban fabric and land use pattern in relation to transport routes
2. Water resources	• The amount of non-revenue water is extremely high and there is a significant lack of plans and investment in repair and maintenance of water supply infrastructure. • Although there is centralised wastewater treatment provision, final treatment of sludge remains unresolved. • Number of illegal dumps are recorded with some being in the vicinity of watercourses • Landfill leachate is not treated • Sewerage network coverage is limited, with around 20% of households discharging to septic tanks or directly into water bodies.	***Water resources vision statement:*** "Sarajevo Canton will have an efficient and well-maintained drinking water supply network as well as wastewater infrastructure serving the entire population, in compliance with EU standards." ***Strategic Objectives:*** WR01 Reduce overall wastage of potable water WR02 Increase wastewater collection and appropriate treatment accessible to all WR03 Improve wastewater and water supply planning, management and investment	• Insufficient and inappropriate wastewater management of all types of wastewater source (households, industry, landfill leachate, agriculture) • Lack of regulated metering and billing for drinking water. • Inappropriate sanitation tariff structure; wastewater treatment collection costs are included but not wastewater treatment costs. • Under resourced capacity to tackle wastewater issues. • Lack of measures for treatment of wastewater sludge, e.g. consideration of waste to energy options.	• Wastewater: wastewater collection and treatment. • Water: potable supply network. • Solid waste: waste disposal and treatment of landfill leachate
3. Soils	• Records of higher concentration of heavy metals in soil is indicating pressure from human activities. • Lack of legal and policy response instruments to adequately manage soil and protect/enhance its quality • Increased number of illegal Limited recycling and composting facilities and lack of education on how and what to recycle. • Erosion and landslides	***Soils vision statement:*** "Sarajevo Canton will achieve better management of soil and will protect/enhance its quality." ***Strategic objectives:*** SL01 Protect and enhance soil quality across the Canton SL02 Improve municipal and industrial waste management including reduced generation of solid waste improved/increased recycling SL03 Promote integration of circular economy principles across all relevant legal, political, and policy frameworks	• Lack of land / soil quality monitoring system and regulations • Insufficient level of policy responses in relation to soil quality • Uncontrolled conversion of agriculture land to construction land • Lack of circular economy policies and measures including awareness campaigns on recycling and composting.	• Land use: adoption of soil quality and use regulations, monitoring and urban planning • Solid waste: MSW and industrial solid waste collection and disposal, integration of circular economy principles • Water: discharge of untreated wastewater.

Environmental Topic	Key Green Canton Challenges	Vision, strategic objectives	Policy gap(s) / issue(s)	Policy / action priority areas
	• Uncontrolled littering • Presence of illegal dumping			
4. Green space	• Although Sarajevo Canton overall seems very green as it includes rural areas and four protected natural areas, the provision of green public areas in Sarajevo Canton is relatively poor. • The urban area of Sarajevo Canton has very limited green areas, not easily accessible by all citizens and is highly urbanised. • Lack of information and monitoring of growth of built-up area and illegal construction. • Littering on green open spaces is not penalised.	***Green space vision statement:*** "Sarajevo Canton will become renowned as a healthy, compact, sustainable place to live and work, with a connected network of good quality green spaces accessible to everyone and an efficient system of land uses" ***Strategic objectives:*** GS01 Ensure adequate provision of accessible, high quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD) GS03 Promote a sequential approach (brownfield, infill, greenfield) to urban development to avoid further urban sprawl GS04 Ensure through good governance, a coordinated approach to the implementation and adoption of spatial planning regulations and policies with all relevant legal and institutional frameworks	• Lack of regulation and control of urban development as a result of the Canton's Urban Plan not being adopted yet. • Poor implementation of existing Spatial Planning regulations/legislation. • Lack of harmonisation of institutional and legal frameworks.	• 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.
5. Mitigation of GHG emissions	• Although current levels of GHG emissions appear relatively low, the high proportion of fossil fuelled vehicles, high average age of the vehicle fleet, low fuel standards, lack of provision of cycling/pedestrian infrastructure, outdated industrial equipment, low share of RES, high use of fossil fuels for heating/cooling, and lack of composting, recycling, waste-to-energy facilities together indicate that potential increases in GHG emissions represent a challenge for the Canton that needs to be addressed.	***Mitigation of GHG emissions vision statement:*** "Sarajevo Canton will become renowned for smart, affordable, low carbon transport, low carbon buildings and industries and provision of sustainable consumer choices" ***Strategic objectives:*** GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes GH03 Encourage energy efficient buildings (new and existing retrofit) GH04 Encourage uptake of low carbon energy generation	• Insufficient policies and measures to address climate change pressure. • Lack of policies/investment on low carbon transport and renewable energy technologies • Lack of energy efficiency and retrofitting programmes in buildings and industries. • Lack of financial mechanisms and regulation to fine polluters	• Transport: fossil fuelled road transport. • Transport: lack of provision for NMU movement. • Buildings, industry, energy: fossil energy consumption
6. Biodiversity and ecosystems	• Low provision of green areas within the built-up area. • Lack of treatment of industrial wastewater and inadequate policy responses in relation to industrial emissions. • For the Canton area there is currently no biodiversity map and inventory of flora, fauna, fungi and identification of habitat types with an appropriate database. Data regarding protected areas and their boundaries are inaccurate and outdated. • Lack of monitoring of preservation and protection of dendroid valuable species. • Littering on green open spaces could put pressure on biodiversity.	***Vision statement:*** "Sarajevo Canton will maintain/enhance biodiversity values and support development of blue and green infrastructure networks that link natural assets and rivers across the Canton and beyond" ***Strategic objectives:*** BE01 Protect, maintain and enhance natural environmental assets across the Canton BE02 Encourage development of green and blue infrastructure across the city as an interconnected network of built environment and natural assets to preserve biodiversity, enhance recreational purposes for all and minimise risk to natural disasters BE03 Promote biodiversity enhancement as integral to land use planning and development management processes	• Under resourced capacity for protected areas management and planning. • Lack of monitoring of preservation and protection of dendroid valuable species. • Insufficient systems for monitoring of biodiversity. • Uncontrolled littering on green open spaces could put pressure on biodiversity. • Insufficient Implementation and regulation of the Canton's Urban Plan.	• 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.

Environmental Topic	Key Green Canton Challenges	Vision, strategic objectives	Policy gap(s) / issue(s)	Policy / action priority areas
7. Adaptation and resilience to natural disaster risks	• The phenomenon of landslides is a very significant issue. However, exact land degradation indicators in the Canton area do not exist. • Lack of resilient infrastructure.	***Vision statement:***[1] "Sarajevo Canton will become resilient to climate change and other natural disaster vulnerabilities" ***Strategic objectives:***[2] AR01 - Promote safe and resilient infrastructure and urban development AR02 - Support the resilience of the Canton's economy, society and environment AR03 – Promote disaster planning and risk management as integral to land use planning and development management processes	• Absence of policies and measures to address climate change. • Absence of climate resilience and adaptation strategy and action plans. • Limited systems to assess vulnerability and risk. • Lack of awareness campaign on disaster risk management. • No contingency plans.	• 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. • Mainstreaming of climate change resilience and adaptation into urban policy, planning, design and procurement. • Identification and securing funds for climate change adaptation. • Land use: incentivising investment in green and blue infrastructure; SUDS and flood risk management; construction related land degradation.

[1] 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
[2] In line with 100 Resilient Cities strategies for advocating for federal resilience policy - http://100resilientcities.org/wp-content/uploads/2018/03/100-Resilient-Cities-Safer-and-Stronger-Cities-Final-PDF.pdf

Table 2.2 presents the linkages between the environmental topics and the identified policy /action priority areas. This information is used to guide the policy options and actions presented in section 3.

Table 2.2: Key linkages between environmental challenge topics and policy / action priority areas

Challenge topic / Priority Area	1 Air quality	2 Water resources	3 Green space	4 Mitigation of GHG emissions	5 Soils	6 Biodiversity and ecosystems	7 Adaptation and resilience
Land use	*Spatial planning*		*Spatial planning* *Green infrastructure*	*Spatial planning* *Future proofing*		*Spatial planning* *Green infrastructure*	*Thermal comfort* *Spatial planning* *Future proofing*
Transport	*Fossil fuelled vehicles* *NMU provision*			*Fossil fuelled vehicles* *NMU provision*			
Water		*Wastewater* *Potable water*	*Surface water quality* *Ground water quality*			*Wastewater*	*Water resource efficiency*
Energy	*Fossil energy consumption*			*Fossil energy consumption*			*Thermal comfort* *Water resource efficiency*
Industry	*Air emissions*	*Water emissions*	*Emissions to water, air & land*	*Air emissions*	*Water and land emissions*	*Air, water and land emissions*	*Water resource efficiency*
Solid waste		*Collection* *Disposal*	*Collection* *Disposal*	*Disposal*	*Collection* *Disposal*	*Disposal*	

3. GCAP policy options and actions

3.1. From vision and objectives to policy options and actions

This chapter of the briefing paper sets out the GCAP policy options and actions, which respond to the topic-based challenges, visions and strategic objectives identified in Chapter 2. The topic challenges areas, in order of priority include:

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

Policy options and actions are presented under the sectors as listed below.

- Land use (LU);
- Transport (TR);
- Water (WR);
- Energy (EN);
- Industry (IN); and
- Solid waste (SW).

Each action is given a unique reference by combining the letter coding from the sector with the type of intervention i.e. policy option (PO) or action (AC).

The chapter also contains:

- A table which lists out all of the policy options and actions, including the unique reference, description, owner, estimate of CAPEX range and delivery year – start and end. The table also links the policy option and action back to the topic-based vision in a matrix;
- A table which links the policy options and actions with the topic based strategic objectives;
- A number of sectors based pro-formas, which include additional detail on each of the policy options and actions, including stakeholders, benefits, delivery dates and a detailed description. The sector pro-formas are supported by sector-based policy option and action maps which shows how the different interventions are phased and link to each other;
- Prioritisation – an initial prioritisation exercise has been undertaken to score each of the policy options and actions against a number of prioritisation filters, in accordance with the GCAP methodology. The filters cover environmental, economic and social benefits; and
- Investments – an emerging list of policy option and action investments have been highlighted, based on their overall CAPEX value.

Table 3.1: Summary of proposed policy options and actions

Policy Option/ Action Ref	Policy Option/ Action Title	Policy Option/ Action Owner	Policy Option/ Action CAPEX Range	Policy Option/ Action Delivery Year (Start/End)	Air quality	Water Resources	Green space	Mitigation of GHG Emissions	Soils	Biodiversity and ecosystems	Adaptation and Resilience
LU01 - AC	Develop, legally adopt and enforce an overarching sustainable urban planning framework for SC aligned with ESDP and Territorial Agenda 2020	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection, Institute for Canton Planning	EUR 100k – 500k	2019-2020							
LU03 - PO	Upgrade and enhance integrated GIS based land use for Sarajevo Canton to facilitate effective monitoring and evaluation systems for planning	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection	EUR 1M – 5M	2020-2021							
LU03-PO	Establish land value capture mechanisms	Government of Federation of Bosnia and Herzegovina	EUR 100k – 500k	2021-2022							
LU04 - PO	Introduce environmental and building code regulations and guidelines to legislative framework in SC	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection	EUR 500k – 1m	2020-2025							
LU05 - PO	Planning for provision of good quality green public parks, green infrastructure and public realm	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection, Institute for Canton Planning, KJKP Park (Canton Public Communal Enterprise “Park”), JKP „Komunalac” Hadzici, JKP Trnovo,	EUR 1m – 50m	2020-ongoing							
LU06 - PO	Develop policy and guidance to encourage brownfield, mixed-use development and Transit-Oriented Development	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection	EUR 100k – 500k	2020-2025							
LU07 - PO	Develop, implement regularly monitor digital inventory system for biodiversity, natural protected areas and green public areas in SC	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection, Canton public institution for protected areas, KJKP Park (Canton Public Communal Enterprise “Park”), JKP “Komunalac” Hadzici, JKP Trnovo, Institute for Canton Planning	EUR 5ook – 1m	2020-2025							
LU08- PO	Mainstreaming climate adaptation and disaster resilience into planning policy framework, design guidelines and procurement to achieve future proofing	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection	EUR 500k – 1m	2020-2021							
TR01 - PO	Develop car parking and management policies.	Sarajevo Canton	EUR 100k – 500k	2019-2021							
TR02 - PO	Develop low transport emission policies	Sarajevo Canton	EUR 500k – 1m	2019-2021							
TR03 - PO	Develop a Sustainable Urban Mobility Plan (SUMP) for Sarajevo Canton	Sarajevo Canton	EUR 1m – 5m	2019-2021							
TR04 - AC	Develop city-wide data collection programme and transport model	Sarajevo Canton	EUR 1m – 5m EUR 2m for the data collection system EUR 1m for the traffic model development	2019-2021							

Policy Option/ Action Ref	Policy Option/ Action Title	Policy Option/ Action Owner	Policy Option/ Action CAPEX Range	Policy Option/ Action Delivery Year (Start/End)	Air quality	Water Resources	Green space	Mitigation of GHG Emissions	Soils	Biodiversity and ecosystems	Adaptation and Resilience
TR05 - AC	Enhance and expand cycling infrastructure	Sarajevo Canton	EUR 10m – 50m	2019-2024							
TR06 – PO	Develop standards and guidelines for travel planning, parking and street design	Sarajevo Canton	EUR 500k – 1m	2019-2021							
TR07 - AC	Promotional campaigns for car sharing, walking and cycling	Sarajevo Canton	EUR 200k – 400k	2019-2021							
TR08 - AC	Upgrading of bus stop infrastructure	Sarajevo Canton	EUR 10m – 50m	Phase 1: 2019 – 2023 Phase 2: 2024 – 2028							
TR09 - AC	Implement bus network infrastructure	Sarajevo Canton	Bus lanes: EUR 10m – 50m Park and ride: EUR 10m – 50m BRT network: EUR 50m+	Bus lanes, Park & Ride: 2020-2024 BRT network: 2024-2029							
TR10 - AC	Implement pedestrian priority infrastructure	Sarajevo Canton	EUR 500k-1m	2020-2023							
TR11 - AC	Implement traffic demand management and control	Sarajevo Canton	Congestion zone: EUR 500k – 1m Parking strategy: EUR 100k – 500k HOV lanes: EUR 1m – 5m Signalling system and control centre: EUR 5m – 10m	Congestion zone: 2022-2024 Parking: 2021-2023 HOV lanes: 2024-2029 Signalling system and control centre: 2022-2024							
TR12 - AC	Implement low emission vehicles and supporting infrastructure	Sarajevo Canton	Electric vehicle charging infrastructure: EUR 1m – 5m City fleet to low emission: EUR 1m – 5m	2022-2024							
TR13 - AC	Feasibility study for expansion of tram system	Sarajevo Canton	EUR 500k – 1m	2022-2024							
WR01 - PO	Strategy and plans for the water supply network and customer management systems	Sarajevo Canton Administration, CPUC VIK Sarajevo	EUR 100k – 500k	2020-2023							
WR02 - AC	Improve monitoring of and data collection from the water supply network	Sarajevo Canton Administration, CPUC ViK Sarajevo	EUR 1m – 3m	2020-2023							
WR03 - AC	Reduce water losses from the network	Sarajevo Canton Administration, CPUC VIK Sarajevo	EUR 1 - 5m per year (network maintenance) EUR 10m per year (network replacement)	2020-ongoing							
WR04 - AC	Reduce risks to water quality	Sarajevo Canton Administration, CPUC ViK Sarajevo, Municipal Authorities	EUR 10m per year	2022-2030							
WR05 - AC	Wastewater strategy, digital planning and design	Sarajevo Canton Administration / Private enterprise, CPUC ViK Sarajevo	EUR 500k – 1m	2020-2022							
WR06 - AC	Wastewater asset monitoring and data collection	Sarajevo Canton Administration / Private enterprise, CPUC ViK Sarajevo	EUR 500k – 1m	2020-2022							

