City of Craiova
Green City Action Plan
Vol 1 – Main Report

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A management team was established to develop the Green City Action Plan. This team included:

- **The Mayor of Craiova,** Mr. Mihail Genoiu;
- **The Vice Mayor of Craiova,** Mr. Stelian Baragan;
- **The Five Members of the "Focal Point" group** – Mr. Alin Glavan (Deputy Director), Mr. Claudiu - Nicu Popescu (Executive Director), Mr. Catalin Popa (Environmental Inspector), Mr. Gabriel Rosca (Energy Inspector), and Mr. Nicu Barbu (Inspector, Public Relations);
- **EBRD's Operational Leader** Ms. Venera Vlad, Ms. Dana Ionescu, Ms. Raluca Badau, Ms. Anamaria Ionita (supported by Mr. Hiroyuki Ito);
- **Three members of the Consultant's management** team: Mr. Phil Le Gouais (Team Leader). Mr. Dumitru Calina (Local Coordinator) and Ms. Alina Dumitrascu (Project Manager) – subsequently replaced by Mr. Alexandru Odangiu

The consultant's team was a consortium led by Mott MacDonald Ltd (UK) with support from E Co. Ltd (UK), Mott MacDonald Romania SRL and a number of independent local and international sector experts.

A range of other institutions and individuals have contributed to the development of the Green City Action Plan through various workshops and meetings, including public utilities and service providers, as well as members of civil society groups, academics and ultimately members of the general public. We thank all involved for their constructive contributions to the process

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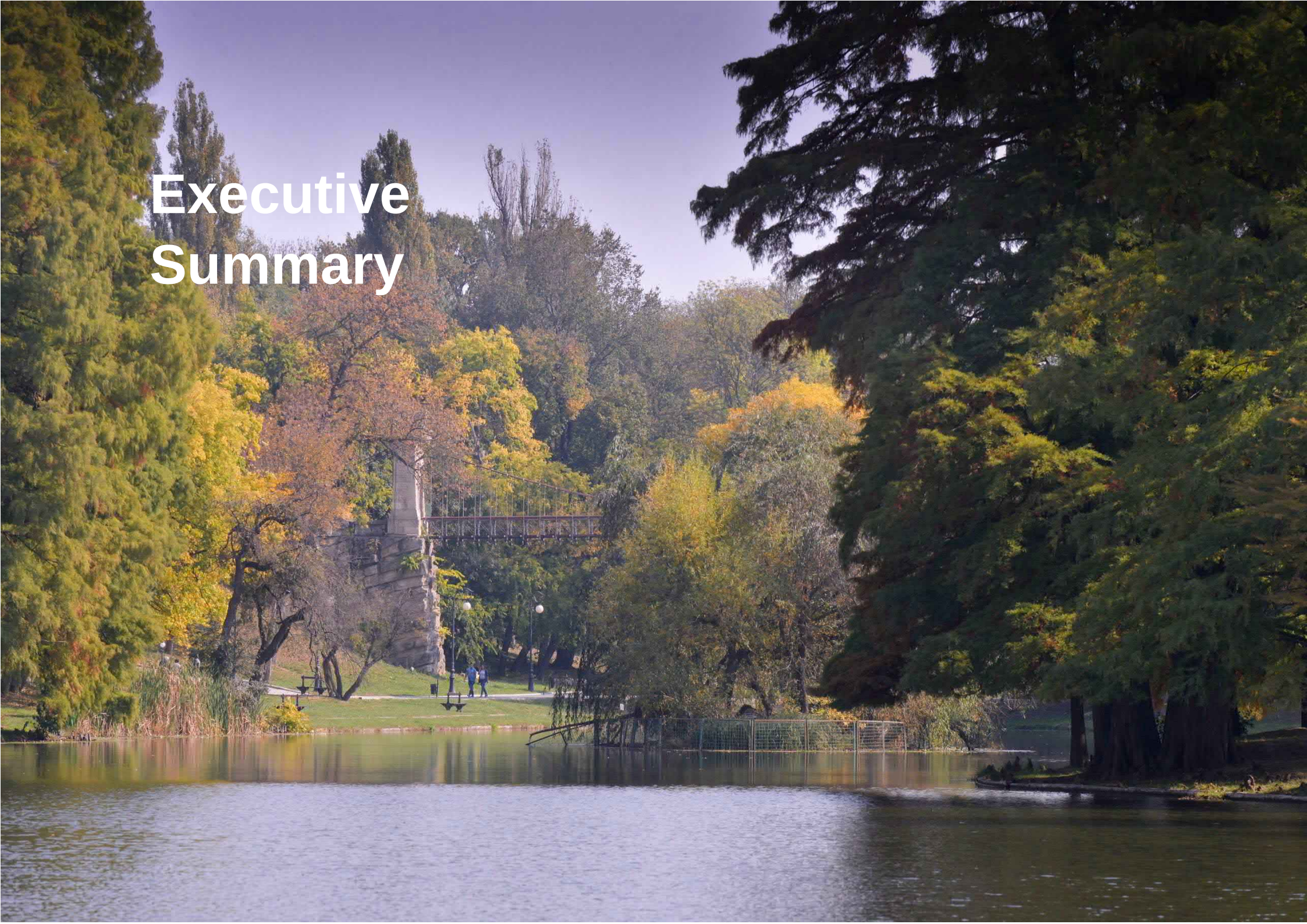


Executive Summary

The City of Craiova is committed to providing a safe, healthy, and clean environment for our citizens and we have undertaken a significant amount of work in recent years to improve the quality of the urban fabric. We are proud to have become the first city in Romania to join the EBRD's "Green City Programme" which aims to support cities in addressing environmental challenges through development of Green City Action Plans, Sustainable Infrastructure Investment and Capacity building.

Since July 2018 we have been working with consultants, service providers and other stakeholders to systematically analyse and prioritise environmental challenges in the city and propose both policy measures and bankable investments that the city can make to improve its environmental performance.

As a part of the process and in consultation with city officials, stakeholders, and citizens, we have established the following Green City vision for Craiova which has guided the development of the Green City Action Plan (GCAP):

"A vibrant, growing city built on the principals of Green Development and smart technology, with rehabilitated green spaces and efficient mobility networks."

What are the priority environmental challenges?

A Green City Baseline was established by measuring our City's performance against a series of Benchmarks considering the current state of the environment, the pressures placed on the environment by society and our current responses to areas of challenge. A consultation exercise was then held to discuss with a wide range of stakeholders including youth groups, community organisations, city officials, infrastructure operators and key service providers.

Key areas of concern as a result of this process included:

Air Quality – levels of the core air quality indicator (PM2.5) were found to be elevated with evidence that there are also elevated levels of PM10 in the winter and occasional exceedances of NOx standards.

GHG Emissions – Annual emissions of GHGs per capita is high at 13.7 tCO_2e/capita/year. Key contributors to this residential buildings, transport, and other buildings (such as private buildings and municipal buildings).

Green Space – While we have several large parks, there has been poor information available on smaller green spaces in the city, many of which have been under development pressure.

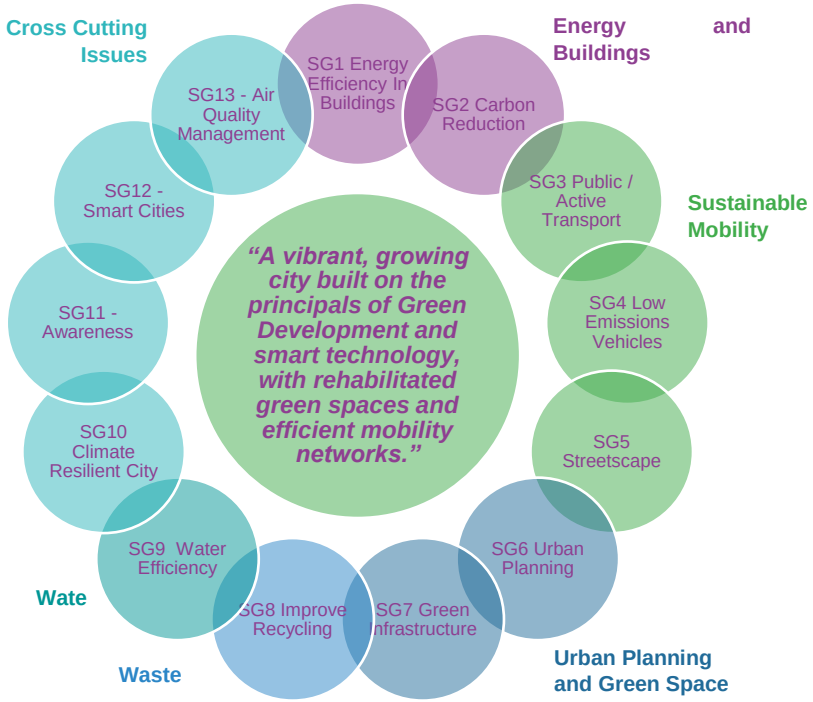
Resource Consumption – Consumption of resources such as water, and energy and production of waste were all of concern.

Climate Vulnerability – There is no formal planning in place to understand risks from Climate Change or develop adaptation strategies.

Land use pressures – Despite a low population density and a stable overall population, there is development pressure on both green space and on city fringe areas, which could encourage 'sprawl'.

What are the plan's goals?

The plan has set out 13 Strategic Goals across 6 Sectors with the aim of addressing the challenges identified in the Green City Baseline. These Strategic Goals are to be achieved over the next 10 -15 years across 6 sectors with a range of supporting "mid term" targets to be achieved with a 5 – 10 year timeframe. These sectors include 5 infrastructure or service sectors such as Energy and Buildings, Sustainable Mobility, Urban Planning and Green Infrastructure, Waste, Water. As well as a Cross Cutting Issues sector



What is in the plan?

A total of 29 Actions across 6 sectors have been identified. 17 are capital/infrastructure investments and 15 are supporting activities such as policies, guidance or capacity building. These include:

Action	Costs (€M) Estimated Total CAPEX	Additional Annual OPEX
Buildings and Energy		
Investments in refurbishment of residential and municipal buildings to improve energy efficiency and in the District Heating network to support national commitments for decarbonization and ensure a long-term sustainable network.	€378.26	€0.05
Sustainable Mobility		
Investments in the public transport network and rolling stock (Tram and Bus) complemented by investment in walking and cycling infrastructure as a significant mode. Supported by planning guidance and revised parking policies	€ 299.86	€ 1.01
Urban Planning and Green Space		
Supporting investment in rehabilitation of brownfield sites for both economic use (e.g. commercial and residential) as well as for green infrastructure such as trees, green walls and small urban greenspaces.	€ 4.84	€ 0.34
Waste		
Supporting infrastructure investment (made under a separate EU supported program) with institutional strengthening and public awareness	€ 0.02	€ 0.41
Water		
Investments in reducing water losses both through demand management and improvements to the distribution network.	€ 6.12	€ 0.03
Cross Cutting		
A range of policy measures and supporting actions to address cross sectoral issues such as Climate Resilience, Air Quality, Public Participation and Smart Cities Technology	€ 0.18	€ 0.03
Totals	**€ 689.28**	**€ 1.87**

What are the main benefits of the plan?

Environmental Benefits - The GCAP process has specifically focused on the development of measures to achieve environmental benefit and address the key areas of concern described above. Some of the key benefits identified include:

- Air Quality – Improved air quality from reduced vehicle emissions and improved efficiency buildings and district heating leading to reduced reliance on polluting fossil fuels.
- Climate Mitigation – Generate **approximately 323,000 tonnes CO_2eq / year** in carbon savings from energy and transport savings.
- Green Space – Improved management of green space maximising biodiversity benefit as well as investment in additional areas.
- Resource Consumption (Material Use) – Supporting existing targets through capacity building and awareness to reduce waste production and increase recycling.
- Resource Consumption (Water Use) – 10% savings in water demand and a reduction in losses by 35% from the network.
- Resource Consumption (Energy Use) – Reduce energy consumption through improved efficiency in buildings (~270,000 MWh/year savings) and improving the district heating network.
- Climate Vulnerability – Integrate adaptation and resilience into existing planning processes to ensure that plans are climate ready.
- Land Use – Deliver an up to date land use plan which: prevents sprawl, factors in transport challenges, and protects and enhances greenspace to deliver a cleaner more efficient city.

Social and Economic Co-Benefits – In addition to environmental benefits it is also important to consider and recognise potential economic and social co-benefits. These include:

- Financial returns - for investors in the projects, many of which will generate either efficiency savings or increased revenue
- Non-financial economic benefits - by making the city a more attractive investment prospect; reduced operating costs; potential tariffs reductions for users; green employment opportunities and creating a reliable and efficient enabling environment for workers and business to prosper.
- Public health - benefits from reduced exposure to pollution, improved wellbeing through improved green space, as well as opportunities to promote more active lifestyles.
- Gender equality - by improving engagement to better hear citizens voices and providing infrastructure that is designed to meet the different needs of both men and women.
- Accessibility - benefits by providing infrastructure and equipment which is designed to modern standards which facilitate better accessibility for users with restricted mobility.

How did we engage stakeholders?

Our stakeholder register includes 18 NGOs/community organisations, 4 public utilities companies; 3 regional governance bodies; 5 major industrial organisations 10 academic institutions, and significant effort was made to reach out to the general public through local media channels (TV, Web and Radio) and an online questionnaire. Both men and women were present at all events. Key engagement activities included:

Activity	No of Attendees/ Respondents
Public Launch Event (Oct ‘19)	74
Visioning and Strategic Objectives Workshop (Dec ‘19)	33
Youth Forum (Dec ‘19)	34
Online “options” Questionnaire Jul ‘20)	135
Formal Disclosure (including online presentation) (Sept/Oct ’19)	No Data
City Website and Social Media Feeds (throughout process)	No Data
Mass Media Coverage (at key events)	Unknown

1 Introduction

The City of Craiova is committed to providing a safe, healthy and clean environment for our citizens and we have undertaken a significant amount of work in recent years to improve the quality of the urban fabric. This has included investment in urban improvement, as well as investing in strategic studies for the city itself, such as a Sustainable Energy Action Plan (SEAP) and Sustainable Urban Mobility Plan (SUMP). We have also worked with members of the Craiova Growth Poll in developing an Integrated Urban Development Plan. These plans have been used to access funding to help implement projects that have improved efficiency in public lighting, implemented energy efficiency measures in public buildings (such as kindergartens and the Victor Babeş hospital); substantial investments in public transport assets (including 38 Euro 6 Buses with finance from the European Bank for Reconstruction and Development (EBRD); 16 Electric buses with EU funds and a further 20 electric buses and 17 trams in process); a number of street rehabilitation schemes and re-surfacing pedestrianised areas of the city centre with high quality materials to create a safe, attractive and accessible environment for people. As part of the wider growth pole investments have been made in improvements to the water and waste infrastructure servicing the city. However, there is more to do to enhance the environmental performance of the city.

That is why Craiova was proud to become the first city in Romania to join the EBRD Green Cities. Since October 2018 we have been working with consultants, service providers and other stakeholders to systematically analyse and prioritise environmental challenges in the city and propose both policy measures and bankable investments that the city can make to improve its environmental performance.

1.1 What is an EBRD Green City?

As an EBRD Green City Craiova has agreed to strive towards building a better and more sustainable future for it's residents. The Green Cities programme aims to achieve this by identifying, prioritising and connecting cities' environmental challenges with sustainable infrastructure investments and policy measures.

An EBRD Green City aims to:

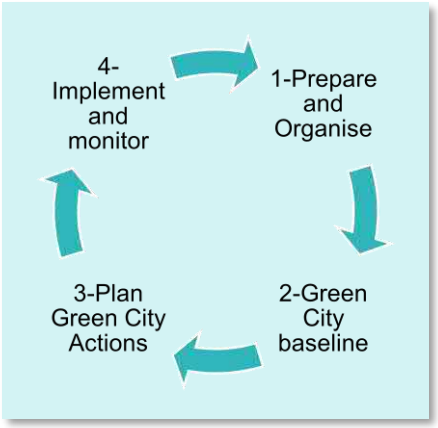
1. Preserve the quality of environmental assets (air, water, land and biodiversity) and use these resources sustainably;
2. Mitigate and adapt to the risks of climate change;
3. Ensure that environmental policies and developments contribute to the social and economic well-being of residents

The GCAP is based around three principles of planning, investment and capacity building (as set out below).

Figure 1.1 Key Components of the Green Cities Programme

1.2 How this plan was produced?

Development of Craiova's GCAP involved assessing the city's environmental performance using 35 core indicators that cover a wide range of urban issues. The indicators evaluate the state of the city's environmental assets, its' overall resource efficiency and climate change risks. These indicators were complemented with local stakeholder input from civil society organisations, private-sector partners and municipal and national actors to help identify and prioritise the city's environmental challenges. This was achieved in four stages, described below.



1. Prepare and organise

As part of the GCAP process we made a commitment to provide time and resources to the development of the plan. This firstly involved establishing[1] a management committee "Focal Point" to help steer the development of the GCAP, consisting of senior members of different municipal departments responsible for different city sectors. The Focal Point was supported by technical experts from their municipal teams who worked collaboratively with the Consultant to provide data and feedback on the technical elements of the GCAP.

A group of consultants was appointed (with support from the EBRD and the Government of Austria) to provide technical support in undertaking the necessary assessments, identifying and evaluating opportunities and developing the GCAP. The consultancy was a

[1] This was established by Disposition J269 approved 10/6/2019

consortium of experts led by Mott MacDonald Ltd and E Co. Ltd, both of the United Kingdom. They were supported by a team of local experts (in house and independent).

Table 1.1 Focal Point Group members

Member	Department	Role
Alin Glavan	Public Services Department	Deputy Director
Claudiu-Nicu Popescu	Public Relations and Document Management	Executive Director
Nicu Eugen Barbu	Publicity Department	Inspector
Catalin Popa	Public Services Department – Environmental Issues	Inspector
Rosca Gabriel	Public Services – Energy Utility	Inspector

A review of existing policies was conducted by EBRD in cooperation with the City to ensure that the GCAP builds on urban policies previously developed. The policy review also assessed the level of political support within the municipal government, as well as identifying a number of legal and political risks related to the GCAP and the potential for future investment.

Figure 1.2 Mayor Genoiu and representatives of the EBRD and Consultants during the launch event October 2019

Stakeholder analysis was undertaken to identify key individuals and stakeholder groups, including private-sector representatives, local academics, civil society organisations (CSOs) and organisations responsible for municipal services such as energy, water, waste and transport utilities. These stakeholders have been involved throughout the development of the GCAP, sharing their views and input to help share the Plan and ensure that all the important environmental challenges and appropriate solutions have been identified.

The GCAP process was formally launched in October 2019 together with a series of stakeholder engagement sessions which sought to collect preliminary views from internal and external stakeholders on the current situation in terms of environmental quality, urban planning and infrastructure development of the City. Discussions also took place with non-governmental organisations, universities and research institutions, as well as international and bilateral organisations conducting similar work in the city.

2. Identifying and prioritising challenges – setting the Green City baseline

The Green City baseline forms the diagnostic component of the GCAP process and documents the city's current environmental performance, including the governance and policy frameworks in place that affect it. Importantly, it identifies a set of priority environmental challenges that the City will be addressed by actions developed as part of the Plan.

To determine the baseline, firstly, the GCAP team mapped out relevant political, legal, economic, social and environmental conditions, as well as emerging urban issues and policies which could affect this GCAP.

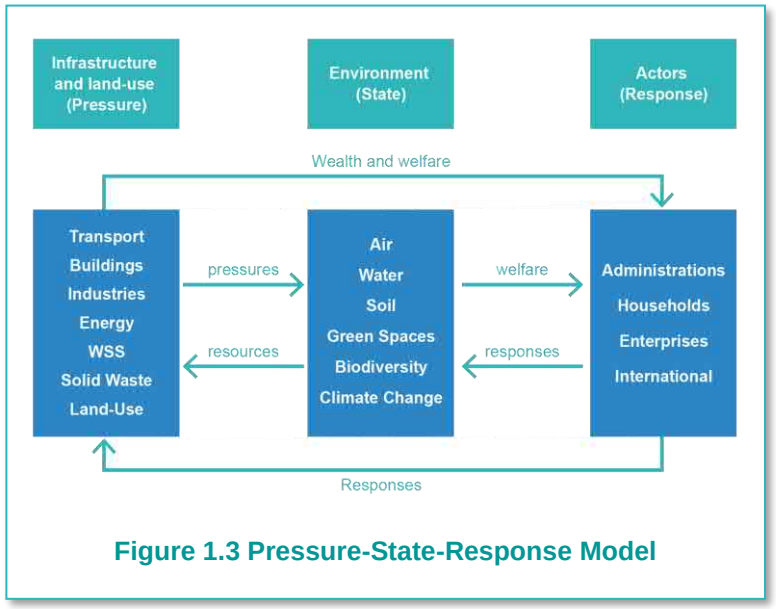


Figure 1.3 Pressure-State-Response Model

Next, we mapped the city's environmental performance by collecting and benchmarking environmental performance against indicators defined by the EBRD's GCAP methodology. These indicators are designed around the OECD[2] Pressure-State-Response model which is a commonly used framework to define environmental performance that examines relationships between the ***Pressures*** we place on the environment (through activities such as transport, energy use, resource consumption), the ***State*** of the environment (for example the quality of the air or the availability of resources such as water) and the ***Responses*** in place to manage the pressures we place on the environment.

The methodology targets 35 core indicators, across the State and Pressure categories but as not all indicators are available in all cities, there are further 55 optional indicators to provide alternative measures for key areas of performance. The full list of indicators assessed as part of the Craiova GCAP collected is included in Appendix **Error! Reference source not found.**.

A technical assessment was undertaken to identify Green City challenges. This explored the drivers of performance, which included a description of the current quality of the city's infrastructure; and existing management approaches, including policies, directives, standards and legal frameworks governing or affecting the indicators. The Green City challenges we identified highlighted areas of concern with respect to the current quality of environmental assets, potential future pressures from development, climate change, and gaps in policy or strategies in relevant sectors.

A stakeholder consultation exercise was held to present our baseline findings and city experts and stakeholder representatives were given the opportunity to confirm or dispute the relevance of Green City challenges that had been identified. This was aided by a first draft of

[2] Organisation for Economic Co-operation and Development

the Green City priorities, based on the technical assessment and a series of workshops that were held in December 2019 to complete the technical assessment, prioritise the challenges to be addressed in the Green City Action Plan and identify strategic goals.

These consultation workshops were held over three days at the Multifunctional Centre in Craiova and included the following key events:

Workshops	Purpose
Youth Forum	It is clear that youth groups take a strong interest in environmental challenges facing society and a specific workshop was held to provide an opportunity for youth groups to contribute to the development of the Plan. Stakeholders were drawn from the existing Craiova Youth Council, as well as representatives from the University.
Prioritisation	The consultant's Technical Assessment of indicators was presented to a range of official and civil society stakeholders to discuss recommendations for the Challenges to be prioritised in the GCAP. The objective was to discuss and finalise the conclusions of the assessment taking account of stakeholder views.
Visioning & Strategic Objectives	A session was held to elicit the key principles to include in a "Vision" for the GCAP and a second session was held to discuss draft Strategic Goals which could be included in the GCAP in support of the new GCAP vision statement. Feedback was used to shape a final strategic framework for the Plan. (Stage 3 – see below)

The Green City baseline was then finalised by the Consultant's team and reviewed and confirmed by the City's Focal Point team to ensure there was support from key stakeholders and experts. The Green City Baseline analysis is presented in Section 1 of this report.

Figure 1.4 Visioning and Objectives Workshop

3. Planning Green City actions

We have established a number of Green City actions to improve Craiova's environmental performance through targeted investment. This involved developing a long-term vision (10 to 15 years) for green city development. We then identified specific, short-term actions (1 to 5 years) that can be taken to reach the long-term vision, as well as medium-term targets (5 - 10 years).

The Green City Vision and Strategic Goals were developed by the consultants following their technical analysis and the stakeholder workshops described which took account of Youth Groups, Technical Stakeholders, Civil Society Groups, Mayor Genoiu and our own staff.

A long list of Green City actions was then developed to meet those strategic goals in collaboration with the consultant team and taking account of ideas that had come out of the workshops in December 2019.

This longlist was circulated via the “Focal Point” group to collect feedback from technical stakeholders including additional information on the status and technical details of ongoing initiatives, as well as an opportunity to review and consider some of the new proposals being developed. The project was required to adapt to the COVID-19 pandemic, resulting in this technical engagement with the Consultant being conducted remotely rather than through more traditional workshops and meetings which have been employed on other projects.

The long list of options was assessed by the Consultant’s team using a Multi-Criteria-Analysis (MCA) appraisal framework which provided an objective basis for filtering and prioritising the projects that are included in this Plan. The criteria used to assess the options included consideration of the level of **Benefit** that a project might deliver, its **Potential to Receive Finance** (from any source), its’ **Technical Deliverability**, whether it achieved “**Additionality**” (i.e. whether the GCAP was duplicating benefit already being achieved or if inclusion in the GCAP would genuinely achieve new benefit) and **Policy Alignment** to avoid including actions that did not align with established policy.

This resulted in a short list of options which were then submitted for further consultation with a broader range of stakeholders. Typically in the GCAP process this would have been delivered through stakeholder workshops, however due again to the constraints placed upon us by the COVID-19 pandemic, the team adapted the approach and developed an online questionnaire was used to collect views from stakeholders (technical, civil society and the general public).

The analysis and stakeholder engagement were then used to develop summary proposals for a series of “Actions” which address the Strategic Objectives and are presented in the Section 3. This included more specific analysis of benefits which included analysis against a list of environmental, social and economic benefits defined in the EBRD GCAP methodology and an approximate calculation of Greenhouse Gas emissions reductions where relevant.

4. Implementing and monitoring Green City actions

We have developed an implementation plan to identify the timescales and resources required to deliver and track the status of the GCAP actions. We have also developed an impact monitoring plan which measures the impact of GCAP projects and policies on the city’s environmental performance.

This section also sets out responsibilities within the City Hall to ensure that activities are coordinated across each municipal department, with appropriate leadership and financial resources allocated to support implementation of the different measures and initiatives identified in the Plan. We will also report on progress against the plan and collect required data to determine the level of impact that the investments carried out have had.

Ultimately, we will update and revise the plans as necessary through the implementation period. Budgets and timescales will be set in each department and they will report back on the performance of the GCAP actions under their responsibility.

The monitoring and reporting tools used to track progress will be used to inform future cycles of the Green City Action Plan.

1.3 How did we involve Stakeholders?

1.3.1 Key Stakeholder Groups

Early in the preparation of the GCAP we undertook a stakeholder mapping exercise to identify key stakeholder groups to be engaged. These groups were invited to take part in initial engagement events.

- **Political leaders** – Mayor and Deputy Mayor;
- **Council Commissions** – Commission for Planning, Environmental Protection and Conservation of Monuments and Commission for Budget and Finance, Studies, Forecasting and the Public Domain Administration;
- **City Hall Departments** – Eight City Hall departments were identified as stakeholders who may be responsible for delivering actions or regulating actions;
- **Civil Society Groups** – 14 Civil Society groups were identified covering a wide range topics;
- **Public Utilities Companies** – four service providers were identified covering water, waste, transport and district heating;
- **Regional Agencies** – four regional agencies were identified including the county council, regional development agency, environmental protection agency and the ROP implementation body;
- **Other Companies and organisations** – several other relevant companies were identified including power providers and industrial companies;
- **Media/General Public** – Consultation activities were promoted to the general public through both mainstream media coverage and online media (including the City Hall Website and Facebook pages) to encourage participation

1.3.2 Key Engagement Activities have been undertaken throughout the process

Stakeholder engagement has been critical to the development of the GCAP and we have worked hard to involve different city stakeholders throughout all stages as the Plan has been developed as summarised below.

Get Prepared	Internal stakeholders were engaged by the Consultants at an **Inception Workshop** in May 2019. A broad ranging **Launch Event** in October 2019 was held which presented the purpose and proposed timeframes for the GCAP development to which all stakeholders were invited.
Baseline	We engaged with a range of technical stakeholders to gather information and data for the benchmarking exercise. Internal stakeholders were consulted over the policy and regulatory framework as well as the preliminary technical assessment. Wider engagement with stakeholders was undertaken in December 2019 when the Consultants hosted a **Prioritisation Workshop.** This included representation from CSOs and a Youth groups as well as technical stakeholders.
Actions	Technical stakeholders were engaged via a **technical questionnaire** which supplied a “long list” of options along with requests for further information on ongoing schemes. The **Vision and Strategic Goals** were prepared following a **dedicated workshop** session in December 2019 held with a wide range of stakeholders. The consultant also developed a questionnaire which sought views on the proposed actions from both technical stakeholders and the general public.
Implementation	The GCAP will be approved as a local decision governed by the Administrative Code. It has been subject to the necessary transparency procedure which required the document to be publicly advertised for comment. Comments received were taken into account in the final document

1.3.3 Impact of Covid-19 on stakeholder engagement

The ability to engage with stakeholders was impacted by the emergence of the COVID-19 pandemic which significantly impact in March 2020 and has had an ongoing impact throughout the development of the plan. In terms of stakeholder engagement this primarily affected our ability to host direct dialogue with people and particularly for the international expert teams to host workshops, which would typically have been undertaken. The original programme envisaged technical meetings with City officials an "options workshop", "a GCAP presentation" event and several capacity-building workshops. The following alternative approaches were used:

- *Meetings with officials* – in place of direct meetings, a technical questionnaire was issued to technical stakeholders with a preliminary list of projects which was developed by the Consultant (based on existing policy documents and ideas captured in workshops held in December 2019). Technical stakeholders gave feedback and where necessary, the consultants experts held telephone calls with counterparts in the City Hall to gain further insights.
- *Options Workshop* – a workshop would have been held to present the proposed options an discuss directly with stakeholders the validity of the options and their priorities. In place of this workshop the Consultant prepared a digital questionnaire accompanied by a summary document to provide background information providing stakeholders (technical and civil society) the opportunity to express their view of the proposed projects for inclusion in the GCAP. Further details of this questionnaire are presented in Appendix **Error! Reference source not found.**.
- *GCAP Presentation* – an event to present the Draft GCAP would have been held towards the end of the process which set out the content of the GCAP and provided an opportunity for final feedback on the document. This meeting was held virtually on the 20th October via a "Zoom" call with members of the press, EBRD, Mayor Genoiu and his team as well as the consultant. In addition to this the draft GCAP document was published on the City's website for public access and stakeholders previously involved in the dialogue were specifically prompted to review and respond to the draft document and provided with a recording of the presentations provided during the Zoom presentations referenced above. The outcomes of this consultation process and the approach to integrating these into the document are summarised in Appendix **Error! Reference source not found.**.

2 Green City Baseline

2.1 General Facts

Our City is the most important municipality in the South-West Oltenia Region. It is the capital of Dolj County and one of the largest cities in Romania. It is also the main commercial city to the west of Bucharest (which is approximately 230 km to the east).

Craiova is located at approximately equal distances from the Southern Carpathians (to the north) and the River Danube (to the south) and is located on the Romanian Plain in the south of Romania. It is on the left bank of the Jiu River, one of the main rivers in Romania, more precisely in the Oltenia Plain that stretches between the Danube River, Olt River and the Getic Plateau.

Our success as a city is an important part of Romania's national economic growth with Craiova being designated one of seven regional Growth Poles. A part of our economic importance relates to our status as an important national transportation hub located at the crossroads of three European roads passing through Romania, connecting the country to Western and Southern Europe.

Historically the Craiova area has been an important industrial centre and we have a long heritage in highly skilled manufacturing with our main industrial platform supporting companies such as Electroputere, FORD, MAT SA, SC POPECI SA, as well as servicing the construction industry, furniture manufacture, aviation, a brewery and many other smaller industrial units. There are also several important power installations in the area, most notably two large thermal power plants in the city.

Size

- Population ~ 303,000 (2018)
- Stable following regrowth after decline in '00s
- Territory ~ 81.4km^2

Key Natural Assets*

- Jiu River
- Parc Nicolae Romanescu (3rd largest urban park in Europe)
- Complexul Lacustru Preajba - Făcăi (Nature reserve to the south)

- ** See figure 2.1 for locations*

Employment:

- Commerce 24%
- Industry 23.8%
- Health & Social Care 9.1%
- Education 7.4%
- Construction 5.9%
- Support Services 5.8%

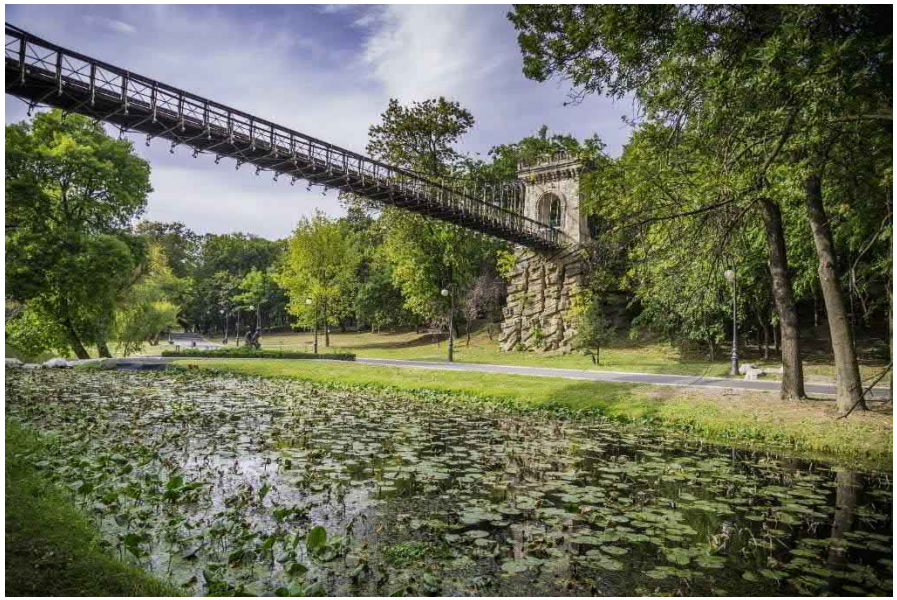
Key Economic Contributors:

- Significant Manufacturing Capacity (incl Automotive, Aviation, Heavy Equipment, Agricultural Machines, Furniture, Brewing)
- Energy (2 major power plants)
- Tertiary Education
- Important role in regional agricultural economy

2.2 Geographical Scope

The agreement we have made with the EBRD in developing this plan is to look at investment that is specifically for municipality of the City of Craiova as the main urban area. It is important to distinguish this from the “Craiova Metropolitan Zone” which is one of seven wider geographical areas designated as “Growth Poles” at a national level to support a “polycentric growth model”. This wider growth pole area includes a number of other municipalities including the towns of Filiaşi and Segarcea which have not been considered within this Plan.

While actions presented in the Plan generally relate to the immediate municipal area, some of the investments may fall outside the administrative boundary if they are substantially linked to the lives of people in the city (for example facilities in Insalnita).



2.3 Key Features in the City

There are some significant assets, both natural and infrastructure related, that are described in the document. For residents of Craiova these may be familiar features, but for potential investors it may be useful to provide orientation. These include:

- Power plants Termocentrala 1 (Insalnita) and Termocentrala 2 (in the north of the main body of the city);
- Various parks and public open spaces including
  - The Nicolae Romanescu Park;
  - Tineretului Park;
  - Complexul Lacustru Preajba in Facai (protected Nature Reserve);
  - Jiu River (international designated site)
- Industrial zones on the Western and Easter ends of the city;
- A central pedestrianised area;
- Water Treatment works at Isalnita to the north of the city;
- Wastewater Treatment Works at Facai to the south of the city;
- Landfill site to the west at Mofleni; and
- The broad area known referred to as the “northern belt” which may have potential for expansion of the city’s territory

These features are identified on Figure 2.1 overleaf.

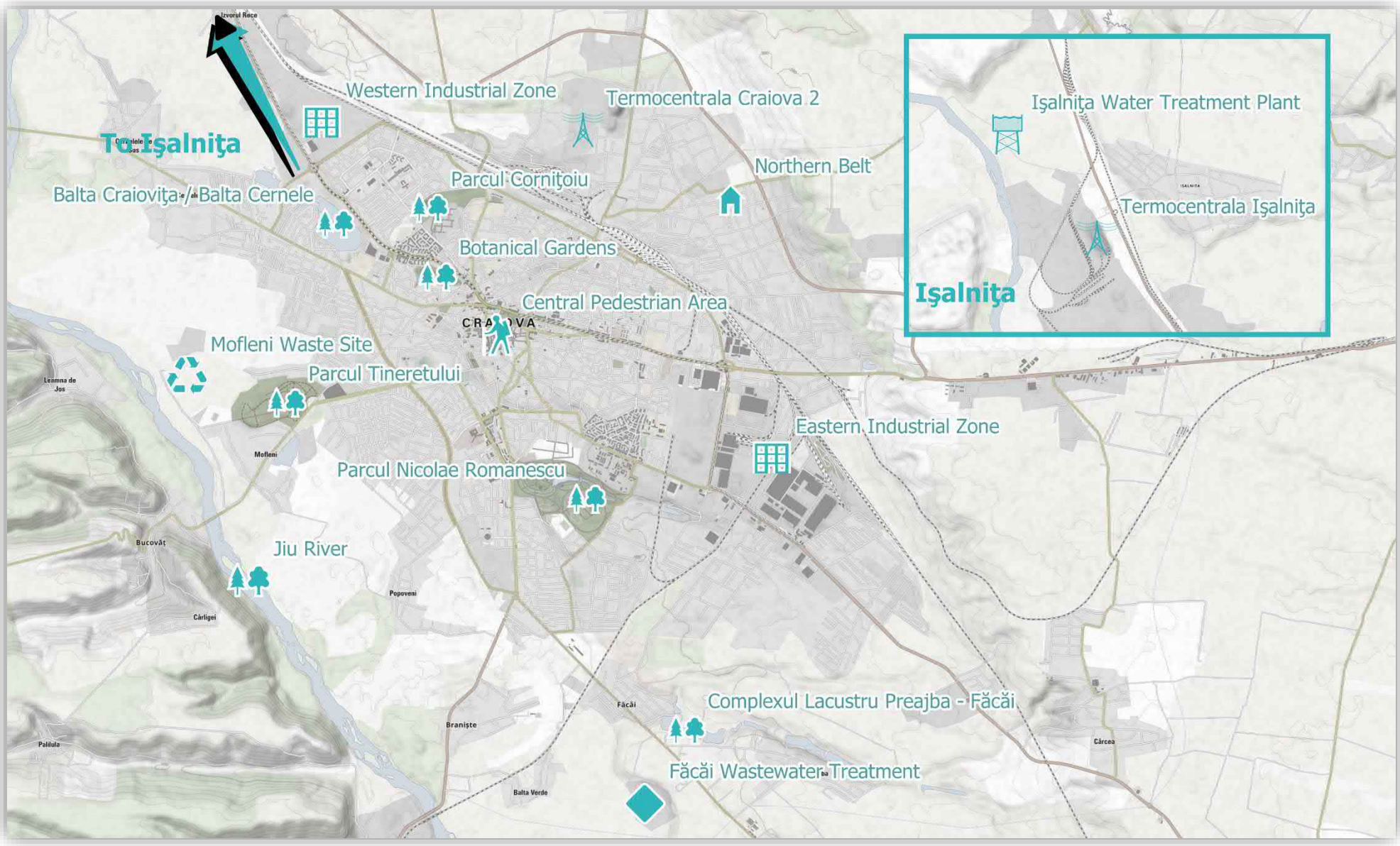


Figure 2.1 Notable features in the City of Craiova

2.4 Current Strategic Plans

The principle of identifying and managing environmental risks is not new to the City of Craiova and, while the EBRD Green Cities programme has provided a useful way of consolidating some of the actions, the plan builds upon some of the existing strategies and activities that we have undertaken. A full analysis of policies and strategies is provided in Appendix **Error! Reference source not found.**. A summary of the key documents and their outcomes is provided below.

- The General Urban Plan (in development – due 2021);
- Integrated Urban Development Strategy (2018);
- Sustainable Urban Mobility Plan (2015);
- Sustainable Energy Action Plan (2014);
- Integrated Waste Management System Dolj County;

General Urban Plan (in development)

Scope: Craiova Municipal Area Timeframe: 2021 - onwards

Overview:

The General Urban Plan produced for the City of Craiova was developed in 1997 and was based on a rolling 10-year programme of updates. However, this did not result in significant changes from plan to plan. The current plan is now effectively defunct, and the absence of an up-to-date plan has made systematic urban planning and development control challenging. As the content is no longer relevant to the city, the GCAP team has not examined schemes or policies included in the now expired General Urban Plan. We have however commissioned a new General Urban Plan to rectify this (https://www.primariacraiova.ro/ro/comunicate-de-presa/municipiul-craiova-va-avea-un-plan-urbanistic-general-pug-nou-si-complet-digitalizat.html).

Linkage to GCAP:

The General Urban Plan (supported by a Zonal Urban Plan and Detailed Urban Plan) sets out the legal basis for development in the city and is a mandatory document for each administrative unit and sets out the future development trajectory for the city. It is essentially the roadmap for the city's development and sets the rules against which development proposals are measured for compliance. Policies proposed by the GCAP could be integrated into the General Urban Plan to ensure they are enacted.