Policy Option/ Action Ref	Policy Option/ Action Title	Policy Option/ Action Owner	Policy Option/ Action CAPEX Range	Policy Option/ Action Delivery Year (Start/End)	Air quality	Water Resources	Green space	Mitigation of GHG Emissions	Soils	Biodiversity and ecosystems	Adaptation and Resilience
WR07 - AC	Wastewater network construction: extension, refurb and new build	Sarajevo Canton Administration, CPUC VIK Sarajevo	EUR 10m – 50m	2020-2024							
WR08 - AC	Wastewater Treatment Works extension and construction of thermal sludge treatment facility	Sarajevo Canton Administration, CPUC VIK Sarajevo	Construction of thermal sludge processing facility - EUR 10 m Construction of nutrient removal and extension of treatment works capacity if required. - EUR 10-15 m	2022 - 2025							
WR09 - AC	Sustainable Urban Drainage systems (SUDs) construction	Sarajevo Canton Administration, CPUC VIK Sarajevo	EUR 10m – 50m	2021-2025							
WR10 - PO	Study into WWTW, sewerage and SUDS financing; review water company regulation and management	Sarajevo Canton Administration, CPUC VIK Sarajevo	EUR 100k – 500k	2019-2020							
WR11 - AC	Industrial wastewater assessment, regulation and treatment investments	Canton enterprises	(The investment costs would fall to specific enterprises, access to a strategic fund or soft loans may be made available)	2019-2022							
EN01 - AC	Study of potential for market penetration of renewable energy technologies in SC	Sarajevo Canton Administration, Industry, Public and private building owners	EUR 100k- Study EUR 50m – Operational program Costs will be dependent on units deployed. Typical costs in the region of 5-6000 EUR per dwelling, 20,000-1M EUR per educational establishment, 5-6M Euros per 5MW solar farm. Around 25 acres of land required. Bulk purchase / roll out can provide cost reduction.	2020 for Assessment 2020-2030 for Deployment							
EN02 - PO	Prepare Energy Efficiency Action Plan for SC	Sarajevo Canton Administration	EUR 150k	2021							
EN03 - AC	Public Building Renovation Program	Sarajevo Canton Administration, Public building owners	EUR 30m – 40m	2021-2031							
EN04-AC	Residential Building Renovation Programme	Sarajevo Canton Administration		2021-2031							
EN05 - AC	Assess the geothermal and ground water / aquifer thermal energy resource in Sarajevo	Sarajevo Canton Administration	EUR 50k for desktop study, EUR 500k (estimate) for additional GI	2020-2021							
EN06 - AC	Rehabilitation and extension of DH system in Canton Sarajevo – priority investment portfolio	Sarajevo Canton Administration, DHN operators	EUR 50m	2020-2024							
IN01 - AC	Enhance the quality of environmental permitting instruments to support energy and material efficiency and cleaner production in the industrial sector in Sarajevo Canton	Sarajevo Canton Administration	< EUR 100k	2020-2021							
IN02 - AC	Raise capacities of the canton industry to implement energy and	Sarajevo Canton Administration	EUR 100k - 250k	2020-2022							

Policy Option/ Action Ref	Policy Option/ Action Title	Policy Option/ Action Owner	Policy Option/ Action CAPEX Range	Policy Option/ Action Delivery Year (Start/End)	Air quality	Water Resources	Green space	Mitigation of GHG Emissions	Soils	Biodiversity and ecosystems	Adaptation and Resilience
	material efficiency and cleaner production measures										
IN03 - PO	Develop strategy to support transition from linear to circular economy	Sarajevo Canton Administration	EUR 100k - 250k	2021-2022							
IN04 - PO	Develop strategy for redevelopment of former industrial sites	Sarajevo Canton Administration	EUR 500k – 1m	2021-2022							
IN05 - PO	Develop standards and regulations to reduce emissions of pollutants from food service sector (restaurants, bakeries etc.)	Sarajevo Canton Administration	EUR 100k - 250k	2020-2021							
SW01 - AC	Implementation of a separate collection system for recyclable waste	Sarajevo Canton Administration	EUR 15m	2019-2020							
SW02 - AC	Development of waste treatment infrastructure	PPP, Sarajevo Canton and/ or waste management companies	EUR 25m – 100m	2020-2026							
SW03 - AC	Development of waste disposal infrastructure	PPP, Sarajevo Canton and/ or waste management companies	EUR 50m+	2020-2026							
SW04 - AC	Progressive closure of Smiljevići Landfill for leachate minimization	Sarajevo Canton Administration	EUR 5m – 10m	2020-2026							
SW05 - PO	Increase waste awareness through education campaigns	PPP, Sarajevo Canton	EUR 100k – 500k	2019-ongoing							
SW06 - AC	Removal of illegal open dumps and remediation of contaminated areas	Ministry of Physical Planning, Construction and Environmental Protection of Sarajevo Canton	EUR 1m	2019-ongoing							
SW07 - PO	Improvement of waste legislation and adoption of planning and regulatory documentation	Sarajevo Canton, Ministry of Physical Planning, Construction and Environmental Protection of Sarajevo Canton	EUR 1m – 5m	2019-2020							

3.2. Proposed policy options and actions by priority area

This section sets out the proposed detailed policy options / actions developed in response to the outline potential policy interventions listed in Table 3.1 above. Each policy option / action is set out using standardised pro-forma. Policy options / actions are organised by priority area.

It should be noted that at this stage the CAPEX figures presented in this draft briefing paper are currently indicative estimates only based on internationally recognised benchmarks and expert knowledge. The costs have not, as yet, been subject to detailed cost calculation or localised. Delivery dates are also subject to further discussion and refinement.

3.2.1. Land use

3.2.1.1. Summary

Figure 3.1: Land use policy options / actions summary

All summary figure will be finalised after workshop

3.2.1.2. Policy option / action pro-formas

Policy option/action reference	**LU01 – AC**
Policy option / action	Develop, legally adopt and enforce an overarching sustainable urban planning framework for SC aligned with ESDP[3] and Territorial Agenda 2020
Environmental topic(s)	Green space
Strategic objective(s)	GS04 Ensure through good governance, a coordinated approach to the implementation and adoption of spatial planning regulations and policies with all relevant legal and institutional frameworks
Description	According to article 14 of the Decree on uniform methodology for creating spatial planning documentation (official gazette of FBiH no. 63/04 and 50/07): *"when defining the main goals for creating the spatial plan of a certain area, we start from common interests and goals defined by the spatial plan of the broader area, strategic development documents of state, entity, canton and international documents (guidelines of ESDP, main principles for sustainable development of the European continent, signed and ratified conventions, charters, etc.), policies of rational land use and environmental protection and sustainable development principles, as well as achieving balanced socio-economic development*". It is crucial for SC not only to revise existing documentation but also to develop, adopt and enforce further spatial planning documentation (e.g. SC Land Use plan 2016 – 2036, currently under development) to be aligned with European planning policies including ESDP and TA 2020[4] to address principles of: • economic and social cohesion; • conservation of natural resources and cultural heritage; • more balanced competitiveness of the European territory; • strengthen polycentric development and innovation through networking of municipalities within the Canton; • partnership and territorial governance between rural and urban areas; • promote regional clusters of competition and innovation; ad • risk management including the impacts of climate change strengthening ecological structures and cultural resources. Subsequently, development and implementation of Strategic Environmental Assessment (SEA) is needed to for spatial planning documentation. According to the Decree on Sustainable Environmental Assessment of plans and programmes (SC official Gazette no 32/11), SEA is mandatory (KEAP, 2017). Developing and implementing SEA for spatial planning documentation in SC will provide decision-makers information regarding the environmental implications of plans / strategies / policies and how these could contribute to sustainable development.

[3] European Spatial Development Perspective.

[4] Territorial Agenda of the European Union 2020 towards an inclusive, smart and sustainable Europe of diverse regions.

Owner	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection, Institute for Canton Planning
Stakeholders	Sarajevo Canton Administration
Capex	EUR 100k -500k
Benefits	Revising the existing and drafting the new spatial planning documentation in line with EU policies will enable implementation of environmental protection principles and EU planning standards. The sustainable urban planning framework will help to address needs and opportunities for the future development of the canton 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 SC, such as the new Land use Plan for the Urban Area of Sarajevo, Hadžići, Trnovo and Ilijaš (Canton Sarajevo Official Gazette no. 48/16), will challenge private developers, canton and municipal administrations, communities, parliamentary members and professionals to work together to ensure that sustainable development in line with the legally adopted urban planning framework for SC is brought forward. Enforcement of development and implementation of SEA for spatial planning documentation is a tool to consider potential impacts of plans and policies on the environment. According to the SC legislative framework, SEA should enhance the quality of spatial planning documentation to achieve sustainable urban development.
Expected start and end dates (Year)	2019 - 2021

Policy option/action reference	**LU02 – A**
Policy option / action	Upgrade and enhance integrated GIS based land use for Sarajevo Canton to facilitate effective monitoring and evaluation systems for planning and management
Environmental topic(s)	Green space Adaptation and resilience to natural disaster risk
Strategic objective(s)	GS04 - Ensure through good governance, a coordinated approach to the implementation and adoption of spatial planning regulations and policies with all relevant legal and institutional frameworks BE01 - Protect, maintain and enhance natural environmental assets across the Canton AR01 - Promote safe and resilient infrastructure and urban development AR03 Promote disaster planning and risk management as integral to land use planning and development management processes
Description	According to article 78 of the Decree on “uniform methodology for creating spatial planning documentation” (official gazette of FBiH no. 63/04 and 50/07) Geographic Information System (GIS) is mandatory in FBiH for the purpose of creating a database and to compare data to neighbouring states. There is a lack of integrated GIS based land use information for SC that considers cadastral information, land register, biodiversity and ecosystems, heritage assets, environmental and natural features, building/planning permissions, utility infrastructure, community assets, transport infrastructure, etc. This negatively affects inter-sectoral coordination and land use procedures. A user-friendly GIS database should comprise a number of layers with different spatial information content. The system should consist of land use types, land ownership (private, public, community), green infrastructure, transport, utilities, hydrology, contaminated land sites, community and public facilities, protected ecological sites, biodiversity hotspots, heritage buildings, historic conservation areas, forests, fertile/agricultural areas, topography (contours), areas prone to landslides, floods, etc. The GIS system will facilitate high quality monitoring of basic climate elements and help define climate trends. The digitisation process and development of the GIS could be a common activity of the Canton administration departments in cooperation with universities, statutory bodies,

	utility companies and NGOs. After development the GIS could later be made available online for public accessibility, which will help citizens and potential developers to identify development constraints and opportunities early. SC operates with limited GIS in spatial planning. Current GIS needs to be expanded to an integrated database on land use, utilities and transport infrastructure assets, natural and historic environment. An integrated GIS based land use, infrastructure and environmental/natural assets, and historic/heritage assets should be developed, as a useful tool for urban planning, research, analysis and monitoring and evaluation system. GIS should be upgraded to establish systems of monitoring and evaluation of land use outcomes (spatial planning documentation preparation, drafting and implementation; inspection activities) available for all spatial planning stakeholders to encourage intersectoral coordination. All stakeholders should be involved in capacity building. A register of land use outcomes monitoring, and evaluation systems, can be created in order to be able to follow land use policies' implementation and to encourage intersectoral coordination and continuous improvement of land use policies.
Owner	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection
Stakeholders	Sarajevo Canton Administration (Institute for Construction, Institute for Cultural and Natural Heritage, Canton public institution for protected areas, KJKP Park (Canton Public Communal Enterprise "Park"), JKP Komunalac Hadzici, JKP Trnovo, municipalities, SC Direction for roads, KJKP Vodovod I kanalizacija, KJKP Rad etc.)
Capex	EUR 500k -1m
Benefits	It is known that some land use instruments are less effective than others, which indicates, based upon spatial planning stakeholders' pro-forma statements, a lack of intersectoral coordination and, consequently, inappropriate implementation of land use policies. Therefore, it is crucial to establish an integrated land use based system that enhances and facilitates effective monitoring and evaluation. The development of a GIS will facilitate better cooperation among institutions and provide an integrated database on land use, utilities and transport infrastructure, natural environment and historic assets. Once data has been digitised they can be used for many purposes, be processed very quickly and can be used by multiple users at once. It will become an effective holistic tool for urban planning in the Canton, facilitating evaluation and monitoring, research activities and analysis as selected layers can be overlain and help with analysis of urban development features, multi-criteria 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. Capacity building in GIS is needed for all stakeholders in order to implement spatial planning documentation in GIS according to article 78 of the Decree on uniform methodology for creating spatial planning documentation (official gazette of FB&H no. 63/04 and 50/07). The framework for this policy is Strategic Measure 5.2.3. Monitoring of development indicators in SC is aligned with EU policy and the Development Strategy of Canton Sarajevo until 2020 (2016).
Expected start and end dates (Year)	2020 - 2021

Policy option/action reference	**LU03 – PO**
Policy option / action	Establish land value capture mechanisms[5]

[5] OECD (2017), *Land-use Planning Systems in the OECD: Country Fact Sheets*, OECD Publishing, Paris. *http://dx.doi.org/10.1787/9789264268579-en*

Environmental topic(s)	Green space
Strategic objective(s)	GS03 Promote a sequential approach (brownfield, infill, greenfield) to urban development to avoid further urban sprawl GS04 Ensure through good governance, a coordinated approach to the implementation and adoption of spatial planning regulations and policies with all relevant legal and institutional frameworks
Description	Within the existing legislation framework valid for SC, Article 53 Law on Agriculture land (Official Gazette of FB&H No.52/09) there is no financial mechanism capturing the uplift in the land value that occurs as a result of changing use from agricultural to non-agricultural uses such as housing development or land within catchment area of public infrastructure development. This, among other causes, has led to continuous urban sprawl, illegal construction and development speculation. Agriculture land is generally cheaper and more affordable for those seeking to build a house.
Owner	Government of Federation of Bosnia and Herzegovina
Stakeholders	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection,
Capex	EUR 100k -500k
Benefits	Land value capture instruments including taxes, levies or any other fiscal instruments would help to avoid urban sprawl, illegal construction and regeneration of brownfield areas within Sarajevo City and the municipalities. Capturing the uplift in land value could help facilitate reinvestment in developing local infrastructure, community services and affordable housing. The framework for this policy is prescribed in Chapters 6 and 7 of The Sociology of Housing Study (Urban Planning Institute of the Republic of Slovenia, 2011), completed as an analytical basis for Canton Sarajevo Spatial Plan for the period 2003 – 2023 (Canton Sarajevo Official Gazette no. 26/06).
Expected start and end dates (Year)	2021 - 2022

Policy option/action reference	**LU04 – PO**
Policy option / action	Introduce environmental and building code regulations and guidelines[6] to the legislative framework in SC
Environmental topic(s)	Air quality, Soil, Green space, Mitigation of GHG emissions, Biodiversity and ecosystems, Adaptation and resilience to natural disaster risks
Strategic objective(s)	AQ06 Improve energy efficiency of buildings and infrastructure SL05 Promote integration of circular economy principles across all relevant legal, political, and policy frameworks GS03 Promote a sequential approach (brownfield, infill, greenfield) to urban development to avoid further urban sprawl GS04 Ensure through good governance, a coordinated approach to the implementation and adoption of spatial planning regulations and policies with all relevant legal and institutional frameworks GH01 Encourage low embodied carbon infrastructure, buildings and industries BE03 Promote biodiversity enhancement as integral to land use planning and development management processes AR03 Promote disaster planning and risk management as integral to land use planning and development management processes
Description	The legislative spatial planning framework in SC should be revised and prepared for the introduction of environmental and building code regulations. These spatial planning tools are lacking in the Sarajevo legislative framework, which result in uncontrolled urban development, affecting in particular building heights, street widths, building standards and environment protection.

[6] OECD (2017), *The Governance of Land Use in OECD Countries: Policy Analysis and Recommendations*, OECD Publishing, Paris, *http://dx.doi.org/10.1787/9789264268609-en*

	There is limited guidance on procedures for what is permitted to be built / developed in a specific urban area in order to obtain planning permission. Currently, obtaining a building permit depends on the individual aesthetic criteria of municipality clerks, who create an individual frame of rules. This issue is particularly sensitive for construction in historic and natural protected areas. Environmental and building code documents should be developed for the entire Canton. But each municipality should adapt these guidelines to take into account its geomorphological conditions, historical, environmentally protected areas and urban character. Provision of river buffer zones for Bosna, Zeljeznica, Miljacka and other rivers in SC should be created as comprehensive policy for the whole Canton and then developed in detail in specific plans, programmes and environmental and building codes (with mandatory distances of buildings from riverbed, mandatory green areas, building heights, etc.).
Owner	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection
Stakeholders	Sarajevo Canton Administration, Municipalities
Capex	EUR 500k -1m
Benefits	The legislative framework in SC does not recognise environmental and building code regulations in the form in which they are applicable in the EU. In EU countries "public policy uses primarily two mechanisms to intentionally influence land use: it allocates public investments across space and it restricts how individuals and businesses are permitted to use land. Its main instruments are the spatial and land use planning process and environmental and building code regulations" (OECD, 2017). These instruments should be clear and easily understandable for individuals, developers and policy-makers to meet the spatial objectives of inclusive growth and environmental sustainability. Introducing codes/guidelines which encourage environmental protection, sustainability and good urban life quality that are complementary with spatial planning documentation will facilitate organic and integrated urban development. The framework for this policy/action is prescribed in strategic objective 5 "Improvement of Canton Sarajevo Governance System" in the Development Strategy of Canton Sarajevo until 2020 (2016) and Implementation Action Plan 2018 – 2020.
Expected start and end dates (Year)	2020 - 2025

Policy option/action reference	**LU05 - PO**
Policy option / action	Planning for provision of good quality green public parks, green infrastructure and public realm
Environmental topic (s)	Green space, Biodiversity and ecosystems
Strategic objective(s)	GS01 Ensure adequate provision of accessible high-quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies BE01 Protect, maintain and enhance natural environmental assets across the Canton BE02 Encourage development of green and blue infrastructure across the city as an interconnected network of built environment and natural assets to preserve biodiversity, enhance recreational purposes for all and minimise risk to natural disasters BE03 Promote biodiversity enhancement as integral to land use planning and development management processes
Description	Overall, SC is very green as it covers a large rural area including protected natural areas. However, the urban area within the Canton has very few green public areas, which are unevenly distributed / accessible by all residents. There is also a lack of green infrastructure and green corridors network within the Canton.

	The establishing of strategic green infrastructure inside the urban area, including the potential for a linear park along the River Miljacka, which has been identified as an urban air ventilation corridor, should be pursued. Standards for green infrastructure should be promoted and developed in the municipalities' planning policy to address space deficiencies with the types of space required, such as playgrounds, sports pitches, wildlife, biodiversity and natural areas. New green spaces and corridors for the Canton should be created and linked to restore, enhance and preserve the landscape in line with best practices for parks and green spaces. Policies for introducing new green areas in SC, in the form of strategies, should first be introduced to legislation and then implemented sequentially in spatial planning documentation and environmental and building code.
Owner	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection, Institute for Canton Planning, KJKP Park (Canton Public Communal Enterprise "Park"), JKP „Komunalac" Hadzici, JKP Trnovo, Institute for Canton Planning
Stakeholders	Municipality Administrations; Statutory Bodies; General Public; NGOs; private developers
Capex	EUR 1m – 50m
Benefits	New public parks, green public spaces and public realm will provide a benefit to residents and visitors. New green infrastructure and corridors will provide positive environmental and ecological benefits in line with the GCAP. Best practices should be promoted in the creation of open space standards and urban planning Establishing a network of green spaces with good quality public realm easily accessible by all and connected with SC mountains and protected natural areas will not only benefit biodiversity and wildlife but also human wellbeing. The framework for this policy is the SC Development Strategy and the Decision for the preparation of the Urban Plan for Sarajevo Urban Area (Stari Grad, Centar, Novo Sarajevo, Novi Grad, Ilidza and Vogosca) (SC Official Gazette no. 48/16).
Expected start and end dates (Year)	2020 - ongoing

Policy option/action reference	**LU06 - PO**
Policy option / action	Develop policy and guidance to encourage brownfield, mixed-use development and Transit-Oriented Development (TOD)
Environmental topic(s)	Green space, air quality, mitigation of GHG emissions
Strategic objective(s)	GS04 Ensure through good governance, a coordinated approach to the implementation and adoption of spatial planning regulations and policies with all relevant legal and institutional frameworks AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes.
Description	SC is comprised of nine municipalities of which six municipalities are the core of Sarajevo. Ilijaš, Trnovo and Hadžići are satellite settlements, mainly for people commuting daily to the core. Trnovo is more focused on tourism, sport and recreation (Bjelašnica and Igman mountains are within the territory of this municipality) as this municipality does not have a large number of inhabitants. Major industrial facilities are mostly abandoned areas after the recent war. The SC Law on Spatial Planning (SC Official Gazette no 24/2017 and 1/2018) does not recognise terms such as brownfield, mixed-use development and TOD. Therefore, it is highly recommended to amend this law.

Policy option/action reference	LU06 - PO
	To facilitate sustainable development and reduce urban sprawl urban planning policy and land use should encourage brownfield, mixed-use development and TOD by promoting human centred mobility. TOD seeks to make optimally sustainable use of land with close access to tram, rail and bus infrastructure by promoting a mix of residential, commercial, retail and leisure opportunities as well as higher densities and high pedestrian/cycling permeability. In January 2019, the EBRD released a tender to support brownfield urban regeneration of the surrounding area of Sarajevo main rail station and GRAS tram depot to be developed as TOD schemes. Environmentally friendly transport modes between Sarajevo city centre, municipalities and recreational zones should also include greater integration of the central business district to the main train station, and opportunities for development of brownfield sites at an appropriate density that is respectful of the urban form and character. To achieve successful TOD and sustainable urban development, a greater synergy between all strategic and action plans in progress, and between institutions in the Canton administration, will be required. Feasibility studies and pilot projects encouraging TOD, brownfield and mixed-use development in SC should be carried out.
Owner	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection
Stakeholders	Municipality Administrations; Statutory Bodies; General Public; NGOs; private developers; transport operators
Capex	EUR 100k -500k
Benefits	Spatial planning documentation in Sarajevo Canton is based upon the Sarajevo Traffic Study, completed in coordination with the Swedish Consulting Group SWECO in 1970. Traditional planning in BiH and most of the world has focused on the private car, while 'human centred mobility planning' puts at the centre of the planning process human activities and not transport. This new approach to planning will also help to reduce CO_2, NO_x, SO_2 and $PM_{2,5}$ emissions, encourage environmentally friendly transport modes such as cycling and walking, promote greener areas, preserving natural and historical heritage. TOD improves the quality of life of for SC residents by reducing commuting time and encouraging walking and cycling, as well as making a variety of land uses easily accessible. TOD will therefore promote healthy lifestyles and wellbeing. It will also improve air quality thanks to a reduced reliance on private transport and support towards social inclusion. The framework for this policy is the Law on Spatial Planning (Canton Sarajevo Official Gazette no.24/17) and the Canton Sarajevo Spatial Plan for the period 2003 – 2023 (Canton Sarajevo Official Gazette no. 26/06, 4/11, 22/17).
Expected start and end dates (Year)	2020 - 2025

Policy option/action reference	LU07 - A
Policy option / action	Develop, implement and regularly monitor a digital inventory system for biodiversity, natural protected areas and green public areas in SC
Environmental topic(s)	Green space, biodiversity and ecosystems, water resources
Strategic objective(s)	GS01 Ensure adequate provision of accessible, high quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies GS04 Ensure through good governance, a coordinated approach to the implementation and adoption of spatial planning regulations and policies with all relevant legal and institutional frameworks BE01 Protect, maintain and enhance natural environmental assets across the Canton

	BE02 Encourage development of green and blue infrastructure across the city as an interconnected network of built environment and natural assets to preserve biodiversity, enhance recreational purposes for all and minimise risk to natural disasters
Description	The is a lack of a register and monitoring system of protected areas, biodiversity, endemic species, impacts of urban development on flora and fauna, number of visitors, accommodation capacities, status of flora and fauna in SC, and also a lack of a register of green public areas in the Canton. A digital inventory system (compatible with GIS) of flora, fauna and fungi, including identification of habitat types, natural protected areas and green open spaces with the aim to monitor the status of biodiversity (gain or loss), impacts from human activities and urban development, deforestation and afforestation rates should be developed and implemented. The database should include information about visitors, capacity and occupancy rates of facilities within natural protected areas and natural parks within SC. Awareness campaigns on the importance of environmental and biodiversity protection should be developed.
Owner	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection, Canton Public institution for protected areas, KJKP Park (Canton Public Communal Enterprise "Park"), JKP "Komunalac" Hadzici, JKP Trnovo, Institute for Canton Planning
Stakeholders	Municipality Administrations; Statutory Bodies; General Public; NGOs; private developers; transport operators
Capex	EUR 500k - 1m
Benefits	A unified register and monitoring system of biodiversity, protected areas and green public areas in Sarajevo Canton will provide information on the status of endemic and endangered species, pressures from human activities, as well as impacts of urban development on flora and fauna, and will facilitate integrated land use planning which is not only human oriented but enhances biodiversity and environmental protection. The digital inventory/database will also serve as a planning tool to identify inadequate provision and effective management of natural protected areas and green public spaces, as well as to identify policies that promote biodiversity protection.
Expected start and end dates (Year)	2020 - 2025

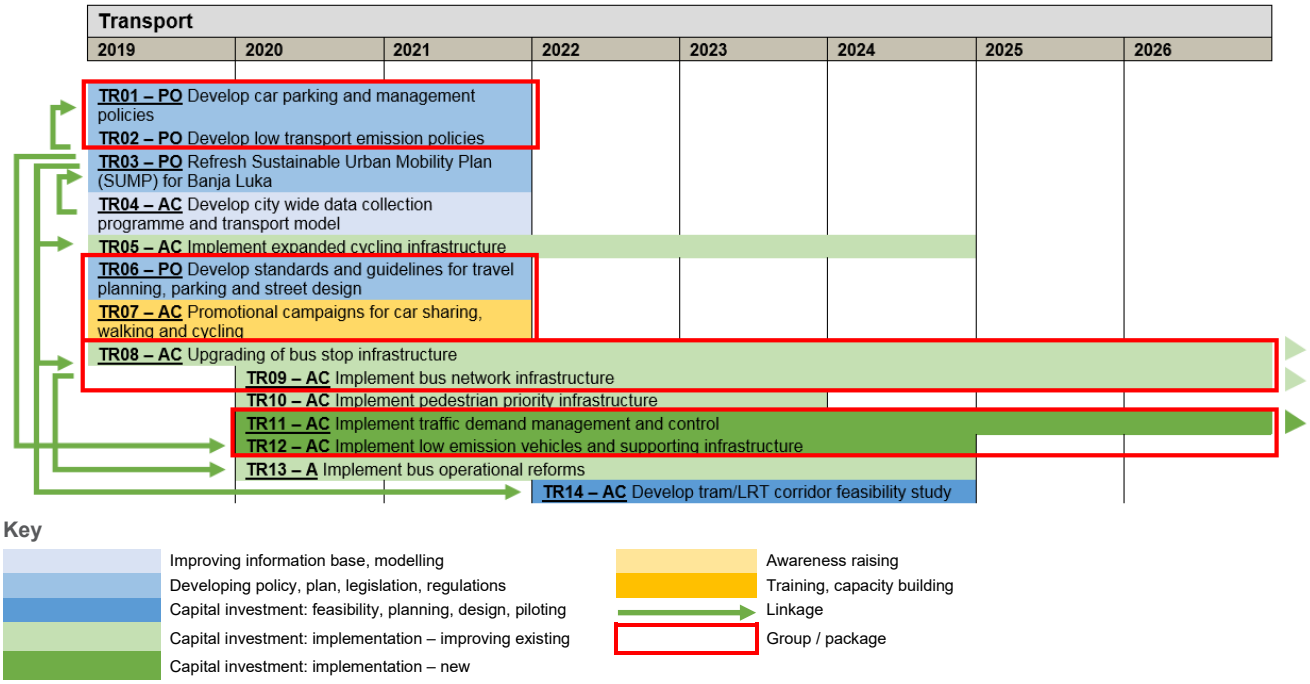
Policy option/action reference	**LU08 – PO**
Policy option / action	Mainstreaming climate adaptation and disaster resilience in the planning policy framework, design guidelines and procurement to achieve future proofing
Environmental topic(s)	Adaptation and resilience to natural disaster risk
Strategic objective(s)	AR01 - Promote safe and resilient infrastructure and urban development AR03 – Promote disaster planning and risk management as integral to land use planning and development management processes
Description	There is a lack of contingency plans or infrastructure plans in case of an emergency or disaster in SC. Currently, due to uncontrolled urban sprawl infrastructure delivery is not coordinated with construction in Sarajevo Canton, which increases the risk to natural disasters, as well as endangering human health and quality of life. The Canton has been looking at flooding issues and investing in flood defence infrastructure. But future proofing should cover all infrastructure sectors – transport, energy, waste, water and sanitation and community infrastructure. Future proofing cities takes into account resilience to natural disasters and extreme weather, risk management of uncontrolled urban sprawl, as well as adaptability to required changes in structure and/or operations of infrastructure including urban heat island effects. Future proofing cities principles and actions should be mainstreamed in spatial planning documentation and infrastructure

	delivery. The SC Spatial Plan should be amended to enable effective delivery of future proofed infrastructure to help achieve a more resilient Canton. Firstly, SC should develop a multi-sectoral risk profile to identify areas and assets at significant risk of hazards, vulnerabilities and capacity to cope under uncertain conditions such as extreme weather, natural disaster, environmental emergencies, etc. This risk assessment should involve engineers, scientists, planners, economists and environmentalists to discuss in an integrated way what the potential risks are, what/where the vulnerabilities are, and what measures are needed to effectively respond to and manage the identified risks / vulnerabilities. It will be appropriate to establish a public institution to drive action to address climate change resilience and adaptation, as well as develop integrated risk management to build adaptive capacity and raise awareness. This new public institution should also coordinate quantitative assessment of climate change risk; identification of, and assistance in securing funds for, climate action and future proofed infrastructure; incentivise investment in green and blue infrastructure, SUDS and flood risk management; control potentially construction contributing to land degradation, etc. It is recommended that Sarajevo Canton take up active membership of resilient city networks and initiatives. Feasibility studies should be undertaken to upgrade infrastructure that is not future proofed. Pilot projects are recommended to showcase the benefits of addressing climate change risk. Guidelines should be developed to help identify and manage future risks from climate change, extreme weather, environmental emergencies, etc. when delivering infrastructure, developing planning and management tools or developing procurement documents. Development of awareness campaigns is recommended for the general public to understand the implications of climate change, and what to do in case of a disaster.
Owner	Sarajevo Canton Ministry of Spatial Planning, Construction and Environmental Protection
Stakeholders	Sarajevo Canton Administration
Capex	EUR 500k -1m
Benefits	The framework for this policy is the Canton Sarajevo Spatial Plan for the period 2003 – 2023 (Canton Sarajevo Official Gazette no. 26/06, 4/11, 22/17). Climate change will have serious impacts on the Canton and the municipalities. Mainstreaming and building resilience is essential to urban policy and a smart investment. Achieving a future proofed Canton will help to alleviate floods, landslides and general risk from natural disaster/emergency, as well as protect biodiversity, ecosystems and natural areas. Many cities/regions are already beginning to build resilience in response to emerging threats associated with climate change. The strategies they are adopting often lead to win-win outcomes, making them healthier, more attractive places to live, do business and visit. The cost of delivering future proofed infrastructure could be initially seen as very high and probably unaffordable for the Canton. But these costs are likely to be lower than the costs of retrofit and recovering after a disaster.
Expected start and end dates (Year)	2020 - 2025

3.2.2. Transport

3.2.2.1. Summary

Figure 3.2: Transport policy options / actions summary



3.2.2.2. Policy option / action pro-formas

Policy option/action reference	**TR01 - PO**
Policy option / action	Develop car parking and management policies
Environmental topic(s)	Air quality, mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH02 Increase modal share of low carbon transport modes
Description	**Restricted car zone policy** A car zone policy is designed to promote an area-wide car-free zone in the city centre. There needs to be a regulatory change in enforcing the car-free zone. It can take the form of full and permanent pedestrianisation of certain streets and thoroughfares. Due to the high pedestrian volume, both citizens and visitors, the zone should be created in the city centre of Sarajevo. The car zone policy should consider the following options for a car-free 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.” By allowing zero-emission cars into the car-free zones will also encourage people to adopt environment-friendly vehicles. The Canton will need to take certain prior measures before the policy is adopted. They are:

	• Carry out a positive campaign to inform the public about the benefits of this policy; • Ensure buy-in from the public and other civil society stakeholders; • Carry out a study to identify the zone 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 management and charging policy** A car parking management policy is designed to discourage people from using cars by increasing parking charges. The revenue generated through the implementation of this policy can be used for the maintenance of other green infrastructure and off-street parking facilities. The main objectives of this policy are • To optimise the management of car parking space; • To encourage a more balanced use of different modes of transport and safeguard the economic activities of the city; • To reduce on-street parking demand in the city and making a safe and secured off-street space; and • To develop and implement a local parking plan to reduce car dependency in the city centre. A differential rate by time of day, vehicle type and car-sharers should be considered in setting the tariff level. The charging policy should consider the followings • High tariff for on-street parking than off-street; • Low or no tariff for low or zero emission vehicles., i.e., electric vehicle; • Discounted price for very early entry and exits to reduce peak traffic; • Discounted rate of parking for High Occupancy Vehicles (HOV); and • Free parking for the mobility impaired/disabled. 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. The policy needs to encourage the use of modern technology for parking management and revenue collection.
Owner	Sarajevo Canton
Stakeholders	Municipalities, public transport operators; local businesses
Capex	EUR 100k -500k
Benefits	• Reduction of congestion within city centre • Reduced air pollution • Improvement in road safety in city centre areas • Increase health and wellbeing of residents
Expected start and end dates (Year)	2019 – 2021

Policy option/action reference	**TR02 - PO**
Policy option / action	Develop low transport emission policies
Environmental topic(s)	Air quality, mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH02 Increase modal share of low carbon transport modes
Description	**Low / zero emission public transport services policy**

Policy option/action reference	TR02 - PO
	Public transport is operated by the GRAS public transport company (Gradski saobraćaj d.o.o) who operate bus, trolleybuses, minibus and trams and Centrotrans private transport company. There are 44 bus lines, 31 of which are city lines and the rest are suburban. The bus fleet is in the process of being renewed but comprises many diesel driven vehicles. The diesel-fuelled buses represent the primary source of PM10 and PM2.5 emissions. The policy is to set a regulatory framework whereby the operators will be asked to replace their existing diesel driven bus fleet with more fuel-efficient low emission vehicles. Alternatives fuels include hybrid; biodiesel; biogas CNG; electric; LPG; hydrogen. Alternate fuels are used in bus fleets throughout the continent and options exist for retrofitting of the existing fleet. Hydrogen-powered vehicles have a range similar to conventional diesel vehicles achieving 350-400 miles on a single tank of fuel, and they can be refuelled within 3-5 minutes. The policy element will, however, have a high cost-implication on the operators. Hence, the step to 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 by next five years • Remaining 50% of the vehicles should be low emission in the next 5-10 years. The policy element will enact and enforce performance standards that drive the industry toward developing clean and more efficient systems and technologies. To incentivise this change, the Government may need to subsidise part of the cost. The Canton will need to take certain prior measures before the policy is adopted. They are • Carry out a positive campaign to inform the public about the benefits of this policy to the operators; • Ensure buy-in from the stakeholders; and • Carry out a study to develop an appropriate standard for technology and develop a plan for implementation, monitoring, and evaluation. • Multi-modal **City centre low emissions zone policy** The policy is to encourage the use of low-emission vehicles in the major urban areas within Sarajevo Canton. The policy will include identification of appropriate geographical areas for Low Emission Zone (LEZ) and targeted vehicle categories. An example of a LEZ is identified in the Action Plan for the reduction of particulate matter in the Sarajevo Canton which identifies a zone in Sarajevo, in the municipality of Centar and Stari Grad, between the intersections of Skenderija Bridge/Hamze Hume, Marsala Tita/Alipasina/Hamze Hume and Kulin Bana Coast/Telali where higher levels of emissions are recorded. There needs to be a regulatory change in enforcing the low emission zone which can take several forms of low emission zones. The policy should be informed by a detailed assessment of the following alternatives and developed on the most appropriate option for the respective geographical areas. • 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; and • Fossil fuel driven vehicles are penalised through fines for accessing the low emission zone. The policy will encourage the usage of more low-emission vehicles. The Municipality will need to take specific prior measures before the policy is adopted. They are: • Agree the low emission zone vehicle categories following the national standard and current EU guidelines. • Carry out a positive campaign to inform the public about the benefits of this policy; • Ensure buy-in from the public and other civil society stakeholders;

Policy option/action reference	TR02 - PO
	• Develop a strategy for implementation including the means of enforcement and identify additional infrastructure support that will be needed. **Low emission vehicle incentivisation policy** Interest in the use of low emission vehicles (including electric vehicles) for road transport is increasing. The potential benefits of implementing low emission vehicles for Sarajevo Canton include business opportunities and in the longer term, carbon emissions savings. For example, electric vehicles are more energy efficient during use than petrol or diesel vehicles and produce less air pollution. The policy element should focus on supporting measures at the city level which would incentivise a wider take up of low emission vehicles which have the potential to replace some of the polluting gasoline vehicles. This could include: • Strengthening of low emission and EV regulations; • More stringent inspection and stronger enforcement of inspections for emission quality for private vehicles; • Implementation of low emission or EV pilot projects; • Consumer incentives which could include purchase grants, registration tax, domestic infrastructure incentives; and • Establishment of an innovation department within the Municipality traffic and transport which focusses on driving forward policies and proposals related low emission vehicles.
Owner	Sarajevo Canton, F BiH
Stakeholders	Municipalities, Public Transport Operating Companies
Capex	EUR 500k - 1m
Benefits	• Reduce air pollution • Increase attractiveness of public transport
Expected start and end dates (Year)	2019 - 2021

Policy option/action reference	TR03 - PO
Policy option / action	Develop a Sustainable Urban Mobility Plan (SUMP) for Sarajevo Canton
Environmental topic(s)	Air quality, mitigation of GHG emissions, green spaces
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GS01 Ensure adequate provision of accessible, high quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD) GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes
Description	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:

Policy option/action reference	TR03 - PO
	• 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 Sarajevo, the SUMP would link back to other plans and strategies which promote carbon reductions and sustainable travel behaviours in the city.
Owner	Sarajevo Canton
Stakeholders	All major city transport stakeholders
Capex	EUR 1m-5m
Benefits	• Sets long term goals and objectives for sustainability planning in transport • Promotes sustainable modes of transport • Contributes to supporting measures which can increase sustainable transport mode share
Expected start and end dates (Year)	2019 – 2021

Policy option/action reference	TR04 - AC
Policy option / action	Develop city-wide data collection programme and transport model
Environmental topic(s)	Air quality, mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes
Description	**Canton wide permanent traffic data collection system** Presently, Sarajevo Canton does not regularly monitor and collect traffic data for all transport modes across the network. A routine monitoring technique, supported by a robust data collection system, can make evidence-based decision-making more efficient. The action is to implement a permanent data collection system, which can be linked to a central data repository. The full data collection system would include the following devices • Inductive loops buried under the road to record traffic flows; • Automatic Number Plate Recognition (ANPR) cameras to monitor vehicular movements; • CCTV camera mounted on specific section of the road network, to monitor behaviour;

Policy option/action reference	TR04 - AC
	• Annual collection and surveying of public transport and taxi ridership; • Origin and destination surveys; • Travel to work surveys; and • Utilisation of GPS mobile phone data. 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. The following corridors are identified as the preliminary candidates for permanent data collection network are- • M18 from Olovo • E73 from Visoko • M5 from Kiseljak • E73 from Jonkic • M18 from Varos • M5 from Pale • R445 from Sumbulovac • A1 from Rakovica **City level multi-modal demand model** There is currently no multi-modal transport model available for Sarajevo Canton A robust regional 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. Availability of traffic data is key to the successful development of a model. The action proposed for the establishment of a permanent data collection system will help to collate the required information for the development and maintenance of the model. The Sarajevo Canton 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.
Owner	Sarajevo Canton
Stakeholders	Public transport operators, taxi operators
Capex	EUR 1m – 5m EUR 2m for the data collection system EUR 1m for the traffic model development
Benefits	• Efficient traffic and transport monitoring and management • Evidence based decision making • Critical data in the formulation of robust traffic and transport strategies
Expected start and end dates (Year)	2019 – 2021

Policy option/action reference	TR05 - AC
Policy option / action	Enhance and expand cycling infrastructure
Environmental topic(s)	Air quality, mitigation of GHG emissions, green space
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies

Policy option/action reference	TR05 - AC
	GS01 Ensure adequate provision of accessible, high quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD) GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes
Description	**City-wide segregated cycle lanes** Segregated cycle lanes are common in many European cities. Dedicated cycle lanes are essential for the busiest streets. The design of the cycle lanes should consider user experience, existing mix of traffic, safety, visibility and integration with key land uses. The proposal is to implement kerb segregated cycleways within the city to promote cycling throughout the city. The routes would need to interface with critical sites such as the city centre bus station, train station, city centre attractions and workplace locations. This would build on existing cycle infrastructure projects at Wilson's promenade, Miljacka coastline on Grbavica and the shores of Mak Dizdara. It is proposed that approximately 100-150km of cycle routes are planned across the Canton. **City-wide 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 following key principles: • Visible – easy to find and well signed • Accessible – within 20m to 30m of the final destination • Safe and secure – secure frames and supported by CCTV • Easy to manage, maintain and monitor – stands able to support all cycle types and have robust and durable finishes • Consistently available – careful planning of numbers to ensure adequate supply is available in locations where demand is highest • Covered – particularly important for long stay cycle parking • Connected – linked to the strategic network of routes • Linked to other services/modes – for example, located at rail and bus stations, • Attractive – high quality fixtures and fit into the surrounding environment In the specific context of Sarajevo Canton, new areas for cycle parking needs 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 Sarajevo city, it is proposed that 30-50 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, universities, etc. Supporting measures relating to bike hire are noted in the Action Plan for the reduction of particulate matter in the air in the Sarajevo Canton, which proposes the promotion of cycling through bikesharing whereby members of a club can hire a bicycle and return it to a predefined location.
Owner	Sarajevo Canton
Stakeholders	Sarajevo Canton Administration
Capex	EUR 10m – 50m
Benefits	• Promotes cycling • Improved overall city streetscape and infrastructure furniture
Expected start and end dates (Year)	2019 – 2024

Policy option/action reference	TR06 - PO
Policy option / action	Develop standards and guidelines for travel planning, parking and street design
Environmental topic(s)	Air quality, mitigation of GHG, green space
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GS01 Ensure adequate provision of accessible, high quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD) GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes
Description	**Standard workplace travel plan policy and guidelines** Workplace travel plans are long term management strategies which should support sustainable and active travel at both new and existing developments. The travel plans would provide incentives to increase public transport mode share and NMU modes. This policy 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. This 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 the following: • Threshold guidance • Recommended content • Recommended measures • Existing mode share • Target setting for car, public transport, walking, cycling and parking Integration with the planning system **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. The standards should equally identify the levels of parking enforcement required which should be proportionate to demand and occupancy. The Action Plan for the reduction of particulate matter in Sarajevo Canton notes a proposal to amend parking policy by increasing the

Policy option/action reference	TR06 - PO
	price of parking and limiting time duration within the city zone. Further proposals for improving enforcement and punishment are included. **Design Guidelines for Streets Manual** In support of efforts to build sustainable communities, it is good practice to change the focus of the function of streets. Traditionally, emphasis has been placed on the movement function of residential and urban streets, resulting in places dominated by motor vehicles, to the extent that streets fail to make a positive contribution to people's quality of life. Rethinking good design, attributing greater focus on the place function of streets, and assigning a higher priority to pedestrians and cyclists plays a role in creating places that work for all members of the community. The development of design guidelines 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 can 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.
Owner	Sarajevo Canton
Stakeholders	Local businesses, residents/consumers
Capex	EUR 500k - 1m
Benefits	• Promotes uptake of public transport • Promotes uptake of non-motorised modes • Promotes a coordinated approach to planning through clear principles and integration with land use planning • Promotes a coordinated approach to street design through clear principles • Promotes a participatory approach to planning practice
Expected start and end dates (Year)	2019-2021

Policy option/action reference	TR07 - AC
Policy option / action	Promotional campaigns for car sharing, walking and cycling
Environmental topic(s)	Air quality, mitigation of GHG
Strategic objective(s)	AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH02 Increase modal share of low carbon transport modes
Description	**Car sharing scheme and promotion** Car sharing scheme is a way of increasing car occupancy by reducing low occupancy car trips. Scheme incentivise the car drivers share their journey with someone else with the same or adjacent destination. Such a sharing scheme can reduce the number of car trips. The scheme also allows the rental of vehicles for a short period of time instead of owning a car. Major schemes such as ZipCar offer rental platforms through

Policy option/action reference	TR07 - AC
	online apps and allow for non-fixed locations and pre-booking. It is generally restricted to a large population or high-density cities. The proposal is to introduce a campaign to promote such a scheme. The following actions are recommended for the promotional campaign • Introduce the scheme and promote it through various media outlets such as distributing leaflets, TV and radio advertisement and on-street billboards; • Run promotional campaign in corporate offices to encourage sharing rides to and from the office with colleagues; • Introduce incentive programs in the workplace for employee car-sharing scheme; • 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. Neighbourhood-based car clubs can reduce the need for owning a car. **City level cycling promotional campaign** Canton Sarajevo has bike sharing system in place established by NEXTBIKE. 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. There are several actions which could be undertaken to encourage more cycling in the city which include: • City/government/workplace incentive schemes to buy cycles; • Promote cycling through various media outlets such as distributing leaflets, TV and radio advertisement and on-street billboards; • Run promotional campaign 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 cyclist • Cycling pocket guides • Establishment of cycling groups The promotional campaign should be integrated into other demand management initiatives and the overarching improvement of cycling infrastructure. **City level walking promotional campaign** There is a high level of pedestrian footfall across the Sarajevo Canton, particular in the central zones driven by the relatively flat topography and general walkability of the city. This footfall comes from both residents and visitors. The central area of the city already has a pedestrian zone, and there is a desire to promote walking throughout the city. 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: • Citywide walking month • Walk to school days/weeks • 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 • Establishment of walking groups
Owner	Sarajevo Canton
Stakeholders	Car rental business, corporate businesses and citizens
Capex	EUR 200k - 400k
Benefits	• Potential for reducing car ownership.

Policy option/action reference	TR07 - AC
	• Potential to reduce car trips, hence improve congestion and creating positive impact on the environment. • Encourage a positive shift from short distance car trips to more environment-friendly sustainable modes of transport. • Help to improve air quality and mitigate other adverse impacts on the environment. • Help to reduce the burden on the public sector fund through private sector participation. • Help to improve road and pedestrian safety.
Expected start and end dates (Year)	2019-2021

Policy option/action reference	TR08 - AC
Policy option / action	Upgrading of bus stop infrastructure
Environmental topic(s)	Air quality, mitigation of GHG, green space
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH02 Increase modal share of low carbon transport modes GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD)
Description	**<u>Upgrading of bus stop infrastructure</u>** 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 Sarajevo Canton should be planned and designed in accordance with international good practice, which should consider as a minimum: • Security and lighting • Posts and flags • Surface markings • Passenger shelters and seating • Utilities • Information provision • Drainage • Pedestrian footways • Height and type of kerb • Waiting areas • 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. **<u>Provision of real time passenger information systems at bus station and stops</u>** 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

Policy option/action reference	TR08 - AC
	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.
Owner	Sarajevo Canton
Stakeholders	City bus operators
Capex	EUR 10m – 50m
Benefits	• Enhanced passenger confidence and satisfaction • Increase bus usage and revenues • Opportunity to embed/support with new technology • Improved overall city streetscape and infrastructure furniture • Improve bus planning • Enhanced accuracy of bus arrivals and departures
Expected start and end dates (Year)	Phase 1: 2019 – 2023 Phase 2: 2024 – 2028

Policy option/action reference	TR09 - AC
Policy option / action	Implement bus network infrastructure
Environmental topic(s)	Air quality, mitigation of GHG, green space
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH02 Increase modal share of low carbon transport modes GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD)
Description	**<u>Implement corridor-based priority bus lanes</u>** Corridor based priority lanes exists part of the urban area. There are currently no means of prioritising the bus movements on the road network outside the urban. 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 Canton 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: • 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 lane. **<u>Implement park and ride facilities</u>** 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 or carpool for the remainder of the journey. The vehicle is left in the parking area and retrieved when the owner returns.