Key Outcomes:

We have commissioned the development of a new digital General Urban Plan to be at the forefront of a new Urban Vision for the city, providing a GIS based digital portal for planning needs. This plan is currently under development and there is ongoing consultation activity to solicit views from citizens, but some central components of the plan are likely to include: a digital approach to improve people's access to information and make permitting processes more efficient; the expansion of the cities boundaries to allow growth and a register of green spaces.

Integrated Urban Development Strategy

Scope: Craiova Growth Pole Area Timeframe: 2017 - 2023

Overview:

An extensive report published in 2017 that outlines the development plan of the Metropolitan Zone of Craiova (which incorporates both the municipality of Craiova as well as the wider development zone including the towns of Filiaşi and Segarcea along with 21 other communes.

The plan maps out comprehensive economic, social and environmental baselines of the “Growth Pole”, analyses problems and potential solutions, defines a vision and strategic objective and maps out specific projects which are considered to have the potential to meet those strategic objectives. This was developed primarily as a tool to identify projects to be implemented under Priority Axis 4 of the Regional Operating Programme (ROP) 2014 - 2020 (and implementation period up to 2023).

T plan aggregated investments contained in other plans such as the Sustainable Urban Mobility Plan and the Sustainable Energy Action Plan and could be seen as a “long list” of potential investment opportunities.

Linkage to GCAP:

This regional plan sets out a very broad investment programme, agreed across a range of stakeholders for the wider Craiova Growth Pole region. It therefore represents existing policy commitments that need to be respected as well as identifying a long list of potential investments, many of which overlap with GCAP objectives. It is therefore important that the projects identified within the Integrated Urban Development Strategy are considered to ensure that the GCAP builds upon existing commitments as well as generating new ideas. It overlaps with almost all of the areas of interest within the GCAP (with perhaps the exception of Climate Resilience which the Integrated Urban Development Strategy does not address in any detail).

Key Outcomes:

We have been able to secure financing (from a range of sources) for a range of projects included in this plan most notably:

- Various street modernisation projects;
- Purchase of 38 new efficient buses (financed by EBRD);
- Securing finance for the rehabilitation of Craiova City Hall headquarters (financed by EBRD);
- Expansion of the clinical hospital with neurological recovery station;
- Feasibility studies for revitalisation of the Cornitoiu area of Craiova

Sustainable Energy Action Plan (SEAP)

Scope: Craiova Growth Pole Area Timeframe: 2013 - 2030

Overview:

In line with the European Communities commitment to significantly reduce Greenhouse Gas (GHG) Emissions, we worked with the other administrations which constitute the Metropolitan Zone of Craiova to produced a Sustainable Energy Action Plan following the methodology set out by the EU Covenant of Mayors. This has a general objective of ***"Reducing energy consumption from conventional sources by improving energy efficiency and sustainable use of renewable sources"***

Linkage to GCAP:

While now several years old, this plan included an important analysis of the energy consumption and GHG emissions in the city, as well as identifying projects which can contribute to improvements in energy efficiency and reductions in GHG emissions. Energy and Carbon are critical elements of the city's performance in a number of sectors but most notably energy, buildings, and transportation. While some projects have been implemented, many of the projects contained within the plan remain useful options to further reduce emissions and improve energy efficiency and therefore both baseline information and projects have been considered within the GCAP development process.

Key Outcomes:

The development of this plan has provided us with a Baseline Emissions Inventory from 2013 and has identified a range of opportunities to improve energy efficiency and reliance on conventional energy sources. It sets specific targets for the overall Metropolitan Zone to reduce energy consumption by 22.6% and CO_2 emissions by 41%.

The projects included in this SEAP were rolled into the Integrated Urban Development Strategy described above and some success has been achieved in progressing projects, notably rehabilitation of the Victor Babes Hospital and several kindergartens in the city. There have also been investments in public transport for more efficient vehicles (including electric busses). However, there is substantially more to be done and this GCAP is an opportunity to continue to drive energy and GHG improvements in our city.

Sustainable Urban Mobility Plan (SUMP)

Scope: Craiova Growth Pole Area Timeframe: 2016 - 2030

Overview:

A SUMP has been prepared for the period 2016 – 2030 for the growth pole known as the “Craiova Metropolitan Zone” (which incorporates the City of Craiova as well as the towns of Filiaşi and Sagarcea and 21 other communes). This document was published in 2015 and was funded by the EBRD.

The objectives of the SUMP were to create a Transport system which responded to the following strategic objectives:

- Accessibility – ensuring that all citizens are offered a transport system that gives them access to essential services and destinations;
- Safety and Security – improving safety and security;
- Environment – Reducing air pollution, noise pollution, reducing greenhouse gas emissions and energy consumption;
- Economy and Efficiency – Enhancing the efficiency and profitability of the transport of people and goods; and
- Quality of the Urban Environment – contributing to the attractiveness of the city the, quality of the environment and landscape, and for the benefit of the economy and society as a whole

Linkage to GCAP:

There is significant synergy between the SUMP and the Transport elements of the Green City Action Plan in particular with improvements to public and active transport networks and approaches to reducing pollution (with a particular focus in the GCAP on Air Quality) and greenhouse gas emissions. Many of the projects included in the SUMP remain relevant to the objectives of the GCAP and have been considered in the development of this plan.

Key Outcomes:

Approximately 100 individual project proposals have been developed under the SUMP ranging from public transport, rolling stock and equipment, infrastructure, as well as policy interventions. Many of these were integrated into the projects list included in the wider Integrated Urban Development Plan (SIDU) discussed above to help support applications for financing under the Regional Operating Programmes.
Several of the projects identified in the SUMP are in progress including various Street Modernisation programmes, purchase of new busses (with a significant number of the busses delivered) and trams (for which tender documents have recently been released).

Integrated Waste Management System Dolj County

Scope: Dolj County Timeframe: 2014 - 2020

Overview:

Managing municipal waste in Craiova is projected to be accomplished as part of an integrated waste management system (IWMS) at the Dolj County level.

Generally municipal waste is disposed of at a type 'b' municipal landfill site operated by ECOSUD S.R.L under a Public Private Partnership which was commissioned in 2006 and is operating effectively.

The IWMS was designed with financial support from EU in order to further develop the environmental infrastructure in waste sector for preserving, protecting and improving the environmental quality in Dolj County, in line with the requirements of national waste management legislation and relevant EU regulations and directives.

Linkage to GCAP

Waste and resource efficiency are important components of the Green City Action Plan and are one of the "pressure" sectors of the GCAP methodology. This plan, operating at the county scale rather than the city scale, provides a range of measures which are funded independently of the Green City Action Plan. The GCAP contains a "Waste" sector however we note that the GCAP has focused on supporting measures such as Capacity Building and Awareness rather than infrastructure which is the focus of this plan.

Key Outcomes:

Key areas of investment resulting from the plan include:

- Waste Collection – through the installation of the 438 underground collection points (early stages of development);
- Waste Sorting – the installation of a waste sorting station with a capacity of 44,000 tonnes/year which was built at the Mofleni landfill for the county;
- Treatment of Biodegradable waste – a composting plant to treat biodegradable waste was built

Note that waste collection services are currently operated by the city (SC Salubritate Craiova) but is likely to transition to private sector operator (Iridex) and while sorting and biodegradable waste sites had been constructed at the time of adoption of this GCAP, these were still pending selection for operators and therefore not operating.

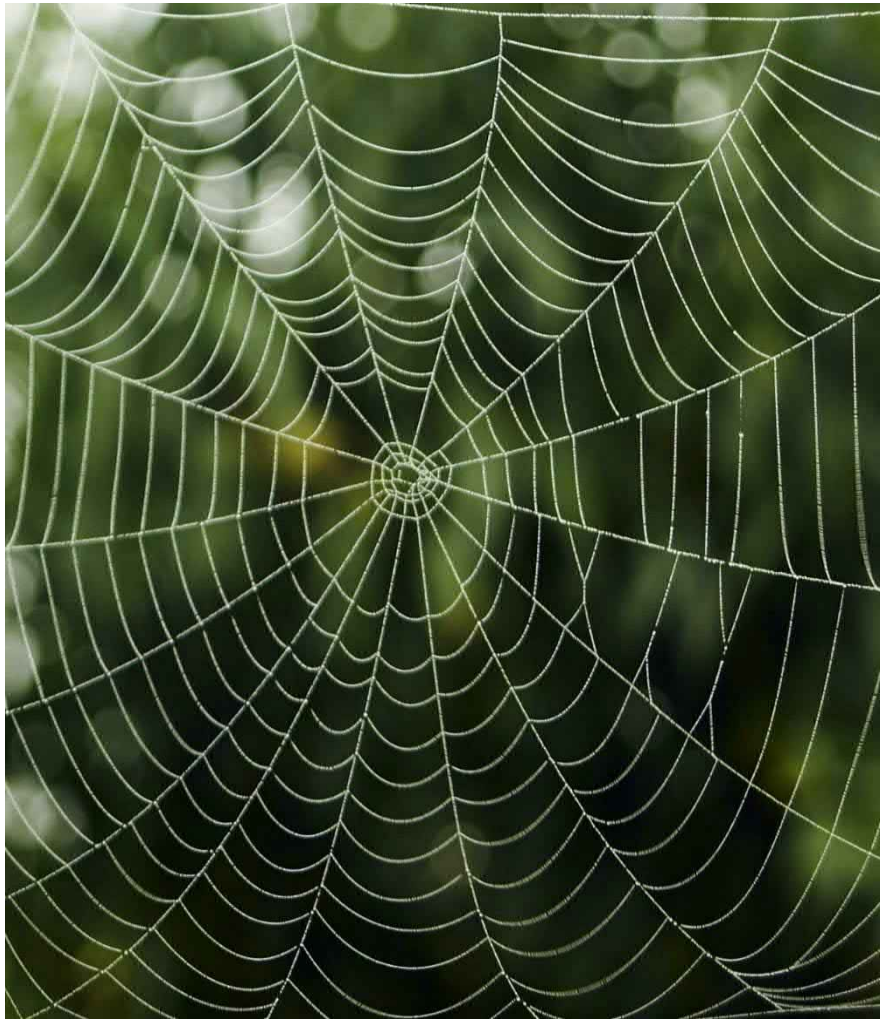
2.5 The Green City Baseline

To understand and prioritise the challenges that Craiova faces we needed to establish a baseline for our city's environmental performance using the EBRD GCAP process methodology. This includes a series of international benchmarks against which city environmental performance can be compared to provide an objective assessment of the city's status. The indicators used for this benchmarking are categorised using the "Pressure-State-Response" framework previously described in Section 1.2.

We collected data linked to the Pressure, State and Response indicators and populated an Indicators Database tool. For each indicator we have sought to collect data over a number of years so that we could not only rate the current performance against the Red, Amber, Green status but also examine historical trends to see whether conditions are improving or deteriorating against the benchmarks that have been set.

The consultant's expert team then looked at the relationships between the Pressures, State of the Environment and Responses to objectively identify performance of the city. A technical assessment report was reviewed by the Focal Point group (with support from technical staff at City Hall) for accuracy and then ultimately presented to stakeholders in a series of workshops held in December 2019 to gain further insight and to agree areas of priority for the plan.

The following section summarises the conclusions of this technical assessment process and highlighted the priorities raised during discussions with stakeholders. This references the Red, Amber, Green colouring and applies a similar colour coding to the level of priority that stakeholders gave to each issue to help to identify where the key areas of concern have been highlighted during the development of the GCAP.



2.5.1 What is the current state of the environment?

Environmental Quality

Air Quality

As with many cities, and particularly those with heavy industry, air quality presents challenges in our city, with the core indicator (Annual Average Concentration of PM2.5) being above the “Red” benchmark threshold. This is due to a combination of the prevalence of solid fuel boilers (both domestic and in some larger municipal and commercial buildings which sees elevated levels of PM10 during the winter), industrial emissions, and emissions from traffic (with occasional exceedances of NOX indicators). Our location in the wide agricultural Plains also creates high levels of dust deposition from the surrounding area which we recognise is a concern to many stakeholders.

We have recently developed an Air Quality Plan for the city which sets out a range of measures to address these challenges with many of the specific investments proposed overlapping with the projects identified in this Green City Action Plan. the complementary nature of these plans will help ensure that the environmental challenges identified in Craiova are being addressed in an integrated manner. This GCAP may provide opportunities to connect some of these projects to external sources of finance.

Air Quality

Core Indicator:	PM 2.5
Stakeholder Prioritisation	High Priority – noting that an air quality plan has been prepared in parallel to this GCAP

Water Quality and Resources

The main waterbody in the city is the Jiu river to the west with several tributaries draining our city and ultimately discharging into the Jiu. There are water quality challenges in the city’s waterbodies and, in particular, for lakes (such as Balta Craioviţa) and smaller watercourses which suffer from stormwater run-off and domestic properties not connected to the sewerage network. However, there is significant existing investment (350 m€) supported by the EU Large Infrastructure Operating Programme (LIOP) to improve wastewater infrastructure and therefore this is an area that many stakeholders felt was not a critical area of importance for the GCAP. However, stakeholders did express interest in green Infrastructure solutions to minimise pollution from urban drainage, which are not included in the LIOP programme.

Water Quality (in rivers and lakes)

Core Indicator:	BOD Levels in Rivers and Lakes – unable to obtain data
Stakeholder Prioritisation	Medium Priority – There are existing challenges and green infrastructure opportunities should be examined

Drinking water indicators suggested that there are no significant challenges in terms of drinking water quality with full compliance in drinking water standards reported. Raw water is predominantly abstracted from the Jiu or from groundwater transferred to Craiova from Izvarna. It is treated before entering the network for consumers.

Drinking Water Quality	
Core Indicator:	% of Potable water Samples in Compliance
Stakeholder Prioritisation	Low Priority – some concern that there may be changes to the standards but currently agreed that this was generally compliant

There is also the challenge of higher water demand than the national average with a local Water Exploitation Index of 18.5% against a national average of 17.5%. While this remains within the < 20% GCAP benchmark for "green" performance, there are opportunities to reduce water losses in the city which should be taken from both an environmental and a commercial perspective. Additionally, stakeholders (whilst comfortable to exclude bulk infrastructure) were keen to include loss reductions (both in terms of demand and leakage) within the city itself in the GCAP.

Water Consumption	
Core Indicator:	Water Exploitation Index
Stakeholder Prioritisation	Medium Priority – Whilst the indicator was low relative to the GCAP benchmarks, there was appetite from stakeholders to address losses.

Soil Quality

The legacy of industrial heritage in our city is likely to have resulted in soil contamination at former industrial sites. This may inhibit reuse of land and encourage sprawling development on "easier" sites, if not tackled through strong urban planning principals. We do not yet have detailed information on levels of contamination in specific sites, although responsibility has recently transferred to City Hall from the Environmental Protection Agency to maintain and understanding of Contamination at sites.

Further work is required to understand the areas of opportunity to rehabilitate and redevelop sites in the city, which could have benefits in terms of improving the density of the city (which has benefits in terms of reducing private car reliance) and protecting greenfield sites.

Soil	
Core Indicator:	Number of Contaminated Sites – judged qualitatively by consultants
Stakeholder Prioritisation	Medium Priority – This was not a theme that attracted significant discussion however we have allocated medium priority on the advice of the Consultants.

Environmental Resources

Green Space

We are fortunate to have a series of high-quality urban parks in the city, such as the Romanescu Park, and the ratio of green space to the population is good at 28 m^2 per capita (against a benchmark of 10m^2 per capita). However, it is difficult to evaluate the quality of this green space and we recognise that some of this is agricultural. Formal parks may not be easily accessible to all residents and proximity of local green space is limited in certain areas of the city. Some areas are degraded and there is considerable pressure on green space and green infrastructure for urban densification, including conversion to parking spaces in the city centre. As a part of the development of the new General Urban Plan, work has been commissioned to develop a GIS based database of green spaces which will help further analysis in this area. However, through engagement with stakeholders, it is clear that there is a strong appetite to improve green

space in the city. Areas such as Balta Craiovita and Balta Cernele have been identified as important areas for potential regeneration. There was also discussion of the value of greening streetscapes and buildings to improve the city.

Access to Greenspace

Core Indicator:	Greenspace per capita
Stakeholder Prioritisation	High Priority – Whilst the indicator was low relative to the GCAP benchmarks, improving green space was of significant interest to stakeholders

Biodiversity

Although we have very limited data available about biodiversity in the city there are several important sites in and around the city, particularly those associated with the Jiu River Corridor (which is a "Site of Community Importance" under the habitats directive and ultimately flows into a Ramsar designated site as it approaches the Danube confluence to the south of the city) and a designated nature reserve called Complexul Lacustru Preajba - Făcăi. We believe that there is also biodiversity value in the city's parks and green spaces and investment in our existing green areas has supported this. There is no current strategy in place to manage, protect or enhance biodiversity beyond the current statutory tools.

Biodiversity

Core Indicator:	Change in Abundance of Bird species – Unable to obtain data
Stakeholder Prioritisation	Medium Priority – There is a recognition that biodiversity improvements can be made and that these should be tied into the provision of good quality green space in the city.

Climate Change

Mitigation

The benchmarking exercise (based on APM Dolj data) identified that Annual CO_2 equivalent emissions per capita were 13.7 tCO_2e/year which is higher than the EBRD Green City Benchmark of 10t CO_2e/year and substantially higher than the national average of/year

We recognise the importance of reducing GHG emissions and, in 2014, published a Sustainable Energy Action Plan (SEAP). This recognised challenges in high per-capita CO_2 emissions, poor energy efficiency in the heating sector (both in the infrastructure and the thermal properties of buildings), aging inefficient vehicles and a lack of integrated energy management in buildings.

According to the SEAP the main energy consuming sectors (and therefore CO_2 emitters) in 2014 were: Residential building sector (1,237,143 MWh), transport (870,022 MWh), Third party buildings and appliances (non-municipal) (490,517 MWh).

Thermal power station sites at Isalniţa and CET II are heavy emitters of CO_2.

Climate Mitigation

Core Indicator:	Annual CO_2 equivalent emissions per capita
Stakeholder Prioritisation	High Priority – Stakeholders noted this as a high priority area which does not yet have a strong response in place.

We have made some progress in tackling some of these challenges, for example significant investment was made in improving efficiency of public lighting; there have been renewables schemes implemented by the energy company (CEZ) in the wider area; several municipal building refurbishment projects have taken place; there has been investment in a more efficient and modern public transport fleet; and smart meters have been installed in some locations. However, there are substantial opportunities to achieve significant savings in carbon, such as further thermal rehabilitation of the buildings stock, improvements to the District Heating System; wider proliferation of renewables and further reductions in emissions from local transport (both public and private).

Adaptation

There are a range of potential climate vulnerabilities for the city, largely associated with extreme weather events such as heavy snowfall, flash flooding and extreme heat events, as well as more chronic heating combined with the "urban heatsink" effect. We have not yet undertaken a detailed analysis of climate vulnerabilities in the city and therefore do not yet have a specific adaptation plan in place to map out responses for the city. However, there are some existing policy measures which may support adaptation, such as afforestation policies in the integrated urban development plan. More work is needed for planning, supporting financing and implementing adaptation measures

Climate Adaptation

Core Indicator:	Estimated economic damage from natural disasters (floods, droughts, earthquakes etc.) as a share of GDP
Stakeholder Prioritisation	Medium Priority – There was limited awareness of risks from stakeholders but a broad understanding of the need to adapt to changing climatic conditions

Summary of Environmental Priorities

While, as would be expected of most cities of the size of Craiova, there are challenges in each of the Environmental Sectors considered within the baseline assessment. However these can be broadly categorised into areas of High and Medium and Low priority as follows:

- High Priority Challenges:
  - Air Quality
  - Access to Greenspace
  - Climate Mitigation
- Medium Priority Challenges
  - Water Quality (in rivers and lakes)
  - Water Consumption
  - Soil Quality
  - Biodiversity
- Low Priority Challenges
  - Drinking Water Quality

2.5.2 What are the current Pressures on the Environment?

Pressures have been analysed by sector. In each sector the indicators point towards a series of typical challenges that cities face. The challenges for Craiova are summarised here:

Transport

Overview

The street network in Craiova has a radial structure with a number of internal ring roads. There are 9 arterial roads totalling 91 km which connect with the National road network and surrounding localities. There are just over 200 km of collectors/distributor roads and 243 km of local streets. There is a strong East-West access driven by historical development in the city.

Public transportation in Craiova is managed and operated by RAT and is comprised of buses and trams.

In 2017 RAT had 190 busses which were required in order to service the current PSC contract with a peak hour maximum fleet size of 85 vehicles. Only 11% of busses are less than 12 years old. During due diligence assessments undertaken for recent financing of bus purchases (2017), RAT had only 120 vehicles available to serve public service contracts and contracted services with only 6 vehicles in reserve. However, a substantial number of new buses have been added recently with 16 Solaris Urbano Electric busses being added to the fleet and a further 38 Euro 6 standard high efficiency diesel buses being financed by EBRD.

The tram in Craiova is one of the newer tram networks in Romania and has been in operation since 1987. The only track is 18 km long and standard gauge, but operates three “lines” running on the same track. The tram line connects the industrial areas east of the city with the north-west industrial areas, via the city centre. The railway station Craiova is not connected with tram line.

There is currently very limited dedicated “Active Infrastructure” provision with just 7.2 km of cycle paths and 8 signalised pedestrian crossings in the city, although the central commercial area is pedestrianised.

Is the vehicle fleet efficient?

While there are some new vehicles on the roads, neither the public transport fleet nor the private vehicle fleet is considered efficient. Our public transport fleet (both buses and trams) has a high proportion of older vehicles, with some well past their intended operational lives, including a number of pre-Euro standard buses.

The private car fleet is on average 12 years old with a high proportion of aged, imported second-hand diesel cars from Western Europe which do not conform to modern standards. We are investing in the public transport sector and have successfully secured both efficient Euro 6 Diesel buses (financed by EBRD) and Electric buses but residual aging vehicles in our

fleet continue to contribute to high running costs and poor air quality issues. They are also less desirable to ride which may be discouraging public transport use.

Vehicle Fleet

Core Indicator:	Average Age of Fleet
Stakeholder Prioritisation	High Priority – Stakeholders agreed there is a need to educate the population on the link between air quality and old vehicles.

What is the preferred choice of transport mode?

Our city is becoming increasingly dependent on car travel, particularly for commuting where the share of trips by private motorised transport (e.g. car) is very high, with a reported 50.5% of all commuting trips made by car. This has implications for both traffic and local air quality levels in the city centre.

There is significant potential for improving modal share of trips by public transport or non-motorised forms of transport such as cycling (for which we currently have very limited infrastructure that is largely designed for recreational rather than commuting use).

We have started to respond to improving travel choices, but to date these have been fairly car-centric and the implementation of the GCAP could usefully support investment in improved quality of public transport and non-motorised transport (as well as some disincentives for using private cars).

Modal Share

Core Indicator:	Private Modal Share for Commuting
Stakeholder Prioritisation	High Priority – Universally accepted this is a challenge recognising the need to improve both public and active transport modes. There was strong advocacy from some stakeholders for improved walking and cycling infrastructure.

Is there significant congestion?

Traffic congestion in our city is increasing with a trend of decreasing average traffic speeds over the last 10 years, currently standing at 27.2 km/h on primary roads (18 km/h for buses). To date we have focused on intelligent traffic systems which have delivered mixed results in the city in terms of reducing traffic congestion. Further investment in public transport and non-motorised transport modes would serve to relieve congestion pressures.

Congestion

Core Indicator:	Average vehicle speed on major thoroughfares
Stakeholder Prioritisation	High Priority – Stakeholders gave this area more weight than the initial assessment based on indicators and felt this needed both infrastructure and land use planning interventions.

Is the transport network resilient to climate change?

Although there may appear to be no significant urgency to climate change responses locally, as described under the “climate adaptation” baseline section above, we have a limited understanding of our vulnerabilities and therefore we have generally had a reactive approach to climate incidents rather than a proactive approach. This has worked well to date, particularly for cold weather events, where RAT are practiced at keeping the network flowing. However, there is an opportunity to better understand resilience and adaptation needs across the transport sector, especially in relation to addressing increased risks resulting from springtime flooding.

Resilience to Climate in Transport

Core Indicator:	Interruption of public transport systems in case of disaster
Stakeholder Prioritisation	Medium Priority – Reactive approach currently but there are responses in place, particularly for cold weather events.

Buildings

Overview

As is the case with many European Cities, buildings are very significant contributors to energy consumption and CO_2 emissions from a city. The Sustainable Energy Action Plan developed in 2014 using the EU Covenant of Mayors methodology identified buildings as a substantial contributor.

In Craiova we have a diverse mix of residential buildings of different types including low density individual housing of one, two and three stories (P, P + 1, P + 2) and collective buildings / blocks which are largely five story (P + 4), but also include buildings of 8 – 11 stories (P + 7, P + 10). There are approximately 59,000 apartments that were connected to the District Heating network in 2018 which is a significant reduction from 79,062 in 1990 and is still declining with many people choosing to use individual natural gas units as their primary heating and hot water source.

Most of the multi-apartment buildings were built between 1950 and 1990 and have not undergone any significant works to improve their energy efficiency. The majority of these have poor thermal characteristics of the building envelope elements, with values depending on both the thermal insulation materials used, as well as on the geometric and structural configuration of the existing buildings.

There are also a large number of municipal buildings ranging from large hospital buildings to kindergartens with a very wide range of heating methods, including solid fuel boilers relying on wood or coal feedstocks.

There are also risks associated with potential asbestos removal in buildings particularly from roofing materials but potentially from thermal insulation installed either in the building fabric or in the heating systems or other sources. This has not been analysed as a part of this study but may impact the cost of building rehabilitation.

Electrical Efficiency in Buildings

It was not possible to obtain reliable consumption data during the baseline phase of the GCAP development for electrical consumption and

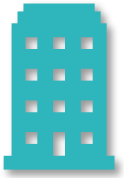
therefore no technical data is available. However, based on the Consultant's expert view, electrical energy consumption in residential buildings is likely to be primarily driven by the use of domestic appliances and lighting rather than significant consumption for heating and cooling.

There may be significant electricity consumption from commercial uses for cooling, but this is again difficult to assess accurately as it is private data. It is also an area where it is difficult to establish interventions as as we have limited authority over private users' energy consumption.

Electrical Efficiency

Core Indicator:	Electricity consumption in residential buildings – No reliable data
Stakeholder Prioritisation	Low Priority - Stakeholders agreed that this is unlikely to be a significant challenge in the buildings sector and that it was better to focus on thermal properties of buildings.

Thermal Efficiency in Residential Buildings



As described in the overview many buildings are old and were built with poor thermal characteristics. The standard thermal resistance of materials used between 1950 and 1985 was low, leading to an overall thermal insulation coefficient of about 1.0 [W / (m^3,K)] while between 1986 and 1990 the overall thermal insulation coefficient was of about 0.8 [W / (m^3,K)].

The buildings connected to the centralized district heating systems have a number of common characteristics in terms of thermal insulation performance, namely:

- exterior walls and terraces were made with technologies and materials that facilitate the transfer of heat;
- they are fitted with low-performance windows; and
- internal heating installations are set up at a building scale rather than independently for each apartment, which is likely to restrict potential for individual metering of each consumer[3].

Heating in the residential sector is mixed, being made up of 54% of housing supplied by the District Heating system, 37% housing using natural gas for heating (individual boilers) and 9% using systems based on firewood or coal.

The Consultant was unable to obtain contemporary raw data to evaluate their respective performance. However, the SEAP does contain data (from 2014) which can be interpreted against this indicator. The report provides data identifying heating consumption per m^2 for various modes of heating, which is summarised below.

Table 2.1: Heating consumption per m^2 for various modes of heating

Medium	SACET (District Heating)	Natural Gas	Other fuels (coal/firewood)
kWh/m^2	130	176	366

Source: Sustainable Energy Action Plan (2014)

It is important to note that this data is from 2014 and some improvement may have been made since then as some rehabilitation projects have been undertaken (both by the City and private building owners). It also generalises performance across both Craiova and wider the "Craiova Growth Pole" (which includes a large number of smaller surrounding rural municipalities and small towns). However, the Consultant's judgement is that it is likely that the overall figure remains over 130 kWh/m^2, which when measured against the EBRD Green City Benchmark would result in this being scored as a "Red" challenge (126 kWh/m^2).

[3] Although it is possible to use Heat Allocators to try to improve Consumer based billing

The SEAP also identifies around 71,000 individual apartments in 600 blocks that could potentially benefit from thermal rehabilitation, but it is not known how many buildings have been renovated in the intervening period. It is reasonable to assume that a substantial number of buildings still require rehabilitation, and significant energy and carbon savings could be made.

Heating in Residential Buildings

Core Indicator:	Heating cooling consumption in residential buildings, fossil fuels
Stakeholder Prioritisation	High Priority – Residents in blocks are often reluctant to accept refurbishment for various reasons including illegal modifications to properties, some properties fearing city modifications will be substandard, or just a lack of awareness. Very few flats have individual heat meters.

Thermal Efficiency in Other Buildings

According to the current strategy for district heating, there are 95 (it is understood municipal buildings and 122 commercial buildings are connected to the DH system. It is assumed that other buildings are largely powered by gas boilers but there is also like to be some buildings operating on fuel oil and potential even solid fuels.

The Sustainable Energy Action Plan (within chapter 8 – Energy Audit of Public Buildings) includes some analysis of public buildings, although this doesn't appear to include non-municipal commercial buildings. The data is also generally presented in terms of total consumption rather than consumption per unit area however, some data is presented and according to the SEAP, the specific heat consumption of municipal buildings in 2014 (page 89) was:

- for medical buildings: 245 kWh/m^2
- for education buildings: 167 kWh/m^2

These values sit across the yellow and red categories of the benchmarks and it is reasonable to assume that there are a substantial number of non-residential buildings which could benefit from thermal rehabilitation.

Most of our municipal buildings are believed to have very poor thermal insulation properties and therefore a low level of energy performance which provides a significant opportunity for improvement.

Some improvement is currently taking place with projects progressed at the Victor Babes Hospital, several Kindergartens and an agreement made with EBRD to rehabilitate the City Hall building itself. However there are a substantial number of other municipal buildings that would benefit from rehabilitation.

Given the limited information available and the limited influence that we have over private building operators, it was decided to focus actions on municipal buildings rather than addressing commercial buildings.

Municipal Buildings

Core Indicator:	Average vehicle speed on major thoroughfares
Stakeholder Prioritisation	High Priority – Considered a high priority but residential buildings are considered to be a higher priority as there are a larger number to address

Industry

Overview

The industrial sector in Craiova City is well developed, with two major areas for industry development: in the north – west and eastern part of the city where companies such as Electroputere, FORD, SC MAT SA, SC POPECI SA are based, as well as businesses servicing the construction industry, furniture manufacture, aviation, a brewery and many other smaller industrial units. These sites provide a significant amount of employment in the city.

With these industries now predominantly under private sector management, the role of the City Hall in managing their environmental performance is limited (with the majority of the regulatory functions being the responsibility of APM Dolj). However, in line with the GCAP methodology the Consultants explored a range of indicators aligned with the environmental performance of industrial sites.

Is industry using energy efficiently?

We have limited information about industrial energy efficiency from either electrical or heat perspectives in the city. Data from national sources suggest that efficiency is quite low and relatively stable at this low level.

Industrial users are increasingly moving away from the centralised heating system to localised power and heat generation on site.

Industrial Energy

Core Indicator:	No local data but nationally poor
Stakeholder Prioritisation	Low/Medium Priority – There was limited representation from industry in the stakeholder workshops. Those who were present felt there was opportunity to improve efficiency. However, given the limited influence the City holds in this area, we are not prioritising this area.

Does industry manage its waste well?

We believe that recycling rates in industry are low. There are also concerns about ash storage at both coal-fired power stations leading to wind-blown and potentially leached pollution of the surrounding environment.

Industrial Waste

Core Indicator:	No local data was available
Stakeholder Prioritisation	Low/Medium Priority – This is primarily a permit management issue and was not considered a priority area for the GCAP. Domestic waste is perceived by stakeholders as significantly more important.

Is economic productivity decoupled from pollution?

We found that there is a fairly stable relationship between GDP and energy consumption at a national level. We have little data on direct local pollution. It is important to note that coal-fired energy generation plays a significant part in the city's industrial landscape, both as a provider of energy but also as a major industrial site. There are pollution issues associated with both the site and the nearby ash-dumps. These sites are intrinsically linked to environmental challenges, including poor air quality in the city.

CEZ have installed significant photovoltaic capacity in the city which reduces reliance on fossil fuel (anecdotally around 10% of the city's demand – although this is sold to the grid rather than the city itself).

Decoupling Economy from Pollution

Core Indicator:	No local information was available
Stakeholder Prioritisation	Medium Priority - CEZ have been installing solar power and have a general interest in supporting renewables in all contexts.

Does industry manage its wastewater well?

Formal compliance statistics indicate that industry is close to 100% compliance, although we have concerns about point sources of pollution discharging directly into the river and smaller watercourses. Given the downstream sensitivity of the Jiu catchment, this is potentially significant, however this is again primarily a permitting issue over which the city has limited jurisdiction.

Decoupling Economy from Pollution

Core Indicator:	No local data was available
Stakeholder Prioritisation	Medium Priority – Some sites may be polluting which needs to be managed more effectively, however this is not an area over which the City Hall has a significant influence

Energy

Overview

we have significant energy generating plants within the city most notably two coal-fired generating plants[4]:

- Termocentrala (Inşalniţa) – 630 MW coal-fired condensation power units (2 x 315 MW) located to the northwest of the city in Inşalniţa for generating electrical power. Reportedly one unit has been modernized and one unit is in the process of rehabilitation;
- Termocentrala II (Bariera Valcii) – 300 MW/160 GCal coal-fired cogeneration plant (2 x 150 MW) used for both electrical energy and thermal energy (hot water) for district heating

The thermal energy consumption of residential consumers in Craiova, in 2014, according to the Sustainable Energy Action Plan, was as follows:

- District Heating (SACET) – 62,826 apartments (54.1% of total dwellings) – note that this has reportedly decreased to 59,000 as of the time of developing the GCAP;
- Natural gas apartment plants – 26,900 apartments (23.2% of total dwellings);
- Houses - heating with natural gas – 15,800 houses (13.6% of total dwellings);
- Houses - heating with firewood (9.1% of total dwellings)

The district heating system provides heating for 6,325,000 m^2, divided between residential (81%) and business (19%) consumers. There are large losses of energy in the system, which diminishes energy efficiency efforts.

The heat system (SACET) consists of:

- The Source of thermal power production – Craiova II;
- 57 km primary thermal network route (57 km of the duct round and 57 km of return);
- 123 thermal points of which includes 104 points for household customers and 19 for public institutions and businesses;
- 121 km secondary thermal heating systems route (this includes 121 km driving the heating, 121 km return network heating, 121 km hot drinking water pipe; 121 km driving the recirculation water);
- There are also 13 zonal thermal power stations and 36 block thermal centres, which belong to 27 Km of secondary thermal grid

The existing natural gas system has excess capacity and can cover up to 120,000 households. However, it currently covers less than 31% of that number.

Do People have adequate access to electricity?

Yes, our city has a comprehensive and generally robust electricity distribution system with a low failure rate.

Access to Electricity

Core Indicator:	Share of population with an authorised connection to electricity
Stakeholder Prioritisation	Low Priority – Stakeholders concur that access to energy is good.

[4] https://www.ceoltenia.ro/en/despre/domenii-de-activitate/producerea-de-energie/

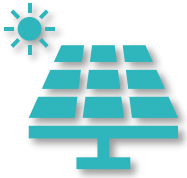
Do people have adequate access to heating systems?

Currently there is good access to the centralised district heating system, although the system is old, inefficient (as it is sized to service a much bigger industrial market than now exists), expensive for consumers and suffers significant losses. There is a long term and established trend of users leaving the system with most large commercial users transferred away from the system (with the exception of the Ford plant) and a significant number of domestic users transitioning to domestic natural gas boilers for their heating.

Access to heating systems

Core Indicator:	Share of population with access to heating and cooling
Stakeholder Prioritisation	Medium Priority – Stakeholders from the electricity provider felt that the district heating system was expensive and better alternatives were available than the current system (with the energy provider highlighting the benefits of electrical heating)

How much energy is derived from renewable sources?



Renewable energy provision for Craiova's energy consumption is currently not being reported. However, electrical energy is consumed from the national mix of electricity, which according to the European Environment Agency was at 25.01% in 2017[5] (and is reported to be up to 38% is produced from renewable sources currently).

It is important to note that locally, coal-fired thermal plants are the predominant source of energy for heating and feed electricity into the grid. Localised environmental impacts (e.g. air quality) are highly relevant to our city as well as the broader question of Greenhouse Gas emissions.

As mentioned, thermal energy is primarily driven by coal-fired district heating systems, with additional natural gas-based heating. There are some national programmes such as the "Casa Verde" programme which has seen some uptake in thermal renewable energy technologies, but the uptake is very low and typically for the production of hot water. It is necessary to increase the amount of energy produced from renewable energy sources and to increase thermal energy from cogeneration plants.

Stakeholders from CEZ (who operate local energy distribution in Oltenia) identified that they had installed a significant amount of photovoltaic (PV) energy in the area surrounding Craiova (although not in the city itself) which could account for up to 10% of the city's electricity demand and are keen to promote further installation of PV panels on buildings (ideally coupled with wider rehabilitation of buildings).

[5] https://www.eea.europa.eu/data-and-maps/indicators/renewable-gross-final-energy-consumption-4/assessment-3

Renewables

Core Indicator:	Proportion of total energy derived from RES as a share of total city energy consumption
Stakeholder Prioritisation	High Priority - The indicator is misleading here as it relates to the national electricity mix. Craiova has a high level of reliance on coal for district heating. Through discussion with stakeholders it was agreed that there is substantial need and opportunity for investment in renewables.

Energy Resilience

Core Indicator:	Average share of population undergoing prolonged power outage
Stakeholder Prioritisation	Low/Medium Priority - CEZ (who operate as the distributor) indicated that there are limited challenges and while there is increased load on the gas network in winter, there is a sufficient headroom in the network. The energy sector could be considered in a wider analysis of vulnerabilities from climate change at the city level.

How resilient is the electricity network to extreme climate events?

We believe that there are limited challenges associated with extreme weather events as the electric network is broadly resilient, with data suggesting that outages are very low and improving (2.28% in 2014 and 1.4% in 2018). However, it would be prudent to evaluate our risks associated with climate exposure and the resulting vulnerabilities in the energy sector and beyond.

Water

Overview

Water and wastewater services in our city are managed by Apa Oltenia, a public company whose main shareholder is the Craiova City Hall with 92% of shares. The rest of shares belong to Dolj County and other localities to which Apa Oltenia caters. Apa Oltenia is a regional water operator responsible for the distribution of treated potable water and management of sewage wastewater in Craiova and surrounding localities.

Craiova has reliable drinking water supply and wastewater collection and treatment systems. Monitoring tests of 2018 show that overall drinking water quality was good with less than 1% of the tests exceeding parameters reference values established by EU Drinking Water Directive and translated into national legislation (Law 458/2002).

However, there are challenges and the wastewater collection network is in bad shape and not all of Craiova's inhabitants are connected to the network. There is also a moderately high level of loss from the network is due to the state of the water distribution network.

The water company recently signed an EU financing contract (Large Infrastructure Operational Programme - LIOP) of about € 350 mil. to improve the water and wastewater systems performance and to reduce the current deficiencies. (This financing contract does not include investments in the stormwater drainage system.). The LIOP aims at promoting sustainable economic growth as well as safe and efficient use of natural resources. It addresses the development challenges identified at national level in terms of transport infrastructure, sustainable urban transport, environment, energy and risk prevention.

Is the water consumption too high?

Water consumption in our city is fairly high compared to the rest of the country at around 174 litres per capita per day (l/c/d), but it is within the EBRD GCAP "Green" indicator threshold of 200 l/c/d. We are encouraging to reduce water consumption metering (apartment buildings and blocks of flats typically have one water meter and the bills for individual apartments are calculated based on individual secondary meters), which has been funded with EU funds, although about 10% of users are still not metered. It is likely that the area of most opportunity is in "soft" measures to encourage households to use less water.

Water Consumption

Core Indicator:	Water Consumption per Capita
Stakeholder Prioritisation	Low Priority – Perceived priority is low amongst water sector stakeholders who feel current responses are adequate. There may be some opportunities as a part of wider awareness raising amongst citizens to take responsibility for their personal environmental footprint

Is the water distribution system efficient?

"Non-revenue water" (i.e. water lost from the network before it reaches the customer) is high with significant losses from both the bulk transfer pipeline which transfers the raw water from Izvarna to the city (about 117 km) and aging local distribution networks which suffer frequent leaks and breakages. However, we are working on reducing leakages and connections, funded partly by the EU.

There are still improvements to be made for water connection rates to drinking water networks which stood at 86% in 2016.

Distribution Network

Core Indicator:	% Non-revenue water
Stakeholder Prioritisation	Medium Priority – There is a lot of EU funded work happening in this area but there may be opportunities to invest in improved monitoring of the network to improve management of assets.

Is wastewater treated effectively?

We have a relatively new Wastewater Treatment Plant at Făcăi which was completed in 2012. All discharges to the network are treated to an appropriate standard with results from Apa Oltenia suggesting 98% of water that is treated meeting the standards (which is inside the EBRD's "Green" benchmark).