Policy option/action reference	TR09 - AC
	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 Sarajevo, 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. **Implement corridor-based Bus Rapid Transit (BRT) routes** Bus Rapid Transit (BRT) is a high-quality bus-based transit system that delivers fast, comfortable, and cost-effective services at metro-level capacities. A fully developed BRT system can carry up to 200,000 passenger trips per day. It does this through the provision of dedicated lanes, either segregated or un-segregated from the road, and given priority at intersections, with busways and iconic stations typically aligned to the centre of the road, off-board fare collection, and fast and frequent operations. BRT contains features similar to a light rail or metro system. As such, it is much more reliable, convenient and faster than regular bus services. With the right features, BRT is able to avoid the causes of delay that typically slow regular bus services, like being stuck in traffic and queuing to pay on board. It is recommended that the following two lines are studied and considered for future implementation of express bus lines: • Line 1: Dobrinja departure station route (approximately Xkm) • Line 2: Ilidza SaoBracaia (approximately Xkm)
Owner	Sarajevo Canton
Stakeholders	City bus operators
Capex	Bus lanes: EUR 10m – 50m Park and ride: EUR 10m – 50m BRT network: EUR 50m +
Benefits	• Improve the travel time reliability of public transport • Improve the attractiveness of public transport • Improve the road safety • Create opportunities for land development for Transit Oriented Development (TOD) around BRT terminals • Reduce congestion on key arterial routes into the city • Minimise demand/need for city centre parking • Promotes use of public transport • Can be integrated with use of low emission buses
Expected start and end dates (Year)	Bus lanes, Park & Ride: 2020-2024 BRT network: 2024-2029

Policy option/action reference	TR10 - AC
Policy option / action	Implement pedestrian priority infrastructure
Environmental topic(s)	Air quality, mitigation of GHG, green space
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies

Policy option/action reference	TR10 - AC
	GH02 Increase modal share of low carbon transport modes GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD)
Description	**Implement city-wide pedestrian wayfinding signage network** The central areas of Sarajevo Canton along the key transportation spines are relatively flat which makes it ideal for walking. The implementation of a citywide pedestrian wayfinding 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 wayfinding information throughout the city. The wayfinding 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 wayfinding network would need to be facilitated through clear and consistent signage and floor markings as applicable. Strategically positioned on street navigation posts which would contain different levels of information. They could include: • Signage which includes detailed directional information and a large walking map to illustrate a five-minute walk in any direction. • Tall, narrower signs that offer detailed information on the local area but are useful where pavement space is at a premium. Their height ensures they are visible from a distance and can be spotted above a crowd of people. • Tall signs which combine detailed directional information and walking maps. Can be used at transport interchanges, such as stations and river piers. The signage would support the following wayfinding principles: • Heads up mapping • Accessibility • Walking times • Walking directions • Building locations • Finder mapping • Integrated transport nodes • Street naming In the specific context of Sarajevo Canton, to ensure that any potential wayfinding signage is appropriate and user friendly, it would be recommended that initially a small area of Sarajevo 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 wayfinding strategy for each of the major towns and cities. It is envisaged that the signage network could be supported by up to 100 maps and signs. **Implement expanded city centre pedestrian zone** Pedestrian zones are areas of a city or town reserved for pedestrian-only use and in which most or all vehicular traffic is prohibited. 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 Sarajevo Canton, it is proposed that an expansion of the existing city centre pedestrian area in Sarajevo is implemented. The pedestrian area would extend around the central cathedral, elements of the national assembly and surrounding streets where there is a high concentration of pedestrian and retail activity.

Policy option/action reference	TR10 - AC
Owner	Sarajevo Canton
Stakeholders	City traders
Capex	EUR 500k – 1m
Benefits	• Promotes and supports an easier, more enjoyable walking experience • Assists residents and visitors with improved accessibility and connectivity • Promotes integration with other modes • A reduction in localised air and noise pollution • Encourages and provides a more conducive environment for cycling • A reduction in vehicular/pedestrian accidents • Increased property values
Expected start and end dates (Year)	2020 – 2023

Policy option/action reference	TR11 - AC
Policy option / action	Implement traffic demand management and control
Environmental topic(s)	Air quality, mitigation of GHG emissions,
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes
Description	**City centre congestion charging zone** A congestion charging zone is a fee charged on most motor vehicles operating within the Congestion Charge Zone. This is usually restricted to specific times during the day, primarily weekdays. Charges do not tend to be implemented weekends or public holidays. The charging zone would be monitored and enforced through the use of technology. The charging by type of vehicle can be tailored towards meeting specific standards i.e. vehicles that do not meet Euro 6 standards, as an example. **Parking rationalisation and technology strategy** There are both on-street parking facilities and off-street parking lots in the main urban areas within the Canton. The motorisation rate for car and motorcycle in Sarajevo Canton (0.340.83) is significantly higher than the European Standard (0.5). With the growth of the economy, car ownership will continue to increase. Unless good alternatives to cars are provided, the demand for parking space will also increase. There are a number of other green policy, and investment proposals are proposed under this study that will help to reduce the demand for parking. To optimise the supply to meet the demand and to ensure efficient management of parking space, a parking rationalization strategy should be developed. The objective of the strategy will be to: • Optimize the parking space; • Optimise the parking locations; • Improve the parking management system through better use of technology. • By keeping the above objectives at the forefront, the following steps need to be taken in developing the strategy • Assessment of existing parking demand compared to the supply; • Parking demand forecast by taking all development policies and plans into account; • Develop strategies to reduce on-street parking space; • Identify locations that are well integrated with the land use; • Assess the technical and financial feasibility of park and ride systems in the city; • Assessing the feasibility of providing dedicated parking zones for electing vehicles that provide charging system;

Policy option/action reference	TR11 - AC
	• Assess the feasibility of better parking management by using the latest technologies such as CCTV, parking sensors, parking route finder, parking space information display and online or over the phone parking booking system. This proposal is to develop a strategy only. The implementation of the will need to be considered once the Canton adopts the strategy. **Implement 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 specific reference to the Sarajevo Canton, candidate routes, at least as pilots, should be considered which include: • A1 • M5 • M18 • E73 • R442a **Implement 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 green 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 the specific context of Sarajevo Canton, 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.
Owner	Sarajevo Canton
Stakeholders	Sarajevo Canton
Capex	Congestion zone: EUR 500k – 1m Parking strategy: EUR 100k – 500k HOV lanes: EUR 1m – 5m Signalling system and control centre: EUR 5m – 10m
Benefits	• Improved air quality in the city in peak hours • Reduced congestion • Encourage the take up of low emission vehicles • Reduction of on-street parking separate • Reduction of traffic congestion

Policy option/action reference	TR11 - AC
	• Promotion of electric vehicle by providing dedicated parking space • Development of a sustainable mode of transport by offering park and ride system • Reduce the overall volumes of car traffic • Contribute to improvements in air quality and noise by reducing the car traffic • Reduce congestion and improve the travel time reliability • Improvement and smoothing of traffic flow – supporting • Improvements in safety and security
Expected start and end dates (Year)	Congestion zone: 2022-2024 Parking: 2021-2023 HOV lanes: 2024-2029 Signalling system and control centre: 2022-2024

Policy option/action reference	TR12 - AC
Policy option / action	Implement low emission vehicles and supporting infrastructure
Environmental topic(s)	Air quality, mitigation of GHG emissions, green spaces
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes GS01 Ensure adequate provision of accessible, high quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies
Description	**<u>Implement public/on-street electric vehicle charging point network</u>** Investment in on-street electric vehicle charging infrastructure is needed to encourage uptake of EVs in any city. The infrastructure would involve 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. The implementation should consider different types of charging point, which generally include rapid, fast, and slow. • Rapid chargers are one of two types – AC or DC. Current Rapid AC chargers are rated at 43 kW, while most Rapid DC units are at least 50 kW. Both will charge the majority of EVs to 80% in around 30-60 minutes (depending a battery capacity). • Fast chargers include those which provide power from 7 kW to 22 kW, which typically fully charge an EV in 3-4 hours. • Slow units (up to 3 kW) are best used for overnight charging and usually take between 6 and 12 hours for a pure-EV, or 2-4 hours for a PHEV. EVs charge on slow devices using a cable which connects the vehicle to a 3-pin or Type 2 socket. In the specific case of Sarajevo, the initial implementation of a public EV charging network would provide the infrastructure needed to support a wider take up of EVs throughout the Canton. The network of chargers would initially be focussed on areas of the Canton 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 (likely targeting Sarajevo city) 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.

Policy option/action reference	TR12 - AC
	Renewal of the city vehicle fleet to low emission vehicles There is a drive and desire within Sarajevo 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 is mentioned in the Action Plan for particulate matter but the actions are high level and not defined in detail. 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 50 vehicles are replaced with low emission alternatives.
Owner	Sarajevo Canton
Stakeholders	Sarajevo Canton
Capex	Electric vehicle charging infrastructure: EUR 1m – 5m City fleet to low emission: EUR 1m – 5m
Benefits	• Promote a higher rate of uptake of low emission/electric vehicles • Encourages the use of alternative/new technologies • City administration and stakeholder level promotion of low emission vehicles • Supports a change in public perception and attitudes towards low emission technology
Expected start and end dates (Year)	2020 – 2024

Policy option/action reference	TR13 - AC
Policy option / action	Feasibility study for expansion of tram system
Environmental topic(s)	Air quality, mitigation of GHG emissions, green spaces, adaptation and resilience to natural disasters
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQO2 Increase modal share of lower emission transport modes AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GS02 Promote higher density residential and mixed-use development easily accessible by public transport (TOD) GH01 Encourage low embodied carbon infrastructure, buildings and industries GH02 Increase modal share of low carbon transport modes AR01 - Promote safe and resilient infrastructure and urban development AR03 – Promote disaster planning and risk management as integral to land use planning and development management processes
Description	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 for expanding the tram system on critical corridors in the Sarajevo Canton. 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; • Potential social, financial and environmental risks; • Potential financial mechanism for implementation; and • Phased action plan for implementation.

	A tram system will present an opportunity for private sector involvement through PPP or operation franchise.
Owner	Sarajevo Canton
Stakeholders	Civil society and other public sector agencies
Capex	EUR 500k - 1m
Benefits	• Help to make an informed decision for an expansion of the tram system in Sarajevo that would have a low environmental impact in the city; • Help to increase the ridership of public transport system.
Expected start and end dates (Year)	2022 – 2024

3.2.3. Water

3.2.3.1. Summary

Figure 3.3: Water policy options / actions summary

TBC

3.2.3.2. Policy option / action pro-formas

Policy option/action reference	**WR01 - PO**
Policy option / action	Strategy and plans for the water supply network and customer management systems
Environmental topic(s)	Water resources
Strategic objective(s)	WR01 Reduce overall wastage of potable water WR03 Improve wastewater and water supply planning, management and investment
Description	This policy option is based on the development of a GIS-based network model to confirm asset locations, enable efficiency programming of future asset maintenance activities allowing for deterioration. This will provide a basis for digital asset management and the ongoing recording of asset health. The network planning should be integrated with planning of water resource requirements, water treatment facilities capacity and water quality within the network. The integrated model should be used to plan and prepare for future pressures to the water supply network including, but not limited to: increasing demand due to population growth in the Sarajevo Canton; changes in water availability due to climate change; and degradation of the network infrastructure. According to the 'Development Strategy of the Sarajevo Canton until 2020', the Cantonal Public Utility Company-CPUC VIK Sarajevo' provides public water supply to c.430,000 customers (as of 2012). In 2014, public water supply was provided to 95.74% of the population of Sarajevo Canton – it is anticipated that this percentage will rise. The population of the Sarajevo Canton is also expected to grow at an annual rate of 0.5%, as noted in the 'Canton Sarajevo Spatial Plan for the period 2003-2023'. As such, the demands on public water supply will increase over the coming years. As defined in the 'Cantonal Plan of Environmental Protection: Sarajevo Canton', underground water storage wells are the primary source from which water is abstracted to serve the Sarajevo Canton accounting for 70% of the total water abstracted (up to 207 Ml/d). An additional 30 Ml/d is available from mountain sources, and 43 Ml/d from surface waters. 'CPUC VIK Sarajevo' purchase further water from other system operators, up to a maximum yield of 60 Ml/d. In total, c. 340 Ml/d is available from these combined sources. Considering the target water consumption per capita of 60 m3/pc (0.06 Ml/y), and an expected population of 442,000 by 2023, the current maximum water available to 'CPUC VIK Sarajevo' for abstraction is around 4x that of the c. 26,500 Ml/y that would be required by the population in 2023.

	However, the high percentage of unbilled water – quoted as 74.80% in 2015 (mostly due to leakage) – brings the maximum available water down to c. 31,400 Ml/y. This suggests that the water supply will be at risk during times of water shortage when it would not be possible to abstract the maximum amount of water from existing sources. 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 percentage of unbilled water is reduced, despite the fact that there appears to be capacity to supply the city's population at current rates of water loss. The per capita consumption of water (pcc) estimate of customers in the Sarajevo Canton, as of 2014, is 151 l/d – slightly higher than the average of European countries (144 l/h/d). Therefore, demand management measures such as customer metering and education of customers about water efficiency could be considered. However, considering the volume of water which could become available if the water losses in the water system were addressed (as per WR03), demand management measures are not priority areas for investment relative to improvements to the supply network. As such, they have not been identified as policy options under this GCAP. It is recommended that the sustainability of existing water sources, and the potential for new water supply options to serve the city in future, are assessed. This assessment of the supply-demand balance should consider potential climate change impacts on both demand and supply, as well as an assessment of the resilience of supply options in the face of drought events. Furthermore, potential new supply options should be evaluated in terms of their long-term economic costs and benefits, including environmental and social impacts. A 25-year water resources management plan for the city is recommended to encompass the above. This plan should be revised at 5-year intervals to account for the latest information and predictions relating to climate change and population growth or movement.
Owner	Sarajevo Canton Administration, CPUC VIK Sarajevo
Stakeholders	Customers
Capex	EUR 100k – 500k
Benefits	Improved digital asset management capability which will enable the assessment and improvement of 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 will help to ensure that existing and future operations are environmentally and financially resilient.
Expected start and end dates (Year)	2020-2023

Policy option/action reference	**WR02 - AC**
Policy option / action	Improve monitoring of and data collection from the water supply network
Environmental topic(s)	Water resources
Strategic objective(s)	WR01 Reduce overall wastage of potable water WR03 Improve wastewater and water supply planning, management and investment
Description	This policy option involves increasing the extent of real-time monitoring across the network, including district metering and conducting leakage surveys. According to the 'Cantonal Plan of Environmental Protection: Sarajevo Canton', continuous monitoring in public water supply systems does not exist at present and the coverage of measurement equipment is insufficient for a proper monitoring and management system.

	Additionally, the development of a customer management system will assist in improvement of revenue collection and the ongoing financial viability of the utility company.
Owner	Sarajevo Canton Administration, CPUC ViK Sarajevo
Stakeholders	Customers
Capex	EUR 1m - 3m
Benefits	Improved understanding of the water balance throughout the supply system will facilitate identification of illegal connections, leakage reduction, pressure management and asset condition.
Expected start and end dates (Year)	2020-2023

Policy option/action reference	**WR03 - AC**
Policy option / action	Reduce water losses from the network
Environmental topic(s)	Water resources
Strategic objective(s)	WR01 Reduce overall wastage of potable water WR03 Improve wastewater and water supply planning, management and investment
Description	This policy is focussed on reducing the considerable water losses from the water supply network through maintenance and/or replace the existing water supply system. As noted in the 'Canton Sarajevo Spatial Plan for the period 2003-2023', water losses are one of the biggest problems in the current water supply network resulting in regular cuts to water supply. As reported in the 'Cantonal Plan of Environmental Protection: Sarajevo Canton', overall water losses in 2015 were 74.80% (equivalent to 72,828,019 m^3/year of unbilled water) classified as a 'red' indicator in the GCAP indicators database, where the red indicator threshold is 45%. The existing water supply network consists of 1,200 km of main water pipes and about 750 km of connecting pipes. Addressing water losses through maintenance of the existing water supply network could be undertaken in the short/medium term; this may involve a 'find and fix' leakage management regime, and also through incorporating water pressure management measures into the network. However, in many areas a programme for mains replacement may need to be developed in the long term (mains replacement is typically undertaken at an annual rate of 2% of the length of the network i.e. 40km/year). In order to understand where investment will yield the greatest benefits in terms of leakage reduction, and to identify potential programme efficiencies, it is recommended that the development of a GIS network model – suggested as part of policy option WR01 – be undertaken prior to this work.
Owner	Sarajevo Canton Administration, CPUC VIK Sarajevo
Stakeholders	Customers
Capex	EUR 1 - 5m per year (network maintenance) EUR 10m per year (network replacement)
Benefits	Effective maintenance of the water supply system will reduce water losses and cuts to water supply. It will also provide environmental (including carbon) and financial benefits associated with reducing abstraction, treatment and distribution of water (although it should be noted that it is likely that the water leaked from pipes will return to the environment through the groundwater system).
Expected start and end dates (Year)	2020 onwards

Policy option/action reference	**WR04 - AC**

Policy option / action	Reduce risks to water quality
Environmental topic(s)	Water resources
Strategic objective(s)	WR01 Reduce overall wastage of potable water WR03 Improve wastewater and water supply planning, management and investment
Description	According to the 'Development Strategy of the Sarajevo Canton until 2020', the percentage of microbially contaminated and physically/chemically defective drinking water samples from local water supply systems in 2014 was 2.15%. In contrast, the percentage of contaminated drinking water samples from wells and the urban supply system was 0%. To reduce the risk of inadequately treated water being supplied to customers, the current urban water supply network should be extended to reach those who are currently reliant on local water supply networks (4.26% in 2014). This action involves increasing public water supply coverage to these customers. It is suggested that a feasibility study and full economic assessment be undertaken within the next 1-3 years, with the actual construction being undertaken in the medium term (5-8 years). Furthermore, it is noted in the 'Cantonal Plan of Environmental Protection: Sarajevo Canton' that asbestos-cement pipes currently account for 20% of the total length of water supply network of the city. To minimise the risk of asbestos contamination from the aging water supply network, replacement of this section of the network should be prioritised as part of the replacement work suggested in WR03.
Owner	Sarajevo Canton Administration, CPUC ViK Sarajevo, Municipal Authorities
Stakeholders	Government, customers, roads authorities,
Capex	EUR 10m per year (network replacement or development) Can be incorporated with the actions for WR03.
Benefits	Connection of the entire city's population to the public water supply network, and replacement of aging asbestos-cement pipes in the supply network, would ensure that high quality drinking water is available to all, providing health benefits.
Expected start and end dates (Year)	2022 - 2030

Policy option/action reference	**WR05 - AC**
Policy option / action	Wastewater strategy, digital planning and design
Environmental topic(s)	Water resources
Strategic objective(s)	WR02 Increase wastewater collection and appropriate treatment accessible to all WR03 Improve wastewater and water supply planning, management and investment
Description	Drawing from the water supply and water resources digital planning report produced in WR01, prepare a wastewater digital planning report. This would include a 25-year projection of wastewater generation based on the phased extension of the water supply and connection of all properties and commercial operations to the wastewater network. This study would utilise Network modelling: existing records and GIS systems should be collated; asset surveys should be undertaken (under WR05) to complete and update records where necessary and a digital model of the drainage and sewerage systems created. This can then be used in combination with numerical models in the optimised design and testing of possible solutions for the underground storm, foul, combined sewers, the surface water flows and how they interact with the city and the river. Digital tools and design methods (such as BIM) may also be used for the WWTW extension design.

	The changes to the river water quality and ecosystem can be quantified using models to ensure compliance with river water quality and ecosystem objectives in the near future and over a 25-year planning horizon. Digital tools should also be used, in combination with urban environment planning tools for the design of sustainable urban drainage features which can provide quantified reductions in runoff to storm drains and multiple quantified benefits to the wider urban environment and property values. These digital models will then feed in to a digital asset management system for the operational phases of all the projects. A drainage management plan looking at the 25-year supply demand balance and scenarios for climate change and economic / population growth should be developed. This would include an investment and programme of measures plan for the next 5 years with more general outlooks for the next 25 years. Risks and options should be identified and valued with estimates of CAPEX, OPEX and revenue. The overall plan should also take account of plans for industrial discharge management, where going to sewers, direct to river or having on-site pre-treatment (from WR11). The models and analysis can also feed in to the regulatory and financial planning of the water utility business. This would coordinate with the preparation of the FOPIP under the EBRD (WR10) If there is the development of SMART city digital systems for the management of Sarajevo's infrastructure and operation, then the wastewater digital tools will form a component of this.
Owner	Sarajevo Canton Administration / Private enterprise CPUC ViK Sarajevo
Stakeholders	Customers, Municipal Administrations, River Authorities, Highways department
Capex	EUR 0.5 - 1m
Benefits	Better planning and design of the wastewater systems investments resulting in higher quality and lower cost solutions with greater confidence that all regulatory and financial objectives will be met. 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.
Expected start and end dates (Year)	2020 - 2022 Network modelling, SUDS, sewerage and WWTW Design and Digital models' creation. Address flood risk, connection to WWTW, collection of Industrial wastewater, design of WWTW, sludge strategy, multiple benefits of SUDS solutions.

Policy option/action reference	**WR06 - AC**
Policy option / action	Wastewater asset monitoring and data collection
Environmental topic(s)	Water resources
Strategic objective(s)	WR02 Increase wastewater collection and appropriate treatment accessible to all WR03 Improve wastewater and water supply planning, management and investment
Description	Carry out asset surveys of the wastewater collection, storm drainage and wastewater treatment systems. Ensure that GIS records and any digital models of the performance of the assets are up to date. Collate data on river flows and quality to use in planning and assessment of flow volume and water quality compliance. Obtain information on surface water runoff characteristics, permeability and drainage catchments to provide base data for planning of flood protection and SUDs measures.

	Prepare GIS layers for interpretation of information.
Owner	Sarajevo Canton Administration / Private enterprise CPUC ViK Sarajevo
Stakeholders	Customers, Municipal Administrations, River Authorities, Highways department
Capex	EUR 0.5 - 1m
Benefits	Ensure provision of data and control infrastructure for the planning and operation of wastewater assets and to be able to ensure river water quality objectives compliance.
Expected start and end dates (Year)	2020 - 2022

Policy option/action reference	**WR07 - AC**
Policy option / action	Wastewater network construction: extension, refurb and new build
Environmental topic(s)	Water resources
Strategic objective(s)	WR02 Increase wastewater collection and appropriate treatment accessible to all WR03 Improve wastewater and water supply planning, management and investment
Description	The older parts of Sarajevo city centre had combined sewers running direct to the river then with suburban areas added and served by septic tanks. In more recent decades separate storm and foul sewers have been installed in many areas. The wastewater from combined system and newer separate systems is transferred by interceptor sewers to a centralised treatment plant downstream at Butila. The septic tanks and private treatment systems would not meet modern WFD / UWWTD standards and are estimated to still serve 22% of population (GCAP TA Report). It is not known if there are any areas of the city still discharging direct to River. Some other towns in the Canton do discharge without treatment and some sewerage and treatment plants are under planning. For those areas of the city not currently connected to the centralised sewer system there are two options to take forward: 1. Install decentralised wastewater treatment with smaller package type treatment works in each district of the Canton. These 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. 2. Conveying the wastewater to the central treatment plant by extending the foul drainage system with new sewers and pumping stations to connect to the existing systems. This would be the conventional and default solution. In addition to collection of foul wastewater for treatment before discharge to the river the drainage system needs to convey stormwater away to avoid flooding. According to Cantonal Operational Plan (2012) Defence from Floods, indicator is benchmarked as “yellow”. The extent and severity of this is not quantified in available documentation. The digital asset and modelling exercises in WW05 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 Urban Drainage features incorporated to buildings and urban spaces can also reduce the load on the sewers and offset some of the requirements for additional investment. However, under the more severe storm conditions hard grey engineering

	solutions are required in addition to green infrastructure to ensure protection against severe flood risks. The wastewater network designs should include sufficient capacity to meet future demand and climate scenarios.
Owner	Sarajevo Canton Administration CPUC ViK Sarajevo
Stakeholders	Customers, Municipal Administrations, River Authorities, Highways department.
Capex	EUR 10m – 50m
Benefits	Conveyance of wastewater to an extended 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.
Expected start and end dates (Year)	2020 - 2024 WW Network Construction: extension, refurb and new build.

Policy option/action reference	**WR08 – AC**
Policy option / action	Wastewater Treatment Works extension and construction of thermal sludge treatment facility
Environmental topic(s)	Water resources
Strategic objective(s)	WR03 Improve wastewater and water supply planning, management and investment
Description	Wastewater treatment plant at Butila, originally constructed in 1984, was rehabilitated commencing 2015 to 2017. This works is reported to have a capacity of 600,000 PE (equivalent to 40,000 to 50,000 m3/d). It has preliminary screening (added in 2016), primary settlement, Activated Sludge aeration lanes (upgraded from mechanical to bubble diffuser aeration 2016) and final settlement. Extension under the EBRD programme was to proceed in 2 phases. to increase capacity from 600,000 PE to 900,000 PE add nutrient removal and facilities for better residual sludge disposal. Picture of Butila Works from Google earth dated March 2019.  The most pressing issue remaining as reported in the Technical assessment report is that though sludge digestion and energy recovery systems have been refurbished with the rest of the plant, there is no facility for the proper disposal of the dewatered sludge. It is stored on site or land filled.

	In 2018, Canton Sarajevo prepared a project proposal for thermal treatment of sludge that needs financing. The project is prepared based on the finding of the Feasibility Study for treatment and disposal of the sludge from WWTW Butila, financed by the World Bank and prepared by IPSA Institute d.o.o. Sarajevo and Institute for Ecological Engineering d.o.o. Maribor. Therefore, this proposed action will include construction of thermal treatment plant for incineration of wastewater sludge as a final treatment.
Owner	Sarajevo Canton Administration CPUC ViK Sarajevo
Stakeholders	Customers, Municipal Administrations, River Authorities, Highways department.
Capex	EUR 10 m Construction of sludge thermal processing facility EUR 10-15 m Construction of nutrient removal and extension of treatment works capacity if required.
Benefits	Compliance with EU UWWTD and WFD. Reduced requirements for land filling of sludge, increased biodiversity and ecosystem health in the river
Expected start and end dates (Year)	2022 - 2025 Construction of WWTW extensions to improve sludge treatment and nutrient removal. Expand capacity to meet future demand

Policy option/action reference	**WR09 - AC**
Policy option / action	Sustainable Urban Drainage systems (SUDs) construction
Environmental topic(s)	Water resources
Strategic objective(s)	WR02 Increase wastewater collection and appropriate treatment accessible to all
Description	The climate of Sarajevo 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. Sustainable urban drainage 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. Sustainable Urban Drainage 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 highways should be considered in proposed works.
Owner	Sarajevo Canton Administration CPUC ViK Sarajevo.
Stakeholders	Customers, Municipal Administrations, River Authorities, Highways department.

Capex	EUR 10m – 50m
Benefits	Improved water quality in river, improved urban air quality and microclimate. Greater value of development along river and in the town, reduced flood risks improved urban environment, increased biodiversity and ecosystem health.
Expected start and end dates (Year)	2021 to 2025 SUDS construction

Policy option/action reference	**WR10 - PO**
Policy option / action	Study into WWTW, sewerage and SUDS financing; review water company regulation and management
Environmental topic(s)	Water resources
Strategic objective(s)	WR02 Increase wastewater collection and appropriate treatment accessible to all WR03 Improve wastewater and water supply planning, management and investment
Description	There is a water company that bills and collects revenue for water and some levies are applied to water bills for wastewater. Financing of the construction of new sewers and the WWTW extensions may be on a loan basis or by PPP letting some form of design, build, operate contract or a concession. Studies would be required for the most effective approach to this in the situation of Sarajevo. 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 companies, how they interact with the city government, industrial enterprises, property owners and customers. Regulatory and financial structures should be analysed. This study would build on the technical sector studies of WR01 and WR04 to put into the context for the financial operation of the utility company. Like the technical studies this should take a 25-year planning horizon from which to propose actions over the next 5 years. EBRD have already launched a similar study - Preparation of the Financial and Operational Performance Programme ("FOPIP"), to assist the Company to prepare and sign a Public Service Contract ("PSC") with the Canton including the phased achievement of full cost recovery tariffs. Any studies under this programme should fully coordinate with FOPIP actions.
Owner	Sarajevo Canton Administration CPUC ViK Sarajevo
Stakeholders	Customers, Municipal Administrations, River Authorities, Highways department.
Capex	EUR 100k – 500k Study into financing options.
Benefits	Better understanding of the most efficient options for financing the different components and linking these with other infrastructure improvements in the city.
Expected start and end dates (Year)	2019 - 2020: Study into SUDS, sewerage and WWTW financing; review water company regulation and management.

Policy option/action reference	**WR11 - AC**
Policy option / action	Industrial wastewater assessment, regulation and treatment investments
Environmental topic(s)	Water resources

Strategic objective(s)	WR03 Improve wastewater and water supply planning, management and investment
Description	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. Regulations regarding industrial discharges to sewers will need to be 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. Actions under this plan would be funded by industry and not by the Canton authorities.
Owner	Canton enterprises
Stakeholders	Canton enterprises, water company, sewerage company, River Authorities, Sarajevo Canton Administration
Capex	EUR 0 The investment costs would fall to specific enterprises, access to a strategic fund or soft loans may be made available.
Benefits	Improved water quality in river, compliance with EU UWWTD and WFD.
Expected start and end dates (Year)	2019 - 2022 Industrial wastewater assessment, regulation and treatment investments

3.2.4. Energy, buildings

3.2.4.1. Summary

Figure 3.4: Energy, buildings policy options / actions summary

TBC

3.2.4.2. Policy option / action pro-formas

Policy option/action reference	**EN01 – AC**
Policy option / action	Study of potential for market penetration of renewable energy technologies in SC
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies AQ05 Increase use of non-fossil fuels and renewable energy sources for heating and cooking GH04 Encourage uptake of low carbon energy generation
Description	Canton Sarajevo has ambition to improve energy efficiency in industry and building sector, as well as to increase proportion of renewable energy in a total energy balance. Locally produced energy may also increase energy security of Canton that is currently very much depending on imported natural gas. Federal Energy Efficiency Action Plan (2016-2018), Action Plan for Renewable Energy in BiH (2016-2020) followed by the Study on Potential for Renewable Energy Production in BiH (2019, UNDP) support the ambitions of Canton to have more concrete actions towards

	introduction of renewable technologies. Initial deployment of solar PV technologies has begun in Sarajevo, to act as educational hubs, in the form of *'solar tree'.* These will provide local lighting and charging hubs for tourists and locals and have been backed by the Mayor of Municipality Stari Grad. A good case study in sector of public buildings is Primary School Meša Selimović with installation of SPV on the roof of the school building. https://solarni.wordpress.com/2014/05/13/sarajevo-solarna-elektrana-na-krovu-os-mesa-selimovic/ There is also a reasonable 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. The proposed investment in wind farm by Suzlon indicates that there is a credible, bankable wind resource in the Sarajevo area. In conjunction with solar energy and heat pumps / geothermal energy wind power can provide a significant component of a low carbon energy infrastructure. The Study should assess potential for application of renewable energy technologies in private and public buildings. The Study should explore potential for installing solar PV and heat pumps and to give clear recommendations for implementing solar energy for heating and cooling and hot water preparation in residential and public building sector as part of building renovation packages. A study should assess areas around the urban zone, which may be suitable for solar and wind farms. The study will include a gap analysis and recommendations for improvement of n the existing regulatory framework regarding PV grid integration, applicable tariffs and net metering schemes. Operational program for implementation of renewable technologies will be based on recommendations given in the Study and split in to two components: • RT as part of cantonal private and public building renovation program • Private investments in heat or electricity RT based production
Owner	Sarajevo Canton Administration, Industry, Public and private building owners
Stakeholders	Sarajevo Canton, Industry, Public and private building owners
Capex	EUR 100k- Study EUR 50m – Operational program Costs will be dependent on units deployed. Typical costs in the region of 5-6000 EUR per dwelling, 20,000-1M EUR per educational establishment, 5-6M Euros per 5MW solar farm. Around 25 acres of land required. Bulk purchase / roll out can provide cost reduction.
Benefits	**Key Benefits** • contribute to the global fight against climate change –the global decrease of greenhouse gases will also protect the Canton against climate change; • economic and employment benefits • access to National/European funding; • improve citizens well-being (reducing energy poverty); • CO2, PM emission reduction • secure future financial resources through energy savings and local energy production; • improve long-term energetic independence of the Canton; • meeting a target for renewable energy
Expected start and end dates (Year)	2020 for Assessment 2020-2030 for Deployment