There are however many dwellings (around 16% in 2016) that are still operating on septic tanks which pose risks for localised pollution in smaller waterbodies. There are also some concerns from the APM Dolj that there are a high number of industrial users who are at risk of failing to meet environmental standards in the city.

Wastewater Treatment

Core Indicator:	% of residential and commercial wastewater that is treated according to applicable standards
Stakeholder Prioritisation	Low Priority – Generally where wastewater is captured, wastewater is treated well although there are some localised risks from economic operators and septic tank users.

Is the city resilient to natural disasters?

There are risks associated with flooding in Craiova and the wider Metropolitan zone (particularly to the north and north west of the city). For our city itself the greatest risk is associated with the capacity of the stormwater network and this is an area which is not subject to existing responses from other projects. Overall, we understand the value in better understanding our city's vulnerabilities to climate change so a coordinated strategy for adaptation could be developed.

Flooding risks

Core Indicator:	% dwellings damaged by flooding in the last 10 years – Official data not available.
Stakeholder Prioritisation	Medium Priority – There have been some incidents of localised flooding and also fluvial flooding which are not currently well understood.

Solid Waste

Overview

Our waste is generally collected by SC Salubritate Craiova (owned by the City Hall) and disposed of to a modern regional landfill site at Mofleni which is operated under a Public Private Partnership model by the company ECOSUD S.R.L. Bucuresti.

There is an Integrated Waste Management Strategy at the County Level which generally governs investment in the Waste Sector in the area. This strategy has seen investment in our city in three main areas:

- Waste Collection – through the installation of underground collection points for both recyclables and residual water;
- Waste Sorting – A sorting station was built at the landfill site at Mofleni which has a capacity of 44,000 tonnes/year, however operationalisation of this contract has been delayed;
- Treatment of biodegradable waste - a composting plant to treat the biodegradable waste separately collected was built at Mofleni, however as with the sorting plant, operationalisation has been delayed.

Waste collection services are due to be transferred from SC Salubritate Craiova to a private sector operator on completion of the installation for the underground collection points.

How much waste do we generate?

Our municipal solid waste generation is low in European terms (at 292 kg/year/capita), which places this indicator in the “green” zone using the EBRD methodology. However, as it is above the national per-capita target (249 kg/year/capita). This should be examined further, and the scoring was adjusted to “yellow” to highlight this. Much of the challenge is in achieve changes to personal behaviours and education and personal responsibility is key to achieving this.

Waste Generation

Core Indicator:	Waste Generation Per-Capita
Stakeholder Prioritisation	High Priority – With existing investment in infrastructure ongoing, and devolved responsibilities for delivery in the waste sector, stakeholders were of the view that the City Hall’s main role was likely to be to educate and raise awareness amongst citizens.

Is waste collected efficiently?

There are comprehensive domestic solid waste collection services in the city. However, there are unfortunately cases of fly tipping and open waste burning in some areas. Awareness raising, education, encouraging people to recycling and pay fees, and incentives for poor households could all be improved.

Waste Collection

Core Indicator:	Share of the population with weekly municipal solid waste (MSW) collection
Stakeholder Prioritisation	Medium Priority – There was uncertainty over the service that the new collection agent would provide during workshops and that it was important to build relationships with them before developing further investment plans/actions.

Does waste treatment include reasonable levels of sorting and recycling?

Recycling rates are extremely low (< 1%) and this needs significant improvement. We have invested in a sorting plant, installation of segregated bins for at source separation, and a composting plant. However, the sorting and composting plants have been significantly delayed and may not meet the projected demand in future. Much of the future planning will need to occur with the new service provider once they have been established. However, there is also significant opportunity to improve public engagement in taking responsibility for sorting waste at source.

Waste Collection

Core Indicator:	Recycling Rates
Stakeholder Prioritisation	Medium Priority – There are policy and awareness/education opportunities to be taken but in the longer term much of this will fall under the scope of the new service provider and performance will need to be judged at a later date

Is there sufficient landfill capacity?

Yes, we have a relatively recent landfill site (2005) with a long design life (38 years) operated by a private operator (ECOSUD). However, increased separation of recyclable materials is needed to avoid the landfill filling up more rapidly than anticipated. We recognise that there is scope for improvement of the environmental management of the landfill site.

Landfill Capacity

Core Indicator:	Remaining Life of Landfill
Stakeholder Prioritisation	Low Priority – The current landfill site has strong capacity. Its filling rate is high. However this is likely to be due to the delays in establishing the recycling service contract (so material is not yet being processed in those plants) and will improve

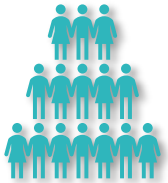
Land Use

Overview

The current General Urban Plan is severely out of date (1997) and not representative of current realities. A consultancy has been appointed to drive the development of a new General Urban Plan over the next 3 years. The age of the plan and the lack of accurate data within the plan has made it hard for us to provide precise up to date statistics for this GCAP. These issues will be resolved as a part of the development of the new urban plan which will be based on a digital “Geographical Information System” platform.

The development of a new General Urban Plan in parallel with this plan also presents us with a significant opportunity for policy options generated during the GCAP development process to be implemented through a policy instrument that is central to future planning (rather than being a parallel plan to formal urban planning policy in the city).

Does the city have an optimal population Density?



The age of the General Urban Plan makes it difficult to establish the precise population density for the city. According to the Directorate of Statistics the figure is around 3,700 people/km^2 with the EBRD benchmark for optimal density being between 7,000 & 20,000, indicating that our city has below optimal density. Alternative estimates provided by stakeholders suggest that the number may be closer to 4,500 people/km^2 if agricultural areas are excluded - which would fall into the "yellow" benchmark category but still be fairly low density. This has particular implications for transport networks, which generally tend towards personal car use if density is low because of the distance to get to a public transport connection and increased journey times. It can also mean reduced access to facilities such as shops and public services. We believe that there is a need to grow the city economically and there is an aspiration to grow the boundaries of the city further to the north which would create space for demographic and economic growth.

Population Density

Core Indicator:	Density
Stakeholder Prioritisation	High Priority - The city has an expired plan and a new plan is required (and under development). It was suggested that the population is 300k in 69km2 which would place it marginally into the "yellow" GCAP indicator rather than the "red" as per the Technical Assessment Report. However low density and a lack of a PUG mean this is a high priority.

Is the city "sprawling"?

Although our city has a low density, pressure on city centre accommodation (including from the student population) is encouraging urban development expansion at the edge of the city, particularly to the north of the city (which the new Urban Plan is seeking to designate formally as a growth area) and the south east of the city which expanded through the development the Veteran's area. It is notable that expansion areas are outside the City Municipality's area and therefore without expansion of the boundary of the city may be difficult to control. With a stable overall population, this kind of expansion could exacerbate challenges associated with lower density cities including access to services and increased levels of personal car use (and associated traffic and pollution issues), although there are proposals to develop public transport connectivity to the fringe areas. We understand expansion needs to be balanced with redevelopment of the underutilised industrial areas of the city as a part of a formal and well implemented General Urban Plan.

Sprawl

Core Indicator:	Average annual growth rate of built-up areas
Stakeholder Prioritisation	Medium Priority – Pressure on accommodation in the city is pushing people to the edge of the urban area. This needs to be considered in both spatial plans and transport plans (in coordination with neighbouring municipalities)

Are existing developed areas well used?

We have limited available data on current occupancy rates, but there is significant anecdotal evidence from observations in the city and informal discussions at engagement events, which suggest that there are areas of the city (particularly some of the sites in the eastern industrial area) which were formerly used intensively for industrial purposes but are currently underutilised. This indicates that strategies of regeneration and densification may be preferable to fringe or satellite development.

Sprawl

Core Indicator:	Percentage of urban development that occurs on existing urban land rather than on greenfield land OR Vacancy rates of offices Data Not Available
Stakeholder Prioritisation	Not discussed in formal workshop due to lack of data.

2.6 Preliminary Smart Maturity Assessment

While a detailed analysis of Craiova's "Smart City" capability was not a part of the formal GCAP analysis process, this plan does identify where smart city opportunities exist within each of the GCAP Actions to ensure that further consideration is given to technological opportunities during the development of individual projects. Nearly all of the actions have potential to benefit from technology. A key challenge will be coordination of technologies to ensure that data is effectively captured and used to its full potential which may mean ensuring compatibility across platforms and critically, accessibility of data beyond the organisation collecting it (ideally into open-source domains).

Supplementary guidance to the Green Cities Methodology recommends that cities undertake a "Maturity Assessment" to understand the extent to which a city has integrated and benefited from smart technologies in their service provision to date and evaluate capacity to adopt smart technologies and over what timescale that might be reasonable. This could then be used to determine the extent to which Smart Technologies could be deployed in GCAP actions or whether planning to achieve actions which are "Smart Ready" is a preferable strategy. This will vary from sector to sector, with some delivery agencies having advance capacities and some agencies requiring further capacity development to fully benefit from technological opportunities.

The scale against which the city's maturity could be measured is presented in Figure 2-2 below. This sets out a series of milestones against the way the city uses data starting from a basic understanding of the importance of data, through several stages of sharing data, then using and analysing data, then publicising and openly sharing data for third parties to use and finally a state where the data is open and there is wide use of common datasets across public sector, private sector and citizen networks to plan activities, whether that is planning a journey as a citizen, making an investment decision in the private sector or designing a policy.

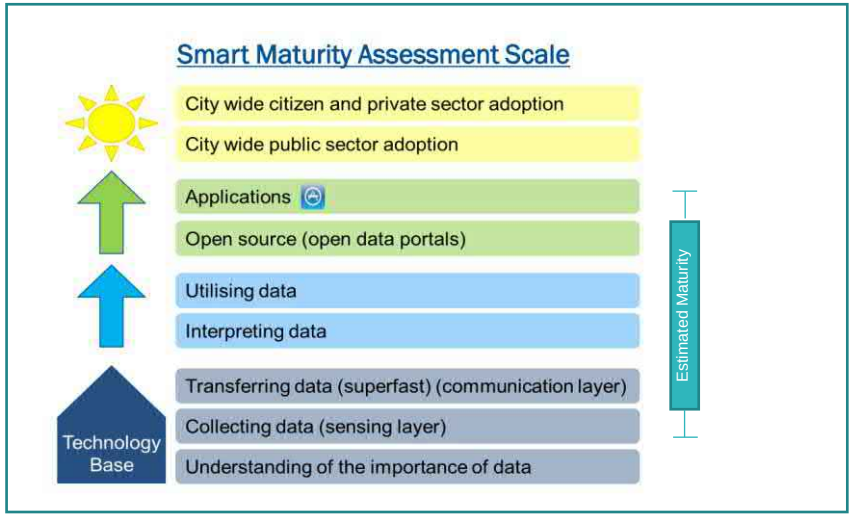


Figure 2-2 Smart maturity assessment scale and basic analysis of Belgrade's position on the scale

The consultant's initial assessment is that in some areas, the city has demonstrated significant innovation and understanding of the potential for Smart Cities technologies. Examples include efforts to make public services available digitally through their website, e-ticketing for public transport services[6], an aspiration to include digital data in their strategic planning (by creating a GIS based land use database as a part of the General Urban Plan Development) and through the development of a mobile app to provide visitors with tourism data[7].

However, it was the experience of the consultant during the development of the "indicators database", that in many areas, data sharing between agencies was challenging.

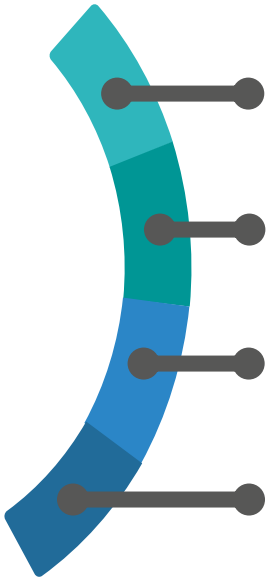
As a result, the preliminary assessment has produced a very mixed assessment of maturity with some areas being advanced and some areas being very basic and that further strategic consideration of Smart Cities strategies would be beneficial.

[6] http://www.rat-craiova.ro/articol.php?id=1

[7] https://play.google.com/store/apps/details?id=com.pds.craiovacity&hl=en_GB&gl=US

3 Action Plan

The Green City Baseline helped us to understand and prioritise environmental challenges within the city. The next important task is to understand and prioritise the opportunities to address those challenges. To do this we have followed the Green Cities Programme's process to formulate Green City Actions. This involved identifying a long-term vision for the city, setting strategic goals for the next 10 to 15 years, establishing mid-term targets so that we can monitor progress towards our vision and finally establishing the specific short term actions that we need to take to make the long term vision a reality.



Green City Vision – 15 years

Where would we like to be in 15 years time?

Strategic Goals 10 -

Which Specific areas do we need to address across sectors?

Mid Term Targets 5 - 10

Which targets should we aim to achieve through our actions?

Green City Actions (1 to 5)

Actions to be implemented in the next 1 - 5 years to achieve the mid-term targets

3.1 What is our vision?

The City's Green City Vision is to be:

"A vibrant, growing city built on the principles of Green Development and smart technology, with rehabilitated green spaces and efficient mobility networks."

This centres around the several key components that were derived by the consultants following direct discussions with Mayor Genoiu and a "Visioning" workshop which was held with a wide group of stakeholders. The main notable components of the vision include:

- **Green growth and development** – We have an ambition for growth and development but we want to do this on the basis of sound green design and growth;
- **Technology-oriented development** – We want to make the most of innovation in technology to help manage our city and make it a good place to live in the future;
- **Importance of Green Space**– We recognise the importance of green spaces both for the health and wellbeing of people but also because of the functional services they provide, particularly in relation to providing resilience to climate change;
- **Efficient sustainable mobility networks** – sustainable mobility is important for our economy and our day-to-day lives. We need a better blend of efficient public transport, active travel networks and private car use

3.2 Sectors and Strategic Goals

There are many opportunities to improve the environmental performance across the city. As a result of technical analysis conducted by our consultant team and discussion with city officials, representatives of service providers, civil society groups and youth groups, we have identified 13 Strategic Goals to be achieved over the next 10 - 15 years and have grouped these into 6 thematic areas as shown below.

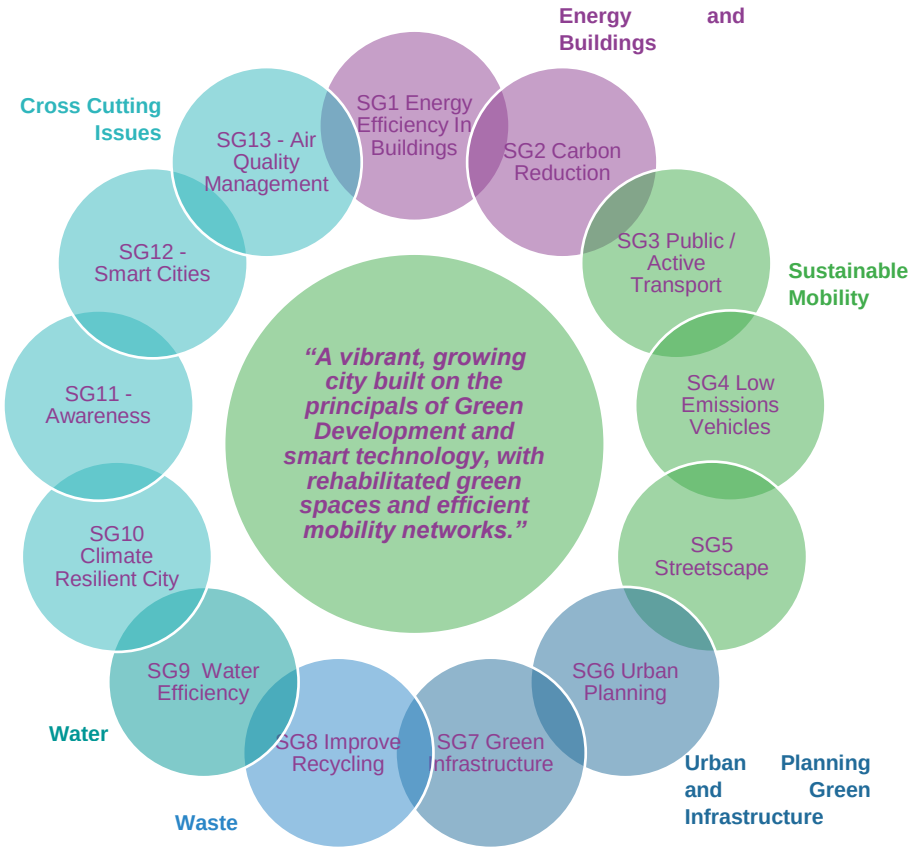


Figure 3.1 Summary of Sectors and Strategic Goals

These thematic areas are presented together with the GCAP's Strategic Goals (which are described further in the next section) in Figure 3.1.

We have, however, made several notable changes to the "sectors":

- The Buildings and Energy sectors have been merged. This is a reflection that the city mainly has influence over the District Heating sector rather than the wider energy sector. We felt it was sensible to aggregate the production elements with complementary energy efficiency measures in the buildings.
- We have incorporated Wider Green Infrastructure considerations in Land Use Planning to capture some of the Environmental Resource challenges that have been identified such as biodiversity and access to greenspace.
- There were a number of Cross Cutting Issues which are relevant to many if not all sectors. Therefore, we have created a separate "sector" for these issues which include a coordinated strategy for Smart Cities technologies, Public and Stakeholder Awareness raising and Climate Resilience and Adaptation issues.
- Industry as a sector has not been included, as whilst the city does have an industrial base, many of the interventions that we considered either sit within the remit of private companies or with third party regulators. The main area of opportunity as a municipal authority is in raising awareness of environmental management challenges which we have considered under Strategic Goal 11 in the Cross-Cutting Issues Sector.

Whilst it is useful to break Strategic Goals and Actions up into Sectors, it is important to recognise that there is a significant overlap between many of the individual actions so while we have allocated Actions to strategic objectives, they may deliver benefit to multiple strategic objectives. This is reflected in the Action Fiche summary sheets.

3.3 Buildings and Energy Actions

3.3.1 What are the key challenges and priorities?

The benchmarking activity undertaken indicates that Craiova has very high CO_2 emissions per capita, with data from APM Dolj suggesting that each person could be emitting up to 13.7 tonnes CO_2e per year, which is more than double the national average. Reduction of CO_2 emissions was identified as a priority both by the Consultant's team and stakeholders during consultation events and was therefore considered important to address. These CO_2 emissions are specifically driven by energy consumption.

The majority of energy consumption is in buildings and like many cities in Romania, many of our buildings were not designed and built during a period when energy efficiency was considered important. As a result, we have a substantial number of buildings with very poor energy performance. A very large number of these are within the Residential Sector although there is also significant opportunity to improve the performance of municipal buildings and other non-residential (commercial) buildings. We have decided to focus on residential and municipal buildings because of the scale of the challenge and because we have more influence here than private commercial sector building stock, at least in the short term.

Much of the city's energy comes from large coal-fired stations Thermocentrala in Inşalniţa (630 MW Coal fired condensation power units providing electrical energy) and Termocentrala II in Bariera Valcii (300 MW Coal fired cogeneration plant for both power and district heating). The latter feeds into the district heating distribution network which currently suffers significant losses.

The district heating system is supplemented by a secondary network which includes 13 zonal thermal power stations and 36 block level thermal centres.

The district heating system is perceived by many as expensive and inefficient and there are an increasing number of people switching to natural gas networks and domestic boilers instead of the District Heating system.

We believe there is significantly more potential for renewable energy to be harnessed, particularly in parallel with building refurbishment projects. Current renewable installed capacity is limited in the city (largely domestic hot water systems), although representatives of CEZ (who operate the local distribution network) have installed significant solar capacity in the surrounding area.

3.3.2 What are we already doing?

In 2014, in collaboration with the Covenant of Mayors, we prepared a Sustainable Energy Action Plan (SEAP) which helped us to understand where the main sources of emissions were in the city and to propose measures to improve energy efficiency and reduce carbon emissions. As a result of the new SEAP, a number of new investments have been established (including those drawing on Regional Operating Programme funding), such as:

- A number of energy efficiency projects in Residential buildings in Craiova;
- Thermal Rehabilitation of the "Victor Babes" Hospital for infectious diseases and Pneumophysiology;
- Rehabilitation of a number of Kindergartens including "Elena Farago", "Floare Albastra", and "Piticot"; and
- Financing has also been agreed with EBRD to rehabilitate our City Hall building itself.

We have also developed a strategy for improving the District Heating system which maps out potential investments to improve efficiency, approved in 2019 by the Local Council of Craiova Municipality (decision number 266). The main actions proposed under this plan are:

- Improved operation and daily maintenance of the distribution system; and
- modernization of the thermal points and the distribution network

The Strategy sets out three scenarios for the district heating system in Craiova Municipality: thermal energy supply in centralized, decentralized or individual systems. Assessment of these scenarios resulted in selection of a centralized supply of thermal energy as the preferred option after the implementation of modernization measures.

There has been limited investment in renewables in the city and this is something that we are keen to integrate into building rehabilitation projects where possible.

A public lighting rehabilitation project (the local strategy for the development of the public lighting service in Craiova) was also undertaken recently to ensure which has led to savings in energy consumption. The main objectives set out in this Strategy include:

- modernization of the public lighting system by replacing all lighting fixtures (18,573 pieces);
- extension of the public lighting system with a number of 870 modern bulbs and new SE lines;
- replacement of architectural lighting with LED bulbs;
- implementation of a public lighting remote management system for the control, command and variation of the light flux;
- festive ornamental lighting; and
- maintenance of the public lighting system

3.3.3 What Strategic Goals and Targets have been set and why?

The following strategic objectives have been set for the Building and Energy Sector. A summary rationale for each of the supporting Mid-Term Targets is also included below.

SG1. Improving energy efficiency of buildings

Supporting Mid Term Targets

SG1a - Executing integrated rehabilitation projects according to existing standards in at least 3% of residential buildings per year and for 25% of municipal buildings by 2030.

This target reflects requirements to undertake comprehensive rehabilitation projects which examine thermal efficiency, potential for renewable energy and electrical efficiency where opportunities arise. A target of 3% of residential stock per year and 25% of municipal buildings by 2030 is considered achievable.

SG2. Reduce Carbon Emissions from the City

Supporting Mid Term Targets

SG2a - Promote the use of renewables achieving a total of 30 % of the city's energy derived from RES by 2030 (aligned to European Commission recommendations).

While there are national level incentives for installing renewable capacity, there has not been significant uptake within the city, despite both the Sustainable Energy Action Plan (SEAP)and the Integrated Urban Development plan identifying significant potential.

SG2b - Overall reduction of Carbon emissions by 40% by 2030 against 1990 levels

This reflects the target previously set in the Sustainable Energy Action Plan (SEA) and provides an overarching target for carbon reduction.

3.3.4 What actions are we proposing to take?

We have proposed a series of short-term actions (to be implemented in the next 3 - 5 years) in the Energy and Buildings sector to support achieving the mid-term targets set out above. These are summarised in Table 3.1 below and then described in more detail in the subsequent pages.

Table 3.1 - Summary of Buildings and Energy Actions

ID	Action	Description
BE1	Energy Efficiency and use of Renewable Energy Systems (RES) in Municipal Buildings	Expansion of existing programmes to improve energy efficiency of municipal buildings Typical measures include the building envelope, glazing, roofs, heating/cooling improvements, elevators, RES
BE2	Energy Efficiency and use of RES in Residential Buildings	Expansion of existing programmes to improve energy efficiency of residential buildings Typical measures include renovation of building envelope, replacement of windows, roofs, basement heating installations, elevators, RES
BE3	Building Management Systems (BMS)	Implementation of Building Management Systems and centralised energy monitoring within Municipal Buildings
BE4	Develop and implement a new district heating strategy for Craiova	Develop and implement a new district heating strategy which identifies alternative sources of energy for the district heating system, reduces losses in the network and improves fairness of billing to individual users, to halt the trend of users leaving the district heating network.

BE1: Energy efficiency and use of RES in municipal buildings

Purpose – Rehabilitate 10% of municipal buildings each year to improve energy efficiency and take advantage of opportunities for renewables

Benefits – Contribution towards a reduction of around 2,400tCO2e/year by 2030 as well as air quality and thermal comfort benefits.

Cost – CAPEX: €8.6m; OPEX: Savings expected

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			Implementation

Description

Many municipal Buildings in Craiova require rehabilitation to improve energy efficiency, reduce the consumption of fossil fuel energy and achieve cost and carbon savings. This action proposes to blend a mix of thermal rehabilitation measures such as improved insulation and to foster the use of RES, particularly for heating, including:

- Building inventory/assessment to identify candidate buildings and measures to be implemented, such as thermal rehabilitation and renewables for heating/hot water considering a mix of PV systems, biomass boilers, and heat pumps.
- Develop a programme of investments (in lots) to integrate Renewable Energy/Energy Efficiency solutions into Municipal Buildings.
- Annual programme of procurement and rehabilitation for buildings seeking to achieve 10% of the total municipal building per year (which would result in an estimated 90% of the total building stock by 2030).

Key Benefits

Key benefits energy/cost savings and GHG reductions of approximately 2,400 tCO2e/year by 2030 (when implemented alongside BE3). Some benefit in terms of air quality reducing reliance on solid fuel boilers, adaptation (in providing greater resilience to extreme temperatures). Likely financial and / or economic to the city – including increased comfort and potentially productivity. Potential third-party investor returns if Energy Performance Contracts used. Some employment benefits supporting

jobs in construction, insulation, and renewables technologies (together with BE2). Supports awareness by providing leadership in improving building stock.

Strategic Objectives Targeted

- SG1 - Improving energy efficiency of buildings
- SG2 – Reduce Carbon Emissions from the City

Key targets and Indicators

- Increasing the share of renewable energy in final energy consumption for heating and hot tap water in municipal buildings by 5%/year
- Emissions reductions by at least 40% by 2030

Current Context

Public buildings are important energy consumers (particularly heat) in the city of Craiova. It is estimated that there are approximately 150 public buildings in Craiova with a total heated floorspace of around 22,000 m2

Energy savings from renovation and modernization of these buildings is on average 30 - 40%. Increasing the share of renewables is a critical measure having a high potential in reducing CO2 emissions of the city. Presently, only 4 public buildings (3 kindergartens and 1 hospital) are being modernized, under ROP however under the Green Cities Framework EBRD are providing financing rehabilitation of 14 further public buildings including the city hall.

Investment Costs

Total CAPEX Investment – €8.6m

- Building audit & investment programme development: €100,000
- Investment Cost: € 8.5 million including: € 80 / m2 x 22,000 m2 and € 1,500 / kW x 2,000 kW of installed solar PV
- € 25,000 / building x 150 buildings for heating / cooling system re-installations

Total OPEX Cost – N/A - It is anticipated that the cost of these developments will be recovered through energy savings.

Fit with Funding sources

Most suitable budgets are Municipal Budget with reimbursable support from IFIs, Private sources (ESCOs, PPP etc.), and National funding Sources

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | Possible fit | Poor fit

Implementation

Timeframe: Audits: Q4 2020; Development and Design of Schemes 2021; Rolling programme of rehabilitation between 2022 and 2030.

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (led by Project Elaboration and Implementation Department),** supported by other municipal departments and building owners

Stakeholders: Ministry of European Funds; Power supply utility – CEZ Craiova; Heat supply utility TERMO CRAIOVA; Association of Metropolitan Area Intercommunity Development; Building users, equipment suppliers, retailers, ESCOs

Key delivery risks:

Willingness of building operators. a lack of qualified staff manpower, technical expertise and capacity of the final beneficiaries to efficiently oversee and monitor the project.

Smart City Potential - **Potential to Benefit**

Dynamic daylight and solar energy control in buildings. Intelligent energy solutions including heat pumps, PV panels and storage batteries could be integrated into an intelligent and efficient Energy Management System.

Synergy with Other Actions

BE3 – Building Management Systems, BE4 - Develop and implement a new district heating strategy for Craiova

BE2: Energy efficiency and use of RES in residential buildings

Purpose – Rehabilitate 10% of residential buildings each year to improve energy efficiency and take advantage of opportunities for renewables

Benefits – Contribution towards a reduction of around 195,700 tonnes CO2eq/year by 2030 as well as air quality and thermal comfort benefits.

Cost – CAPEX: €231.6m (€46m - €70m from city budgets); OPEX: €50,000/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			Implementation

Description

Many residential buildings in Craiova require measures to improve energy efficiency and meet modern standards. There are an estimated 80,000 apartments in the city (with 60,000 connected to the District Heating System). The scheme would collect an inventory of the buildings stock and to evaluate that inventory to identify the highest potential for both energy savings and renewables opportunities. Key measures to be considered include:

- Improvement of building envelopes (exterior walls and doors, windows, interior ceilings, roofs and basements)
- Renewable energy use for heat and waste supply systems (including Solar PV or heat pumps)
- Awareness campaigns for BAT and energy efficient equipment
- Improvements to internal distribution of district heating
- Introduction of Building Management Systems where possible

The scheme further aim to increase existing efforts to support improvements to around 10% of apartments (8000) per year until 2030.

Key Benefits

Key benefits energy/savings and GHG reductions of approximately 195,700 tonnes CO2eq/year by 2030 with the vast majority of this benefit being delivered from thermal improvements (191,100 tonnes

CO2eq/year) and a much smaller but still notable contribution (4,600 tCO2eq/year) from the addition of renewables schemes. Some benefit in terms of air quality (if reductions in reliance on solid fuel boilers adaptation (in providing greater resilience to extreme temperatures) and associated public health and economic benefits through reduced bills. Potential economic and financial returns to households investing – including increased comfort, increased property prices, and energy cost savings. Likely employment benefits supporting jobs in construction, insulation, and renewables technologies. Can support awareness, particularly if individual metering is used.

Strategic Objectives Targeted

- SG1 - Improving energy efficiency of buildings
- SG2 – Reduce Carbon Emissions from the City

Key targets and Indicators

- Emissions reductions by at least 40% by 2030

Current Context

The housing stock contains a high proportion of apartment blocks with 80,000 apartments, many which were constructed from materials with poor thermal insulation. A small number of blocks of flats are currently being modernised presently but this is expected to increase to about 10%/year over the next 10 years.

Investment Costs

Total CAPEX Investment – 231.6 million – of which the city could contribute 20 – 30% with the rest from the building owners and central government.

- Building audit & investment programme development: € 100,000
- Refurbishment costs: € 80 /m2 – with target of 50% of apartment blocks with EE (40,000 apartments x 70 m2/ apartment = 2.8 million m2)
- PV or solar thermal installation = 5 MW at € 1,500 / MW
- Investment Cost: € 224 million (EE), € 7.5 million (RE)

Total OPEX Cost – € 50,000 per year for ongoing M&E / promotion of the programme

Fit with Funding sources

Municipal Budget, Private sources (building owners), IFIs (likely as credit lines) and National funding Sources (particularly the Casa Verde Programme)

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	Significant requirement for investment by owners (70-80%)	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Audits: Q1 2021; Development and Design of Schemes 2021; Rolling programme of rehabilitation between 2222 and 2030.

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (led Directorate of Housing Funds);** Property Owners/Owners associations

Stakeholders: Ministry of European Funds; Power supply utility – CEZ Craiova; Heat supply utility TERMO CRAIOVA; Association of Metropolitan Area Intercommunity Development; Building users, equipment suppliers, retailers, ESCOs

Key delivery risks:

Lack of financing and co-financing from owners and the challenge of persuading full blocks to access the programme.

Smart City Potential - **Potential to Benefit**

Use of remote heat cost allocators to monitor apartment level billing. Cloud-based applications such as smart metering. Building Energy Management System etc.

Synergy with Other Actions

BE3 – Building Management Systems, BE4 - Develop and implement a new district heating strategy for Craiova

BE3: Building Management Systems

Purpose – Install and building management systems to optimise energy use in municipal buildings

Benefits – Contribution towards carbon reductions set out in BE1 and thermal comfort for users

Cost – CAPEX: €910,000; OPEX: Cost neutral/saving

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			Implementation

Description

The municipal buildings in Craiova would benefit from the introduction of building management systems (BMS) establishing centralised control of thermal and electrical equipment. This would allow optimal operation of building services to achieve a balance of comfort and efficiency. This would be achieve by integration and control of all energy equipment of a building or series of buildings, monitoring of parameters in real time or near real time, and the possibility of visualization and remote control. The approach would be to:

- Identify suitable candidate buildings (through the same process as Action BE1) and develop a pilot study for BMS in the first rehabilitation programme
- If successful include in ToR for other municipal building refurbishment projects under BE1
- Establish and operate centralised monitoring of energy performance of buildings to maintain

Key Benefits

Key benefits energy/cost savings and GHG reductions (which would support the estimated 2,400 tCO2e/year by 2030 in BE1). Benefit in adaptation (in providing greater resilience to extreme temperatures). Economic and social benefits are complementary to benefits under BE1.

Strategic Objectives Targeted

- SG1 - Improving energy efficiency of buildings
- SG2 – Reduce Carbon Emissions from the City

Key targets and Indicators

- Emissions reductions by at least 40% by 2030

Current Context

Most municipal buildings are facing significant challenges of obsolete, energy-intensive infrastructure and limited public funds to renovate or replace it.

Investment Costs

Total CAPEX Investment – € 910,000

€895,000 - Automation systems typically $2.50 - 7.50 per ft2 (20 - 60 EUR / m2) plus € 15,000 for database and hardware.

Building audit & investment programme development: (covered under B1)

Total OPEX Cost – There will be operational costs in managing software and staff time (likely 1 staff-person or a portion of a staff-person's time), but this should be lower than the savings achieved. This could also be linked to national EMIS if appropriate.

Fit with Funding sources

Municipal Budget with reimbursable support from IFIs, Private sources (ESCOs, PPP etc.), and National funding Sources

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs[8]	SPVs
General Public/Other:		n/a

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Audits: Q1 2021; Scheme Development and Design of Schemes 2021; Rolling programme of rehabilitation between 2222 and 2030 – aligned with BE2

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (led by Project Elaboration and Implementation Department).** Supported by other municipal departments and building owners/operators

Stakeholders: Ministry of European Funds; Power supply utility – CEZ Craiova; Heat supply utility TERMO CRAIOVA; Association of Metropolitan Area Intercommunity Development; Building users, equipment suppliers, retailers, ESCOs

Key delivery risks:

- Lack of financing and co-financing from owners.
- Reluctance of owners/operators to engage in the programme.

Smart City Potential - **Potential to Benefit**

- Use of remote heat cost allocators to monitor apartment level billing
- Cloud-based applications such as smart metering,
- Building Energy Management System etc.

Synergy with Other Actions

- BE1 – Energy efficiency and use of RES in municipal buildings
- BE4 - Develop and implement a new district heating strategy for Craiova

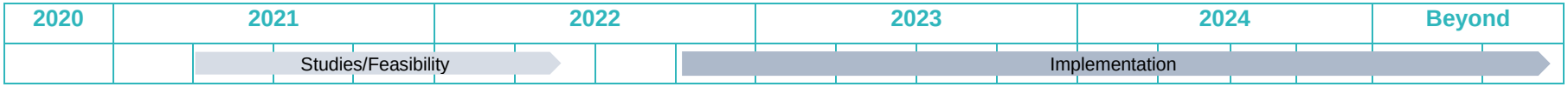
[8] While the overall scheme may not be suitable for a PPP due to its scale, there is potential for private sector engagement in operating potential Energy Management Schemes under an ESCO type arrangement.

BE4: Develop and implement a new district heating strategy for Craiova

Purpose – Develops a comprehensive strategy to determine the future of the District Heating supply for the city in line with EU expectations

Benefits – Decarbonising the heating system is key to meeting GHG objectives and to ensure long term sustainability

Cost – CAPEX: €250,000; OPEX: N/a likely to result in additional infrastructure investment/institutional reforms



Description

Undertake a holistic review of the district heating network aligned to policies set out in the Final Integrated National Energy and Climate Plan (INECP) for 2021 – 2030[9], including elements under the control of the municipality, and its interaction with third parties, so that the overall performance of the network is understood. This study should include:

Energy Sources

- Evaluation of the long-term financial sustainability of the arrangements between Termo Craiova and the energy supplier considering costs of energy, recovery from tariffs, and subsidies
- Consideration of CE Oltenia's decarbonisation plans (which include installation of Solar generation capacity on sludge/ash landfills at sites including Insalnita) and the impact they will have on the price, delivery and carbon intensity of heat supplied to the District Heating system supplied by their assets
- Evaluate the contribution which building / block scale "off grid" renewables (e.g. solar water heaters or air source heat pumps) may make to the overall picture of heating and hot-water provision

[9] The INCEP sets out Romania's commitments under regulations (EU) 2018/1999 on the Governance of the Energy Union and Climate Action

- Potential to enhance contributions from additional decentralised DH thermal plants (either gas or renewables) within the secondary networks at a neighbourhood level

Distribution

- Evaluation of potential for loss reduction (both thermal and hydraulic) from the existing primary and secondary networks

Billing and Demand Management

- Opportunities for a full transition to customer-based billing systems using metering or Heat Cost Allocators (where vertical systems exist)
- Root causes of decline in service provision, including customer views
- Apartment block level heat exchangers directly on the primary network in areas with a high density of users and where the losses are lower on the primary network than on the secondary network
- Consideration of broader social, economic, and environmental benefits (particularly climate) resulting from a new strategy.
- In light of the conclusions of the above, if any further or alternative infrastructure investment opportunities exist (outside the 2019 strategy) that support a more sustainable model for Termo Craiova.

Following this study to move forward appropriate policies and projects for implementation to meet national and EU commitments for decarbonisation and energy efficiency as set out in the INCEP 2021 – 2030.

Key Benefits

Provides an opportunity to create a better district heating services which improves energy efficiency and reduces GHG emissions in line with national and EU decarbonisation policies, strengthens resilience of the network and reduces reliance on boilers (by improving attractiveness of District Heating).

While the outcome of the strategy, and therefore costs and benefits are not certain, a basic analysis of potential key components based on existing proposals includes the installation of a 200 MW combined cycle (gas turbine, steam recovery and steam), rehabilitation of the secondary network and rehabilitation of the primary network, would generate around 112,000 tCO_2eq/year in GHG emissions savings.

There is potential for financial benefits to investors (both public and private as parts of the system are operated privately) and knock on social and economic benefits from potential reductions in costs if investments carried out. Consideration of gender equality issues should be considered in the study but are likely to represent benefits to economically marginalised group which may include a higher proportion of female headed households for example. There is also an opportunity to consult with stakeholders to gain community views.

Strategic Objectives Targeted

- SG1 - Improving energy efficiency of buildings
- SG2 – Reduce Carbon Emissions from the City

Key targets and Indicators

Strategy developed and in place with objectives for the Introduction of Consumer based billing; Reduction of thermal energy consumption; Reduction of fuel consumption; Reduction of Carbon Emissions

Current Context

The district heating system in Craiova is old and inefficient and demand is falling at a steady rate in favour of small gas boilers. The current strategy was revised in 2019, but only partially addresses opportunities for the modernisation of the System. It focused on the secondary distribution network and concluded upgrading current arrangement of the system. The main sources of EU funds for this type of investment (European funds - POIM) requires that such as strategy is in place to access finance and therefore this is an important enabling measure.

The recently published “Integrated National Energy and Climate Plan (INECP) 2021 to 2030”[10] sets ambitious targets for decarbonisation of the

[10] https://ec.europa.eu/energy/sites/ener/files/documents/ro_final_necp_main_en.pdf

energy system at a national scale requiring replacement of conventional power generation capacities with low carbon generation capacities. In the context of district heating this includes transit through the National Energy System and the use of heat pumps at source. Gas is identified as a transitional fuel to these lower carbon technologies from lignite.

Investment Costs

Total CAPEX Investment – €137.15 m *based on €250,000 for the study and nominally capital expenditure of €48.6m (co-generation) €48.1 m (primary network rehabilitation)*[11] *€ 40.2m (secondary network rehabilitation)*[12] *however this is subject to the outcome of the study itself. Additional investment-grade feasibility studies should be included in these investment figures.*

Total OPEX Cost – € 0 for the study. Operational cost will depend on the projects and investments implemented, however ultimately it is anticipated that energy efficiency gains and surplus sales to the grid would be financially beneficial to investors (including households themselves). If there are additional costs, they would need to be included in billing to heat consumers.

Fit with Funding sources

Local budget with possible support from Donor / IFI. Potentially IFI investment with central government / donor support for investments. It also may be possible to arrange investments as a PPP. Additional investments from the population for distributed sources could also be expected.

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q2 2021 – Q3 2021: Initial Study; Q4 2021 – Q2 2022: Project Feasibility Studies/Planning, Q3 2022 onwards: Project Implementation *(programme to be determined in study)*

*Implementing Agencies (lead in **Bold**):* **Craiova Municipality (Craiova City Hall),** Termo Craiova for the Study.

Project implementing agencies to be determined by the study, however this is likely to include CE Oltenia, Termo Craiova and CEZ.

Stakeholders:; Building owners/users; CE Oltenia; CEZ (Powerplant operators); Ministry of Energy; Ministry of European Funds; CEZ; Users

Key delivery risks:

Study - Failure to draw up a complete and comprehensive strategy; Contracting the evaluation with an inexperienced company; Failure to address long term decline in subscription to the district heating company

Delivery – To be determined during the study but key challenges are likely to include project ownership amongst stakeholders, accessing funding, and technical design and delivery risks.