Policy option/action reference	**EN02 - PO**
Policy option / action	Prepare Energy Efficiency Action Plan for SC
Environmental topic(s)	Air quality, Mitigation of GHG emissions, Climate Change

Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies AQ05 Increase use of non-fossil fuels and renewable energy sources for heating and cooking GH04 Encourage uptake of low carbon energy generation
Description	Preparation of an Energy Efficiency Action Plan for Canton Sarajevo is legal obligation based on federal Law on EE. The EE action plan should be built on the Baseline Emission Inventory to identify the best fields of action and opportunities for setting the Cantonal CO2 reduction target. It will define concrete reduction measures, together with time frames and assigned responsibilities, which translate the long-term strategy into action. The activity will start with gap analyses of the existing Baseline Emission Inventory and followed by its upgrade if necessary. The EEAP will cover main target sectors: buildings, industry and other commercial users and urban transport. The EEAP will also include actions related to local electricity production (development of PV, wind power, CHP, improvement of local power generation), and local heating/cooling generation. The plan will identify the key financing resources that will be used to finance the actions.
Owner	Sarajevo Canton Administration
Stakeholders	Sarajevo Canton Administration, range of heat users, district energy operators, industry, transport, investors.
Capex	EUR 150k
Benefits	• contribute to the global fight against climate change –the global decrease of greenhouse gases will also protect the Canton against climate change; • demonstrate commitment to environmental protection and efficient management of resources; • participation of civil society, improvement of local democracy; • economic and employment benefits (retrofitting of buildings…); • develop a clear, holistic and realistic strategy for improvement in the situation; • access to National/European funding; • improve citizens well-being (reducing energy poverty); • local health and quality of life (reduced traffic congestion, improved air quality…); • secure future financial resources through energy savings and local energy production; • improve long-term energetic independence of the Canton; • better position for implementation of national and/or EU policies and legislation;
Expected start and end dates (Year)	2021 - XXX

Policy option/action reference	**EN03 - AC**
Policy option / action	Public Building Renovation Program
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ06 Improve energy efficiency of buildings and infrastructure GH01 Encourage low embodied carbon infrastructure, buildings and industries GH03 Encourage energy efficient buildings (new and existing retrofit)
Description	Canton Sarajevo adopted an Energy Efficiency Action Plan for Public Buildings period 2018-2021. The aim of this plan is to reduce energy consumption by 6,958,624 kWh per

	year or 5,01 percent of current energy needs, 322 of the aforementioned public building analysed by the Study. The assumption is that its implementation would result in financial savings in the amount of KM 1,085,839 annually, while achieving the standards of the required comfort, i.e., temperature and humidity in work and living rooms, budget savings, reduction in the use of fossil fuels, conservation of natural resources, and ultimately improvement of air quality in KS. For 3 years implementation 36 buildings have been selected for renovation. So far 21 public building has been renovated, plus 15 on-going, with support of UNDP the Green Economic Development Program. Total of 8 mil. BAM has been invested so far. Remaining 286 will be renovated in coming years. The on-going public building renovation program should be upgraded by renovation packages that combine building envelope renovation with HVAC and hot water preparation based on renewable energy technologies were possible. Prior to a decision on cost optimal renovation packages for public buildings, an energy audit and cost-benefit analyses of different renovation packages (including renewable technologies) should be done for each building. The program should build up on conclusions and recommendations of Study of potential for market penetration of renewable energy technologies in Canton Sarajevo
Owner	Canton Administration, Public building owners
Stakeholders	Canton Administration, Public building owners,
Capex	Energy audit and Cost benefit analyses of renovation packages Renovation: EUR 30-40 mil
Benefits	• Improved thermal comfort • Reduced energy consumption • Reduce CO_2, PM emissions • Increase renewable energy in total energy balance • Increase employment opportunities
Expected start and end dates (Year)	2021 - 2031

Policy option/action reference	**EN04 - AC**
Policy option / action	Residential Building Renovation Programme
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies AQ05 Increase use of non-fossil fuels and renewable energy sources for heating and cooking GH04 Encourage uptake of low carbon energy generation
Description	In November 2018, Canton Sarajevo in cooperation with Sarajevo Economic Regional Agency SERDA developed a model for improving energy efficiency in buildings in the function of increasing the number of users. The model is based 50:50 ratio for financing. 50% comes from building owners, while 50% is subsided by the government. It is estimated that renovation of building envelopes will cost approx. 250.000 EURO annually. The Canton will support this program with 125.000 EURO in 2019. However, the building renovation based only on renovation of building envelopes will not sufficiently contribute to the emission reduction, since most of individual houses use fossil fuel for heat production. In addition to gas, in the Canton Sarajevo in 2017, the registered consumption of solid fuels amounted of 96.098 tons, of which: fuel wood 52%, brown coal 12%, coal lignite 34% and other solid fuels (wood charcoal, wood briquettes and pellets) 2%. Thus, the renovation packages in Canton Sarajevo, beside renovation of building envelope, should include new heating and cooling and hot water preparation technological solutions including renewable technology solutions.

	The program should build up on conclusions and recommendations of Study of potential for market penetration of renewable energy technologies in Canton Sarajevo.
Owner	Sarajevo Canton Administration
Stakeholders	Sarajevo Canton Administration, range of heat users, district energy operators, investors.
Capex	
Benefits	• Reduced energy consumption • Reduce CO2, PM emissions • Improve citizens well-being (reducing energy poverty); • Increase renewable energy in total energy balance • Increase employment opportunities
Expected start and end dates (Year)	2021 - 2031

Policy option/action reference	**EN05 - AC**
Policy option / action	Assess the geothermal and ground water / aquifer thermal energy resource in Sarajevo
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies AQ05 Increase use of non-fossil fuels and renewable energy sources for heating and cooking GH04 Encourage uptake of low carbon energy generation
Description	Sarajevo has a widespread district heat network, composed of several smaller networks. According to historic and recent reports* large areas of the network are in a state of disrepair /damaged and many of the heat sources are also in need of replacement. The main heat sources are understood to be steam boilers, fuelled by gas and heavy oil, and are distributed across many different locations. A UN sponsored study was completed in early 2019 (add ref) and concluded that a replacement of steam heating plant, and distribution pipework with low temperature hot water (LTHW) based systems was the preferred approach for future refurbishment and expansion of the DHN. Modern district heat networks are utilising ever decreasing flow and return temperatures to distribute the heat. This results in two key benefits, the first being that the losses associated with distributing the heat are much lower, and the second being that lower temperatures are much more suited to the use of heat pumps, which utilise renewable energy from the local environment. If areas of the district heat network were converted to low temperature distribution, the large geothermal resource could be harnessed to potentially provide a significant amount of the city' heating. Heat pumps can be coupled with low grade heat from the geothermal resource to supply heat at the necessary temperatures to end users. To be able to properly assess the potential benefits that could be provided by the geothermal and aquifer based heat sources it is recommended that a full study of the resource across the city and nearby areas is undertaken. It is also recommended that this is completed and fully considered prior to significant investment being undertaken in the existing heat network distribution system and heat supplies. The use of the geothermal resource and other local low-grade heat sources have the potential to provide a future ready thermal energy system for the city. This would be highly decarbonised, efficient and clean and with the extensive proposed DHN rehabilitation and expansion work, the development of the network in a manner to accommodate a wider range of clean, low carbon, thermal sources are strongly recommended. The study would be conducted in two phases. Phase 1 being a desk top analysis of all existing known resources and Phase 2 conducting additional Ground Investigations as identified in Phase1.

Owner	Sarajevo Canton Administration
Stakeholders	Sarajevo Canton Administration, range of heat users, district energy operators, investors.
Capex	EUR 50k for Desk top study, EUR 500k (estimate) for additional GI
Benefits	• Mapping of geothermal and aquifer resource • Facilitating of local renewable heat for use across the city • Reduced airborne emissions • Enable optimum targeting of district heat network rehabilitation and future investment.
Expected start and end dates (Year)	2020 - 2021

Policy option/action reference	**EN06 - AC**
Policy option / action	Rehabilitation and extension of DH system in Canton Sarajevo – priority investment portfolio
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies AQ05 Increase use of non-fossil fuels and renewable energy sources for heating and cooking GH04 Encourage uptake of low carbon energy generation
Description	A feasibility study has recently been undertaken to assess potential for improving end expanding DH system in Canton Sarajevo (UNDP funded 2019) The selected scenario implies the modernisation of existing boiler rooms, including the replacement and installation of new gas fuelled boilers. In addition, installation of biomass and/or chip wood fuelled boilers has also been considered. Such new wood biomass boiler rooms should be set up in municipalities outside the City of Sarajevo; more specifically, one boiler room in each Vogošća, Ilijaš and Ilidža (in the neighbourhood of Hrasnica). The new wood biomass boiler rooms would have sufficient capacity to meet the heat demand in the municipalities of Vogošća and Ilijaš, and the neighbourhood Hrasnica. The priority investment plan 2020 - 2024 is oriented towards maximisation of operational cost savings and improved efficiency of the heat production and distribution companies in SC, as well as priority measures, which are applicable (in accordance with the conclusions of the baseline study) for the considered period of three to five years. The short-term investment plan includes legal, institutional, technical and environmental and health and safety measures. Expansion of the DH system in the period considered is focused towards connection of the public and residential buildings in system area to boiler houses which have sufficient capacity to cover heat demand, as well as modernisation of some boiler houses based on the current state of equipment. In addition, it is planned to install a new boiler house in Bistrik in Stari Grad municipality in order to enable the connection of public buildings to the DH system, as well as a new boiler house in the University of Sarajevo Campus located in Novo Sarajevo municipality in order to enable the connection of public and residential buildings in Centar Sarajevo and Novo Sarajevo municipalities. Furthermore, a new biomass-based boiler house is envisaged in Hrasnica in Ilidža municipality, complete with primary and secondary networks to connect new users to the DH system, as well as replacement of the existing heavy fuel oil boilers with biomass-based boilers in Vogošća municipality including network extension.
Owner	Sarajevo Canton and DHN operators

Stakeholders	Sarajevo Canton and DHN operators, customers, current and future heat suppliers
Capex	EUR 50m. Install retrofit heat metering across primary network and substations.
Benefits	The total heated surface area after the implementation of the selected scenario will be 4,825,113 m^2. Reduction of CO_2e emissions 10 % Reduction of SO_2 emissions 14 % Reduction of NO_2 emissions 10 % Reduction of PM_{10} 10 %
Expected start and end dates (Year)	2020 - 2024

3.2.5. Industry

3.2.5.1. Summary

Figure 3.5: Industry policy options / actions summary

TBC

3.2.5.2. Policy option / action pro-formas

Policy option/action reference	**IN01 - PA**
Policy option / action	Enhance the quality of environmental permitting instruments to support energy and materials efficiency and cleaner production in the industrial sector in SC
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	GH01 Encourage low embodied carbon infrastructure, buildings and industries AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies
Description	According to the FBiH Law on Environmental Protection and Rulebook on Facilities for which Environmental Impact Assessment is Mandatory and Facilities That May Be Built and Commissioned Only Upon Receiving an Environmental Permit, the Cantonal Administration is responsible for permitting of small and medium industrial facilities below the thresholds prescribed by the Rulebook. Although according to the Law, the environmental permit should ensure resource efficiency and cleaner production in accordance with best available techniques, today's environmental permits are focused more on emission control rather than on pollution prevention and resource efficiency. It is proposed to build the capacities of the Cantonal Administration to enhance the quality of environmental permitting instruments giving a focus on pollution prevention and supporting resource efficiency (including water and energy). This should be done by development of a comprehensive training programme for the Cantonal Administration and guidelines for environmental permitting for those industrial sectors that are under their jurisdiction. The ministry responsible for issuing water acts and cantonal inspection should also take part in this training.
Owner	Sarajevo Canton, Cantonal Administration
Stakeholders	Ministry of Physical Planning, Construction and Environmental Protection, Ministry of Economy, Cantonal Administration for Inspection Affairs

Capex	Up to EUR 100k
Benefits	Increased quality of environmental permit as an administration incentive to improve industrial environmental performance.
Expected start and end dates (Year)	2020 - 2021

Policy option/action reference	**IN02 - PA**
Policy option / action	Raise capacities of the canton industry to implement energy and materials efficiency and cleaner production measures
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	GH01 Encourage low embodied carbon infrastructure, buildings and industries AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies
Description	The city industry is the holder of environmental permits and is responsible for preventing and controlling emissions to the environment. Traditionally, industry is control oriented and has no knowledge on best available techniques, pollution prevention, resource efficiency and cleaner production options. The policy action IND01- PA should be coupled with a comprehensive training programme for industries 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 industries with the ultimate aim of developing implementable options for resource efficiency and cleaner production in each industry. The program should address all environmental permit holders, from both cantonal and federal level located at the territory of the Canton. The programme can be developed in cooperation with the Chamber of Commerce of Canton Sarajevo and experts from National Cleaner Production Programme in BiH (http://ncpp.ba/).
Owner	Sarajevo Canton Administration
Stakeholders	Ministry of Physical Planning, Construction and Environmental Protection, Ministry of Economy, Cantonal Administration for Inspection Affairs, The Canton Sarajevo Chamber of Commerce, industry located on the territory of the Canton, National Cleaner Production Programme in BiH
Capex	EUR 100k to 250k
Benefits	Improved industrial environmental performance and cleaner environment in the Canton.
Expected start and end dates (Year)	2020 - 2022

Policy option/action reference	**IN03 - PO**
Policy option / action	Develop strategy to support transition from linear to circular economy
Environmental topic(s)	Air quality, Mitigation of GHG emissions, Soils
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH01 Encourage low embodied carbon infrastructure, buildings and industries GH04 Encourage uptake of low carbon energy generation

	SL02 Reduce discharge of untreated wastewater and generation of solid waste in new and existing industrial development SL04 Reduce solid waste disposed on site and/or landfill and increase/improve recycling facilities accessible to all across the Canton SL05 Promote integration of circular economy principles across all relevant legal, political, and policy frameworks
Description	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. This transition to circular economy and industrial symbiosis can be further facilitated with the development of sustainable industrial zones where it is easier for an industry to use the waste of another one (e.g. thermal waste from one industry can be used as heat by another). Therefore, it is suggested the new study examines this option from a technical point of view. Given that the Cantonal 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 policy option involves development of a strategic study on transition to circular economy, mapping the resources and identifying enabling factors and options for urban-industrial symbiosis. As a further step it is suggested to perform a gap analysis regarding whether the needed regulatory framework is in place. Based on the results of the gap analysis on the needed regulatory framework the relevant legal drafting can be followed.
Owner	Sarajevo Canton Administration
Stakeholders	Ministry of Physical Planning, Construction and Environmental Protection, Cantonal Communal Solid Waste Management Utility KJKP Rad, industry, experts
Capex	EUR 100k – 250k
Benefits	Reducing pressure on the environment, improving the security of the supply of raw materials, increasing competitiveness, stimulating innovation, boosting economic growth, creating jobs
Expected start and end dates (Year)	2021 - 2022

Policy option/action reference	**IN04 - PO**
Policy option / action	Develop strategy for redevelopment of former industrial sites
Environmental topic(s)	Green space
Strategic objective(s)	GS01 Ensure adequate provision of accessible, high quality green spaces through adoption and enforcement of appropriate spatial planning and development management policies GS03 Promote a sequential approach (brownfield, infill, greenfield) to urban development to avoid further urban sprawl
Description	There are several former industrial/commercial sites in Sarajevo Canton which are fully or partially abandoned as a result of bankruptcy of former industrial giants or are partially sold/rented to small private businesses. If rehabilitated, these brownfield sites could create jobs, improve the environment and promote innovation. This study will identify and analyse present brownfield sites in Canton Sarajevo and propose option for their regeneration, helping old industrial and commercial areas generate new economic activity in the Canton. This study should also examine potential contamination of the proposed industrial sites and provide initial analysis of potential remediation measures. Furthermore, the study will also provide cost estimates and actions that need to be taken by the Canton in

	order to redevelop these sites. Contamination remediation issues will be considered as a key to feasibility of any future action.
Owner	Sarajevo Canton Administration
Stakeholders	Ministry of Physical Planning, Construction and Environmental Protection as a project initiator with participation of the whole Cantonal Government
Capex	EUR 500k - 1m
Benefits	Increasing sustainability, boosting urban development, stimulating innovation, boosting economic growth, creating jobs
Expected start and end dates (Year)	2021 - 2022

Policy option/action reference	**IN05 - PO**
Policy option / action	Develop standards and regulations to reduce emissions of pollutants from food service sector (restaurants, bakeries, etc.)
Environmental topic(s)	Air quality, Mitigation of GHG emissions
Strategic objective(s)	AQO1 Decrease emissions of air pollutants from transport, housing, energy generation and industry AQ03 Promote the adoption of less polluting transport, energy generation and industrial technologies GH01 Encourage low embodied carbon infrastructure, buildings and industries
Description	Small restaurant, catering and bakery businesses in Sarajevo Canton are not subject to environmental permitting but are contributing to the air pollution and odour emissions which create nuisance for the citizens. Depending on the type of the restaurant and the furnace and fuel used, most common emissions are PMs, VOCs, oily fumes and cooking odour. There is a need for development of technical standards (BAT based) and legally binding rules for HVAC systems and flue gas treatment for food service sector that will eliminate the existing problem. Appropriate legislative changes should also be introduced to support use of these standards. Development of technical standards and technological solutions should be coupled with their promotion among the service providers and include their capacity building to implement the standards.
Owner	Sarajevo Canton Administration
Stakeholders	Ministry of Physical Planning, Construction and Environmental Protection, Ministry of Economy, Cantonal Administration for Inspection Affairs, food service sector
Capex	EUR 100k-250k
Benefits	Improved environmental performance of food service sector, reduction of air emission and cleaner air in the Canton.
Expected start and end dates (Year)	2020-2021

3.2.6. Solid Waste

3.2.6.1. Summary

Figure 3.6: Solid waste policy options / actions summary

TBC

3.2.6.2. Policy option / action pro-formas

Policy option/action reference	**SW01 - AC**
Policy option / action	Implementation of a separate collection system for recyclable waste

Environmental topic(s)	Soils
Strategic objective(s)	SL02, SL03
Description	Sarajevo Canton currently relies mainly on a single-stream collection system for MSW and more than 90% of collected municipal solid waste is disposed of in Smiljevići's landfill. The establishment of a separate waste collection in all municipalities of the Canton has been identified as an objective in the Sarajevo Canton Waste Management Plan 2015 – 2020. In 2018 the Canton prepared a "Study on location of recycling yards and green islands on the territory of nine municipalities in Canton Sarajevo with their location in spatial documents and including the investment plan", the GIS database with waste collection locations, and Technical Guidelines for Design of Waste Disposal Infrastructure. The Technical Guidelines present the existing situation in the municipal waste management system in Sarajevo Canton, the concept of collection, guidelines and conceptual solutions for the planned infrastructure, as well as the zoning of the Sarajevo Canton according to the typical municipal waste quality. The technical guidelines were produced with the aim to ensure efficient separation and collection of waste materials in accordance with the objectives, (ii) plan the space for location of waste infrastructure in spatial planning documents, (iii) prescribe technical requirements and ensuring functional usage and maintenance. The proposed solutions need financing.
Owner	Cantonal Administration
Stakeholders	Canton Administration, cantonal waste utility KJKP Rad
Capex	EUR 15m Procurement of waste disposal equipment and construction of green islands
Benefits	Benefits from the separate collection of recyclable waste include improvements in recycling and recovery rates, landfill diversion rates and increased remaining capacity for Smiljevići's landfill.
Expected start and end dates (Year)	2019 – 2020

Policy option/action reference	**SW02 – AC**
Policy option / action	Development of waste treatment infrastructure
Environmental topic(s)	Air quality, Soils, Water, Mitigation of GHG emissions
Strategic objective(s)	AQ01, SL02, SL03, GH01
Description	Sarajevo Canton is currently preparing a Feasibility Study for Waste Treatment Options for the Canton. The Study analysed four different scenarios: • Scenario S1 implies the mechanical and biological treatment MBT aiming to separate recyclables + produce refuse derived fuels (RDF) and compost. Intention is to sell RDF to cement factories in BH (Kakanj or Lukavac). • Scenario S2 also implies Mechanical Biological Treatment (MBT), with biogas instead of compost production. This scenario also envisages a cogeneration plant for combustion of the resulting biogas, where heat energy is used to heat the digestor while electric energy can be sold at feed-in rates. This scenario considers using slaughter waste category in total balance. • Scenario S3 represents the thermal treatment of municipal waste in a cogeneration plant to produce electrical and thermal energy. It is estimated that facility can provide heat for 17,000 households. The installed power of the plant would be 5 MW. • Scenario S4 is the same as S3 + 45,000 t / year of sludge from the waste water treatment plant that will be considered. The value of the investment in plant construction varies from 25 million (S1) to 100 million EUR (S4). A detailed technical-economic-environmental assessment

	of all options has been carried out and will be followed by a multicriteria analysis to select the optimal scenario. The deadline for completion of the study is June 2019. Following the results of the waste treatment and disposal feasibility study, the proposed infrastructure needs to be developed.
Owner	PPP, Sarajevo Canton and/ or waste management companies
Stakeholders	Canton Administration, cantonal waste utility KJKP Rad
Capex	EUR 25 -100 m depending on facilities developed
Benefits	The provision of alternatives to landfill will increase recycling and recovery rates as well as landfill diversion. Consequently, lower GHG emissions will be linked to waste management in Sarajevo and water and soil contamination will be mitigated.
Expected start and end dates (Year)	2020 – 2026

Policy option/action reference	**SW03 – AC**
Policy option / action	Development of waste disposal infrastructure
Environmental topic(s)	Air quality, Soils, Water, Mitigation of GHG emissions
Strategic objective(s)	AQ01, SL02, GH01
Description	Improvements to the engineering of the current Smiljevići's landfill: installing a double liner, improving and re-operating its landfill gas collection and recovery system, energy recovery possibilities and a leachate collection and treatment system. The landfill should, moreover, be expanded and a dedicated cell for the disposal of C&D waste should be created.
Owner	PPP, Sarajevo Canton
Stakeholders	Canton Administration, cantonal waste utility KJKP Rad
Capex	EUR 50m+ Depending on facilities developed
Benefits	The improvement of disposal conditions at the landfill will generate positive environ. Following the creation of a specific cell for the disposal of C&D waste at the Smiljevići's landfill, will prevent wild dumping phenomena.
Expected start and end dates (Year)	2020 – 2026

Policy option/action reference	**SW04 – AC**
Policy option / action	Progressive closure of Smiljevići Landfill for leachate minimization
Environmental topic(s)	Air quality, Soils, Water, Mitigation of GHG emissions
Strategic objective(s)	AQ01, SL02, GH01
Description	In 2018/2019 the World Bank financed a project on Leachate Generation Assessment for Smiljevici Landfill, Lifespan Analysis and Assessment of Progressive Closure for Leachate Minimization. The Study included: • Leachate Generation Minimization Analysis, including interpretation and recommendations on the actions needed to minimise the leachate generation in a preliminary design with cost estimate for implementation of the interventions, without affecting the landfill operation. • Landfill lifespan (volumetric) analysis. • Progressive Closure System including preliminary design and preliminary cost estimate for the closure system for the areas ready to be capped. Sarajevo Canton is interested to finance closure of the part of the landfill in line with the recommendations from this Study.
Owner	Sarajevo Canton
Stakeholders	Canton Administration, cantonal waste utility KJKP Rad

Capex	EUR 5m-10m. Depending on the selected capping option.
Benefits	Reduce quantity of leachate production, decreased load on the future leachate treatment facility, reduced impact on water resources, faster stabilisation of the landfill.
Expected start and end dates (Year)	2020 – 2026

Policy option/action reference	**SW05 – PO**
Policy option / action	Increase waste awareness through education campaigns
Environmental topic(s)	Soils
Strategic objective(s)	SL02, SL03
Description	Creation of dedicated campaigns aimed at educating citizens of Sarajevo on the impact of waste management on the environment. Special attention to be paid to source segregation of recyclables and waste minimisation measures. The promotion of solid waste reduction, reuse, sorting and recycling through awareness campaigns represents two 'Response' 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 enough to solve the issue. SIDA in partnership with the World Bank implemented in 2018/2019 the programme "Technical Assistance on Solid Waste Management Public Awareness Raising and Education". Set of awareness raising materials including branding of the campaign, visuals, TV and radio adverts have been produced. Canton Sarajevo can opt for using these materials and finance only implementation of the campaign.
Owner	Sarajevo Canton, PPP
Stakeholders	Canton Administration, cantonal waste utility KJKP Rad, schools
Capex	EUR 500k
Benefits	By reducing waste generation and source segregating recyclables, Sarajevo's waste management system will rely less on the Smiljevići's landfill, thus reducing environmental hazards such as pollution of water and soils through discharge of untreated leachate and release of landfill gas to the air.
Expected start and end dates (Year)	2019 – ongoing

Policy option/action reference	**SW06 – AC**
Policy option / action	Removal of illegal open dumps and remediation of contaminated areas
Environmental topic(s)	Soils, Water, Mitigation of GHG emissions
Strategic objective(s)	SL02, SL03
Description	According to the Sarajevo Canton Waste Management Plan 2015 – 2020, a total number of 41 illegal open dumps has been counted in the Sarajevo Canton. Additional smaller temporary dumps are formed around waste containers, due to insufficient waste collection capacity. According to the Sarajevo Cantonal Plan of Environmental Protection 2016 – 2021, illegal dumps are created because of lack of adequate collection infrastructure and poor public awareness. Sarajevo Canton in spring of 2019 financed a two-month long clean-up action to remove most of the illegal dumps in nine municipalities. Following the removal of the wastes, the identified areas are sanitised and recovered. Monitoring of these areas is recommended in order to avoid similar illegal dumping events. The clean-up action should be continued in future with permanent financing.
Owner	Ministry of Physical Planning, Construction and Environmental Protection of Sarajevo Canton

Stakeholders	Waste management companies, private land owners, environmental companies and associations
Capex	EUR 1m
Benefits	The removal of illegal open dumps will ensure the controlled disposal of wastes and minimise hazards on the environment such as the generation of leachate and infiltration in soils and groundwaters and will minimise GHG emission (in the form of CH4 release in the air) in case of dumping of organic waste. The remediation of the contaminated areas will guarantee enhanced soil quality.
Expected start and end dates (Year)	2019 – ongoing (monitoring)

Policy option/action reference	**SW07– PO**
Policy option / action	Improvement of planning and regulatory documentation for better waste management
Environmental topic(s)	Soils, Water, Mitigation of GHG emissions
Strategic objective(s)	SL02, SL03, GH01
Description	The current Spatial Plan for Canton of Sarajevo 2003-2023 does not include any allocated space for the development of waste treatment and disposal infrastructure. A change in the waste fees system will be required as the current system is not profitable and is based on the occupied square metres rather than on the actual generated quantities of waste, as proposed in the Sarajevo Canton Waste Management Plan 2015 - 2020. To overcome the risk of illegal dumping because of this change, it will be required to introduce high fines. All these aspects should be treated within new spatial documents and regulatory documents at cantonal level.
Owner	Sarajevo Canton, Ministry of Physical Planning, Construction and Environmental Protection of Sarajevo Canton
Stakeholders	Waste management companies
Capex	EUR 1
Benefits	The review of waste fees and the shift from an area-based fee system towards one based on generated quantities will be an important driver for the reduction of generated quantities of waste, as residents producing larger quantities will be financially penalised.
Expected start and end dates (Year)	2019-2020

3.3. Prioritisation of policy options and actions

To be finalised after workshop

Table 3.2: Policy option / action initial prioritisation

To be finalised after workshop

3.4. List of actions requiring investment

To be developed after workshop

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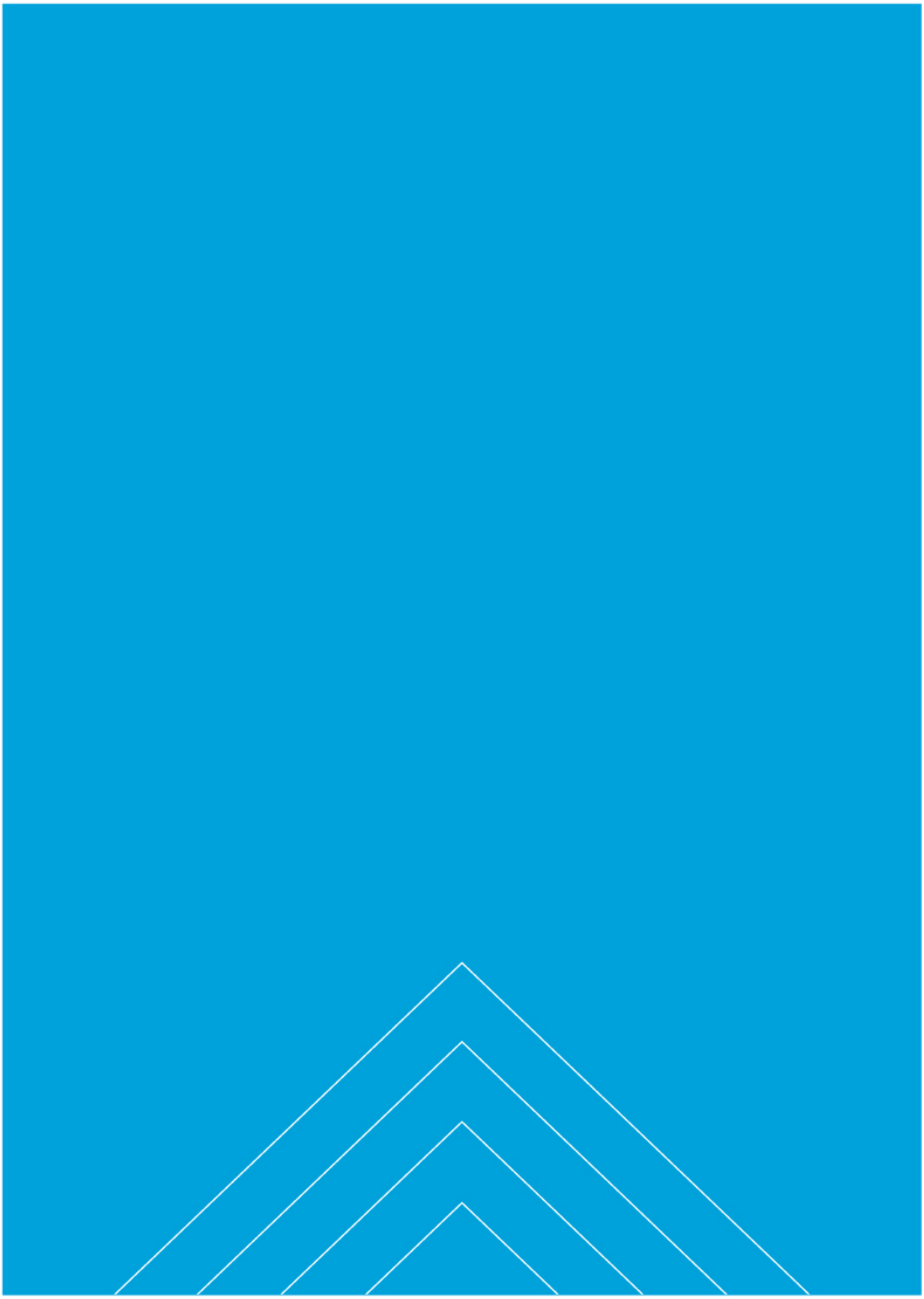

Mark Hewlett / Catalina Gallego-Lopez
Atkins Limited
Nova North
11 Bressenden Place
Westminster
London
SW1E 5BY

Tel: +44 (0)20 7121 2000
Fax: +44 (0)20 7121 2111