Smart City Potential - **Potential to Benefit**

The study should consider asset management tools as well as monitoring and control mechanisms in the network itself. It is particularly important that the study considers technologies to achieve more equitable billing at apartment level (likely using Heat Cost Allocators due to the prevalence of vertical distribution systems).

Synergy with Other Actions

There is substantial overlap with Building energy measures BE1 & BE2

[11] Based on 60km of dual 600mm lines

[12] Estimated from tender documentation for similar schemes in Iasi, Focsani, Valcea, & Oradea (assumes 88km)

3.4 Sustainable Mobility

3.4.1 What are the key challenges and priorities?

While there are some new vehicles on the roads, neither the public transport fleet nor the private vehicle fleet is efficient. The public transport fleet (both busses and trams) have a high proportion of older vehicles in the fleet with some vehicles well past their intended operational lives, including a number of pre-Euro standard busses. The private car fleet is on average 12 years old with a high proportion of aged, imported second-hand diesel cars from Western Europe which do not conform to modern standards. Some investment is taking place in the public transport sector but there are limited responses in terms of managing the air quality issues that arise from an aging vehicle fleet.

Craiova is becoming increasingly dependent on car travel, particularly for commuting where the share of trips by private motorised transport (e.g. car) is very high with a reported 50.5% of all commuting trips made by car. This has implications for both traffic and perhaps more importantly local air quality. There is significant potential for improving modal share to public transport or to non-motorised forms of transport such as cycling. While there are some responses in place, these are fairly car centric and the GCAP can usefully support investment in public transport and non-motorised transport (as well as some disincentives for using private cars).

Traffic congestion in the city is increasing with a negative trend in average traffic speed over the last 10 years, currently standing at 27.2 km/h on primary roads (18 km/h for busses). Solutions to date have focused around intelligent traffic systems which are understood to have delivered mixed results in the city in terms of reducing traffic. Further investment in public transport and non-motorised vehicle modes would serve to relieve congestion pressures.

3.4.2 What are we already doing?

The primary policy document for the city for the transport sector is the Sustainable Urban Mobility Plan (SUMP) which has been prepared for the period 2016 – 2030 for the growth pole known as the Craiova Metropolitan Zone". This incorporates the City of Craiova, as well as adjacent towns of Filiaşi and Sagarcea and 21 other communes. Adopted in 2015, the Plan's objectives are to create a transport system which responds to the following strategic objectives:

- Accessibility: ensuring that all citizens are offered a transport system that gives them access to essential services and destinations;
- Safety and Security: improving safety and security;
- Environment: reducing air pollution, noise pollution, reducing greenhouse gas emissions and energy consumption;
- Economy and Efficiency: Enhancing the efficiency and profitability of the transport of people and goods; and
- Quality of the Urban Environment: contributing to the attractiveness of the city the, quality of the environment and landscape, and for the benefit of the economy and society as a whole.

The baseline analysis for the SUMP identified a number of key challenges to be addressed in Craiova including:

- Urban Mobility in Craiova City including: Road safety and severity of accidents; Pedestrian safety; and Bicycle safety
- Environment in Craiova including: Greenhouse gas emissions; Air pollution emissions; Noise pollution; and Energy consumption
- Economic efficiency including: Traveling time and cost; and Accessibility the population at public transport system.

Approximately 100 individual project proposals have been developed for the SUMP which include equipment, rolling stock, infrastructure and policy interventions. These have been integrated into the projects list in the wider Integrated Urban Development Plan (SIDU). Some of the key investments set out in the SUMP action plan include the following:

- A new bus terminal in the southern area of the city;
- Modernisation of the existing tramway;
- Renewal of buses and trams;
- Enhancing cycling infrastructure (including routes and Bike and Ride schemes);

- Various adjustments to the existing road network including new circulatory links and reorganisation of existing junctions and systems;
- Closer management of parking with improved parking facilities but also an overarching policy with respect to parking;
- Improved inter-modality with better Park & Ride and Bike & Ride facilities;
- Improved traffic management systems & freight parking locations; and
- Addressing specific challenges on the urban road network with rearrangement of intersections/speed limitations

In terms of other policy documents which address transport sector aspirations in Craiova these include the following:

Scale	Document	Summary
National	Government Programme 2018-2020	Transport infrastructure which includes significant investments in road (including ring road construction) and rail but also encourages multimodal transport usage with the objective of modal shift away from private transport.
	National Strategy and Action Plan on Climate Change (2013-2020)	In 2013 The Ministry of Environment and Climate Change (as it was then) produced a national strategy for climate change cover covering the period from 2013 to 2020 which was promoted by Government Decision No 529/2013. The strategy covers both the mitigation (the reduction of in emissions of greenhouse gasses) and adaptation to reduce the effects of climate changes already underway. It provides a sectoral analysis of both adaptation risks and mitigation, including the transport sector.
	General Masterplan for Transport in Romania	The General Transport Master Plan (GTMP) provides a development strategy of the transport sector in Romania for over a 15-year period (from 2014-2030) and has proposes implementable solutions for the problems and requirements of the transport sector in Romani. It sets out priorities for investment in the TEN-T core network as well as the wider primary and secondary networks which are expected to be completed with the RDFE and Cohesion Funds. Its overarching objective is to “Ensure conditions to create an efficient, sustainable, flexible and secure transport system, key concern for the economic development of Romania.” The plan covers the rail network, road network, ports and navigation, aviation and intermodal transport options.
Metro-politan	Urban Development Integrated Strategy (SIDU) Craiova (2014 – 2020)	The document sets out a vision and strategic objectives for the future development of the growth pole area. The strategic objectives include the ‘development of the Craiova Growth Pole by connection to Regional, National and European Transport Networks’.

3.4.3 What Strategic Goals and Targets have been set and why?

The following strategic objectives have been set for the Sustainable Mobility Sector. A summary rationale for each of the supporting Mid-Term Targets is also included below.

SG3 Encouraging greater use of public transport and active travel networks

The public transport fleet (both buses and trams) includes a high proportion of older vehicles, with many past their operational lives. There is a significant amount of second-hand diesel cars in the city that are easy and cheap to obtain. The result is a consistent problem of poor air quality levels in the city centre, which reduces the environmental amenity and attractiveness of the urban area to both residents and visitors.

Whilst the City is currently seeking to address this issue through the introduction of a new bus fleet (with low emission standards), it is considered essential that there should be a strategy to promote and facilitate the introduction of low emission vehicles entering the city centre to deliver environmental enhancements and help meet local air quality standards.

Supporting Mid Term Targets

SG3a - Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.

Performance of this strategic objective can be measured against the level of public satisfaction with city public transport services and infrastructure, as well as walking and cycling facilities via a social survey. The key indicator for this will be implementation of public satisfaction surveys by the RAT and an ability to demonstrate consistent annual improvement over 5 years.

SG3b - Increasing levels of sustainable travel to all key education, employment, leisure, and retail destinations across the city, measured buy an increase in modal share for public and active transport modes by 5%.

Data collected during the baseline analysis indicates that private car transport has around 35% of the overall modal share and the Green City benchmark is 30% of modal share. The aim is to increase other modes by 5% over the next 10 years to meet the "green" benchmark.

SG3c - Expanding the public transport and active travel networks seamlessly to meet the demands of commuter patterns with 90% of the population living within 500m of a public transport hub or a segregated cycleway

The 500 m distance to bus stops is based on the World Bank PPIAF Urban Bus Toolkit. There is no fixed benchmark for access to segregated cycleways however our judgement is that a similar distance and level of access would be appropriate.

SG4 Encouraging the use of Low Emission Vehicles

Supporting Mid Term Targets

SG4a - Increasing the proportion of alternatively fuelled (low emission) vehicles within the vehicle fleet to 3%.

This 3% of the total private car fleet is the Green Cities benchmark for alternatively fuelled vehicles. The consultants recommended that we apply this beyond the private car fleet to include all motorised vehicles.

SG5 Improving streetscape

Supporting Mid Term Targets

SG5a - Public perception is that the balance of space allocated to parking and economic, social, and cultural activity is correct

It is important to enhance the city's public streets and spaces to improve the quality of life, minimise the impact of motorised traffic and encourage economic, social and cultural activity. Improving the efficiency of the streets and reallocation of the road space will help to reduce the number of cars in the city centre and create more opportunities to establish more and better quality facilities for pedestrians, cyclists and public transport users. Work has recently been undertaken to re-surface the pedestrianised area of the city centre, with high quality materials to create an attractive, accessible environment, with traffic restrictions in place to reduce pedestrian-vehicular conflict, creating a safer environment for users.

SG6 Urban planning that minimises environmental impact and enhances natural assets

[13]

Supporting Mid Term Targets

SG6a - Planning new development to ensure adequate connection to public transport or active transport network.

The key focus here is on maximising accessibility and connectivity by establishing new development that is close to public transport and active travel networks. It is important to consider existing areas of the city that are well connected to public transport networks and promote these more fully, where new development can be accommodated. The intention is to reduce reliance of private motorised transport by integrating land use and transport more effectively to reduce the need for car ownership and to promote sustainable travel. The efficient coverage of the public transport and active travel networks should be a key principle for the new design of the City PUG.

[13] Note that SO6 also appears under the Urban Planning and Greenspace Section with Mid Term Targets SO6b-c as the objective straddles each of the objectives.

3.4.4 What actions are we proposing to take?

We have proposed a series of short-term actions (to be implemented in the next 3 - 5 years) in the sustainable mobility sector to support achieving the mid-term targets set out above. These are summarised in Table 3.2 below and then described in more detail in the subsequent pages.

Table 3.2 - Summary of Sustainable Mobility Actions

ID	Action	Description
SM1	Extension of public transport services & infrastructure in the new district areas of the City	Feasibility study/action plan to expand public transport network (bus) including supporting infrastructure in the new district areas of the City to improve connectivity to the network and attract new passengers for citywide services.
SM2	Modernization of City tramway network	Enhancement of tramway infrastructure including running path, contact network, trackers, arrangement of stations in order to enhance the quality of the network/service to attract new passengers and reduce level of car use.
SM3	Modernisation of the Bus Depot	Rehabilitation of the city's bus depot to improve service to bus fleet and improve efficiency
SM4	Renewal of the Urban Public Transport Vehicle Fleet	Acquisition of new trams and bus vehicles to enhance the quality of rolling stock to deliver higher quality services to city residents.
SM5	Citywide Cycle Route Network & Parking Development	Feasibility study to identify routes and solutions for arranging bicycle lanes and facilities across the city. Cycle network will encourage more sustainable travel, reduce car use, and support healthier lifestyles.
SM6	City Bike Hire Scheme	The development of a new Municipal Bicycle Rental Scheme across the city to encourage greater take-up of cycling as a regular mode of transport for commuting and leisure trips.
SM7	New Parking Policy for Craiova – including residential and freight parking facilities	Development of a study to define a new citywide parking policy to control and manage traffic demand/movement in the city. This includes reviewing and updating parking charges and regulations that consider the needs of residents and businesses in the central area and residential districts of the city. Dedicated parking facilities should also be provided for freight (e.g. Old Market area) as well as residential requirements
SM8	Development of new Transport Assessment Guidelines	The development and adoption of new guidelines for Transport Assessments (TA) relating to new developments will seek to enhance integration of land use planning and transport decisions through strengthened/new planning processes within the Municipality.
SM9	Development of New Citywide Pedestrian Route Network	The development of a new citywide network for pedestrian movement with a route network hierarchy based on usage, which will include footpath area modification (incl. construction works and new urban street furniture), together with the construction of pedestrian priority areas/zones.
SM10	City Access Restrictions	Management of the city access restrictions within the pedestrianised areas of the city including new controls of vehicle operation, vehicle access and vehicle type.; enhanced facilities and signing for loading and delivery bays; stronger enforcement to reduce the level of non-discriminatory parking and minimizing conflicts with pedestrians and other road users in the city centre. Reducing emissions, increasing traffic safety, enhancing road capacity and reliability of the transport system.

SM1: Extension of public transport services & infrastructure in the new district areas of the City

Purpose – Extend public bus and tram services into new areas of the city and to intermodal hubs. Feasibility study followed by investment.

Benefits – Improved access to services supporting modal shift and reduced pollution (GHG and Air Quality) as well as social benefits.

Cost – CAPEX €2.5M; OPEX: €0.3M/Year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

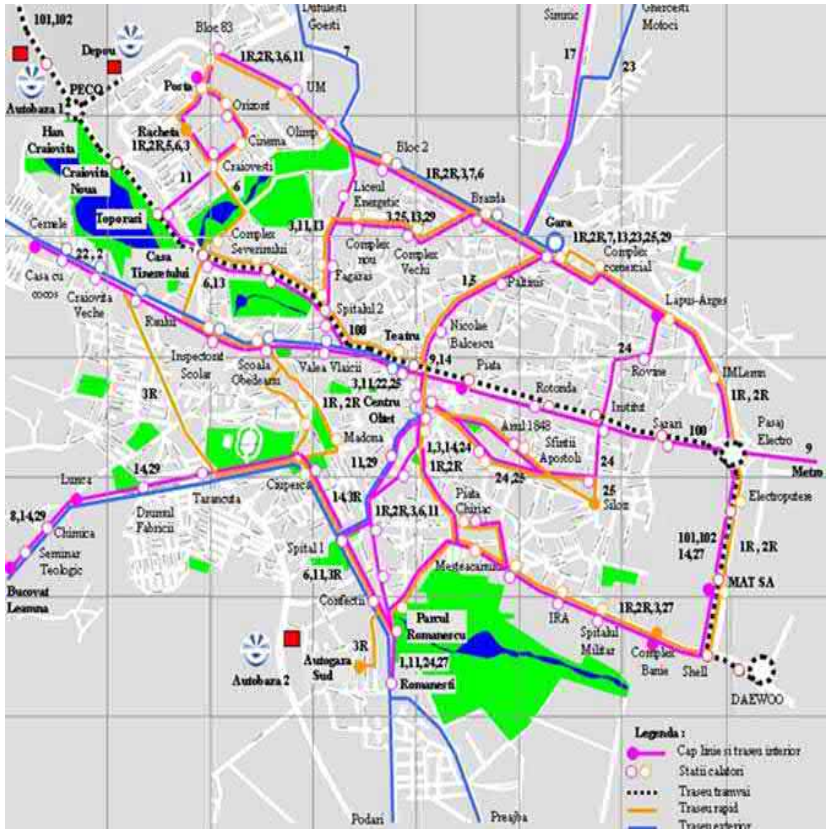
Feasibility study/action plan to expand public transport network (bus) including supporting infrastructure in the new district areas of the City and intermodal hubs (including the wider rail network and airport) to improve connectivity to the network and attract new passengers for citywide services. The feasibility study will also consider intermodal opportunities for the Tram network (i.e. connectivity to the Rail and Air links).

Key Benefits

Primary benefit is improved access to service which could in turn (as a result of modal shift) have broad social, economic and environmental benefit, supporting better accessibility to jobs and centralised services, improved safety, improved air quality, reduced energy consumption / GHG emissions, more efficiently and resilient travel (more options). Combined with other SM measures (not including SM4 calculated separately), the emissions reduction per year is estimated to be at least 11,467 tCO_2eq. The measure is likely to benefit female users (who are often more frequent users of PT than males) proportionately more.

Strategic Objectives Targeted

- SG3 Encouraging greater use of public transport and active travel networks.
- SG2 Reduce Carbon Emissions from the City.



- SG4 Encouraging the use of Low Emissions Vehicles.

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key education, employment, leisure, retail destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030.

Current Context

In recent years there has been a rise in the share of private transport (cars and motorcycles) in the City, due to increase in household wealth and greater numbers of people living outside the city centre, where there are lower levels of public transport penetration. At the same time, the quality of the public transport offer is also decreasing with older, life-expired vehicles and a lack of modern network infrastructure to attract new users to the system. Further work is required to connect the city's public (bus) network to serve new areas of development to provide a viable alternative to the private car, coupled with new infrastructure (including stops/shelters and waiting environment.

Investment Costs

Total CAPEX Investment – €2.5m

- € 500,000 (study – network/infrastructure)
- Investment: Typical infrastructure costs of € 20,000 per stop, with 5 routes developed/introduced and estimate of 20 stops per route; total of € 2 million (infrastructure).

Total OPEX Cost – € 300,000 / year (15% CAPEX); an element of cost recovery will take place through bus fares / advertising

Fit with Funding sources

Municipally-owned companies (and potentially via a PPP), IFI, Central Government, and Donors

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Study – Q2 2021 to Q4 2023, Implementation Q1 2022 – Q4 2024

*Implementing Agencies (lead in **Bold**):* **Craiova Municipality/RAT,** Other transport operators where relevant

Stakeholders: City Hall, RAT public transport operators; public transport user groups, local district community/resident groups

Key delivery risks:

- Traffic regulation orders relating to new routes/contracts.
- The ability of bus operators to maintain and expand bus fleets to be able to deliver expanded bus network.
- Outcome of public feedback and reaction to changing bus routes to serve new areas.
- Impact on general traffic across the city with introduction of new bus routes, and infrastructure

Smart City Potential - **Potential to Benefit**

Potential for smart infrastructure to be developed on bus routes including real-time passenger information and online journey planners with the introduction of new routes/timetables

Synergy with Other Actions

SM4 - Renewal of the urban public transport vehicle fleet; SM2 - Modernization of City tramway network; SM3 - Modernisation of the bus depot; CC4 - Implementation of the Air Quality Plan; CC5 - Smart air quality and environment monitoring in Craiova

SM2: Modernisation of city tram network

Purpose – Improve the quality of the existing tramway by upgrading the running path, contact network, trackers, and arrangement of stations

Benefits – Improved attractiveness encouraging modal shift from car use. Quality, safety and reliability benefits. Energy and GHG benefits.

Cost – CAPEX €270.15m; OPEX: Cost saving

2020	2021	2022	2023	2024	Beyond
		Planning	Implementation		

Description

Enhancement of tramway infrastructure including running path from the Ford Plant in the south east to the Termo Plant in the north west including contact network and tracks as well as adjusting the arrangement of stations in order to enhance the quality of the network/service and attract new passengers, thereby reducing levels of car use. There may also be a case for expanding the tram network to the Airport (and possibly connectivity to the Rail Station) however the business case for this would need to be explored under item SM1 and these options would be a longer term investment and have not been included in this Action at this stage.

Key Benefits

Upgrading of the existing tram network will increase the attractiveness of tram services and encourage modal shift from car use. it will also improve the quality, safety, reliability, and efficiency of the tram service, delivering infrastructure to match levels currently experienced in most cities across Europe. Improvements could improve access to social and economic opportunities which may have a greater benefit on less well off citizens. Combined with other SM measures (not including SM4 calculated separately), could deliver emissions reductions of at least 11,467 tCO_2eq/year

Strategic Objectives Targeted

- SG3 - Encouraging greater use of public transport and active travel networks.
- SG2 - Reduce Carbon Emissions from the City.
- SG4 - Encouraging the use of Low Emissions Vehicles.

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key education, employment, leisure, retail destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030
- Increasing the proportion of alternatively fuelled (low emission) vehicles within the vehicle fleet to 3%
- Additional benefits in terms of improved energy efficiency and carbon reduction.

Current Context

The tram network in Craiova is one of the newer tram networks in Romania, operating since 1987. The system's only track is 18 kilometres long and standard gauge, there are three lines running on same track and they are divided by density. Over the past 30 years the City has been keen to enhance infrastructure to address problems resulting from the aging tram fleet and operation, including high levels of power consumption and also improving the ridership quality for passengers..

Investment Costs

Total CAPEX Investment – €270.15M. € 0.15 million (study) plus average infrastructure cost of € 15 million / km – up to 18 km

Total OPEX Cost – N/A - Operating costs would likely decrease due to improved efficiency and less repairs required.

Fit with Funding sources

Municipally-owned companies, IFI, Central Government, and Donors. There is also PPP potential but it is more likely to be delivered RAT.

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:		n/a

Good fit | Possible fit | Poor fit

Implementation

Timeframe: Study Q1 2022 – Q2 2022, Implementation Q3 2022 to Q2 2024

*Implementing Agencies (lead in **Bold**):* **City Hall – Municipality, RAT, public transport operators.**

Stakeholders: Local district community/resident groups; Chamber of Commerce etc.

Key delivery risks:

- Stakeholder feedback and concerns (e.g. impact on parking/traffic flow)
- construction risks relating to network improvements.

Smart City Potential - **Potential to Benefit**

Options exist to continue to improve the application of smart technology such as real time customer information (ideally provided as open data) and e-ticketing, as well as new operating models including autonomous vehicles as part of an overall strategy to tackle traffic congestion and air quality. Autonomous models could also provide public health benefits in the post-COVID-19 era.

Synergy with Other Actions

- SM1 – Extension of public transport services & infrastructure in the new district areas of the City;
- SM4 – Renewal of the urban public transport fleet;
- CC5 - Smart air quality and environment monitoring in Craiova

SM3: Modernisation of the Bus Depot

Purpose – Rehabilitation of the city's bus depot to improve service to bus fleet and improve efficiency

Benefits – Improved servicing of bus fleet leading to a more reliable service. Improved working conditions for staff. Reduced localised pollution

Cost – CAPEX €3.35m; OPEX: Cost saving

2020	2021	2022	2023	2024	Beyond
	Planning / Implementation	Implementation			

Description

Modernization of the depot, including the modernisation of recovery stations for the electrical supply of TRCS. Implementation of modern systems/equipment, active electrical station to improve maintenance and service facilities for bus vehicles. There may also be potential for solar panels at the site taking advantage of large roof-space - there is potentially 5700 m2 of roof-space which would result in approximately 0.25 MW available for this.

Key Benefits

Main benefits revolve around supporting improved servicing of bus fleet and is therefore an enabling measure for actions such as SM1 and SM4. However, there are some direct benefits in improved performance of the facility including potential installation of PV panels, improvements to efficiency of building and general improvements to environmental/OHS management at the site. There may also be improved efficiency/cost effectiveness of the site

Strategic Objectives Targeted

- SG3 - Encouraging greater use of public transport and active travel networks.
- SG2 - Reduce Carbon Emissions from the City.
- SG4 - Encouraging the use of Low Emissions Vehicles

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key education, employment, leisure, retail destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030.

Current Context

At present the Bus Depot dates back to 1965 and it is clear that it has benefited from very little in the way of modernisation or maintenance during that time. The depot is largely self-sufficient offering mechanical maintenance, and paint-shop facilities as well as fuelling and vehicle washing. The existing depot buildings, whilst functionally life-expired, are structurally sound and so the emphasis is to undertake a major refit, to include ventilation, mechanical and electrical fittings, drainage etc. It is intended that the depot functions will be brought up-to date to enable more sophisticated vehicles such as electric and hybrid buses to be maintained. Cleaning and maintenance work is currently being undertaken on a day-to-day basis but there are limited facilities to minimise environmental impacts, for example, preventing run-off of contaminants, dispersal of VOCs from paint, to recycle water or to recycle waste. The continued upgrade and renewal programme of the city's public transport fleet means that a new facility is required to be able to maintain and manage the fleet efficiency and safely.

Investment Costs

Total CAPEX Investment – €10,000,000 (based on feasibility study)[14]

Total OPEX Cost – Assumed reduction in operating costs

Fit with Funding sources

City Municipality and IFIs

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:		

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q1 2021 – Q2 2022

*Implementing Agencies (lead in **Bold**):* **City Hall – Municipality/RAT**

Stakeholders: City Hall, RAT, public transport operators

Key delivery risks:

- Implementation risks including need for increased levels of air conditioning (given high summer temperatures),
- addressing air quality issues within the site (e.g. painting of vehicle, produce harmful emissions).

Smart City Potential - **Potential to Benefit**

Options exist to explore a range of Smart options as part of the re-development of the city bus dept, including the installation of modern new charging facilities/systems; asset management software to help improvement the management and scheduling of vehicle servicing; as well as the potential to include solar power equipment to as a longer term sustainable energy source for the depot.

Synergy with Other Actions

- CC4 - Implementation of the Air Quality Plan;
- CC5 - Smart air quality and environment monitoring in Craiova;
- SM1 - Extension of public transport services & infrastructure in the new district areas of the City.

[14] The consultant was not able to review the feasibility study in the available timeframes

SM4: Renewal of Urban Public Transport Fleet

Purpose – Acquisition of new bus vehicles to enhance the quality of rolling stock and deliver better service

Benefits – Supporting modal shift to Public Transport with associated air quality and GHG benefits (at least 1,021 tCO_2eq)

Cost – CAPEX €7.5m; OPEX: Cost saving

2020	2021	2022	2023	2024	Beyond
	Implementation				

Description

Acquisition of new bus vehicles to enhance the quality of rolling stock to deliver higher quality services to city residents. An additional 30 electric hybrid buses are being sought to continue the programme of fleet renewal in the city to achieve environmental and operational efficiency benefits

Key Benefits

Important measure to support reduced private car use which has benefits for access to services, air quality, energy use, and GHG emissions. The emissions reduction per year is estimated to be at least 1,021 tCO_2eq. Higher ridership would provide improved revenue for RAT. Wider social and economic benefits likely to include supporting better public health, improved road safety, visible commitment to improving service/environmental performance. As with other transport related services improvements to public transport tend to improve female citizens as typically female ridership is higher

Strategic Objectives Targeted

- SG3 - Encouraging greater use of public transport and active travel networks.
- SG2 - Reduce Carbon Emissions from the City.
- SG4 - Encouraging the use of Low Emissions Vehicles

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key education, employment, leisure, retail destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030
- Increasing the proportion of alternatively fuelled (low emission) vehicles within the vehicle fleet to 3%

Current Context

The City has developed plans to invest in the modernization of the public transport fleet and replace vehicles whose life cycle has reached its limits with modern, energy-efficient buses and trams. The city's existing bus fleet still includes pre-Euro standard vehicles and second-hand buses of early Euro standard. The poor quality of buses, and the challenges in maintenance production mean that in turn the public transport operation is poorly perceived, and unable to achieve adequate farebox revenues. As part of the City's overall plan to develop the citywide public transport network, new Euro VI Buses are being procured to replace obsolete buses in the RAT fleet. Previous studies have been undertaken to assess the city's public fleet and future requirements as part of the 2018 Smart Fleet Renewables Project Romania. New hybrid electric bus vehicles are being sought which will establish a major step-change in the quality of the public transport offer in Craiova, providing modern, clean accessible vehicles for passengers. As part of the EU MOTORIC 1 program, 16 new electronic buses are being introduced in 2021 as part of a phased approach to fleet renewal. Further vehicles are required to enhance the quality of the city's public transport service. The main outcomes from the investment will be enhanced comfort, safety and satisfaction for passengers which in turn will increase the level of use compared to private motorised transport.

Investment Costs

Total CAPEX Investment – € 7,500,000

Total OPEX Cost – Reduction in level of OPEX per year

Fit with Funding sources

Municipally-owned companies, IFIs and Donors

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q3 2020 – 2030 (ongoing programme of renewal)

*Implementing Agencies (lead in **Bold**):* **RAT,** City Hall

Stakeholders: City Hall, User Groups

Key delivery risks: Limited risks – well established project type

Smart City Potential - **Potential to Benefit**

Facilities such as air conditioning / heating and cooling system, Wi-Fi equipment, traffic management system, passenger audio-video information system, passenger counting system, 7-camera video surveillance system, USB sockets for charging various devices. A new traffic management and monitoring system is also in progress to help improve the quality of public transport services in Craiova which will provide priority for bus vehicles at junctions. Plans exist to expanding e-ticketing and equipping all bus stops with screens displaying information on schedules and routes.

Synergy with Other Actions

- CC4 - Implementation of the Air Quality Plan;
- CC5 - Smart air quality and environment monitoring in Craiova;
- SM1 - Extension of public transport services & infrastructure in the new district areas of the City.

SM5: Citywide Cycle Route Network Development & Cycle Parking

Purpose – Install a modern and safe cycle network including cycle parking provision to facilitate cycling as a significant mode of transport

Benefits – Modal shift away from cars with associated GHG/Air Quality benefits. Public health benefits. Economically inclusive investment.

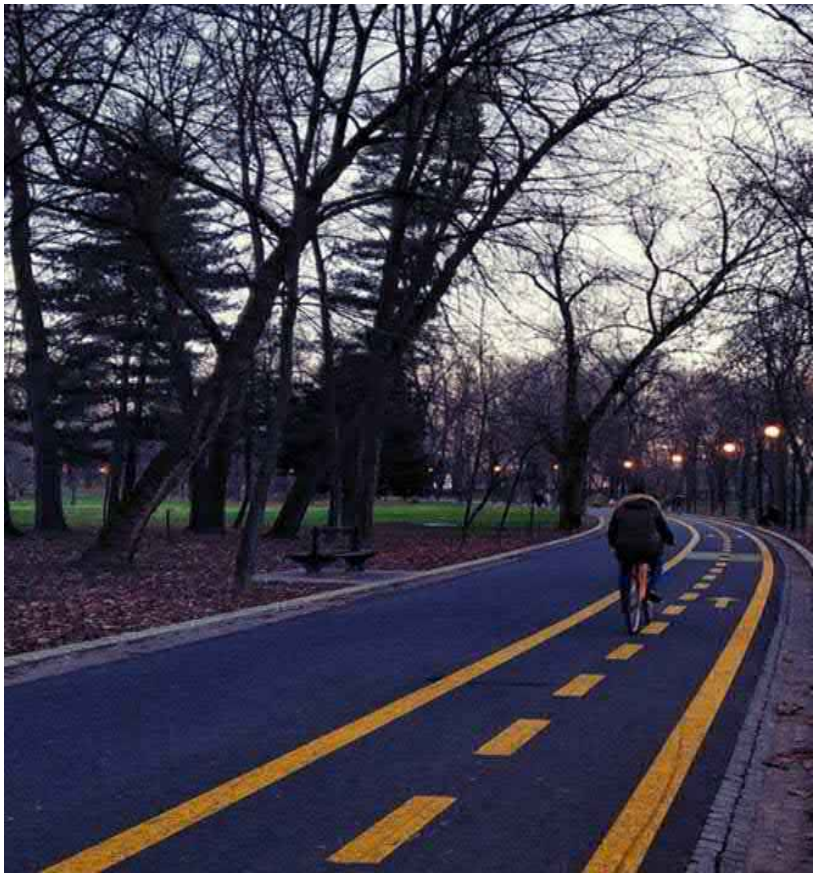
Cost – CAPEX €3.6m; OPEX: 0.36m/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

Creating a cycle network with safe, direct cycle connections that link residential areas with the city centre and key places of employment, retail and education. Feasibility study will be conducted to identify routes and solutions for arranging bicycle lanes and facilities (such as cycle parking) across the city and subsequent investment in a first phase of segregated routes in the city centre. It is suggested that routes are arranged in a ring around the city centre with radial routes connecting outlying areas. These would be supported by cycle parking which is a very important aspect of any cycle route and facility programme, with stands required at all main destinations such as public buildings, shopping areas and employment areas.

It is noted that a local architect has shared a concept for a cycle network referred to as “Step UP” which should also be considered as a potential conceptual layout to develop further within the feasibility study.



Key Benefits

A well-developed scheme will support a safe and efficient active travel mode which is clean, very low GHG, low cost for users, promote public health, and could have significant benefits for city centre congestion. Combined with other SM measures (not including SM4 calculated separately), the emissions reduction per year is estimated to be at least 11,467 tCO_2eq.

Strategic Objectives Targeted

- SG2 Reduce Carbon Emissions from the City.
- SG3 Encouraging greater use of public transport and active travel
- SG4 Encouraging the use of Low Emissions Vehicles.
- SG13 Air Quality Management.

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030.

Current Context

There are limited cycle paths and lanes provided in Craiova with only 7.2 km implemented up until 2018, and current paths supporting recreational use (e.g. around Romanescu Park) rather than commuter travel. A new network is proposed for development and implementation as part of the City SUMP and there is significant stakeholder support for more cycle routes and infrastructure to create safe and attractive routes, connecting destinations throughout the city.

Investment Costs

Total CAPEX Investment – € 3,600,000m

- € 150,000 (study/design)
- Investment: €120,000 per km – estimated 30 km segregated cycle paths comprising a ring and intersecting routes to connect suburbs
- Total of € 3.6 million including cycle parking (basic) at € 100 / stand

Total OPEX Cost – Up to 10% of capital cost for maintenance and re-surfacing per year – € 360,000

Fit with Funding sources

City Budget, EU Structural Funds, IFIs (non-project based finance)

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q2 - 3 2021 (Feasibility Study), Q4 2021 – Ongoing (Design & Implementation)

*Implementing Agencies (lead in **Bold**):* **City Hall - Municipality**

Stakeholders: City Hall, cycle user groups and associations; local district community/resident groups, “Step UP” developer.

Key delivery risks:

- Traffic regulation orders relating to new cycle routes/contracts.
- Ability to implement safe routes segregated from motorised traffic.
- Impact on local parking spaces and capacity
- Outcome of public feedback and reaction to location of new routes and cycle parking facilities.
- Impact on general traffic across the city with introduction of new cycle routes potentially requiring reallocation of road space on key corridors and at junctions

Smart City Potential - **Potential to Benefit**

Options exist to use artificial intelligence (AI) to better plan and operate new cycle routes in the city, using sensors to gather data on people cycling, walking and using other traffic modes to better understand travel patterns and improve conditions for cycling. Cycle route journey planning applications can also be offered.

Synergy with Other Actions

SM6 - Citywide Bike Hire scheme; CC4 - Implementation of the Air Quality Plan; CC5 - Smart air quality and environment monitoring in Craiova;

SM6: City bike hire scheme

Purpose – Creation of a city bike hire scheme allowing people to rent bikes at low cost to travel around the city

Benefits – Clean, efficient, very low carbon GHG mode. Reduced congestion and improved public health.

Cost – CAPEX €0.5m-€1m; OPEX: Likely net cost neutral but dependent on uptake

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

As part of the overall strategy for encouraging and promoting more cycling activity in Craiova new cycle parking facilities (including secured/covered cycle parking) will be installed across the city including park areas, university faculty buildings, public institutions, markets and retail areas – all linked with the cycle route network to attract new cyclist activity in the city. It also includes the implementation of Bike & Ride facilities at rail stations. The measure includes the development of a new Municipal Bicycle Rental Scheme across the city to encourage greater take-up of cycling as a regular mode of transport for commuting and leisure trips

This system will provide readily available, good quality and regularly maintained bikes and cycle parking facilities which can be hired according to user requirements. An option exists to include electric bicycles within the bike share scheme to help improve the attractiveness to potential cyclists. Electric bicycles also enable larger distances to be travelled, which would enable users and the Bike Share scheme) to cover a larger geographical area.

Key Benefits

Commercially operating bike scheme provides a low-cost alternative to private car transport. As with SM5, this provides an opportunity for clean, efficient, and very-low GHG transport mode around the city.

Combined with other SM measures (not including SM4 calculated separately), the emissions reduction per year is estimated to be at least 11,467 tCO_2eq. This measure also has additional social inclusion benefits (due to low cost) and public health benefits with regular use.

Strategic Objectives Targeted

- SG2 Reduce Carbon Emissions from the City,
- SG3 Encouraging greater use of public transport and active travel networks,
- SG4 Encouraging the use of Low Emissions Vehicles

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030

Current Context

Craiova faces issues of high volumes of traffic congestion and environmental problems especially in the central area and the city is keen to maximise the benefits offered by cycling as an alternative to private motorised transport. In addition to the development of the citywide cycle route network (Option SM5), the city is keen to develop a citywide bike-hire scheme which will enable people to have access to bikes and safe, secure facilities that are provided across the city.

Investment Costs

Total CAPEX Investment – Study: € 30,000 Investment: € 500,000 – 1 million

Total OPEX Cost – € 1,000 per bike / year (costs offset by revenue from charges for bike hire) – up to EUR 500,000 per year without user contributions This would be cost neutral if just 10% of the population signed up to a scheme @16€ per/year.

Fit with Funding sources

Commercial Operators/City Budgets

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	Ultimately revenue for bike scheme would come from the public but not the initial capital.	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q1-2 2021 (Feasibility Study), Q2 2021 – Q3 2022 (Implementation)

*Implementing Agencies (lead in **Bold**):* **City Hall, Commercial Bike-Hire Scheme Operator**

Stakeholders: City Hall, City police, Commercial Bike Hire Operator Cycle user groups, local district community/residents

Key delivery risks:

- Identification of suitable commercial bike-hire operator;
- provision of suitable quantity of cycle parking & bikes for hire,
- identification of suitable sites for parking .
- Maintenance of cycle parking & bike hire scheme.

Smart City Potential - **Potential to Benefit**

Existing technology allows for the application of smart to citywide bike-hire schemes to manage and hire bikes. In Romania systems such as IVELO offer https://ivelo.ro/en/urban/ offer users access to bikes through an easy-to-use system that enables cyclists to book, pay for and manage the daily cycling needs effectively..

Synergy with Other Actions

SM5 - Citywide cycle route network development; SM8 - Development of new Transport Assessment Guidelines; CC4 - Implementation of the Air Quality Plan; CC5 - Smart air quality and environment monitoring in Craiova

SM7: New parking management policy in Craiova

Purpose – Develop and implement a new city centre parking policy to control traffic demand/movement in the city centre

Benefits – Encourage and support modal shift with associated GHG and air quality benefits

Cost – CAPEX €0.5m-€1m; OPEX: To be determined in study – likely to be cost neutral after revenue

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

Development of a study to define a new city centre parking policy and implementation of scheme to control and manage traffic demand/movement in the city. This will include reviewing and updating parking charges and regulations that consider the needs of residents and businesses in the central area and residential districts of the city. For example, though access restrictions (see SM10), establishing controlled areas such as 'residents only' parking areas, implementing pricing controls for on-street and off-street parking and reducing the availability of long stay parking spaces in the city centre. Dedicated parking facilities should also be provided for freight (e.g. old market area) as well as residential requirements. Consideration of E-charging facilities should be considered as a part of the wider strategy.

Demand management measures will also need to form an important part of the strategy to discourage unnecessary journeys by car to the city centre and promote public and active transport modes. It is important that any perceived reduction in convenience for parking is matched by improved public and active transport facilities (as promoted in this document).

Any new regulations would also require consideration of appropriate enforcement measures to ensure effectiveness.

Key Benefits

Key benefit is to encourage alternatives to private car use and is therefore an enabler for wider modal shift which has benefits in terms of air quality, GHG emissions and economic growth which is less tied to private car use. This can also be used to encourage alternatively fuelled vehicles and protect sensitive areas of the city from pollution. Combined with other SM measures (not including SM4 calculated separately), the emissions reduction per year is estimated to be at least 11,467 tCO_2eq.

Strategic Objectives Targeted

- SG2 Reduce Carbon Emissions from the City.
- SG3 Encouraging greater use of public transport and active travel networks. SG4 Encouraging the use of Low Emissions Vehicles.
- SG6 Urban planning that minimises environmental impact and enhances natural assets.
- SG13 Air Quality Management.

Key targets and Indicators

- Increasing levels of sustainable travel to all key destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030.

Current Context

There has been a rise in the share of private transport (cars and motorcycles) in the City, due to increase in household wealth and greater numbers of people living outside the city centre, which is placing additional demand for parking within the city centre.

Investment Costs

Total CAPEX Investment – € 500,000 – €1m (€50k for a study and €500k – €1m investment)

Total OPEX Cost – Need to establish parking enforcement team to manage and enforce the scheme; City Centre Parking Scheme will generate revenue for the city

Fit with Funding sources

City Budgets, IFIs, Private operators for parking fee collection (mobile, on-street pay-and-display machines, etc.)

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	Although cost recovery through parking fees	

Good fit | Possible fit | Poor fit

Implementation

Timeframe: Feasibility Study: Q1 – Q2 2021 (Study); Q3 onwards (Design & Implementation)

*Implementing Agencies (lead in **Bold**):* **City Hall, private car park operators**

Stakeholders: City Hall, local district community/resident groups, business sector representatives including local Chamber of Commerce, enforcement agencies

Key delivery risks:

- Traffic regulation orders relating to new routes/contracts.
- Support from the city business and retail trade.
- Public response to introducing parking charges and regulations

Smart City Potential - **Potential to Benefit**

Potential smart options to be considered as part of new strategic approach including parking space monitoring, car park counting systems, fixed and mobile automatic number plate recognition (ANPR), guidance signage and payment meters (including connectivity to cashless app based payment such as RingGo).

Synergy with Other Actions

SM10 – City Access Restrictions; SM8 - Development of new Transport Assessment Guidelines; CC4 - Implementation of the Air Quality Plan; CC5 - Smart air quality and environment monitoring

SM8: Development of new Transport Assessment Guidelines

Purpose – Create established guidance to ensure that future development adequately considers transport issues

Benefits – Supports long term modal shift and associated environmental and social benefits

Cost – CAPEX €25,000; OPEX: €20,000/year

2020	2021				2022				2023				2024				Beyond	
	Planning																	

Description

Enhanced integration of land use planning and transport decisions through strengthened/new planning processes within the Municipality which support a pattern of development and redevelopment which supports sustainable economic growth and regeneration. In support of the new City PUG and development/zoning regulations – the development and adoption of new guidelines for Transport Assessments (TA) relating to new developments will seek to maximise focus on sustainable travel modes (especially Non-Motorised Transport and public transport) and minimise the need to own cars especially in the central areas of the city. Well-designed transport infrastructure will become an essential condition as part of the city's development control policies for all new land-use development. Sustainable transport design will be integral as part of all land use planning decisions.

The Guidelines will seek to ensure that options to encourage use of public transport and non-motorised modes is taken when designing and implementing new development projects and plans.

Key Benefits

Provides a mechanism for mainstreaming good quality transport infrastructure into land use planning and permitting decisions to ensure that long term modal shift (and associated environmental and social benefits) are achieved.

Strategic Objectives Targeted

- SG2 Reduce Carbon Emissions from the City.
- SG3 Encouraging greater use of public transport and active travel networks.
- SG4 Encouraging the use of Low Emissions Vehicles.
- SG6 Urban planning that minimises environmental impact and enhances natural assets.
- SG13 Air Quality Management.

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key education, employment, leisure, retail destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030

Current Context

In recent years the City has seen significant urban development and growth with many new developments being established on the fringes of the city area, creating urban sprawl. In some cases these new developments are not fully accessible by public transport or sustainable modes such as walking and cycling. Most new developments and changes of use will have some form of transport implication. Given the policy significance of the links between land use and transport the likely transport impacts of development proposals need to be identified and dealt with as early as possible in the planning process.

Investment Costs

Total CAPEX Investment – € 25,000

Total OPEX Cost – An additional ½ - 1 staff-person to assess applications and provide guidance on Transport planning – approximately **€ 20,000 per year** as covered in the operational budget of the Planning Department and Projects Implementation Department

Fit with Funding sources

Municipal Budget only

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | Possible fit | Poor fit

Implementation

Timeframe: Feasibility Study: Q1- Q2 2021

*Implementing Agencies (lead in **Bold**):* **Craiova Municipality**

Stakeholders: City Hall, RAT public transport operators, City developers, local district community/resident groups

Key delivery risks:

- Adoption and application of Transport Assessment Guidelines.
- Buy-in and support from commercial developers

Smart City Potential - **Potential to Benefit**

The process of developing guidelines could include the use of “smart” tools to improve planning and usage of sustainable transport modes. This could include, for example, better modelling of transport patterns, and then incorporation of smart journey planning tools actions implemented as part of the guidelines. New infrastructure and services which are informed by the guidelines can also include smart technology (information/ticketing etc.)

Synergy with Other Actions

- CC4 - Implementation of the Air Quality Plan;
- CC5 - Smart air quality and environment monitoring in Craiova,
- CC2 - Public participation in city planning

SM9: Development of New Citywide Pedestrian Route Network

Purpose – Develop a new citywide network for pedestrian movement.

Benefits – Supporting modal shift to active modes with associated environmental and health benefits as well as inclusive design

Cost – CAPEX €3m; OPEX: 300,000/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

The development of a new citywide network for pedestrian movement with a route network hierarchy based on usage. The scheme will include footpath area modification (incl. construction works and new urban street furniture), plus the construction of pedestrian priority areas/zones. This measure will create a safe environment for pedestrians and will motivate people to use other transport modes than the private car. This scheme also relates to a proposal to develop street greening to improve road infrastructure across the city. An important principle of developing the route network concept would be improving links with existing initiatives already in place including local road safety work to ensure consistency of approach across the city. Different route types would be supported by specific design standards and infrastructure to ensure consistency is applied when implementing new schemes. This network will feature quality elements such as dropped kerbs, priority crossings, lack of street clutter and good signage.

Key Benefits

Potential to support a safe and efficient active travel mode which is clean, GHG-free, no cost for users, promotes public health, and if adopted, significant benefits for city centre congestion. Combined with other SM measures (not including SM4 calculated separately), the emissions reduction per year is estimated to be at least 11,467 tCO_2eq.

It also provides opportunity to improve accessibility for users with disabilities through the application of improved design standards.

Strategic Objectives Targeted

- SG2 Reduce Carbon Emissions from the City.
- SG3 Encouraging greater use of public and active transport networks.
- SG4 Encouraging the use of Low Emissions Vehicles.
- SG5 Improving streetscape
- SG6 Urban planning that minimises environmental impact and enhances natural assets.
- SG13 Air Quality Management.

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030.

Current Context

Craiova faces issues of high volumes of traffic congestion and environmental problems especially in the central area and in recent years the city has introduced a number of measures to improve conditions for pedestrians to provide more access and safer conditions for walking in the city centre.

Investment Costs

Total CAPEX Investment – €3,000,000

Typically € 300 /meter of standard footway excluding crossings etc.
Total of 10km of footway construction/upgrade would require € 3 million.

Total OPEX Cost – €300,000/year. Costs to cover footway clearance and some re-surfacing where defects occur. A nominal budget of 10% of CAPEX has been allowed.

Fit with Funding sources

Municipal Budget, National Budget, and Donors

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | Possible fit | Poor fit

Implementation

Timeframe: Q1 – Q2 2021 (Study); Q3 2021 – Ongoing (Design & Implementation)

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (led by Project Elaboration and Implementation Department)**

Stakeholders: City Hall, City police, local district community/resident groups

Key delivery risks:

- Feedback and input from local resident/community groups.
- Adoption and application of new pedestrian route standards.
- Pedestrian route audits to identify improvements.
- Assessment of pedestrian volumes and demand.
- Commitment to maintenance of pedestrian routes.

Smart City Potential - **Potential to Benefit**

Options exist to develop online journey planning tools that provide easy-to-use access to applications that enable people to plan their walking routes to work/school/leisure destinations and to ensure existing tools (such as google maps) have access to route data.

Synergy with Other Actions

CC4 - Implementation of the Air Quality Plan; CC5 - Smart air quality and environment monitoring in Craiova

SM10: City access restrictions

Purpose – Manage restrictions to the city centre to prioritise modes other than private cars

Benefits – Reducing emissions, increasing traffic safety, enhancing road capacity and reliability of the transport system.

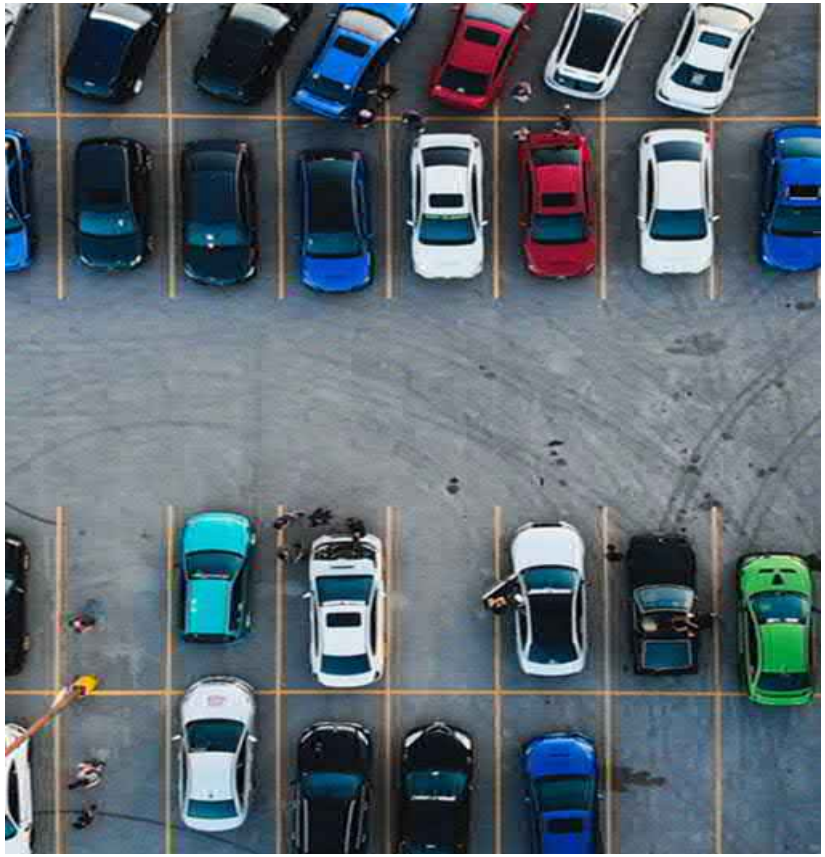
Cost – CAPEX €0.5m - €1m depending on the final scheme; OPEX: €0.3m/year

2020	2021			2022				2023				2024				Beyond	
			Planning	Implementation													

Description

Management of the city access restrictions within the pedestrianised areas of the city including new controls of vehicle operation, vehicle access and vehicle type; enhanced facilities and signing for loading and delivery bays; stronger enforcement to reduce the level of non-discriminatory parking and minimizing conflicts with pedestrians and other road users in the city centre. Reducing emissions, increasing traffic safety, enhancing road capacity and reliability of the transport system.

New dynamic vehicle control will manage access to and from the city centre, with priority given to public transport, taxis, and city centre residents and businesses. The aim of this measure is to create pollutant-free area in the city centre, free of high levels of motorised traffic and encouraging more pedestrian activity, as well as supporting the reliability of the City's public transport service and network.



Key Benefits

Key benefit is to encourage alternatives to private car use and is therefore an enabler for wider modal shift which has benefits in terms of air quality, GHG emissions and economic growth which is less tied to private car use. This can also be used to encourage alternatively fuelled vehicles and protect sensitive areas of the city from pollution. Combined with other SM measures (not including SM4 calculated separately), the emissions reduction per year is estimated to be at least 11,467 tCO_2eq.

Strategic Objectives Targeted

- SG2 Reduce Carbon Emissions from the City.
- SG3 Encouraging greater use of public and active transport networks.
- SG4 Encouraging the use of Low Emissions Vehicles.
- SG5 Improving streetscape
- SG6 Urban planning that minimises environmental impact and enhances natural assets.
- SG13 Air Quality Management.

Key targets and Indicators

- Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.
- Increasing levels of sustainable travel to all key destinations across the city, measured by an increase in modal share for public & active transport modes by 5% by 2030.

Current Context

Craiova faces issues of high volumes of traffic congestion and environmental problems especially in the central area. In recent years measures have been introduced in Craiova to introduce access restrictions for private cars in the central area of the town, by installing barriers at three main access points aimed at reducing levels of vehicular pollution and reduce the volume of city-centre bound traffic. Supported by traffic management technology, as part of a CIVITAS project entitled MODERN, rising bollards were used on the entry points to help optimize private and public traffic flow, and provide better bus service access and encouraging a better streetscape environment in the city centre. The work complements the historical centre with a large pedestrian area having been introduced with additional streets planned, with parked vehicles removed to create more open space in the heart of Craiova.

Investment Costs

Total CAPEX Investment – € 500,000 – € 1 million

Total OPEX Cost – Approximately €300,000 operating costs (including staffing) budget of the Planning Department and Projects Implementation Department

Fit with Funding sources

City Budgets, potentially with support from central government / donors

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | Possible fit | Poor fit

Implementation

Timeframe: Study Q2-Q3 2021, Financing & Procurement Q4 2021 – Q3 2022, Implementation Q1 2023

*Implementing Agencies (lead in **Bold**):* **City Hall, City Police (enforcement)**

Stakeholders: City Hall, RAT public transport operators; City police, Chamber of Commerce, local district community/resident groups

Key delivery risks:

- Traffic regulation orders relating to introduction of new restrictions.
- Outcome of public general public and businesses feedback
- Impact on general traffic across the city with introduction of new restrictions (parking/routing).

Smart City Potential - **Potential to Benefit**

Smart traffic management options to control and manage access to the city centre more effectively. Includes smart rising bollards with automatic number plate recognition, mobile applications, permit-based systems, variable messaging systems advise motorists etc.

Synergy with Other Actions

SM7 - New parking policy for Craiova – including residential and freight parking facilities; CC4 - Implementation of the Air Quality Plan; CC5 - Smart air quality and environment monitoring in Craiova

3.5 Urban Planning and Green Space

3.5.1 What are the key challenges and priorities?

The existing planning document providing information on land-use in Craiova is the General Urban Plan (PUG) developed in 1997 - 1998 and approved in 2000. Important changes were expected to take place since this date but the development of a new PUG, with an updated proposal for land-use situation is still currently in progress.

Population density is below the level that is optimal for a city according to the GCAP indicators. There are variable population densities across the city, but there is a general downward trend, as the population has fallen constantly since 2011. Even though the city's population is shrinking, pressure on property in the central areas is leading to development on the fringes of the city, with notable growth outside the Municipal Boundary to the South East (Banu Mărăcine) and pressure to develop to the north of the city in areas such as Şimnicu de Jos.

The expansion of built-up areas should be controlled, as there are a range of green-field and brownfield spaces within the city that could be further developed. The use of built-up areas or restructuring of old industrial areas (e.g. available land and facilities of the three main industrial platforms of the city – Isalnita, West platform, and East platform) could attract new businesses and complementary functions to help support the development of economic clusters.

A large number of indicators are not currently monitored, such as vacancy rates of offices, average commuting time, proportion of the population living within 20 minutes to everyday services, grocery stores, clinics, etc., and share of urban development that occurs on existing urban land rather than on greenfield land. Given the significance of these indicators in terms of assessing the quality of life for city citezens, it is important to establish a new monitoring framework to routinely obtain this information as part of the GCAP to strengthen city evidence-based planning.

The City of Craiova holds 92.9% of the total green urban space surface of Craiova Growth Pole, estimated at 1,120 ha of green space (2015). The latest value (2018) represents 27.98 square meters per capita compared against the total number of inhabitants in Craiova Growth Pole area. The main green spaces are concentrated in the city's large parks, while others are concentrated into certain areas of the city and are difficult to access for citizens living in other neighbourhoods.

Unbalanced urban development often happens at the expense of green spaces, generating public disappointment (which we see expressed through social media and local newspapers) and we understand that levels of public information on the green public areas of the city and intended change of their status has not always met people's expectations.

3.5.2 What are we already doing?

In May 2019 the municipal authorities signed a contract for the development of a new General Urban Plan (PUG) over a three-year period. The new General Urban Plan has as its main objective, the identification of areas and sub-areas where the regulations of the previous plan should be revised and which no longer correspond to the identified development needs, in order to ensure a sustainable development of Craiova based on attractive urban indicators.

An important component of the General Urban Plan is the development of a new city Geograhical Information System (GIS) which aims to standardize the interoperability of IT applications and increase the consistency and accuracy of data that we manage and process. This will include a register of green spaces to provide a stronger understanding of these resources.

At the same time, maintenance and development of green spaces in the city are progressing, according to priorities for the expansion and rehabilitation of green public areas set in the Integrated Urban Development Strategy of Craiova Growth Pole. Recently, a feasibility study for urban regeneration in the Cornitoiu has been approved by the City Council, and a feasibility study for Balta Cernele area is in progress. Approximately RON 54,346,024.96 are allocated for the rehabilitation of parks and green public areas in the city, such as in Romanescu Park, where a rehabilitation project is in progress.

In terms of brownfield development, some existing industrial sites have already been developed by private investors in Craiova. A series of Zonal Urban Plans for these areas have been approved by the municipality (e.g. Pan Group site – Calea Bucuresti Sarari; Electroputere site/partially – Calea Bucuresti; and the site of Fabrica 7 Noiembrie – str. A. Macedonski, which is in progress). The new General Urban Plan will identify all similar sites, and land use regulations for their potential development.

As the spatial planning process is in progress, it is an opportunity to involve the citizens more fully in strategic decisions regarding the scale of future urban development. A number of public participation tools are available to help identify the main city problems and specific needs in terms of urban services, green space, and connectivity to major transport and energy networks. The future land-use plan and zoning regulation will also become a platform for public consultation and debate.

3.5.3 What Strategic Goals and Targets have been set and why?

The following strategic objectives have been set for Urban Planning and Green Space Sector. A summary rationale for each of the supporting Mid-Term Targets is also included below.

SG6. Urban Planning that minimises environmental impact and enhances natural assets

Supporting Mid Term Targets

SG6b - Finding opportunities to create development space by reusing land more effectively, resulting in at least 20 ha of new development on brownfield land by 2030.

City centre accommodation is under pressure in terms of high levels of demand which is causing people to move towards the fringes of the city. There are many candidate industrial sites which appear to be underutilised which could provide an alternative to growth through expansion of the territorial boundaries of the city. Increasing density and avoiding sprawl can play a significant role in not only preserving the green spaces of the city but also reducing reliance on private car travel and improving the efficiency of public transport networks.

SG6c - Mainstreaming biodiversity into planning decision making for new development with clear targets included in the General Urban plan for Biodiversity.

Current planning decision-making related to biodiversity is limited to meeting statutory obligations meaning that they are only considered late on in the process and only on a site by site basis. Embedding the question of biodiversity in strategic planning processes rather than considering them in on a development by development basis could have a significant benefit for biodiversity and ecosystem services.

SG7. Encourage the use of Green Infrastructure to meet the needs of citizens and the environment

Supporting Mid Term Targets

SG7a - Invest in wastewater and green infrastructure solutions to improve sustainable urban drainage and reduce the risk of urban flooding in the city.

We do not yet have a comprehensive assessment of climate-related vulnerabilities such as urban drainage and flood risk, so it is challenging to set a tangible target for this mid-term target in terms of investment amounts. However, attenuating stormwater flows rather than diverting them to watercourses is well accepted as being key to sustainable urban drainage.

SG7b - Improve access to greenspace so that all citizens have access to good quality green space (large or small) within 300m of their home.

While we have quite high levels of green space within the municipal boundaries, substantial amounts of this are agricultural land located at the edge of the city and are not easily accessible. Access to green space is good for both physical and mental health and has been has particularly important during Covid Epidemic.

SG7c - People feel connected to their own biodiversity in the city and around the city.

Biodiversity holds significant environmental and social value (from pollination to making green spaces more resilient to change to the intangible wellbeing benefits of being in a high quality diverse green space vs a monoculture of amenity grass) but this can be difficult for people to understand and value as its impacts on our wellbeing are often difficult to tangibly measure (unlike wealth for example). Alongside strengthening consideration in planning, general awareness in the population is valuable to help maintain priority for biodiversity as without interest from citizens, the political drivers to protect or enhance biodiversity are reduced.

3.5.4 What actions are we proposing to take?

We have proposed a series of short-term actions (to be implemented in the next 3 - 5 years) in the Urban Planning and Greenspace sector to support achieving the mid-term targets set out above. These are summarised in Table 3.3 below and then described in more detail in the subsequent pages.

Table 3.3 - Summary of Urban Planning and Greenspace Actions

ID	Action	Description
UG1	Local Register of Green spaces in Craiova	Develop an extended digital inventory of green spaces based on existing categories (e.g. gardens, parks, streets greening, green roofs/facades, etc.)
UG2	Urban regeneration of the Balta Cernele area of Craiova	Development of a lot of underused open space into a recreational greenspace.
UG3	Promotion of Brownfield Sites	Development of a strategic study to identify potential development sites and to develop preliminary terms of reference for their development
UG4	Guidance on gardens, interstitial space and other green spaces	Development of public guidance and designs for landscaping of different types of greenspace including gardens, allotments, interstitial space, playgrounds etc., for example their potential value as “pocket parks”.
UG5	Green infrastructure plan	Development of a plan which creates additional green areas, enhances biodiversity and creates urban cooling zones.
UG6	Afforestation and Greening Programme	Planting 10,000 trees per year until 2030.

UG1: Local register of green spaces in Craiova

Purpose – Ensure that the development of a Local Register of Green Space is developed and has public access.

Benefits – Facilitate better decision in development relevant to green spaces in the city to help ensure adequate provision

Cost – CAPEX €150,000; OPEX: No additional cost

2020	2021	2022	2023	2024	Beyond
Implementation					

Description

The project relates to the development of a detailed inventory of green spaces based on existing categories (e.g. gardens, parks, streets greening, green roofs/facades, etc.) – The database will identify in detail, the situation of each green space within the city. It will include information on the land use type, species of trees present (including details such as the dimensions of the trunk and the crown, their viability, and possible risks). It will also play a conservation role, as green areas that are not included in the register are not recognized by the administration and do not benefit from legal protection and protection measures established by law, being vulnerable and exposed to real estate pressures, and infrastructure development (especially roads). The GCAP proposes to extend the project to include an application for citizens to check the status of each registered green space.

Key Benefits

Improved decision- making capacity could lead to improve outcomes in Biodiversity, Land use (particularly in greenspace provision) and general spatial planning. Greenspace has a role to play in carbon sequestration and perhaps more importantly providing climate-regulating services which can help the city adapt to climate change if investments are subsequently implemented. There are also public health benefits to good management of greenspace particularly if this is joined up with walking and cycling strategies).

Strategic Objectives Targeted

- SG6 Urban Planning that minimises environmental impact and enhances natural assets
- SG7 Encourage the use of Green Infrastructure to meet the needs of citizens and the environment
- S12 Developing Smart Cities technologies to achieve better decision making and management

Key targets and Indicators

- Functional data base to monitor the protection of green space and functional application to ensure the public access to information regarding green space
- Mid-term target: Mainstreaming biodiversity into planning decision making for new development with clear targets

Current Context

The project was in progress, but the contract was delayed, and is understood to have been terminated. A ToR is in place for this assignment, but the initial budget was underestimated which has lead to delays in its implementation.

Investment Costs

Total CAPEX Investment – € 150,000 (approximately 100 € / ha of green space)

Total OPEX Cost – Included in the operational budget of the Planning Department with marginal ongoing costs

Fit with Funding sources

Municipal Budget

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:		

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Q4 2020 – Q4 2021

*Implementing Agencies (lead in **Bold**):* **Urban Planning Department and Public Services Department – Office for Green Spaces Administration and Monitoring, Craiova City Hall**

Stakeholders: Environment NGOs (including CCAES-Centrul de Cercetare Aplicată în Ecologia Sistemică), Housing Owners Associations (involved in the operational phase, by submitting updates on the actual status of the green spaces).

Key delivery risks:

Based on the current context, the only risks foreseen are related to the public procurement process and the implementation of the contract between the City Hall and private company providing the inventory and data management services.

Smart City Potential - **Potential to Benefit**

Potential for usage data to be collected and published to indicate to potential users whether/how a green space plot is likely to be affected by a future development.

Synergy with Other Actions

- UG5 – Green infrastructure plan
- UG3 - Identification of brownfield development;
- UG6 - Afforestation and drought tolerant species planting measures to reduce urban heat island effect.

UG2: Urban regeneration of Balta Cernele area in Craiova

Purpose – Regeneration of Balta Cernele wetland by developing a new park

Benefits – Biodiversity and public amenity benefit (and associated social and heath benefits)

Cost – CAPEX €3.5m; OPEX: €60,000/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

The project contributes to the increase of green areas, and a better micro-climate in the neighbourhood, by developing a new park on the wetland situated in Balta Cernele area. The investment will include a lake, green spaces, pedestrian alleys, benches and pergolas, a playground and commercial facilities, as well as the needed public utilities infrastructure. It would be sensible to connect this area up to the propose cycle network in option SM5.

Key Benefits

Balta Cernele (and Craiovita) have significant potential as urban greenspaces providing ecosystem services such as water retention, urban cooling, and supporting biodiversity as well as providing recreational and wellbeing benefits. It may also improve local property value and provide some economic benefit to the developer (subject to rehabilitation costs).

Strategic Objectives Targeted

- CC2 - Public participation in city planning, as it requires commitment/involvement of local citizens and NGOs.
- UG6 - Afforestation and drought tolerant species planting measures to reduce urban heat island effect.
- UG5 - Green infrastructure plan

- SM5 - Citywide Cycle Route Network & Parking Development

Key targets and Indicators

- 6 ha of green spaces developed.
- Mid-term target: People feel connected to their own biodiversity in the city

Current Context

The project is identified in the ISUD. The land is vacant, publicly owned, and has a surface of 6.2 ha. An initial Zonal Urban Plan was formulated in 2017, and the Feasibility Study is in progress.

Investment Costs

Total CAPEX Investment – € 3,500,000 (estimated in SIDU) (approximately 50 € / m2)

Total OPEX Cost – Additional annual maintenance of approximately € 60,000.

Costs vary depending on the type of greenspace implemented and facilities provided and vary from € 0.50 and € 4 per m2. We have assumed 1 € / m2.

Fit with Funding sources

City budget and ROP 2021-2027 (Priority 3: A region with environment friendly communities). Potential for Land value capture/ Property Taxation (if legally permissible[15])

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q4 2021 – Q2 2023

*Implementing Agencies (lead in **Bold**):* **Investment Department and Public Services Department – Office for Green Spaces Administration and Monitoring, Craiova City Hall**

Stakeholders: Ministry of Energy; Craiova City Hall; Ministry of European Funds; Users

Key delivery risks:

Based on the current context, the only risks foreseen are related to the public procurement process and the implementation of the contract between the City Hall and private company providing the inventory and data management services.

Smart City Potential – No foreseeable Opportunity

Synergy with Other Actions

- UG6 - Afforestation and drought tolerant species planting measures to reduce urban heat island effect.
- UG5 - Green infrastructure plan
- SM5 - Citywide Cycle Route Network & Parking Development

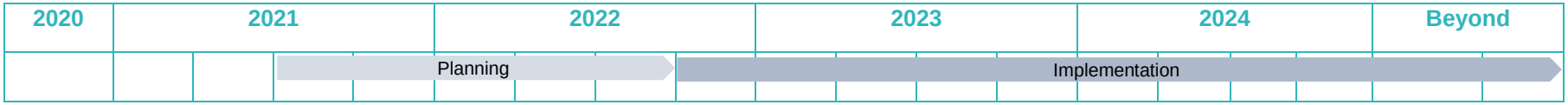
[15] We are not aware of an existing mechanism for land value capture in Romania however this should be explored further in the development of the study to determine if it is a viable source of funding.

UG3: Promotion of Brownfield Sites

Purpose – Develop strategy for brownfield land development including identifying sites, engaging developers, and developing zonal plans.

Benefits – Supports reuse of land, minimising sprawl and associated pollution, generates financial and economic opportunity

Cost – CAPEX €250,000 (study only); OPEX: Minimal as development money likely to come from private sector



Description

Identification of brownfield sites with redevelopment potential, clarification of ownership, provision of zoning regulation and incentives for private sector investment. Brownfield development will provide opportunities for business with efficient use of land. The process for brownfield development involves: (1.) Identification of brownfield site for potential redevelopment; (2.) Development of a specific ToR for the development of zonal plans of each brownfield site; (3.) Negotiations with potential investors on redevelopment of these areas according to the General Urban Plan; (4.) Elaboration of Zonal Urban Plans (by developers; (5). Redevelopment of the areas. The first 2 points would be covered in this action. The action will take over the brownfield sites identified in the General Urban Plan and will formulate specific ToR for the development of Zonal Plans, ToR that include mix of functions and land use indicators, and that will be used as a negotiation tools with potential investors. The information regarding the investment opportunities will be made publicly available on the municipal website, together with land ownership aspects, ToR for zonal plans and zoning, and incentives related to the planning process.

Key Benefits

Reuse of land is important in preventing sprawl and car reliance and acts to support benefits associated with modal shift including, potentially, improved central air quality and reduced energy costs / GHG emissions

for transport. There may also (subject to the development) be soil remediation and habitat creation as a part of schemes. Ensuring land supply is critical to long term economic growth.

Strategic Objectives Targeted

- SG6 - Urban Planning that minimises environmental impact and enhances natural assets

Key targets and Indicators

- ToR in place for the elaboration of Zonal Plans for brownfield development; information on investment opportunities on the municipal website
- Mid-term targets: Finding opportunities to create development space by reusing land more effectively, resulting in about 20 ha of redeveloped land.

Current Context

Some existing industrial sites (privately owned) have been already developed by private investors in Craiova. A series of Zonal Urban Plans for these areas have been approved by the municipality (e.g. Pan Group site – Calea Bucuresti Sarari; Electroputere site/partially – Calea Bucuresti; and the site of Fabrica 7 Noiembrie – str. A. Macedonski, which is in progress). The new General Urban Plan (in progress) will identify all similar sites, with redevelopment potential.

Investment Costs

Total CAPEX Investment – Investment studies and zonal plans: €250,000.

Specific development proposals/remediation subject to separate commercial investments

Total OPEX Cost – No additional – private sector investment to drive regeneration

Fit with Funding sources

City budget; Donors (CREATE Fund) for the development of studies. Potential for Land value capture/ Property Taxation (if legally permissible[16]) and Ultimately private sector investment to develop sites

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs[17]	SPVs
General Public/Other:	Relevant to development of studies only	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Sites Identified: Q4 2021; Zonal Plans/ToRs Developed: Q2 – Q4 2022; Engagement and development of investment projects: 2023 onwards

*Implementing Agencies (lead in **Bold**):* **Craiova Municipality Department of Urbanism**

Stakeholders: Owners of the land plots located in identified brownfields with development potential; Local communities in the development areas; Current site operators

Key delivery risks: Brownfield land development is a complex process involving many different stakeholders. The risks are related to the clarification of ownership rights and to the negotiation of land use regulations.

Smart City Potential – No foreseeable opportunity in study (potential for future use of BIM/Digital twin technology to develop sites)

Synergy with Other Actions

SM8 - Development of new Transport Assessment Guidelines; CC2 - Public participation in city planning, as it requires commitment/involvement of local citizens and NGOs; UG6 Afforestation and drought tolerant species planting measures to reduce urban heat island effect; UG5 - Green infrastructure plan

[16] We are not aware of an existing mechanism for land value capture in Romania however this should be explored further in the development of the study to determine if it is a viable source of funding.

[17] While Private finance is unlikely to fund a strategic study, it will be important as a part of the capital investment that results from the study.

UG4: Guidance on best use of gardens, interstitial space (in multi-story housing neighbourhoods) and other green spaces

Purpose – Guidance on ensuring good use of space supported by small grants to drive community improvement of local greenspace

Benefits – Developing a network of small high value green spaces for biodiversity, resilience and community benefit

Cost – CAPEX €50,000 to develop guidance; OPEX: €100,000

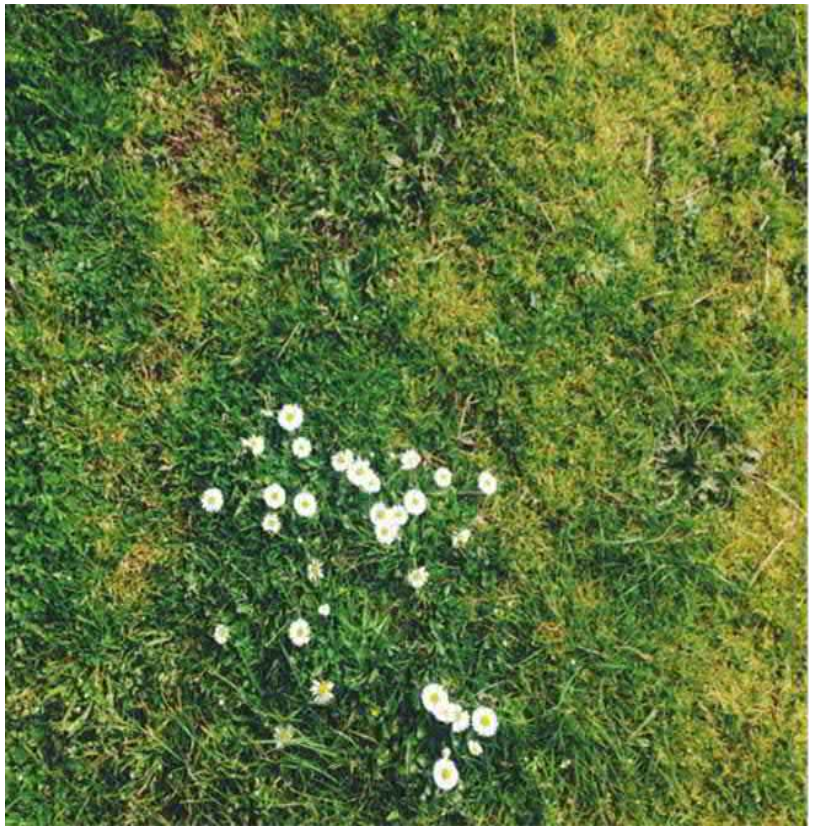
2020	2021	2022	2023	2024	Beyond
		Planning	Implementation		

Description

Preparation of publicly available guidelines, and designs for the landscaping of different types of green spaces (private gardens, allotments, interstitial space, playgrounds, etc.). The project is a partnership between the municipality and the regional branches of the Architects Register and the Urban Planners Register, and includes 4 phases: (1) survey on green space typology and needs for intervention; (2) organization of a local (or national) competition on design solutions for green space landscaping; (3) online publication of a local guide with adopted solutions (“best solutions” in cost-benefit terms) for the different types of green spaces; (4) small grants scheme for the local stakeholders (associations of housing owners, schools, other NGOs) to improve green space landscape.

Key Benefits

Primarily concerned with delivering good quality greenspace space for people to use irrespective of public or private ownership. This should lead to improved accessibility to good quality space, improved local biodiversity, and increased public health/wellbeing. There should be indirect economic benefit through improved "liveability" of the city.



Strategic Objectives Targeted

- SG5 Improving streetscape
- SG6 Urban Planning that minimises environmental impact and enhances natural assets
- SG7 Encourage the use of Green Infrastructure to meet the needs of citizens and the environment

Key targets and Indicators

- Local guide published for green space landscaping; number of small landscaping projects funded in the grant scheme; sqm of green space improved and maintained
- Mid-term target: Citizens and Civil Society Organisations feel engaged with City on environmental matters and able to offer community-based solutions.

Current Context

The existing small-scale green spaces (squares, gardens, interstitial space) are not attractive for the residents to spend time, and go out with children, as their landscape and maintenance service are neglected. Community participation in this respect is also weak, as no local initiatives have been encouraged and supported in the past.

Investment Costs

Total CAPEX Investment – € 50,000 (phases 1-2-3)

Total OPEX Cost – € 100,000 (phase 4 – grants of € 5,000 – 10,000) with possibility to extend based on demand

Fit with Funding sources

Municipally-owned companies, National Funds, Donor (EU) Funds, IFIs

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:		

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q1 2022 – Q4 2022 (phases 1-2-3); Q1 2023 – Q4 2025 (phase 4)

*Implementing Agencies (lead in **Bold**):* **Urban Planning Department and Public Services Department – Office for Green Spaces Administration and Monitoring,** Craiova City Hall; the regional branches of the Architects Register and the Urban Planners Register

Stakeholders: Housing Owners Associations, education institutions, local NGOs

Key delivery risks:

The project sustainability is uncertain. Without financial incentives for private stakeholders to implement small landscaping projects this is likely to have minimal impact.

Smart City Potential - **Potential to Benefit**

Potential for integration of data into the Greenspace database developed under measure UG1.

Synergy with Other Actions

- UG1 - Greenspace register
- UG5 – Green infrastructure plan

UG5: Green Infrastructure plan

Purpose – Develop a plan which creates additional green areas, enhances biodiversity and creates urban cooling zones

Benefits – Recreational and health benefits, improved biodiversity, climate resilience and other natural capital benefits.

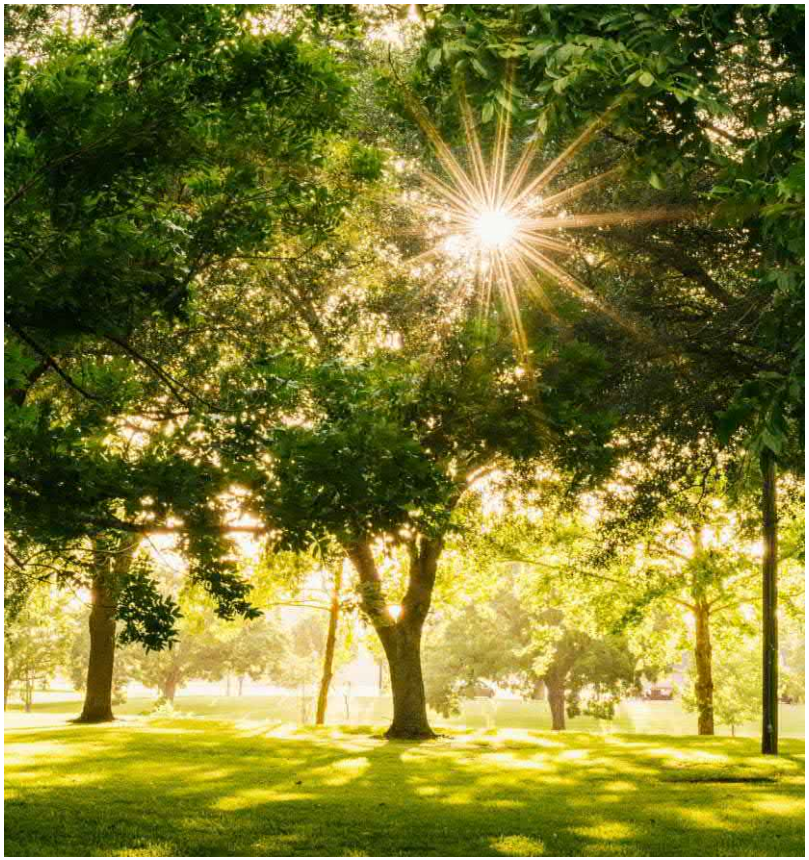
Cost – CAPEX €150,000; OPEX: €5,000/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

Development of a green infrastructure plan, focused on the development of greenspaces and parks which would provide space for recreation, biodiversity, and other ecosystem services, particularly those which are relevant to adaption to a changing climate.

The plan would also include a series of development principals (to be agreed amongst stakeholders) for new development to maximise natural capital, climate adaptation and biodiversity benefits of sites. These would be included in the PUG as formal guidance and consider: Biodiversity net gain/no net loss principals; Climate resilience principals (to be determined following completion of CC1) but for example “greenfield runoff rates” for site drainage; Opportunities for developer contributions to third party greening schemes (such as the afforestation process proposed in UG6) and Minimum open-space requirements including (where greenspace is not available on site) a minimum distance to quality greenspace



Key Benefits

Primary benefits are in ensuring that “natural capital” principals are are appropriately integrated into the planning process and to ensure that the City identifies and takes the opportunities to make the most of its natural assets. However, there are multiple secondary benefits to this including wider ecosystem services provided by greenspace with high biodiversity

value, benefits to public health and wellbeing and involvement and engagement of people with local biodiversity

Strategic Objectives Targeted

- Urban Planning that minimises environmental impact and enhances natural assets
- SG7 Encourage the use of Green Infrastructure to meet the needs of citizens and the environment

Key targets and Indicators

- Criteria developed to identify "biodiversity hotspots" (e.g species richness, biomass, population density, evenness, rarity)
- Quantitative targets for green infrastructure (nature infrastructure) investments
- Policies included in the PUG

Current Context

Craiova is developing its new general GIS supported Urban Development Plan expected to be finalised in 2022. Although the inventory of green spaces is included in the new General Urban Development Plan, there are other opportunities available to unlock the city's full urban regeneration potential. The redevelopment of the General Urban Plan (and its supporting plans) which establish the legal framework for development in the city, provides an opportunity to embed green infrastructure development policies to support development which delivers for economic, social and environmental needs.

Investment Costs

Total CAPEX Investment – €180,000 for plan development and data management;

Total OPEX Cost – Ongoing update of inventory € 5,000

Fit with Funding sources

Municipal Budget or Donors

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:		

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Plan Development Q2-Q4 2021 (until integrated into the PUG); Implementation: Ongoing following development

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (Directorate of Urbanism);** Environmental Monitoring Inspectorate

Stakeholders: The City of Craiova; Ministry of Environment, Water and Forests; Environmental Protection Agency Land Cadastre; owners of potential suitable land plots; the public; environmental NGOs

Key delivery risks:

- Lack of engagement with a representative group of stakeholders
- Absence of quality data (note that this should be at least partially resolved by action UG1)
- Resistance to policies from developers
- Limits in municipal powers to implement policy measures

Smart City Potential - **Potential to Benefit**

Substantial opportunity to capture digital data on green infrastructure assets and integrate this data with digital urban planning databases proposed for the new PUG. Potential for data collected to be published and used by future investors in the city's green/smart infrastructure.

Synergy with Other Actions

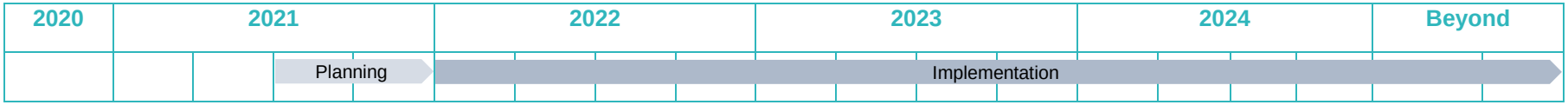
UG1 - Local register of green spaces in Craiova ; UG3 - Identification of brownfield development; UG6 - Afforestation and drought tolerant species planting measures to reduce urban heat island effect

UG6: Afforestation and Greening Programme

Purpose – Afforestation of at least 200ha of degraded land and investment in green walls on at least 10 buildings

Benefits – Climate benefits, primarily resilience at this scale but some carbon sequestration potential. Potential air quality & economic benefits

Cost – CAPEX €740,000; OPEX: 163,000/year

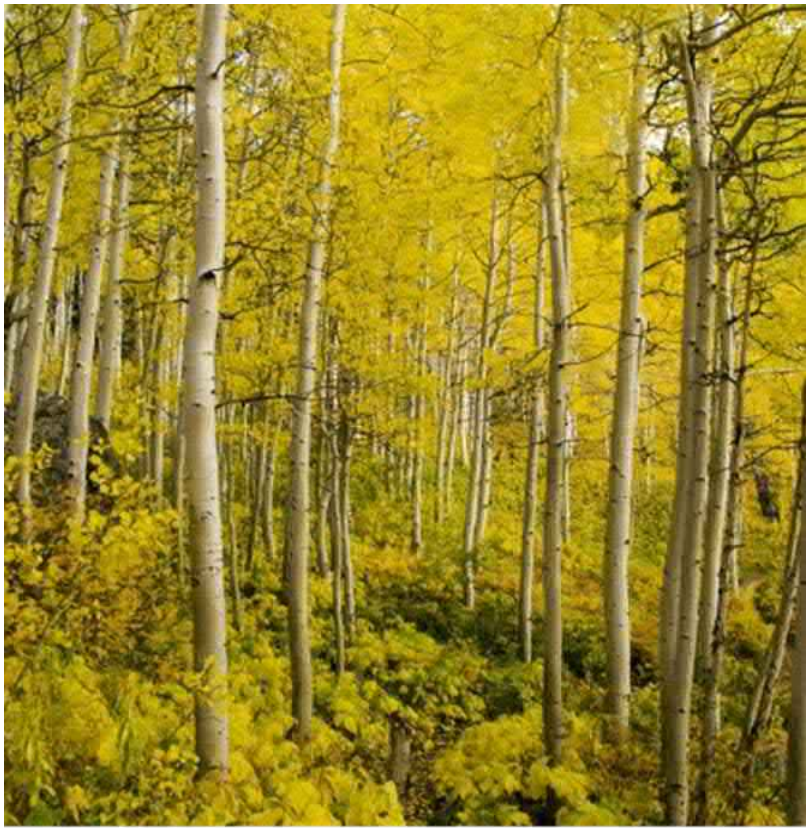


Description

The proposed project will implement afforestation on 200 ha of degraded/ other suitable land in residential areas and road belts that are suitable for afforestation, within the City of Craiova. This will include the identification of suitable land for afforestation in coordination with the land use planning under the new General Urban Plan and planting at a rate of 1000 trees per hectare and 20 ha/year over 8 years (10% in urban streetscape)

The project will also promote green facades (green walls) initially on 10 buildings situated around the Urban Heat Island (UHI) areas, initially resorting to less costly measures such as simple wall climbing plants (Hedera helix) potentially exploring additional funding for more elaborated “living walls”.

Through GIS overlay, data provided by the proposed project could be superimposed over the existing data sets (collected during the new General Urban Plan development) and analysed for identifying the suitable tree planting areas



Key Benefits

Afforestation and use of technologies such as green roofs and green walls create additional carbon sinks but also provide resilience benefits such as slowed runoff and mitigation of urban heat island effects. Trees in urban areas can also provide localised air quality benefits when installed appropriately. This has economic and financial benefits due to

increase property values, positive health impacts, and reduced energy bills.

Strategic Objectives Targeted

- SG5 Improving streetscape
- SG6 Urban Planning that minimises environmental impact and enhances natural assets
- SG7 Encourage the use of Green Infrastructure to meet the needs of citizens and the environment
- SG10 Climate Resilient City
- SG11 Improving awareness and Participation and Awareness of Citizens in Environmental Matters

Key targets and Indicators

At least 80 ha of trees planted & at least 1000 m2 of Green walls provided

Current Context

Research from the University of Craiova, shows at least four micro-urban heat islands have been identified during a 2015 heat wave in Craiova, with Temperature-Humidity Index (THI) value as high as 94.93, which always translates into significant thermal discomfort and potential negative health impacts.

Investment Costs

Total CAPEX Investment – Tree Planting: € 640,000 (4000€/ha); Green walls : € 100,000 (based on 100€/m^2) [18]

Total OPEX Cost – Tree Pruning (1%/year @ 100€/Tree): € 160,000; Green walls: € 3,000 (@3€/m^2)

Fit with Funding sources

Municipal Budget, Donors and EU Funds. There may also be opportunity for private philanthropic investment, and Crowdsourced investment.

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	Potential for philanthropic investment/crowdsourced investment if afforestation managed in partnership with a NGO	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Greenspace Inventory Mid 2021, Development of plan End 2021; Annual Tree Planting 2022 – 2030

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (led by Project Elaboration and Implementation Department),** "Romsilva" Agency/Directia Silvica Dolj

Stakeholders: The City of Craiova and RAAPDFL Craiova; Ministry of Environment, Water and Forests/ "Romsilva" Agency; owners of potential suitable land plots; the public; environmental NGOs; University of Craiova

Key delivery risks: Planting has limitations, there are potential social, environmental and operational risks including road safety, land ownership, and there are potentially concerns regarding women walking safely around areas with trees and dense vegetation.

Smart City Potential - **Potential to Benefit**

Potential to use GIS/Greenspace database to monitor quality of trees and manage maintenance regime.

Synergy with Other Actions

BE1 – Energy Efficiency and use of Renewable Energy Systems (RES) in Municipal Buildings (for green walls); UG1 - Local register of green spaces in Craiova; UG3 - Identification of brownfield development; UG5 - Green infrastructure plan

[18] Simple wall-climbing plants can be installed for between 30 – 45 EUR / m2. Where additional infrastructure is required this can be between 140 – 225 EUR / m2 https://scbrims.files.wordpress.com/2013/10/111013-cost-benefit-analysis-for-green-facades-and-lws.pdf)

3.6 Waste

3.6.1 What are the key challenges and priorities?

There are a range of areas where the waste situation could be improved in Craiova. These include:

- Total Solid Waste Generation – per-capita waste generation is above the national average and could be reduced;
- Collection of Solid Waste – While we have good coverage of waste collection in the city, essentially all of the waste currently goes to Landfill;
- Treatment of Solid Waste – There is a programme for development of integrated waste management systems at local and regional levels. However low selective collection rates (driven by a combination of a lack of both infrastructure and public concern in waste segregation) means that challenges exist;
- Landfill – In terms of landfill capacity, the Molfeni is relatively new and has a long life ahead (estimated closure is 2046). There are however some concerns about operational standards at the landfill site which is managed by a third party operator

Much of the concern from stakeholders related to the collection and treatment of recyclable and compostable wastes which are currently largely being landfilled. However, as investment has been made in improving these processes which are manged at a county level, much of the emphasis from stakeholders at the city level has been on public awareness of the importance of the need to recycle with a infrastructural elements of the waste sector progressing separately (although are delayed through procurement challenges), and therefore there was limited benefit in including them in the GCAP.

3.6.2 What are we already doing?

A strategy for managing municipal waste in Craiova is being undertaken as part of an integrated waste management system (IWMS) at the Dolj County level.

This IWMS was designed with financial support from EU in order to develop the environmental infrastructure in waste sector for preserving, protecting and improving the environmental quality in Dolj County, in line with the requirements of national waste management legislation and relevant EU regulations and directives. For the Craiova area the following investments have been developed:

- **Waste collection**: construction of 438 underground collection points for both residual and recyclable waste in which 729 containers will be assembled.
- **Waste sorting**: in order to achieve the targets for recycling and recovery of packaging waste, a sorting station with a capacity of about 44,000 tons/year was built in Mofleni adjacent to the landfill which will serve the entire county. The sorting plant is designed to receive source separated material only; material, which is collected at the pre-collection points for paper, plastic and metals. Source separated glass will be delivered to the sorting plant for temporary storage and transfer to the glass recycling companies;
- **Treatment of biodegradable waste**: to achieve targets for diversion of biodegradable waste from landfill, a composting plant to treat the biodegradable waste separately collected was built for the Municipality and another two waste management zones (Filiasi and Dobresti). The composting plant is located on the same site as the sorting plant of Craiova and has a capacity of about 18,000 tons/year (e.g. 10,000 tons/year of separately collected bio-waste, 4,500 tons /year park & garden waste and 3,500 tons /year market waste)

These investments were originally scheduled to be implemented during the 2007 - 2013 programming period. The project has however encountered a series of delays in all phases: preparation, procurement and implementation, which has resulted in the re-programming of a number of investment components to the next programming period (2014 - 2020).

Under these conditions, we have kept our own sanitation operator – SC Salubritate Craiova – until the completion of the underground collection points for waste. Regarding the infrastructure elements for sorting and composting the municipal waste in Craiova, these were finalised at the

beginning of 2019, but are not functional at the moment due to delays in the public procurement procedure for selecting the operator.

In this context, the existing waste management practices do not comply with the EU legislation and national and regional waste management policy. With regards to waste management and recycling, Craiova Municipality as well as the other municipalities of Dolj County are facing serious challenges to reach the targets of the EU on recycling and reducing the amounts of waste being disposed at landfill.

We have made great efforts to improve the waste management system in the city since 2011. From 2013, the percentage of total population who benefit from sanitation services is 100%. Waste collection is carried out via a door-to-door system for housing areas and via collection points for apartment buildings. The municipal waste collected annually in Craiova amounts to 85,000 tons, with each citizen in Craiova produces around 292 kilograms of municipal waste each year.

Starting from 2012, through our own sanitation company, we have made efforts to improve the selective collection of waste by creating collection points fitted with igloo-type containers for paper, plastic and glass and/or distributing plastic bags for recyclable waste to individual households. However, despite this progress, we still have a very low selective collection rate in the city due to a lack of collection infrastructure and low levels of public interest in recycling.

The sorting and recovery rates of municipal waste are also currently very low, influenced both by the delays in the implementation of the new waste collection system, and by the fact that the two sorting and composting stations are not yet functional, as no operator has been selected for operation of these facilities.

Waste is disposed at a compliant municipal waste landfill type ‘b’, owned and operated by the ECOSUD S.R.L. Bucuresti. The landfill is located at Mofleni, just a few kilometres from the city centre. The landfill was built based on a public - private partnership between the Local Council of Craiova Municipality and SC SYSTEMA ECOLOGIC SRL which, subsequently, conceded its shares to ECOSUD S.R.L. Bucuresti. The landfill was commissioned on 31 March 2006, and the year envisaged for its closure is 2046. The landfill was designed for a capacity of approx. 6,000,000 m³. The total landfill capacity of the current cells, namely cells 2 and 3, is of approximately 200,000 m³/cell, according to the Integrated Environmental Permit no. 50/17.03.2008, issued by the Regional Environmental Protection Agency Craiova. The landfill is included in the IWMS Project as a regional landfill.

We note that the GCAP document is not looking to replicate the investments that are being progressed under the proposed Dolj County Integrated Waste Management System and therefore our focus has been on developing complementary supporting actions in the GCAP rather than identifying capital investments in infrastructure.

3.6.3 What Strategic Goals and Targets have been set and why?

The following strategic objectives have been set for the Waste Sector. A summary rationale for each of the supporting Mid-Term Targets is also included below.

SG8. Build on new waste management arrangements to maximise recover and recycling of waste

Supporting Mid Term Targets

SG8a - 35% of domestic waste is recycled within the city.by 2030.

One of the key challenges is to support new investments to significantly improve recycling rates and ensure effective processing and treatment of the municipal waste, and achievement of national targets for 2030. In this context, the efforts of cooperation at the inter-municipal level should be intensified.

According to the National Plan for Waste Management (approved by HG no. 942/20.12.2017), the alternative chosen for managing municipal solid waste, which will be implemented during the planning period 2018 - 2025, comprises, in addition to the existing infrastructure in Dolj County, two new investments. One is an installation for mechanical-biological treatment (MBT) with bio-drying (with an estimated capacity of 64,000

tons) and the other is an installation of anaerobic digestion (with an estimated capacity of 12,000 tons). In determining the solutions for municipal solid waste treatment, the main objectives and targets for managing municipal solid waste have been taken into account, namely that the *landfilling of waste is only allowed if the waste is subjected beforehand to treatment procedures that are technically feasible – deadline 2025.* However, the specifications of the new facilities should be carefully determined at the level of the feasibility study in order to ensure effective processing and treatment of the municipal waste, and achievement of targets.

In the context of insufficient fiscal space and public sector inefficiencies, private financing of infrastructure investments could be an attractive alternative. Public-private partnership (PPP) initiatives can be a viable option to mobilize private savings, increase efficiency, and provide value for money for the waste sector. Therefore, the mobilisation of private investors for the construction of MBT could be possible through the PPP scheme. Nevertheless, there are currently limitations to the PPP scheme in the waste sector, due to various factors, such as the small size of national market, inadequate legal and institutional frameworks, and perceived regional political risks. In addition, efforts are currently constrained by the low capacity of public stakeholders to prepare and implement PPP projects (including procurement procedures), as well as by the complexity of the institutional framework for this type of investment. In this context, earmarking funds for a TA component to support final beneficiaries is essential to ensure the quality of PPP-contract and enhance the likelihood of successful implementation.

From the perspective of the requirements imposed by an integrated, modern concept of waste management, the public cooperation and acceptance is an essential condition. An intensive public awareness campaign with the aim to increase knowledge and to motivate changes in the waste generators' behaviour is required at a large scale and for longer periods. Moreover, all essential activities, the preparation of crucial changes, have to be accompanied by comprehensive information and the Waste Prevention Programme.

At the same time, the 'polluter pays' principle must be applied. In this context, the Sanitation Regulations should stipulate penalties for the beneficiaries of sanitation services that do not collect generated waste separately and correctly.

An important component of any waste management system is consistent reporting of accurate data on waste. This allows for the following:

- monitoring of the environmental and operational performance of the entire waste management system;
- accurate measurement of performance against recycling targets;
- meeting of various obligations to report data on waste; and,
- projections to be developed that can be used for planning processes

3.6.4 What actions are we proposing to take?

We have proposed a series of short-term actions (to be implemented in the next 3 - 5 years) in the Waste sector to support achieving the mid-term targets set out above. These are summarised in Table 3.3 below and then described in more detail in the subsequent pages.

Table 3.4 - Summary of Waste Actions

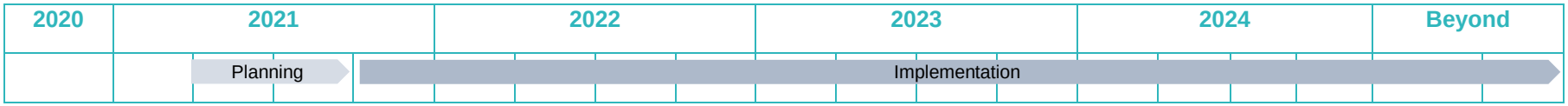
ID	Action	Description
WA1	Enhance organisational capacity	Strengthen capacity of municipal staff and service providers in the development of managerial and operational skills, adaptation to new tasks and challenges in order to ensure appropriate management of new infrastructure and improve quality to citizens
WA2	Improving awareness and Participation and Awareness of Citizens in Environmental Matters	Organisation and support of public information and awareness campaigns regarding the prevention of waste generation and the selective collection of the municipal waste generated

WA1: Enhance the organizational and institutional capacity of waste management structures in order to embrace reforms for a sustainable waste management

Purpose – Provide capacity building and institutional strengthening to support ongoing changes to the waste sector

Benefits – Improve performance of providers and stakeholders in the waste sector leading to more effective functioning in the sector

Cost – CAPEX €n/a; OPEX: €135,000/year



Description

Strengthening the capacity of the staff within the municipality and service providers for the development of managerial and operational skills, adaptation to new tasks and challenges in order to ensure appropriate management of the new infrastructure, and to increase the quality of services provided to the citizens.

The activity could be organised around two main pillars: (i) organisation of knowledge sharing and capacity building (training events, seminars, workshops, conference, study tours, 'on-the-job training'/ working meetings and ad-hoc support); (ii) development and dissemination of guidance documentation, methodologies, and guidelines, rules and procedures.

Key Benefits

Main benefit is in improvements to waste management services for citizens. However, there are a range of secondary environmental benefits that may be delivered from improved waste management.

Strategic Objectives Targeted

- SG8. Build on new waste management arrangements to maximise recover and recycling of waste

Key targets and Indicators

- Progress made towards strengthening the institutional and organisational capacity of waste management structures

Current Context

The waste sector is in a state of transition from the collection being managed by a public company, to transferring to a private-sector operation. During this transfer, many of the challenges should be addressed (e.g. segregation, improved recycling rates, reduced rate of fill in the landfill, etc.). Moreover, the newly developed waste infrastructure requires significant increase of the capacity of municipality and service providers to operate and maintain it. Besides the technical solution, bringing the relevant stakeholders and decision-makers together to increase the common understanding of the new requirements related to legal aspects, technical solutions and financial needs are the key issues to ensure the sustainability of new waste management system (WMS). Accordingly, these new changes have to be accompanied by comprehensive capacity building and training programmes for the relevant stakeholders and decision-makers (e.g. municipal employees and elected local officials, the staff of sanitation companies, IDA representatives, etc.) to increase the level of professional qualification and, implicitly, to create a fair-minded, stable and efficient team of experts at the local level.

Investment Costs

Total CAPEX Investment – € n/a

Total OPEX Cost – €135,000/year (↔ €0.5 per inhabitant per year)

Fit with Funding sources

Municipal Local budget/ other sources (e.g. private sources from service providers under their existing contract arrangements, IDA, donors, etc.)

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Q2-3 2021 – Develop Programme; Q4 2021 – Q4 2025 Implementation.

*Implementing Agencies (lead in **Bold**):* **Craiova Municipality** (in partnership with Intercommunity Development Association)

Stakeholders: Intercommunity Development Association (IDA) and Service providers

Key delivery risks:

- Limited stakeholder engagement/ Unmotivated staff participates in the project activities/
- Little interest in promoting the development of the environment and waste sector in particular

Smart City Potential – **No Foreseeable Opportunity**

No direct opportunity however capacity building could include smart technologies in waste management. This might include smart waste collection systems, IT platform for monitoring the service used, security measures, collection and discharge operations, data processing, etc

Synergy with Other Actions

Several donors and funders are active in the environment sector in Craiova. Regular consultations have to be organised so that the financial support should achieve maximum synergy and impact, and implicit avoid any overlap between these funds/actions.

WA2: Improving awareness and participation of citizens in environmental matters

Purpose – Establish information centres to inform and advise citizens on opportunities to prevent, reuse and appropriately dispose of waste

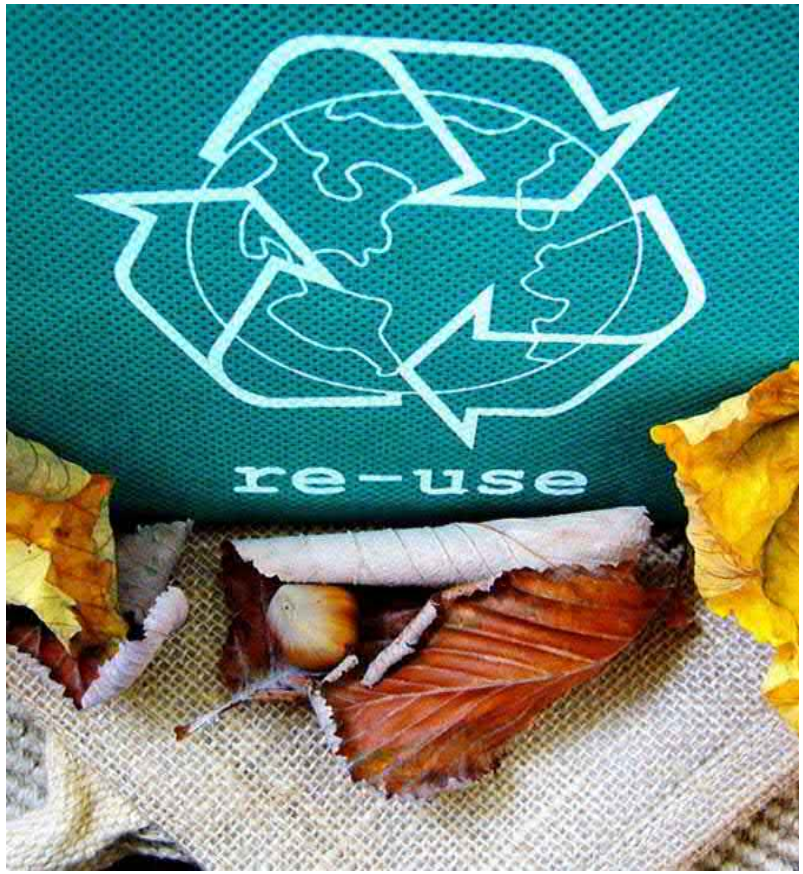
Benefits – Improved segregation of waste resulting in improved recycling rates (along-side investments made under the Dolj Waste Masterplan)

Cost – CAPEX €20,000; OPEX: €270,000/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

- Promotion of 'prevention' by introducing awareness campaigns to encourage the use of products which create less waste;
- Develop campaign materials for information provision and awareness-raising on issues around waste prevention, recycling, the safe disposal of certain products (e.g. batteries and WEEE, etc.);
- Development, production, and introduction of teaching and learning materials for schools;
- Set-up of Information Centre(s) to inform and advise citizens on possibilities to prevent, re-use, and dispose of waste.



Key Benefits

More engaged people are likely to be more compliant with initiatives to reduce resource consumption. Also provides an engagement opportunity for citizens particularly less well engaged groups who may have more limited access to other forms of engagement.

Strategic Objectives Targeted

- SG8 Build on new waste management arrangements to maximise recover and recycling of waste
- SG11 Improving awareness and Participation and Awareness of Citizens in Environmental Matters

Key targets and Indicators

- Percent of population targeted of environment awareness raising activities.

Current Context

The concept of integrated waste management bears the message that the solution to a "waste problem" does not solely lie in technology and financial matters. An extended approach considers cultural, social, institutional/organisational factors, as well as aspects concerning environmental technology.

Therefore, municipal waste represents a problem that can be solved technically only after the community assumes its major role in the separation, reuse, recycling, and composting of waste. For the successful implementation of waste management measures, an indispensable condition is public acceptance and cooperation. Moreover, an intensive communication between the municipality, the sanitation operators, the enterprises of recoverable materials processing, and the citizens, as well as the commercial and production units – as waste producers are required. Thus, all essential activities in the waste sector, as well as the preparation of crucial changes, have to be accompanied by a comprehensive information and education programmes. These must create a positive public sentiment towards environmental protection and improved waste management and illustrate its impact on people's quality of life.

Investment Costs

Total CAPEX Investment – € 20,000 (establishing information centres)

Total OPEX Cost – €270,000/year (€1 per inhabitant per year)

Fit with Funding sources

Local budget/ other sources (e.g. private sources from service providers - tariff, donors, etc.)

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Q1-3 2021 – Develop Programme; Q4 2021 – Q4 2025 Implementation.

*Implementing Agencies (lead in **Bold**):* **Craiova Municipality** (in partnership with Intercommunity Development Association)

Stakeholders: Intercommunity Development Association (IDA) and Service providers

Key delivery risks:

- Lack of interest of the responsible parties;
- Design and execution of defective works;
- Improper resizing;
- Usage of materials of poor quality

Smart City Potential - **Potential to Benefit**

There is significant potential for digital technologies to be used to reach out citizens and raise awareness of recycling routes and methods. There are also opportunities to monitor recycling rates through receipts at reception facilities which may help understand patterns of compliance to help target awareness and engagement activities within the community.

Synergy with Other Actions

- CC2 - Public participation in city planning
- WA1 - Enhance the organizational and institutional capacity of waste management structures in order to embrace reforms for a sustainable waste management

3.7 Water Efficiency

3.7.1 What are the key challenges and priorities?

The key perceived challenges and priorities are:

Water consumption

- As about 10% of domestic consumers are not equipped with water meters, the control over their water consumptions is not well managed. This means higher and uncontrolled per capita water consumption (174 lcd).

Non-Revenue Water

- 38% of the water in Craiova comes from a large spring water source, Izvarna, located in Gorj County, about 117 kilometres from Craiova. The transport line is in a very bad shape with a high rate of accidental failures causing temporary interruptions of raw water supply from this source and significant water losses.
- The City's 745 km of water distribution network is **aging and leaky,** with frequent breakages which leads to **water losses and increased energy consumption** (as increased effort is required to maintain pressure). The high value of NRW is causing environmental issues linked to pressure on the raw water sources, energy efficiency of the water pumping stations (as increased effort is required to maintain pressure) and soil degradation.

3.7.2 What are we already doing?

There is an existing strategy in place to tackle some of the issues described above know as the "Extension of water supply network and wastewater network in Craiova and Rehabilitation of Bordei water treatment plant". This was funded by the Strategic Operational Programme (SOP) Environment

The medium- and long-term strategies addressing water infrastructure in Craiova city are summarized in the Water Master Plan. This Plan presents the development strategy for Dolj County (including Craiova) for the water and wastewater services covering the time horizon of 30 years beginning with the year 2014 and ending in 2044.

Based on the provisions of the Plan, a detailed Feasibility Study was developed, including details of the necessary medium-term investments to improve the present status of the water infrastructure. The proposed investments targeting the mentioned challenges are:

- Rehabilitation of a D1000 adduction pipe in GA Garlesti industrial area
- Rehabilitation of the Isalnita-Simnic adduction pipe
- Rehabilitation of the Isalnita-Simnic adduction pipe from the Simnic inferior reservoirs
- Rehabilitation of the water distribution network
- New water meters on the distribution network
- Extension of SCADA

Based on the above details, the water company (SC Compania de Apa Oltenia SA) recently signed an EU financing contract (LIOP) of about 350 mil. EURO to improve the water and wastewater systems performance and to reduce the current deficiencies. The Large Infrastructure Operational Programme (LIOP) aims at promoting sustainable economic growth as well as safe and efficient use of natural resources. It addresses the development challenges identified at national level in terms of transport infrastructure, sustainable urban transport, environment, energy and risk prevention.

3.7.3 What Strategic Goals and Targets have been set and why?

The following strategic goals have been set for the Water Sector. A summary rationale for each of the supporting Mid-Term Targets is also included below.

SG9. Improve the city's water efficiency

Supporting Mid Term Targets

SG9a - Reduce per Capita Water Consumption in the city by 10% through a range of infrastructure and awareness programmes.

While city water quality is considered acceptable, and there are plentiful supplies of water from Izvarna, there is still a high level of per capita water consumption (174 lcd). This high per capita consumption is due to a mixture of components, such as: improper water measurements, low level of water prices, consumers attitude to environmental issues, etc. In order to address this high water consumption challenge users will need to be encouraged to reduce their own consumption through soft measures to manage demand (such as awareness and encouraging water saving practices and technologies on the consumer side)

SG9b - Reduce the physical water losses in the city to 35% through a range of infrastructure and O&M programmes

There is currently a high level of water loss in the city's water network (~42%), primarily due to a combination of infrastructure challenges (degraded distribution network, for which there is limited asset condition information) and the NRW related O&M activities of the water supply company (SC Compania de Apa Oltenia SA). To address this challenge, both infrastructure investments and O&M practices must be considered to reduce the physical water losses to the achieve the target.

3.7.4 What actions are we proposing to take?

We have proposed a series of short-term actions (to be implemented in the next 3 - 5 years) in the Water sector to support achieving the mid-term targets set out above. These are summarised in Table 3.5 below and then described in more detail in the subsequent pages.

Table 3.5 - Summary of Water Efficiency Actions

ID	Action	Description
W1	Water demand management initiative (soft)	The following actions are proposed in order to reduce per capita water consumption in households and small commercial entities, including the following components: • Water saving awareness campaign for households and industry • Education • Financial Incentive to reduce water use A small scale pilot for fitting of water saving devices is also proposed (low CAPEX component)
W2	Physical losses management system (DMA's, active loss detection, pressure control)	The system will include a component for a NRW management system to reduce physical water losses in the distribution system, including: • Design, build and equip DMA's in Craiova city water distribution network • Procurement of pressure control equipment (including SCADA support) and other leakage management related devices (flow meters, bulk meters, valves, pressure loggers, leak correlators, telemetry, and other devices)

W1: Water demand management campaign

Purpose – Establish an awareness campaign to reduce per-capita water consumption at the point of the consumer

Benefits – 10% reduction in per-capita water consumption

Cost – CAPEX €115,000; OPEX: €25,000/year (offset by savings)

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

This project proposes the following actions in order to reduce the per capita water consumption of the households and small commercial entities:

- Water saving awareness campaign for households and industry – for example Thames Water's "Be Water Smart" or Anglian Waters "Love Every Drop" campaigns. This would involve online, social media and traditional media advertising
- A small-scale pilot (2000 houses) for supplying low cost domestic water saving devices (such as flow reducers, efficient shower heads and cistern blocks to reduce flush volume) is also proposed
- Conduct an evidence review of Smart Meters from other companies, such as SC CUP Dunarea Braila SA to determine viability of installation of Smart Metering solutions (noting that low water bills may mean impact is not sufficient to change behaviours).

Key Benefits

The primary driver is to reduce personal water consumption however which can have benefits for either the producer or users (or both). It is another tool to improve awareness and consciousness of citizens which may in turn improve their personal participation in reducing resource use.

Strategic Objectives Targeted

- SG9 - Improve the city's water efficiency - Reduce the overall use of water in the city through improvements in infrastructure and supporting behavioural change in citizens
- SG11 - Improving awareness and Participation and Awareness of Citizens in Environmental Matters

Key targets and Indicators

- Reduce per Capita Water Consumption in the city by 10% through education

Current Context

While water quality is generally acceptable, and there are plentiful supplies of water from Izvarna, there is still a high level of loss in the city's water network and in per capita water consumption (174 lcd). This is through a combination of infrastructure challenges (degraded distribution network, for which there is limited asset condition information) and behavioural change in terms of water usage.

Investment Costs

Total CAPEX Investment – € 115,000

- Establish awareness campaign: € 50,000
- Pilot Study & Evidence Review: € 65,000

Total OPEX Cost – Likely that savings would offset operational costs but costs could be:

- Maintenance of Campaign: € 10,000
- Ongoing supply of household equipment: € 15,000

Fit with Funding sources

Compania de Apa Oltenia (operational budget)

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	N/A	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Q2 2021 – Q4 2021 - Design and implement campaign; Q1 2022 – Q4 2022 – Pilot study; Q1 2023 – Ongoing – Awareness campaign

*Implementing Agencies (lead in **Bold**):* **Compania de Apa Oltenia (regional water company)**

Stakeholders: CAO, City's inhabitants, small local commercial entities

Key delivery risks:

- Low public participation and stakeholder engagement
- The campaigns do not reach target groups

Smart City Potential - **Potential to Benefit**

Potential for Smart metering but needs a thorough review of evidence to determine viability

Synergy with Other Actions

- W2 – Physical Losses Management

W2: Physical losses management system (DMA's, active loss detection, pressure control)

Purpose – Reduction of non-revenue water through infrastructure and monitoring interventions in the distribution network

Benefits – Reduction of losses to 35%

Cost – CAPEX €6m; OPEX: €50,000/year (offset by savings)

2020	2021	2022	2023	2024	Beyond
		Design and Procurement			Operation

Description

The system will include a component for a Non - Revenue Water management system to reduce physical water losses in the distribution system, including:

- Design, build and equip District Meter Areas (DMA) in Craiova city water distribution network
- Procurement of pressure control equipment (including SCADA support) and other leakage management related devices (flow meters, bulk meters, valves, pressure loggers, leak correlators, telemetry, and other devices)
- This measure can be implemented as part of, for example, a Performance Based Service Contract.

Key Benefits

Primary benefit is the reduction of losses which has resource use benefits (water, energy, and other resources used) as well as cost benefits for the operator as less production water is lost without revenue.

Strategic Objectives Targeted

- SG9 - Improve the city's water efficiency

- SG12 - Developing Smart Cities technologies to achieve better decision making and management

Key targets and Indicators

- Reduce the physical water losses in the city's network to 35% through a range of infrastructure and O&M programmes

Current Context

While water quality is generally acceptable, and there are plentiful supplies of water from Izvarna, there is still a high level of loss in the city's water network (~42%) and in per capita water consumption (174 litres per capita per day - lcd). This is through a combination of infrastructure challenges (degraded distribution network, for which there is limited asset condition information) and behavioural change in terms of water usage.

Investment Costs

Total CAPEX Investment – € 6,000,000 (based on a similar programme implemented in Constanta)

Total OPEX Cost – Expected that savings would offset operational cost but costs could be: ~€ 50,000

Fit with Funding sources

Compania de Apa Oltenia, IFI/Donors, Performance based contract

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	N/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Q1 2021 – Q4 2021 – Feasibility Studies; Q1 2022 – Q4 2022 – Design and Procurement; Q1 2023 – Q4 2024 – Implementation; Q4 2024 Onwards – Operation

*Implementing Agencies (lead in **Bold**):* **Compania de Apa Oltenia (regional water company)**

Stakeholders: CAO, City's inhabitants, small local commercial entities

Key delivery risks:

- Unexpected water network problems/ issues can increase the forecasted CAPEX/ OPEX
- Difficulties to find a professional entity for a Performance based Service Contract.
- If cost of fixing and finding leak outweighs cost of production, the target of 35% losses may not be an economic value.

Smart City Potential - **Potential to Benefit**

Potential for usage of smart water metering technologies. Other IoT sensors can monitor pressure, flow volume and direction, delivering considerable information and insight into the conditions within the water supply networks. It is also possible to monitor for leaks using remote sensing techniques.

Synergy with Other Actions

- W1 ‑ Water Demand Management Campaign

3.8 Cross Cutting Issues

3.8.1 What are the key challenges and priorities?

There are a number of issues that could create benefit across multiple sectors included in the GCAP. To avoid repeating these measures in each sector, we have included this section to capture these cross sectoral issues. The key challenges noted included:

- **Climate Adaptation** – There are a range of potential climate vulnerabilities for the city, largely associated with extreme weather events such as heavy snowfall, flash flooding and extreme heat events, as well as more chronic heating combined with the "urban heatsink" effect. We have not yet undertaken a detailed analysis of climate vulnerabilities in the city and therefore do not yet have a specific adaptation plan in place to map out responses for the city.
- **Public Awareness and Engagement** – During the stakeholder engagement process, a recurrent theme across many sectors included the need to engage citizens to empower them with better information about the cities environmental performance, but also to encourage citizens to be more aware of their own environmental footprint and the actions that they can take to preserve, enhance and enjoy the natural assets of the city.
- **"Smart Cities" technologies** – A basic assessment of opportunity has been undertaken on each of the projects that have been identified in the Green City Action Plan and there are a number of projects that have already been implemented across the city which take advantage of smart technologies (including intelligent traffic control, utilities metering equipment and public transport information systems). These initiatives have evolved through the initiative of specific departments and projects rather than through a centralised coordinate strategy.
- **Air Quality Management** – Air quality in the city was identified as being an area which requires improvement both in the objective assessment of indicators during the baseline assessment and though discussion with stakeholders. The necessary interventions such as reducing reliance on solid fuels for heating or improving the quality of the vehicle fleet, are implicitly captured in many of the actions proposed above, however there is a need to coordinate with other air quality strategies to ensure that impact is properly captured.

3.8.2 What are we already doing?

Climate Adaptation

While climate change is an important issue our attention to date has been focused on the reduction of greenhouse gasses (mitigation) rather than the adaptation of services to changes in the climate. To date we have not been severely affected by climate related disasters and therefore we have not yet developed a coordinated adaptation plan. However, we do recognise that the changing climate will present challenges for our city that we must understand and prepare for.

Public Awareness and Engagement

As a city we are open with our citizens and follow the necessary transparency procedures for all decisions made through the council. We recognise the now very dated General Urban Plan has reduced transparency in urban planning processes in particular and we have been working towards a more modern and open governance processes and citizen services. However, to date, these have not been focused on environmental performance.

Smart Cities Technologies

There are a number of projects where we have invested in technologies as we have described above. These have tended to be driven by project needs and technological solutions presented at a project level, rather than being a part of a wider integrated smart city strategy and the consultant has recommended a more strategic review of the use of technology in the city.

We are also aiming to use technology to engage with citizens through improved information on urban planning, digital consultation and customer services/complaints processes and the development of a CityApp to act as an interface for citizens and visitors for points of interest in the city.

Air Quality Management

We have prepared an Air Quality Plan for the period 2020 – 2024. Established a baseline for NOx and PM10 (using data from 2014-2018), examined sources of pollution, developed a dispersion model to understand the air quality issues in the city better, and developed a range of interventions for the city. Most of the significant interventions in this document are well aligned to the Actions included in this GCAP document including measures such as tree planting, improvements to the district heating system, rehabilitation of buildings, and improvements to the public transport system). There are several areas where the plan identifies areas which were not included in the GCAP including improved street sweeping, modernisation of ring roads and construction of parking lots. However, the plans are considered to complement each other and should be viewed in parallel. What Strategic Goals and Targets have been set and why?

The following strategic objectives have been set which sit across the various Sectors. A summary rationale for each of the supporting Mid-Term Targets is also included below.

SG10 - Create a City Resilient to Climate Change

Supporting Mid Term Targets

SG10a - The city is aware of its vulnerabilities to climate change and actively planning to adapt (disaster risk informed urban planning)

There is awareness that Craiova could be subject to challenges from the changing climate but at this stage has not developed a strong understanding of the specific risks to which we need to adapt. An important first step in this process is understanding those risks and vulnerabilities.

SG11 - Improving awareness and Participation and Awareness of Citizens in Environmental Matters

Supporting Mid Term Targets

SG11a - The city is active in encouraging citizens to be aware of their environmental impact and fostering behavioural change to improve environmental performance across sectors.

In addition to ensuring that the necessary infrastructure is available for Craiova to be a “Green City”, many of the improvements to the performance of the city rely on citizens understanding the environmental challenges in the city and buying into the solutions that hare developed. This will require behavioural changes to reduce resources used or waste produced and the GCAP should provide support in encouraging those changes. This should consider both private citizens and businesses & industrial operators.

SG11.b - Citizens and Civil Society Organisations feel engaged with City on environmental matters and able to offer community-based solutions

There was significant feedback from Stakeholders that they want to be better involved in planning and implementing green city projects (as well as general planning decision making). We are already seeking to make the City more open and efficient to engage with through improved technological tools, however we believe it is useful to monitor (via periodic social survey) the extent to which people feel engaged.

SG12 - Developing Smart Cities technologies to achieve better decision making and management

Supporting Mid Term Targets

SG12a - People and city officials are able to access accurate data on resource consumption and environmental conditions to inform decision making.

The ultimate goal of "Smart Cities" technologies is that information is available to operators and users to inform decision making. The extent to which data can be made available will need to be subject to the assessment of Smart City potential and the resulting actions. However we believe a commitment to ensuring that accurate data is made available is an important mid term target.

SG13 – Implementation of the Air Quality Management Plan

Supporting Mid Term Targets

SG13a – Significant progress has been made in operationalising the Air Quality Plan published in 2020

While there are significant overlaps with the recently published Air Quality Plan in the Green City Action Plan, the GCAP has not set out a detailed air quality baseline or indicators for long term air quality improvements. It is anticipated that these will be collected and monitored under the Air Quality Plan. However, we believe it is useful to monitor the extent of implementation of the Air Quality Plan under the GCAP given the close relationship between the two documents.

3.8.3 What actions are we proposing to take?

We have proposed a series of short-term actions (to be implemented in the next 3 - 5 years) in the Waste sector to support achieving the mid-term targets set out above. These are summarised in Table 3.3 below and then described in more detail in the subsequent pages.

Table 3.6 - Summary of Cross Cutting Actions

ID	Action	Description
CC1	Climate Change Vulnerability Plan	Development of a Climate Change Vulnerability Assessment to better understand the risks and vulnerabilities arising for Craiova from Climate Change. Propose appropriate management strategies to be implemented to adapt to these vulnerabilities.
CC2	Public participation in city planning	Establish a public consultation framework to involve the local community in the planning process and decisions regarding green city development.
CC3	Smart Cities Maturity Assessment & Strategy	Development of a strategy for the development and implementation of smart cities technologies across the GCAP projects (and where appropriate beyond into other sectors).
CC4	Air Quality Plan Implementation	Establishing coordination between the implementation of the Air Quality plan and the GCAP.
CC5	Smart Air Quality monitoring	This is a smart city pilot project, proposed to be implemented in cooperation with one of the mobile operators (e.g. Orange). The system works with IoT (Internet of Things), monitoring air pollution using wireless sensors attached on public transport vehicles, which can complement air pollution monitoring from the City air monitoring stations

CC1: Climate change vulnerability plan

Purpose – Develop an understanding of vulnerabilities and a mechanism for ensuring responses are "mainstreamed" into plans

Benefits – Supports good decision making which will ultimately reduce risks, costs and quality of life/prosperity for citizens as climate changes

Cost – CAPEX €50,000; OPEX: €10,000/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

The development of a Vulnerability Assessment and Action Plan which will provide the city with a tool to prevent and manage climate change induce risks and plan investments to increase adaptation and resilience. The proposed vulnerability assessment will include safety assessments of critical infrastructure and developing and documenting hazard scenarios. This could be an important milestone, supporting the Risk and Vulnerability Assessment (RVA) under any future engagement with the EU Covenant of Mayors. It is important that policy outcomes are embedded into City decision making procedures so that these are systematically considered in future.

The proposed Vulnerability Assessment Report will prioritize adaptation measures and will include a Costed Action Plan, clear institutional responsibilities, and a Climate Vulnerability and Disaster Risk Screening mechanism (checklist) for new local developments and investments to be integrated into Craiova Local Council decision making process.

Key Benefits

The main benefit is ensuring that future planning decisions adequately consider changes to the climate which could have social, financial, economic and environmental implications if not considered well.

Strategic Objectives Targeted

- SG10. Create a City Resilient to Climate Change

Key targets and Indicators

- Costed Action Plan developed, institutional roles and responsibilities established;
- Checklist developed and integrated into local governance process

Current Context

Climate change affects soil quality and the trend observed is that of an increased aridification in the southern part of Oltenia Plain, affecting approximately 6% of Dolj county. Floods and flash floods have been recorded especially in the Northern part of Craiova. While the city has made some commitment to the Covenant of Mayors (although not yet a signatory party) and has developed a Sustainable Energy Action Plan (SEAP), an assessment of vulnerabilities from climate change or resulting adaptation plan has not yet been developed therefore adaptation and resilience issues are not systematically considered in policy and decision making.

Investment Costs

Total CAPEX Investment – € 50,000 for climate screening / action plan. Additional expenses for specific analysis of physical infrastructure and risk assessments (e.g. evaluation of flood-plain levels and according risk, sewerage channels, etc.)

Total OPEX Cost – € 10,000 annually salary of Task Leader (Municipality staff) to coordinate Action Plan implementation and Mainstreaming of the Vulnerability Checklist into Local Governance process, within the framework of GCAP

Fit with Funding sources

Municipal Budget, Donors (possible IFIs may fund through technical assistance)

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Development of Plan (including procurement) – Q1 - Q3 2021; Implementation: Ongoing

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (led from the department of Urban Planning)**

Stakeholders: Municipality of Craiova (Primaria); The Social Assistance Department within the Municipality (Directia generala de asistenta sociala); Meteorological Administration (Administratia Nationala de Meteorologie Centrul Meteorologic Oltenia), Inspectorate for Emergency Situations - Oltenia (Inspectoratul General pentru Situatii de Urgenta Oltenia); Romanian Waters Agency (Administratia Nationalal Apele Romane-Administratia Bazinala Jiu); Agency for Environmental Protection (Agentia de Protectie a Mediului); Craiova University; Public transport operators (RAT Craiova)

Key delivery risks:

- Very low risk intervention – main challenge will be embedding the plan in routine practice against competing challenges

Smart City Potential - **Potential to Benefit**

Potential for monitoring and warning of extreme events (such as heatwaves) via mobile/social media notifications.

Synergy with Other Actions

Key direct links with UG6 Afforestation and drought tolerant species planting measures to reduce urban heat island effect and with Action UG1- Local register of green spaces in Craiova. However there implications across all measures;

CC2: Public participation in planning

Purpose – Improve public engagement in decision making using a representative Advisory Committee and online consultation tools

Benefits – improved decision making and citizen buy in to development proposals

Cost – CAPEX €10,000; OPEX: €20,000/year

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

Establish a public consultation framework to involve the local community in the planning process and decisions regarding green city development. The action includes the organization of an Advisory Committee with stakeholders' representatives and an agenda for regular consultation meetings on development programs and projects. According to the new circumstance of social distancing, the project will also develop and operate an online platform for public debates (forum or webinar) on subjects of general concern.

Key Benefits

Potential to benefit across all sectors subject to the outcome of project specific consultations. However key benefits of enhanced public consultation are improved ownership of decision making and ensuring that a wider range of voices are represented in decision making (including disadvantaged groups).

Strategic Objectives Targeted

- SG11 - Improving Participation and Awareness of Citizens in Environmental Matters

Key targets and Indicators

- Advisory Committee in place (with key stakeholders' representatives); number of meeting organised/year; functional online platform for public debates/number of visitors
- Mid-term target: The city is active in encouraging citizens to be aware of their environmental impact and fostering behavioural change to improve environmental performance across sectors.

Current Context

Public participation is carried out in the city but generally for compliance with legal requirements with respect to planning. Stakeholders felt that a more consultative process for planning would lead to better and more engaged development. Equally there was a sense that stakeholders would feel more obliged to take responsibility for their own actions if they were more engaged in planning decisions. This action could help to organize the process and has education and awareness raising objectives, with long term indirect impact.

Investment Costs

Total CAPEX Investment – € 10,000 for initial planning and establishment (staff time)

Total OPEX Cost – An additional ½ - 1 staff-person – approximately € 20,000 per year as covered in the operational budget of the Planning Department and Projects Implementation Department.

Fit with Funding sources

Municipal Budget

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	Although some recovery may ultimately come from customer billing	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Planning and Establishment: Q1/2:2021; Implementation: Permanent

*Implementing Agencies (lead in **Bold**):* **Urban Planning Department and Projects Implementation Department (supported by IT Department), Craiova City Hall**

Stakeholders: Private sector representatives, Public utilities companies, Public transport company, Housing Owners Associations, professional organizations, local NGOs, etc.

Key delivery risks:

The project depends on the public willingness/availability to participate. It might take some time until a sufficient number of people join the online platform, or until the input from the Advisory Committee meetings is taken into consideration in the decision-making process.

Smart City Potential - **Potential to Benefit**

Significant opportunities for digital engagement through interactive planning tools. This could range from presenting data online (such as online GIS forums), digital permitting tools; online interactive engagement (webinars etc) to make consultations more accessible; online questionnaires; engagement through social media etc. It is noted that the city of Craiova is already investigating these tools.

Synergy with Other Actions

This is a cross cutting measure which will overlap with all other measures

CC3: Smart Cities maturity assessment and plan

Purpose – Understand current levels of technological maturity and develop a plan to maximise environmental benefit from technology

Benefits – Benefits specific to solutions but for example Smart Technology could provide 10-15% improvements in GHG emissions[19]

Cost – CAPEX €50,000; OPEX: To be determined by study but likely to create net savings rather than additional costs

2020	2021			2022				2023				2024				Beyond	
			Planning														

Description

To gain a systematic understanding of the Smart Cities Opportunities in Craiova we propose that the City undertakes a study to determine their existing "digital maturity" by determining the extent to which the city has integrated and benefited from Digital Technologies to date; understand readiness across the various implementing bodies for adopting technologies; screen the GCAP projects (and other ongoing projects as appropriate) to further determine their suitability for smart technologies; and to the extent that is appropriate (following maturity assessment), establish an institutional framework to ensure that data is appropriate captured, analysed and published.

Key Benefits

Has good potential to provide cross sectoral benefits depending on the technologies proposed in the Strategy.

Strategic Objectives Targeted

- SG12 - Developing Smart Cities technologies to achieve better decision making and management

Key targets and Indicators

- A strategy is adopted and implemented

[19] Smart Cities: Digital Solutions for a more liveable future, McKinsey Global Institute 2018

- People and city officials are able to access accurate data on resource consumption and environmental conditions to inform decision making.

Current Context

There is an aspiration to take advantage of technology to more efficiently manage municipal services and there are several areas where smart cities technologies have been deployed to provide improved services, ranging from metering of utilities, to intelligent traffic systems, to the ongoing work to develop a digital Urban Plan to improve management of planning and permitting services. While municipal departments and service providers are adopting such technologies, it is on a project by project rather than systematically across all of the city's services.

Investment Costs

Total CAPEX Investment – € 50,000 for assessment and study

Total OPEX Cost – OPEX costs to be determined by the study. Generally smart city applications are designed to reduce costs

Fit with Funding sources

Municipal Budget with IFI/Donor support

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:		

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Q3/Q4 2022; Implementation by Q2 2024 (depending on the request and approval of financing).

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (Green City Coordinator);** Directorate of Public Services (Environmental Monitoring)

Stakeholders: Various Municipal Departments and public companies on which the majority of actions stand

Key delivery risks:

Limited risk for study itself – implementation risks should be considered in the development of the study

Smart City Potential – **Entirely Smart**

The proposal is to develop a systematic analysis of the digital opportunities and undertake a study to identify and prioritise both sectoral opportunities (many of which have been flagged the various proposed actions in this GCAP).

Synergy with Other Actions

Cross cutting and relevant to most actions

CC4: Air quality plan implementation

Purpose – Aligning the implementation of the Air Quality Plan and the GCAP

Benefits – Meet the planned objective of compliance with annual average and daily average NOx and PM10 limits by 2024

Cost – CAPEX €20,000 nominal additional administration costs; OPEX: As per costs in the Air Quality Plan

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

The Air Quality Plan and GCAP have significant overlap in their scope and the measures that have been proposed. We propose that the plan is executed through the same institutional arrangements as the Green City Action Plan with the Green City Coordinator:

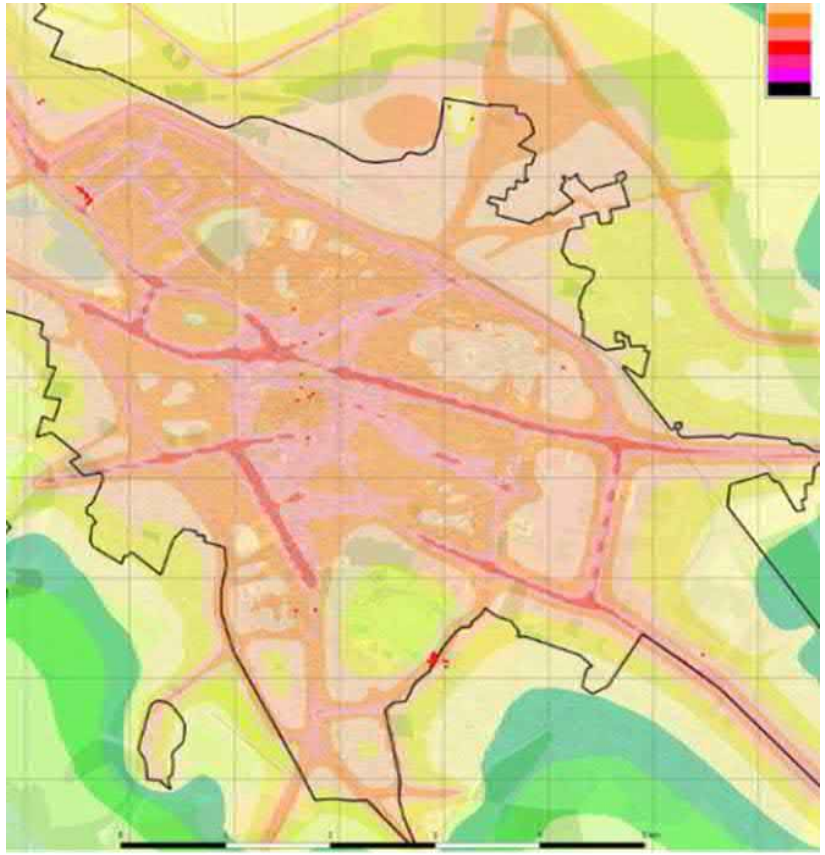
- Incorporating additional actions resulting from the plan into the GCAP monitoring framework
- Pursuing the additional actions in the Air Quality plan in parallel with the GCAP actions
- Coordination with the Environmental Monitoring Department

Key Benefits

Key benefit is to improve performance of the city in air quality and subsequent benefits in terms of heath and social well being. The Air Quality plan sets out that by 2024 Average Daily concentrations of NOx and PM10 can be within prescribed limit values. This improvement may also enable economic growth without further degradation of the city's environment.

Strategic Objectives Targeted

- SG13 Improve Air Quality in the city



Key targets and Indicators

- The city's air quality plan is implemented and desired improvements in Air Quality parameters are achieved.

Current Context

The City of Craiova has developed an Air Quality management plan which sets out current and projected for air quality scenarios. It outlines a number of investments required to improve air quality in the City, which are largely aligned to the measures included within this plan (for example improving greenspace, rehabilitation of buildings, improvements to the district heating system, transport and parking measures etc). The main additional area of activity is dust management particularly through street sanitisation, which is not an area covered strongly by the GCAP benchmarks. The plan identifies measures but does not provide a clear institutional mechanism for implementation.

Investment Costs

Total CAPEX Investment – Marginal additional cost for the administrative measures (<€20,000)

Total OPEX Cost – Investment costs as per measures in the already adopted plan

Fit with Funding sources

Municipally-owned companies, National Funds, Donor (EU) Funds, IFIs

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	Although some recovery may ultimately come from customer billing	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Feasibility Study: Integration of Air Quality Plan into GCAP monitoring – Q1 2021; Implementation: Ongoing through life of GCAP

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (Green City Coordinator);** Directorate of Public Services (Environmental Monitoring)

Stakeholders: Various Municipal Departments and public companies on which the majority of actions stand

Key delivery risks:

This is essentially and administrative interaction – the key challenge is implementing projects which are discussed under their own respective actions

Smart City Potential - **Potential to Benefit**

Potential for monitoring and warning of extreme events (such as unfavourable meteorological events or anticipated high emissions events) via mobile/social media notifications to allow users to plan around air quality issues. Also possible to disseminate long term monitoring data to allow users/NGOs to monitor progress independently.

Synergy with Other Actions

Cross cutting and relevant to most actions

CC5: Smart environmental monitoring

Purpose – Real time environmental monitoring programme which provides data to both officials and citizens

Benefits – Improved understanding of performance and enhanced transparency for citizens

Cost – CAPEX €50,000; OPEX: Marginal - Built into existing monitoring costs

2020	2021	2022	2023	2024	Beyond
	Planning	Implementation			

Description

This is a smart city pilot project, proposed to be implemented in cooperation with one of the mobile operators (e.g. Orange). The system works with IoT (Internet of Things), monitoring air pollution using wireless sensors attached on public transport vehicles, which can complement air pollution monitoring from the City air monitoring stations. These wireless sensors can monitor other environmental parameters too (such as water consumption energy, GHG emissions etc) and can deliver a fine level of granularity. The system ensures delivery of real time air quality (and other env. parameters) via an internet-based dashboard that can be accessible in real time by any internet user. The smart monitoring could address citizens' concerns over accessibility of air quality data and serve as a decision-making tool to support adaptation of infrastructure (environmental monitoring, customer services, parking, security).

Key Benefits

Improved data will help improve planning decisions as well as allowing people to make better informed personal decisions (in the event of poor air quality) and encouraging awareness of air quality challenges amongst citizens

Strategic Objectives Targeted

- SG12 - Developing Smart Cities technologies to achieve better decision making and management

- SG13 - Improve Air Quality in the city

Key targets and Indicators

- MoU between the City of Craiova and a service provider
- At least 10 sensors (including protective equipment) installed

Current Context

The primary distribution network for the District Heating system is 30-48 GCAP Stakeholder engagement process showed a high citizens' awareness on the issue of the city's pollution and particularly over the lack of accessible, good air quality data on which to base local decisions and keep citizens informed. Pollutants levels measured by the City permanent monitoring stations during past years showed that the dominant air pollutants in Craiova are Particulate Matter (PM2,5 & PM 10 – particularly in winter months). There are also concerns around Nitrogen oxides. Monitoring and awareness has been identified in the Air Quality Plan although the details and costs for such a system have not been defined.

As an example Alba Iulia has established successful partnerships between a mobile service provider (Orange), City Hall and local startups based on the providers existing smart city technology platform https://www.orangefab.ro/en/news/startups/3-orange-fab-startups-involved-in-the-smart-city/

Investment Costs

Total CAPEX Investment – Initial development and setup estimated at € 50,000 from the City Hall for Air Quality modelling

Total OPEX Cost – Marginal – built into existing monitoring costs.

Fit with Funding sources

Municipal Budget

City Budget	National or regional funds	IFIs – re-imbursable
Donors	Private sector / PPPs	SPVs
General Public/Other:	n/a	

Good fit | **Possible fit** | **Poor fit**

Implementation

Timeframe: Development Q2-Q4 2021; Implementation: Installation of equipment Q1 2022; Monitoring and development: ongoing

*Implementing Agencies (lead in **Bold**):* **Municipality of Craiova (Directorate of Project Elaboration and Implementation)**; Environmental Monitoring Inspectorate

Stakeholders: The City of Craiova; Orange, Environmental Protection Agency; potential local interested high-tech start-ups

Key delivery risks:

- Reliance on startups to create apps – poor uptake could be an inhibitor
- Commercial arrangements with technology providers
- New technology risks.

Smart City Potential – **Entirely Smart**

This is a low-cost smart city project, and partnership with mobile operators and high tech start-ups can be a first step to creating integrated smart city solutions ranging from intelligent lighting, intelligent transport, smart metering, to studying behavioural change and migration patterns.

Synergy with Other Actions

- SG11: Improved awareness and participation of citizens in environmental governance
- SG12: Developing Smart Cities technologies for improved local decision-making processes

4 Financing Options

4.1 Summary of City's Financial Status

Craiova accounts for around 2.4% of the national GDP and has a per-capita GDP which is lower than the country average. It was equivalent to approximately EUR 6,000 per capita versus a national average of approximately EUR 8,000 in 2014. Craiova is part of the South-West Oltenia Development Region which is amongst the 10 poorest EU28 regions, being the major city in the region. As it can be seen from Table 4.1, both average monthly income and expenditures per household in the South-West Oltenia Region are below the national average (at approximately 90%). Regarding the unemployment rate, Dolj County with capital city in Craiova, has 80% higher unemployment rate that the country average.

Table 4.1 Economic context data

Item	2014	2015	2016	2017
GDP total Romania (in Mill EUR) 20	150,458	160,298	170,394	187,517
GDP of Craiova (Mill EUR)	3,743	3,888	4,044	Not available
GDP of Craiova as % of the total GDP	2.49	2.43	2.37	Not available
GDP per capita, Romania (Th EUR)	8	8	9	10[4]
GDP per capita, Craiova (Th EUR)	6	6	6	Not available
Unemployment rate Romania (%)[21]	6.8	6.8	5.9	4.9
Unemployment rate Dolj County (%)	9.4	9.5	9.8	8.8
Average monthly incomes per household, Romania RON	2,501	2,687	2,945	3,392
EUR	563	604	656	742
Average monthly incomes per household, South-Vest-Oltenia region RON	2,285	2,448	2,632	2,995
EUR	514	551	586	655
Average monthly incomes per household, SW-Oltenia region as % of national average	91.39%	91.11%	89.38%	88.30%
Average monthly expenditure per household, Romania RON	1,637	1,703	1,811	2,039
EUR	368	383	403	446
Average monthly expenditure per household South-West-Oltenia region RON	1,459	1,456	1,558	1,799
EUR	328	327	347	394
Average monthly incomes per household, SW-Oltenia region as % of national average	89.10%	85.48%	86.03%	88.20%

Figure 4.1 shows the revenues and expenses for Craiova city from 2014 to 2018. It can be seen that both revenues and expenses have decreased in the past few years.

Figure 4.1: City revenues and expenses from 2014 to 2018[22]

The City of Craiova is not rated by the rating agencies, so information regarding Craiova's debt rating by the rating agencies is not available. However, from data provided by EBRD who performed its own assessment regarding the borrowing capacity of the City of Craiova and

[20] Source Eurostat: https://ec.europa.eu/eurostat/data/database

[21] Source: National Institute for Statistics, Romania: http://www.insse.ro/cms/files/IDDT2012/index_IDDT.htm

[22] Source: City of Craiova: https://www.primariacraiova.ro/ro/buget

found that the general level of debt service is relatively manageable – under 7% which is well below the maximum 30%.

4.2 Sources of Potential Finances

There are a number of potential sources for financing of GCAP Actions which are included in the table below. Within the process of development of the GCAP, each action was evaluated for the likelihood of being able to attract appropriate finance from either the city or other sources.

Financing mechanism	Description
City funding	This would be direct funding via mechanisms such as municipal budgets (including future capital project budgets, and in-kind contributions of items such as land or time of existing staff). Additional city funding availability could be made available from sources such as bond issuances – though this is likely difficult in Craiova's circumstances.
National or regional funds	This would include finance (typically non-reimbursable) in the form of direct fiscal transfers. It could also be a mechanism for distribution of other financing mechanisms (such as those below).
International Financial Institutions (IFIs) – reimbursable	This would include, for example EBRD, EIB, etc. Funding via this mechanism is most typically via debt instruments wherein the banks provide finance to cities either via national governments with sovereign loans or by lending directly to the city. Different development banks have different policies on lending practices. In some cases, equity finance is also possible. In this sort of mechanism, there is an expectation / requirement to repay the investment. It could also include, for example, guarantee mechanisms set up.
Donor funds – non-reimbursable	This would include, for example, the EU structural funds and other donor sources which are non-reimbursable (typically grants). Funding via these sources is often used as a means to close funding gaps to enable loans and other investments to be viable. It could also include technical assistance. It could also include donor funds mobilized by IFIs.
Private sector finance / Public-Private Partnerships (PPPs)	Some actions will involve city policies or investments which trigger private sector finance (such as encouraging new forms of energy production) while others could be linked to a joint venture or public-private partnership with private sector investors or other third parties – such as in the case of waste management, district heating, and even energy efficiency in publicly-owned buildings. Involving private sector investment will help reduce the financial liabilities for the City and allow for shared risk burden between City and the private investor, while still allowing the City to retain a degree of control and influence over investment activities. Some capital projects may be financed, built, controlled and operated by private organisations. This could include private companies working under services contracts with the city, such as a utility concession operating for a defined time period (e.g. 25 years).
Limited resource (project) finance via special purpose vehicle (SPV)	An SPV is a separate legal entity created by the City to deliver a specific infrastructure project. An SPV may be wholly owned by the City or owned jointly with third parties through shareholding agreements. SPVs can facilitate transfer of services or disposal of assets in the future.
General public and other sources	This would include financing from the general public (for example in renovations of the residential sector) or other decentralised models of fundraising, including payment by service users and crowd-funding.

As has been used in other GCAPs, a scoring system based on colours was used (Red, Amber, Green) to assess the appropriateness of financing mechanisms and sources for each action as follows:

- **Green - Good fit:** to be prioritised in further investigation. This may be because the finance source is well matched to the scale of the intervention and / or this type of activity is common for this type of mechanism / source.
- **Amber - Possible fit:** to be explored, but not necessarily the right fit. This rating indicates that the scale of financing required is inappropriate for this financing mechanism (to some extent either too large or too small), or that this action is not typically financed via the mechanism – with some exceptions.
- **Red - Poor fit:** This may be because the scale of the project is well outside the boundary in terms of scale for a type of financing or is inapplicable (e.g. the funding is for capital investments from).

4.3 Assessment of Actions against Financing Options

The following table outlines the likely appropriateness of potential financing options (mechanisms and sources) for specific actions within the GCAP. In practice there are elements of financing for some actions which will not need to be raised, as funds are already in place via a public or private body.

The total investment required over the coming 10-year period (through 2030) to implement the GCAP is approximately € 682 million of which over half (€ 458 million) would likely come from the city either in the form of direct investments or through municipally-owned companies. There may also be further opportunities for PPPs / private sector involvement – which is shown in the table below. This would be a sizable amount of investment in comparison to city revenues.

Increased OPEX from the GCAP is estimated to be around € 2.24 million – a significant amount of which is accounted for from increasing ongoing costs for the city bike hire scheme (SM6),the citywide cycle route (SM5), City Access Restrictions (SM10), and the extension of public transport services and infrastructure in new districts (T03). All of these actions would likely save money in economic terms (in terms of decreased traffic congestion, improved health, etc.) but would be increasing ongoing costs.

Many of the larger investments in the city (such as BE1, BE4, and SM2) would result in decreases in Operational Expenditures (OPEX) while improving the environment. While a full cost-benefit analysis has not been carried out for the GCAP, we expect many of these investments will actually be financially profitable enough to justify investment.

Overall, the assessment shows that all interventions have at least one potential alternative method of financing. It can be expected that many of the actions requiring larger investments would involve at least one additional finance source (in addition to the city). Investment by the Central Government (including using EU funds), donor involvement, IFI investment, and the involvement of the private sector will be critical to the full implementation of the GCAP actions – in particular for the larger investments. Continued donor support for policy development and studies to fully scope investments will also be important. The next step in implementation of the GCAP will involve confirming financing sources where possible and contacting potential sources of finance where they have not yet been confirmed. This will be done on an action-by-action basis by the organisations / departments responsible for implementation of the specific measures.

Table 4.2: Financing requirements of actions (in millions of euros) and potential financing options

Action	Total investment (capital expenditure)	Investment - city	Type of city finance	Additional annual OPEX for the city	City Budget	National or regional funds	IFIs – re-imbursable	Donors	Private sector / PPPs	SPVs	General public / other
BE1 - Energy Efficiency and use of Renewable Energy Systems (RES) in Municipal Buildings	€ 8.61	€ 8.61	Investment by city	N/A - savings expected							
BE2 - Energy Efficiency and use of RES in Residential Buildings	€ 231.60	€ 46.32	Grant	€ 0.05							
BE3 - Building Management Systems (BMS)	€ 0.90	€ 0.90	Investment by city	N/A - savings expected							
BE4 - Develop and implement a new district heating strategy for Craiova	€ 137.15	€ 44.28	Investment by city for study. Likely to be that infrastructure is cofinanced by the city (including municipally owned companies), energy generation companies, national government, EU funds, and the general public where distributed energy is implemented	N/A - covered in ongoing O&M							
SM1 - Extension of public transport services & infrastructure in the new district areas of the City	€ 2.50	€ 2.50	Investment by municipally owned company	€ 0.30							

Action	Total investment (capital expenditure)	Investment - city	Type of city finance	Additional annual OPEX for the city	City Budget	National or regional funds	IFIs – re-imbursable	Donors	Private sector / PPPs	SPVs	General public / other
SM2 - Modernisation of City tramway network	€ 270.15	€ 270.15	Investment by municipally owned company	N/A - savings expected							
SM3 - Modernisation of the Bus Depot	€ 10.00	€ 10.00	Investment by municipally owned company with IFI Loan	N/A - savings expected							
SM4 - Renewal of the Urban Public Transport Vehicle Fleet	€ 7.50	€ 7.50	Investment by municipally owned company	N/A - savings expected							
SM5 - Citywide Cycle Route Network & Parking Development	€ 3.60	€ 3.60	Investment by city	€ 0.36							
SM6 - City Bike Hire Scheme	€ 1.03	€ 1.03	Investment by municipally owned company	Likely cost neutral dependent on uptake							
SM7 - New Parking Policy for Craiova – including residential and freight parking facilities	€ 1.05	€ 1.05	Investment via PPP	€ 0.00							
SM8 - Development of new Transport Assessment Guidelines	€ 0.03	€ 0.03	Investment by city	€ 0.02							
SM9 - Development of New Citywide Pedestrian Route Network	€ 3.00	€ 3.00	Investment by city	€ 0.03							
SM10 - City Access Restrictions	€ 1.00	€ 1.00	Investment by city	€ 0.30							

Action	Total investment (capital expenditure)	Investment - city	Type of city finance	Additional annual OPEX for the city	City Budget	National or regional funds	IFIs – re-imbursable	Donors	Private sector / PPPs	SPVs	General public / other
UG1 - Local Register of Green spaces in Craiova	€ 0.15	€ 0.15	Investment by city	N/A - included in existing budgets							
UG2 - Urban regeneration of the Balta Cernele area of Craiova	€ 3.50	€ 3.50	Investment by city	€ 0.06							
UG3 - Promotion of Brownfield Sites	€ 0.25	€ 0.25	Investment by city	N/A - linked to private investment							
UG4 - Guidance on gardens, interstitial space and other green spaces	€ 0.05	€ 0.05	Investment by city	€ 0.10							
UG5 - Green infrastructure plan	€ 0.15	€ 0.15	Investment by city	€ 0.01							
UG6 - Afforestation and Greening Programme	€ 0.74	€ 0.74	Investment by city	€ 0.168							
WA1 - Enhance the organizational and institutional capacity of waste management structures in order to embrace reforms for a sustainable waste management	€ 0.00	€ 0.00	Investment by municipally owned company	€ 0.14							
WA2 - Improving awareness and Participation and Awareness of Citizens in Environmental Matters	€ 0.02	€ 0.02	Investment by city	€ 0.27							
W1 - Water demand management initiative (soft)	€ 0.12	€ 0.12	Investment by municipally owned company	€ 0.03							

Action	Total investment (capital expenditure)	Investment - city	Type of city finance	Additional annual OPEX for the city	City Budget	National or regional funds	IFIs – re-imbursable	Donors	Private sector / PPPs	SPVs	General public / other
W2 - Physical losses management system (DMA's, active loss detection, pressure control)	€ 6.00	€ 6.00	Investment by partially municipally owned company	€ 0.00							
CC1 - Climate Change Vulnerability Plan	€ 0.05	€ 0.05	Investment by city	€ 0.01							
CC2 - Public participation in city planning	€ 0.01	€ 0.01	Investment by city	€ 0.02							
CC3 - Smart Cities Maturity Assessment & Strategy	€ 0.05	€ 0.05	Investment by city	TBD							
CC4 – Air Quality Plan Implementation	€ 0.02	€ 0.02	In-kind	TBD - expected as € 0 additional							
CC5 – Smart Air Quality monitoring	€ 0.05	€ 0.05	Investment by city	€ 0.00							
Total	**€ 689.28**	**€ 411.13**		**€ 1.87**							

5 Implementation and Monitoring

Regular monitoring of GCAP measures and projects forms an essential part of the implementation process, as it will help the City determine whether progress is being made as planned and whether the strategic goals are being delivered. A monitoring framework has been established for the GCAP that will serve the following purposes:

- To support planning, the process of figuring out where the city wants to go and how they can get there;
- To improve decision-making by giving a clearer understanding of current conditions and trends;
- To enable benchmarking of conditions and performance across the different environmental sectors; and
- To ensure accountability for actions and results set out in the GCAP.

Routine monitoring of the GCAP action plan will help assess whether the environmental challenges identified in the Plan are being overcome or whether new problems are being seen to emerge. The monitoring framework for the Craiova GCAP is based on agreed performance indicators (using the GCAP Pressure-State-Response indictor structure as the basis of this) which can be readily measured and easily interpreted against the benchmarks that have been established. We have modified some of the indicators to reflect local conditions and data availability.

5.1 Craiova GCAP Governance – Implementation & Monitoring

It is essential to establish effective implementation arrangements to ensure successfully delivery of the GCAP. A new governance structure has been established to co-ordinate, manage and oversee successful implementation of the GCAP. This structure reflects the importance of political decision-making and technical inputs to ensure good progress is made on scheme development and subsequent implementation, as well as assessment of the impact of actions and assessing progress in achieving GCAP targets and delivering the strategic goals. Proposed roles and responsibilities are set out in below:

Mayor & Deputy Mayor (Political Champion)

A political champion will be designated as having overall responsibility for the driving the GCAP. The political champion will Chair the GCAP Coordination Board and champion the relevant administrative motions to progress the actions within the GCAP (noting that the preparation of such documents are likely to be delegated). Due to the transition in leadership following the 2020 Elections, it is yet to be established whether this will be the Mayor who will provide direct leadership or whether this will be delegated to a Deputy (as was the case during the development phase).

GCAP Coordination Board

A GCAP coordination board will be formed to ensure a joined-up approach to implementing the GCAP and to understanding the ongoing environmental performance in the city. This will be chaired by the Political Champion with support from the GCAP Coordinator and will bring together senior representatives from the key directorates within the municipality. This will include the Public Services Directorate, Finance Directorate, Project Implementation Directorate, Urbanism Directorate and the Public Relations team. The coordination group will meet at least 6 monthly and will a) Confirm projects to be progressed (subject to the appropriate approvals of the council) b) monitor progress of projects c) review environmental performance monitoring data d) validate and approve GCAP reporting (including any proposed corrective actions) e) initiate further rounds of GCAP planning when appropriate.

GCAP City Coordinator

The GCAP Coordinator holds primary responsibility for co-ordinating the implementation and subsequent monitoring. They have the authority to collaborate and work closely with all relevant municipal departments to ensure successful delivery of all GCAP actions. The Green City Coordinator will also seek to align the monitoring and evaluation process with other City processes and other strategic objectives of the City. This will be undertaken through regular liaison with the GCAP Sector Leaders in parallel to scheme implementation on the ground. The GCAP Co-ordinator plays a critical role in supporting the GCAP Co-ordination and

facilitating good co-ordination and collaboration with the GCAP Project and Sector Leaders.

GCAP Project Leaders

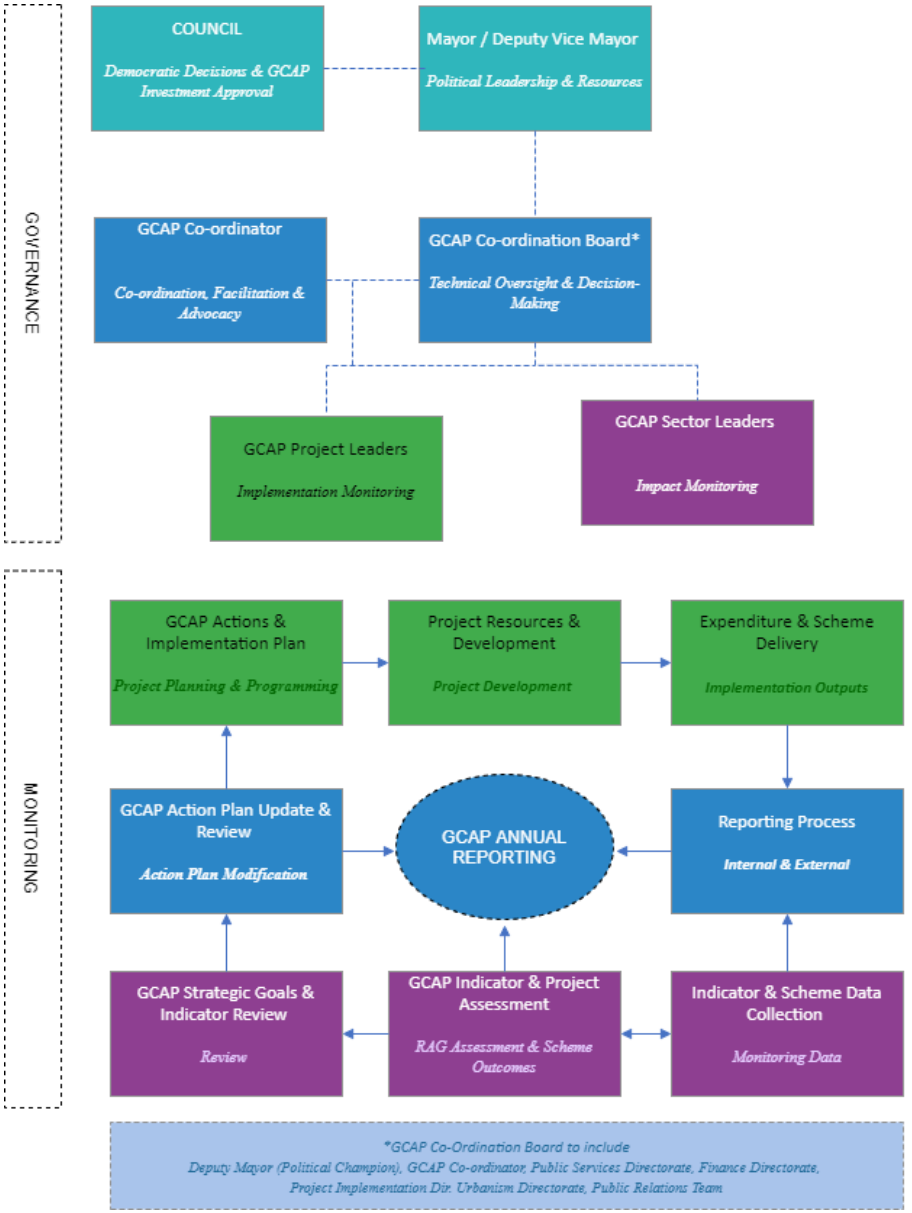
Within City Hall, dedicated project leaders will need to be appointed to actively manage the development and implementation of GCAP schemes and initiatives. The nominated officers will oversee the implementation of specific actions, report on the progress of implementation and help collect any necessary impact data. Each year departments within City Hall will set budgets and timescales for delivering assigned actions. Quarterly reports will be provided on the progress of implementation and environmental impact to the City's Co-ordination Group. The results of this will inform the planning of subsequent stages of each action, including amendments to timescales, resources and the budget, as necessary.

GCAP Sector Leaders

Sector Leaders will operate at an operational level, working closely collaboratively with GCAP City Coordinator to collate information on the sector performance indicators is routinely collected and assessed to gauge overall performance and contribution toward targets and benchmarks set. The outcomes of this work will feed into an annual report, which will also take account of city investment and implementation progress. The GCAP City Coordinator will work directly with the Sector Leaders to prepare the data and resulting reports.

The full governance structure that will be established to co-ordinate, manage and oversee successful implementation of the GCAP is presented in Figure 5.1 below.

Figure 5.1 Governance Structure



Individual actions may be implemented by any entity that is agreed with the GCAP Coordination Board which could be a City department, enterprise or an external party (such as a state entity or a private sector entity). The agency implementing a GCAP action will be required to coordinate with the GCAP Coordination Team through liaison with the GCAP Co-ordinator.

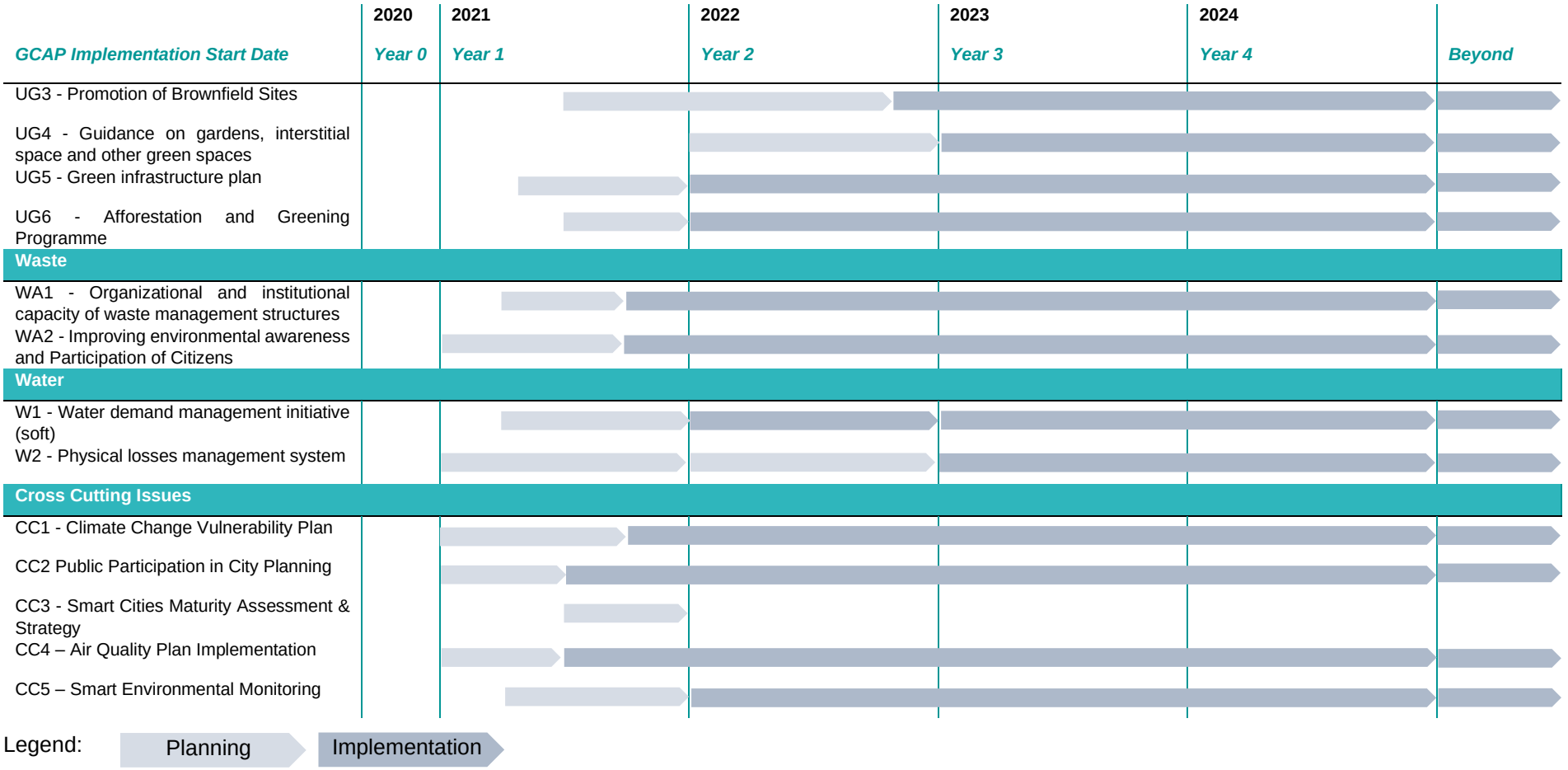
To help project leaders manage data correctly, the GCAP co-ordinator will work closely with the Sector Leaders to ensure that relevant data is collected and analysed to assess performance of (i) impact of individual schemes and (ii) assessment of overall GCAP indicators compared to baselines and targets. Where new baselines are required, new data will be obtained which will then feed into future annual reports in terms of progress against targets.

5.2 GCAP Implementation and Monitoring

Having developed a list of Actions to be implemented and identified a governance structure for delivering projects we have also established an outline programme for the implementation of these projects which is set out overleaf in

This identifies the proposed timeframes for implementing projects throughout the life of this GCAP Period (3-5 years) which are generally broken down into a preparatory phase (which would include preparation of studies, engagement with delivery partners, applications for finance etc) followed by a delivery phase, which may be either on a rolling annual basis (where actions are programmatic by nature) or a single phase where appropriate. These are based on estimates from the Consultants based on the perceived scale and complexity of the project. This programme should however be viewed as preliminary as a further process of detailed planning will be required in the initial implementation period for the GCAP phase to allow more detailed consideration of resourcing, availability of budget, lead in for financing processes, requirements from potential delivery partners.

Table 5.1: Implementation Timeframes



5.3 Mobilisation

This phase of the GCAP focuses on establishing and identifying a phased approach to delivery and programming in relation to GCAP projects and measures. Key components of this phase will include:

- **Establishment of institutional and governance structures**: During this period the current GCAP "Focal Point" (who have been working closely with the consultants to develop this document), along with the Mayor will identify and allocate resources to the roles named in the governance structure above. Of particular importance are the GCAP Coordinator and the GCAP Coordination Board.
- **Capacity Building Workshops**: The consultants will provide Capacity Building workshops to the identified members of the Coordination Board and other necessary staff to support the effectively delivery, monitoring and reporting of the GCAP.

- **Engagement with Project Leaders and allocation of budgets for development**: The GCAP Coordination board will identify individuals within delivery partners (internal and external) identified for each "Action" and agree a Project Leader to take responsibility for progressing the project and ensure that appropriate resources are allocated to the delivery of the project.
- **Detailed terms of reference**: Project Leaders will then build upon the high-level information in this plan to develop detailed terms of reference the implementation of their allocated projects. This will consider in more detail:
  - Programme - The need to consider the long lead-in times associated with the construction of specific projects (especially if major infrastructure is proposed. The need for realistic timescales for delivery is important here.
  - Outcomes – Detailed outcomes, including project specific monitoring criteria for the project, ideally aligned to the GCAP Indicators database.
  - Delivery Risks - There is a clear need to consider any potential risks to delivery and associated contingency plans, and to reflect these in the potential barriers to implementation.
  - Funding options – Identifying specific funding organisations (internal and external) that should be approached to determine specific interest in projects.
  - Alignment – reviewing the current policy context (particularly in light of potential changes to city leadership in the September elections) to ensure that actions are synchronised with complementary activities.
  - Budget and Value for Money – developing an outline business case to agree project specific budgets for the next period to progress the action
- **Agreed budgets**: The Co-ordination Board will collate budgets to be submitted to the appropriate municipal process to ensure that budgets to progress the action are formally adopted in the city's budgeting process.
- **Finalisation of a phased implementation plan**: In setting out a phased set of interventions it is important for the implementation programme to retain sufficient flexibility to reflect particular changes in the Plan (for example, as a result of stakeholder engagement or the outcome of feasibility studies) and development of schemes, including the potential for accelerated or slower than expected delivery. In developing the phased programmes, interventions will be prioritised so as to:
  - adopt a clear policy-driven process that directs GCAP expenditure and focuses attention on demonstrating expected scheme impacts as the Plan is delivered; and
  - focus on effective forward planning, examining the scope to implement packages of schemes (where possible and beneficial).
- **Establish Monitoring**: Implementation monitoring is required to be undertaken on both a short-term and long-term basis and will list all Green City actions and initiatives, indicating project status and progress against milestones. As part of the overall GCAP action planning process, a sequential set of steps will be required to establish realistic scheme programmes and schedules. In the first instance, the selection of suitable projects and associated times, many of which will be based on further feasibilities studies and development work. Once schemes are ready for implementation resources and budgets will be set and milestones for the project programmes.

Partnership Delivery

Many of the measures put forward within the GCAP involve different partners and agencies and so their participation and involvement in the development of the implementation plan is important. and A range of implementation issues will be addressed including the following:

- methods to ensure a positive approach to implementation, to ensure that the GCAP proposals are proactively taken up by implementation agencies as part of a collaborative approach to delivery of interventions;
- a review of appropriate partnerships and responsibilities (especially lead agencies) for individual interventions, identifying key

organisations and agencies involved in schemes and programmes, highlighting areas where resources can be pooled and co-ordinated; and

- innovative approaches to developing scheme finance and contributions.

5.4 GCAP Impact Monitoring

As well as monitoring the progress of implementation for the Actions that have been included this plan, we will also monitor the progress we make against the Strategic Goals and Mid Term Targets that we have set, to determine the level of impact that the GCAP has had on the Environmental Performance of Craiova.

For each of the indicators to be tracked, a GCAP impact monitoring plan will identify the municipal department or external agency who is responsible for providing the required data. It will be important for the GCAP Co-ordinator to engage regularly with indicator owners during the delivery of the Plan to ensure a clear picture of performance is made.

overleaf highlights the full list of indicators and data that will be required to be collated and reviewed as part of the monitoring framework, including responsibility for each indicator set.

For some indicators it will be necessary to review the Database in more detail and work collaboratively with other agencies to define agreed metrics for measuring the impact (outcome) of each GCAP action. The full set or indicators covering each of the GCAP sectors is set out below – including source data and method of collection. Mid-term and longer-term targets are also shown which will be used to gauge the level of success as the Plan programme is delivered over the coming years.

Table 5.2: Strategic Goals and Mid Term Targets

Strategic Goals	Mid-term Targets	Indicators & Measurement	Freq.	Responsibility
Buildings & Energy				
SG1 Improving Energy Efficiency of Buildings	SG1a - Executing integrated rehabilitation projects according to existing standards in at least 3% of residential buildings per year and for 25% of municipal buildings by 2030.	• Number of residential buildings rehabilitated per year	Yearly	Public Services Directorate (energy)
SG2 Reduce Carbon Emissions from the City	SG2a - Promote the use of renewables achieving a total of 30% of the city's energy derived from RES by 2030 (aligned to EU recommendations).	• Installed capacity of renewables	Yearly	Public Services Directorate (energy)
	SG2b - Overall reduction of Carbon emissions by 40% by 2030 against 1990 levels	• CO2 emissions per capita	Yearly	Public Services Directorate (energy)
Sustainable Mobility				
SG3 Encouraging greater use of public transport and active travel networks	SG3a - Increasing travel choice by improving the quality and connectivity to reliable public transport and active travel networks leading to improved levels of travel satisfaction by citizens using these modes.	• Level of public satisfaction with city public transport services and infrastructure, as well as walking and cycling facilities via a social survey *(Baseline to be set in 2021)*	Yearly	Public Services Directorate (Transport) in collaboration with RAT
	SG3b - Increasing levels of sustainable travel to all key education, employment, leisure, and retail destinations across the city, measured buy an increase in modal share for public and active transport modes by 5%.	• Modal share of all trips (annual travel diary – sample of population).	Bi-yearly	Public Services Directorate (Transport)
	SG3c - Expanding the public transport and active travel networks seamlessly to meet the demands of commuter patterns with 90% of the population living within 500m of a public transport hub or a segregated cycleway	• Percentage of population within 500m of public transport hub or segregated cycleway *(Baseline to be set in 2021)*	Yearly	Public Services Directorate (Transport) in collaboration with RAT
SG4 Encouraging the use of Low Emission Vehicles	SG4a - Increasing the proportion of alternatively fuelled (low emission) vehicles within the vehicle fleet to 3%.	• Percentage of registered vehicles – Romanian Automative Register	Yearly	Public Services Directorate (Transport)
SG5 Improving streetscape	SG5a – Public perception is that the balance of space allocated to parking and economic, social, and cultural activity is correct	• Level of public satisfaction with streetscape environment *(Baseline to be set in 2021). Estimated target of 60% satisfaction.*	Yearly	Public Services Directorate (Transport)

Strategic Goals	Mid-term Targets	Indicators & Measurement	Freq.	Responsibility
SG6 Urban planning that minimises environmental impact and enhances natural assets	SG6a - Planning new development to ensure adequate connection to public transport or active transport network.	• Percentage of population within 500m of public transport hub or segregated cycleway (Baseline to be set in 2021)	Yearly	Public Services Directorate (Transport) in collaboration with RAT
Urban Planning and Green Space				
SG6 Urban planning that minimises environmental impact and enhances natural assets	SG6b - Finding opportunities to create development space by reusing land more effectively, resulting in at least 20 ha of new development on brownfield land by 2030.	• Area (ha) developed on brownfield land.	Yearly	Urbanism Directorate
	SG6c - Mainstreaming biodiversity into planning decision making for new development with clear targets included in the General Urban plan for Biodiversity.	• To be aligned with biodiversity targets in the General Urban Plan. *(Baseline to be established as there is currently no biodiversity in the City.)*	Yearly	Urbanism Directorate
SG7 Encourage the use of green Infrastructure to meet the needs of citizens and the environment	SG7a - Invest in wastewater and green infrastructure solutions to improve sustainable urban drainage and reduce the risk of urban flooding in the city	• Evidence of policy measures in the General Urban Plan to encourage SUDS (Sustainable Urban Drainage Systems) • Number of flooding incidents per year	Yearly	Public Services Director (Water)
	SG7b - Improve access to green space so that all citizens have access to good quality green space (large or small) within 300m of their home.	• Percentage of residential properties within 300m of green space	Yearly	Urbanism Directorate
	SG7c - People feel connected to their own biodiversity in the city and around the city.	• Public satisfaction with local biodiversity	Yearly	Public Services Directorate (Environment)
Waste				
SG8 Build on new waste management arrangements to maximise recover and recycling of waste	SG8a - 35% of domestic waste is recycled within the city by 2030.	• Percentage of recycled waste per year	Year	Public Utility Services Directorate (Sanitation)

Strategic Goals	Mid-term Targets	Indicators & Measurement	Freq.	Responsibility
Water Efficiency				
SG9 Improve the city's water efficiency	SG9a - Reduce Per Capita Water Consumption in the city by 10% through a range of infrastructure and awareness programmes	• Per capita water consumption (l/c/d)	Yearly	Water Company - Compania De Apa Oltenia
	SG9b - Reduce the physical water losses in the city to 35% through a range of infrastructure and O&M programmes.	• Percentage non-revenue water	Yearly	Water Company - Compania De Apa Oltenia
Cross Cutting Issues				
SG10 Create a City Resilient to Climate Change	SG10a - The city is aware of its vulnerabilities to climate change and actively planning to adapt (disaster risk informed urban planning)	• Number of properties at risk from extreme climate	Yearly	Urbanism Directorate
SG11 Improving awareness and Participation and Awareness of Citizens in Environmental Matters	SG11.a - The city is active in encouraging citizens to be aware of their environmental impact and fostering behavioural change to improve environmental performance across sectors.	• Level of citizen awareness of environmental issues (%)	Yearly	Public Relations & Document Control
	SG11.b - Citizens and Civil Society Organisations feel engaged with City on environmental matters and able to offer community-based solutions.	• Establishment of a citizen's advisory committee with at least two meetings per year. • Recruitment of a public engagement officer dedicated to planning and project implementation.	Yearly	Public Relations & Document Control
SG12 Developing Smart Cities technologies to achieve better decision making and management	SG12a - People and city officials are able to access accurate data on resource consumption and environmental conditions to inform decision making.	• Smart City Strategy developed and implemented. • Number of datasets that are publicly available in digital format.	Yearly	Public Relations & Document Control
SG13 Implementation of the Air Quality Management Plan	SG13a – Significant progress has been made in operationalising the Air Quality Plan published in 2020.	• Implementation of the AQAP	Yearly	Public Services Directorate (Environment)

The Municipality will carry out regular monitoring of the GCAP sector indicators to review progress against the GCAP Strategic Goals and targets that have been set.

An illustration of the relationships between the Strategic Objectives and the proposed actions is provided in Table 5.3: Contribution of Actions to Mid Term Targets below. As is evident from the table, many of the Actions will create benefit against more than one strategic objective. Two tiers of benefit have been defined:

- Primary Benefit – the action is specifically targeting the strategic goal and is designed to have benefit in this area. These are highlighted with a Dark Blue
- Secondary Benefit – the action is not primarily designed to benefit this strategic goal but may support improvements. These are highlighted with a Light Blue

Table 5.3: Contribution of Actions to Mid Term Targets

	Buildings and Energy		Sustainable Mobility		Urban Planning and Green Infrastructure			Waste	Water	Cross Cutting Issues			
	SG1 Energy Efficiency in Buildings	SG2 Carbon Reduction	SG3 Public / Active Transport	SG4 Low Emissions Vehicles	SG5 Streetscape	SG6 Urban Planning	SG7 Green Infrastructure	SG8 Improve Recycling	SG9 Water Efficiency	SG10 Climate Resilient City	SG11 - Awareness	SG12 Smart Cities	SG13 Air Quality Management
Buildings and Energy													
BE1 Energy Efficiency & Use of RES in Municipal Buildings													
BE2 Energy Efficiency and use of RES in Residential Buildings													
BE3 Building Management Systems													
BE4 Develop and implement a new district heating strategy for Craiova													
Sustainable Mobility													
SM1 Extension of Public Transport Services & Infrastructure in New District Areas													
SM2 Modernisation of City Tramway Network													
SM3 Modernisation of Bus Depot													
SM4 renewal of Urban Public Transport Vehicle Fleet													
SM5 Citywide Cycle Route Network & Parking Devt.													
SM6 City Bike Hire Scheme													
SM7 New Parking Policy for Craiova - incl. residential & freight parking facilities													

	Buildings and Energy		Sustainable Mobility		Urban Planning and Green Infrastructure			Waste	Water	Cross Cutting Issues			
	SG1 Energy in Efficiency Buildings	SG2 Carbon Reduction	SG3 Public / Active Transport	SG4 Low Emissions Vehicles	SG5 Streetscape	SG6 Urban Planning	SG7 Green Infrastructure	SG8 Improve Recycling	SG9 Water Efficiency	SG10 Climate Resilient City	SG11 - Awareness	SG12 Smart Cities	SG13 Air Quality Management
SM8 - Devt. of new Transport Asssessment Guidelines													
SM9 - Devt. Of New Citywide Pedestrian Route Network													
SM10 City Access Restrictions													
Urban Planning and Green Infrastructure													
UG1 - Local Register of Green spaces in Craiova													
UG2 - Urban regeneration of the Balta Cernele area of Craiova													
UG3 - Promotion of Brownfield Sites													
UG4 - Guidance on gardens, interstitial space and other green spaces													
UG5 - Green infrastructure plan													
UG6 - Afforestation and Greening Programme													
Waste													
WA1 – Capacity building in Waste management													
WA2 - Improving awareness and Participation and Awareness of Citizens in Environmental Matters													
Water Efficiency													

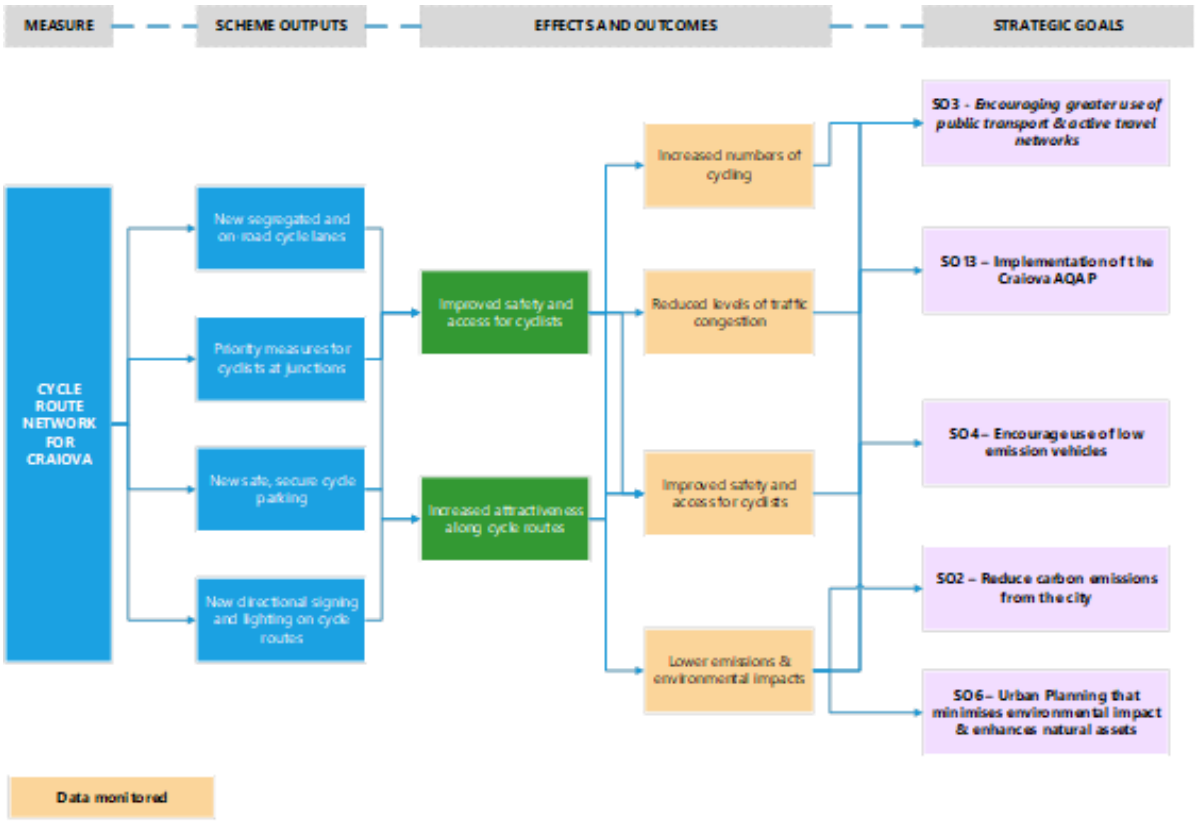
	Buildings and Energy		Sustainable Mobility		Urban Planning and Green Infrastructure			Waste	Water	Cross Cutting Issues			
	SG1 Energy in Efficiency Buildings	SG2 Carbon Reduction	SG3 Public / Active Transport	SG4 Low Emissions Vehicles	SG5 Streetscape	SG6 Urban Planning	SG7 Green Infrastructure	SG8 Improve Recycling	SG9 Water Efficiency	SG10 Climate Resilient City	SG11 - Awareness	SG12 Smart Cities	SG13 Air Quality Management
W1 - Water demand management initiative (soft)Enhance organisational capacity													
W2 - Physical losses management system (DMA's, active loss detection, pressure control)													
Cross Cutting Issues													
CC1 - Climate Change Vulnerability Plan													
CC2 Public Participation in City Planning													
CC3 - Smart Cities Maturity Assessment & Strategy													
CC4 – Air Quality Plan Implementation													
CC5 – Smart Environmental Monitoring													

5.5 Scheme Impact Monitoring

Within the GCAP monitoring and evaluation framework individual scheme monitoring will be included to review the effectiveness of the proposed interventions in delivering the GCAP vision and strategic goals. Every new GCAP scheme provides an opportunity for learning from experience and improving the level of understanding of the performance of different tools and measures that have been included in the GCAP to improve environmental performance. This can only be achieved if there are effective before and after surveys which help identify the impact of schemes on key performance indicators and against the primary GCAP strategic goals and targets.

Outcome indicators provide crucial information about the performance of the project and in conjunction with data on resource inputs enable factors such as cost effectiveness to be assessed. It is important to highlight the linkages between measures, outcomes and the GCAP Strategic Goals to clearly demonstrate that these are being delivered. An example of such a scheme impact assessment is highlighted below focusing on the development of the Cycle Route Network in Craiova (Measure SM5) and the impacts and contributions that this measure will deliver in relation to the GCAP strategic goals.

Table 5.4 Causal Chain Link between GCAP Actions & Strategic Goals



5.6 Annual Report & Future GCAP Action Planning

Based on the assessment of actions their performance in terms of meeting GCAP targets and strategic goals, the action plan may need modification. Unforeseen events can potentially impact on the GCAP implementation plan, for example, a city flooding event may mean that City Hall may be required to prioritise repairing critical highway infrastructure over one of the other planned investments.

As part of the overall GCAP monitoring plan, appropriate quality management processes will be developed and put in place to record and store data centrally and consistently to help validate the data with the Sector and Project Leaders. Each year an GCAP Monitoring Report will be published, which will be available to external stakeholders and the general public. This will present a clear, and user-friendly summary of GCAP sector performance and progress with the implementation of actions.

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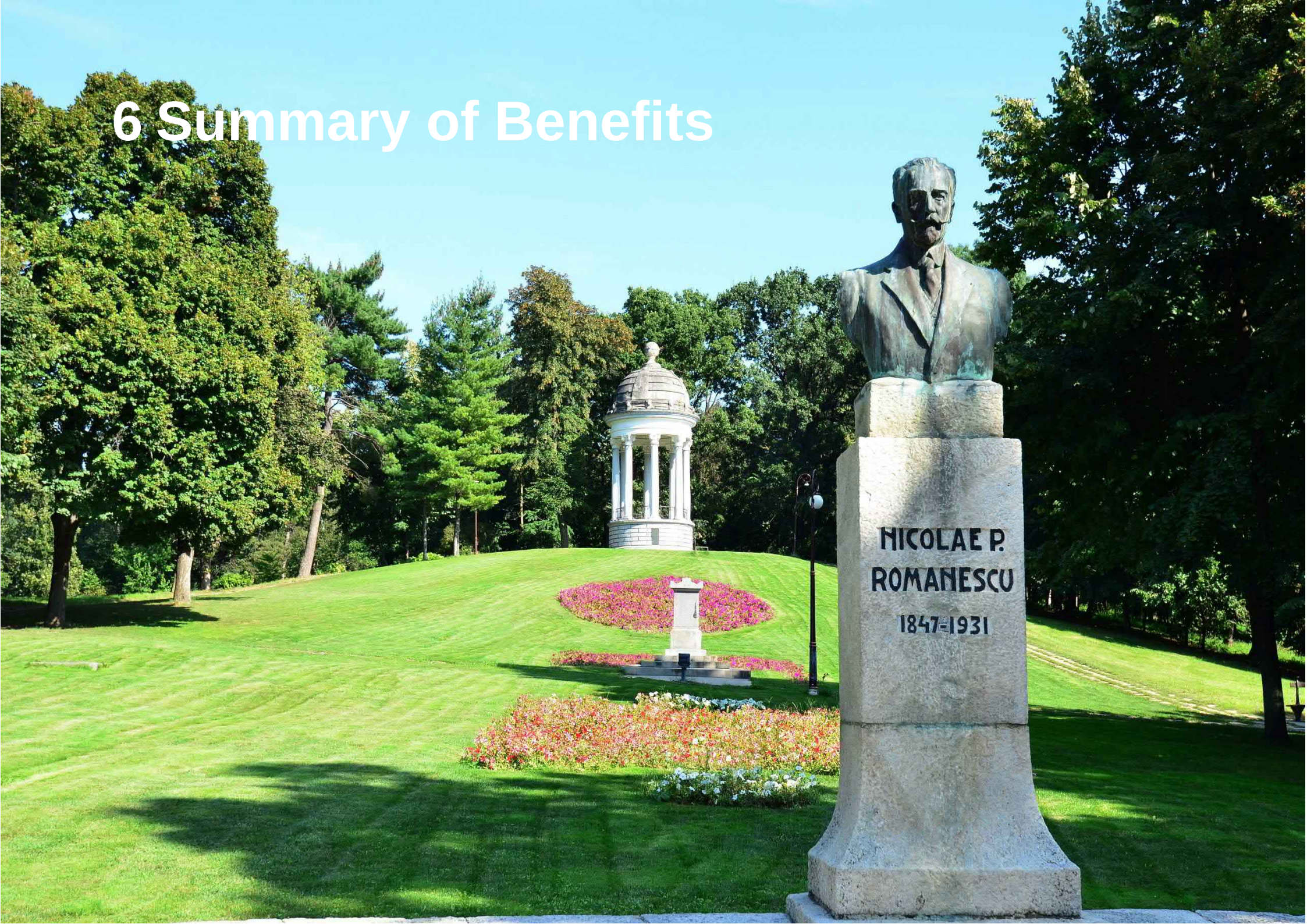
Depending on progress with GCAP scheme delivery corrective action may be required which will be considered in the first instance by the appointed GCAP Coordination Board. If any change to the GCAP action and investment plan is required, the Mayor together with the Deputy Mayor will be notified and requested to make a final decision. Full Council will then be asked to approve an updated Plan, together with any modified timescales and financial resources required to implement this.

The GCAP Co-ordination Group is responsible for engaging with the relevant Project Officers/Leaders and Sector Leaders to ensure that any updates to the monitoring plans receive appropriate approvals. Good collaboration will also be required with a number of external agencies in Craiova to ensure that indicator data is collected across multiple sectors and there is a cross-departmental collaboration in place within the City to continue to align the actions with other planned activities of the City outside of the Craiova GCAP

6 Summary of Benefits



6.1 Introduction

This Green City Action Plan is aiming to drive improvement in the environmental performance of our city. The benefits of each of the Actions were assessed against a range of typical benefits defined in the EBRD Green Cities Methodology. These reflect not just Environmental benefits but also social and economic co-benefits which should be achieved with the implementation of the action plan.

Each action has potential to benefit multiple areas identified within this framework and a matrix approach has been used to identify which actions will support which areas of benefit. Benefit has been categorised into three levels:

- 3 Significant Benefit: There is substantial potential benefit which is core to the selection of the option for the GCAP
- 2 Secondary Benefit: There is likely to be some benefit which is material to the selection of the option, but not the primary driver
- 1 Marginal Benefit: There may be marginal benefits, but these are not factors which were material to the selection of the option

The analysis of benefit for each project is presented in Table 6.1 below.

Due to the strategic nature of this plan, these benefits have been assessed largely qualitatively and should be considered indicative. They do however provide guidance to implementing agencies on the range of benefits likely to be derived by each action.

A short narrative Summary of Benefits has been provided within each of the detailed descriptions of Actions in the main body of this report. This is based on the assessment below

Table 6.1 Assessment of Benefits

	Environmental Benefits										Economic Co-Benefits				Social Co-Benefits					
Action	Air Quality	Water quality	Soil quality	Biodiversity	Water use	Energy use	Land use	Material use	Climate change mitigation	Climate change adaptation	Financial returns for investor	Non-financial Economic Benefits	Employment	Economic inclusion	Public health	Access to basic services	Safety	Gender equality	Green behaviour and awareness	Community involvement
BE1 - Energy Efficiency and use of Renewable Energy Systems (RES) in Municipal Buildings	2	0	0	0	0	3	0	0	3	2	2	3	2	1	1	1	1	0	2	2
BE2 - Energy Efficiency and use of RES in Residential Buildings	2	0	0	0	0	3	0	0	3	2	2	3	2	2	2	1	1	0	2	1
BE3 - Building Management Systems (BMS)	1	0	0	0	0	3	0	0	3	2	2	1	1	1	1	1	1	0	1	0
BE4 - Develop and implement a new district heating strategy for Craiova	3	0	0	0	0	3	0	0	3	2	2	3	1	1	1	2	0	2	2	2
SM1 - Extension of public transport services & infrastructure in the new district areas of the City	2					3	3		3	1	2	3	2	2	2	3	2	2	3	2
SM2 - Modernisation of City tramway network	2					3	2		3	1	2	3	2	2	1	3	2	2	2	2
SM3 - Modernisation of the Bus Depot	2	1	1		1	2		1	1	1	2	2	1	1	1	2	2	1	1	1
SM4 - Renewal of the Urban Public Transport Vehicle Fleet	3					2			2	1	2	3	1	1	2	2	2	2	2	1

Action	Environmental Benefits										Economic Co-Benefits				Social Co-Benefits					
	Air Quality	Water quality	Soil quality	Biodiversity	Water use	Energy use	Land use	Material use	Climate change mitigation	Climate change adaptation	Financial returns for investor	Non-financial Economic Benefits	Employment	Economic inclusion	Public health	Access to basic services	Safety	Gender equality	Green behaviour and awareness	Community involvement
SM5 - Citywide Cycle Route Network & Parking Development	3					2	2		3	1		3	1	3	3	2	3	2	3	2
SM6 - City Bike Hire Scheme	3					2			3		2	3	2	2	3	2		1	2	2
SM7 - New Parking Policy for Craiova – including residential and freight parking facilities	2					1	2		3		2	3	1	2	1	2	2	1	2	
SM8 - Development of new Transport Assessment Guidelines	2					2	3		2	2		2	2	2	3	2	3	2	2	2
SM9 - Development of New Citywide Pedestrian Route Network	3					2	2		3		1	3	1	3	3	2	3	2	3	2
SM10 - City Access Restrictions	2					1	3		3		2	2	1	2	1	2	2	1	2	
UG1 - Local Register of Green spaces in Craiova	1	1	1	2			3		1	2		1	1	1	3	1	1	1	2	1
UG2 - Urban regeneration of the Balta Cernele area of Craiova	1	2	1	3			2		1	3	1	3	1	1	3	1	1	1	2	1
UG3 - Promotion of Brownfield Sites	2	1	2	2		1	3		3	1	3	2	2	1	1	1			1	2
UG4 - Guidance on gardens, interstitial space and other green spaces	2	1	2	2		1	2		1	2		2			3	1		1	2	2
UG5 - Green infrastructure plan	1	1	1	3			2		1	2		2			2				2	2
UG6 - Afforestation and Greening Programme	2	1	1	3		2	2		2	3	1	2	1		2				2	2
WA1 - Enhance the organizational and institutional capacity of waste management structures	1	1	1	1	1	1	1	3	1	1	1	2			1	2			2	1
WA2 - Improving awareness and Participation and Awareness of Citizens in Environmental Matters	1	1	1	1	2	2	1	3	1						1	1		2	3	3
W1 - Water demand management initiative (soft) Enhance organisational capacity				1	3	1				2	2				1	1			3	2
W2 - Physical losses management system (DMA's, active loss detection, pressure control)				1	3	2	1		1	3	2					1				
CC1 - Climate Change Vulnerability Plan	1	1	1	2	2	1	2	1		3	2	2	2	2	2	1	2	2	2	2
CC2 - Public participation in city planning	1	1	1	1	1	1	1	1	1	1		2	1	2	1	2	1	2	3	3
CC3 - Smart Cities Maturity Assessment & Strategy	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2
CC4 – Air Quality Plan Implementation	3											2		1	3				3	2

Action	Environmental Benefits										Economic Co-Benefits				Social Co-Benefits					
	Air Quality	Water quality	Soil quality	Biodiversity	Water use	Energy use	Land use	Material use	Climate change mitigation	Climate change adaptation	Financial returns for investor	Non-financial Economic Benefits	Employment	Economic inclusion	Public health	Access to basic services	Safety	Gender equality	Green behaviour and awareness	Community involvement
CC5 – Smart Air Quality monitoring	3											1			3	1			2	2

6.2 Key Environmental Benefits

The following section provides a summary of the key environmental benefits which are likely to be achieved through the implementation of the Craiova GCAP.

6.2.1 Air Quality

The city has a current Air Quality Plan which has characterised the key areas of challenge and remains the primary planning tool for addressing air quality issues in the city and its implementation is key to delivering improvements in Air Quality in the city **(Action CC4)**. However, there are a number of complementary Actions within this plan which are critical to the success of the Air Quality Plan.

Improvements to the thermal efficiency of buildings in the city and expansion of the use of renewables **(Actions BE1 - 3)** within the city will reduce demand for heating services and critically reduce the load placed on air quality by the combustion of fossil fuels from both solid fuel boilers and from the district heating plant.

A strategy which is developed and implemented to improve the district heating system **(Action BE4)** will have both direct benefit on local air quality, by investing in opportunities to transition away from coal as a primary energy source; and indirect benefits as maintaining and encouraging users and businesses to remain with or join the network will help to reduce reliance on less clean solid fuel burners and boilers which are common in our city.

The GCAP also contains a range of measures which will encourage a reduction in the reliance on private car use in favour of public transport with improved bus and tram services **(Actions SM1 – 4)** and also active transport modes with proposals for improved designated walking and cycling routes as well as a city bike sharing scheme **(Actions SM 5,6,8 &9)**. As the private vehicle fleet has a high proportion of aged diesel vehicles, this would contribute towards a significant improvement in local air quality, especially in the city centre.

Finally, to improve our understanding of the air quality in the city and enable people to make better decisions to reduce their contribution to air quality challenges or to better protect their own health, a smart air quality monitoring scheme **(Action CC5)** is proposed.

6.2.2 Biodiversity

While there are formally protected sites around the city (notably the Jiu River Corridor and the Lacustrine Complex Preajba – Făcăi), very little information is available for biodiversity within the city itself. There is ongoing work to better understand greenspaces in the city as a part of the development of a new General Urban Plan (PUG), however the GCAP builds on this to create a specific green infrastructure plan which would help build biodiversity into planning and decision making

processes **(Action UG5).** The GCAP also promotes several schemes that would create additional urban habitat including the planting of 1,600,000 trees by 2030, promoting green walls **(Action UG6)**, rehabilitate Balta Cernele **(Action UG2) and** systematically identify other areas of opportunity **(Action UG3).** Other actions which promote encouragement of greenspace in land use planning will also provide additional biodiversity opportunity.

6.2.3 Water Use

While the availability and quality of water in Craiova is generally good, there are opportunities to reduce the volumes of water used by consumers through water awareness by up to 10% **(Action WA1)**. There is also a proposal to further reduce wastage of water through a 35% reduction of losses in the water network **(Action WA2)** using a combination of pressure control, metering and other leakage control techniques. Water investments will be developed in parallel to ongoing investments supported with EU funded Operating Programmes.

6.2.4 Energy Use

As with Climate Mitigation, the primary area of opportunity for reductions in energy use is via improved energy efficiency (primarily thermal efficiency) in buildings, of which the majority of benefit is likely to be found in the residential sector. An estimated 266,000 MWh/year savings can be achieved from residential building rehabilitation projects **(Action BE2)** by 2030 and a further 4,180 MWh / year from rehabilitation and improved management of municipal buildings **(Actions BE1&3)**.

The other area of significant opportunity is in rehabilitation of the District Heating system for which a new strategy for the future of the district heating will be set out **(Action BE4)**. This will be aligned with EU and national objectives to reduce reliance on fossil fuels, however any rehabilitation of the network is also likely to involve significantly reducing inefficiency in the system (for example by improvements to distribution network to reduce losses) and the introduction of improved customer-based billing. Both of these factors could substantially improve energy performance of the network.

6.2.5 Land Use

The city has typical land use demands with central areas heavily occupied and there is pressure to expand the city boundary to help facilitate further development growth. This presents a range of challenges such as less efficient/commercially viable transport networks and social issues such as remoteness from key municipal services. These challenges have been compounded by an out-of-date General Urban Plan. However, a revision to this Plan is currently under development and is expected to be ready in 2021. The GCAP has identified a number of complementary measures to make more efficient use of land in Craiova. These include promotion of development on “brownfield sites” **(Action UG3)** which would potentially free up land in more central areas; extensions of public transport networks to growth areas **(Action SM1)** and to develop specific transport guidance for the planning process **(Action SM8)** to mitigate transport challenges associated with urban sprawl.

6.2.6 Material Use

There are already significant investments in the development of infrastructure to improve waste management and encourage recycling at county level. Through engagement with stakeholders we agreed that a key area of opportunity for the City Hall to support these measures was to raise awareness amongst citizens and support further institutional capacity in the sector.

6.2.7 Climate Change Mitigation

Key areas of opportunity for the reduction of Greenhouse Gas (GHG) emissions are energy efficiency in buildings (and particularly residential buildings), improvements to the District Heating network and reductions in emissions from transport, largely by encouraging modal shift away from private cars to less polluting measures. The measures (outlined in more detail below and presented in Table 6.2) are anticipated to provide up to

It is important to note that the scope of developing this GCAP did not provide for the consultants calculating an accurate baseline emissions

inventory or developing models to assess GHG reductions by sector or project, and therefore the estimates presented in this section should be considered indicative of the scale of savings that could be achieved by implementing actions rather than accurate targets, which will need to be calculated on a project by project basis as a part of the initial documentation for the project.

Opportunities for Buildings

The largest area of opportunity for GHG emissions reduction is in the thermal rehabilitation of building stocks, and particularly in the rehabilitation of residential buildings. The GCAP proposes an integrated programme of thermal rehabilitation and small scale renewables projects **(Action BE2)** which we have calculated could result in approximately 195,700 tonnes CO_2eq/year by 2030 with the vast majority of this benefit being delivered from thermal improvements (191,100 tonnes CO_2eq/year) and a much smaller but still notable contribution (4,600 tCO_2eq/year) from the addition of renewables schemes. These calculations are based on approximately 2.8 million m^2 of residential floorspace being rehabilitated and delivering both specific heat and specific electricity consumption savings of approximately 50% against the Business as Usual (BAU) scenario set out in the 2013 TRACE City Energy Efficiency Diagnostic Study[23]

There are benefits available in the Municipal Buildings sector **(Actions BE1 & BE3)** which could deliver approximately 2,400 tCO_2eq/year in GHG reductions. This is based on the rehabilitation of 22,000 m^2 of floorspace rehabilitated with improvements of 60% for specific electricity consumption (including for cooling due to improved cooling equipment) and 78% specific energy consumption for heating (including improved heating equipment) against the same BAU scenario. Whilst this would deliver considerably less direct savings (largely due to there being considerably less floorspace available) it would also demonstrate leadership to other owners of tertiary building, as well as helpi to facilitate the establishment of a local market for providers of appropriate green technologies.

[23] https://esmap.org/sites/esmap.org/files/DocumentLibrary/TRACE_Romania_Craiova_Optimized.pdf

Opportunities for District Heating

The development and implementation of a new strategy is proposed to modernise the District Heating system and align with both EU and National Strategies for decarbonisation of the energy system in Romania **(Action BE4).** As the study is yet to be completed, an accurate GHG emissions reduction value is hard to define, however options previously under assessment included the rehabilitation of both Primary and secondary Thermal Networks and the establishment of a new gas fuelled combined cycle turbine at the CET II site. The estimated total benefit for the rehabilitation of the District Heating Network based on these measures would be approximately 112,000 tCO2eq / year in emissions reductions and it is likely that consideration of wider integration of renewables and customer-based billing systems, could improve this benefit.

Opportunities for Sustainable Mobility

There are a range of measures proposed in the transport sector **(Actions SM1 - 3 and SM5 - 10)** which collectively encourage modal shift away from private car use towards increased use of alternative sustainable transport modes. A detailed transport emissions model has not been developed for this study but a basic calculation of a 5% reduction in private car use (with that use transferring to walking and cycling and maintenance of current share for public transport) would create a saving of approximately 11,467 tCO_2eq / year.

There is further opportunity to reduce emissions from the Public Transport fleet with the replacement of old diesel busses with modern electric busses **(Action SM4)**. Replacement of 30 of the current diesel busses with modern electric equivalents generates a further 1,021 tCO_2eq / year savings of GHG emissions

Table 6.2 Estimated GHG Emissions Savings from GCAP Actions

Measure	Estimated GHG savings in year 2030 (tonnes CO2eq / year)
BE1 - Energy Efficiency and use of Renewable Energy Systems (RES) in Municipal Buildings	2,446
BE3 - Building Management Systems (BMS)	
BE2 - Energy Efficiency and use of RES in Residential Buildings	195,769
BE4 - Develop and implement a new district heating strategy for Craiova	112,000[24]
SM1 - Extension of public transport services & infrastructure in the new district areas	11,467
SM2 - Modernisation of City tramway network	
SM3 - Modernisation of the Bus Depot	
SM5 - Citywide Cycle Route Network & Parking Development	
SM6 - City Bike Hire Scheme	
SM7 - New Parking Policy for Craiova – including residential and freight parking facilities	
SM8 - Development of new Transport Assessment Guidelines	
SM9 - Development of New Citywide Pedestrian Route Network	
SM10 - City Access Restrictions	
SM4 - Renewal of the Urban Public Transport Vehicle Fleet	1,021
Total	**322,703**

Other Opportunities

Many of the other Actions proposed may also provide GHG emissions savings for example through more efficient land use planning to reduce the number of trips made across the city **(Actions SM8 and UG3)** and there may be some benefit from afforestation and greening programmes proposed **(Action UG6).** There is also evidence that implementing Smart Cities technologies **(Action CC3)** can improve efficiency with a 2018 McKinsey report stating that smart applications in infrastructure could cut greenhouse gas emissions by 10 - 15%.[25]

6.2.8 Climate Adaptation

While we recognise that there are potential risks to our city from Climate Change, to date, there has been limited work undertaken to understand these risks and to develop appropriate responses to them. This GCAP contains actions which inherently improve resilience to challenges that climate change may create, such as improved thermal insulation of buildings providing security of comfort for residents and building users in heat extremes, greater use of green infrastructure such as trees and green walls to provide natural resilience services such as retention of rainwater flows and cooling effects and encouraging the use of smart technologies which can make the operation of utilities and services more adaptable to change and to extreme events. The key measure adopted in this GCAP is however, the development of a Climate Change Vulnerability Plan **(Action CC1)** which will allow more deliberate consideration of vulnerabilities and adaptation needs in future planning and policy making processes.

6.3 Key Economic and Social Co-Benefits

The GCAP process has specifically focused on the development of measures to achieve environmental benefit. However, it is important to consider and recognise potential economic and social co-benefits that may be delivered as a result of the implementation of the GCAP actions This section sets out where we believe these co-benefits exist within this GCAP.

6.3.1 Financial Returns for Investors

Many of the Actions that have been developed have potential to financially benefit investors in the schemes, whether it is the City Hall

[24] This number is based on an assessment of potential benefit prior to a further strategic study and has potential to be substantially increased especially with fuel switching to GHG neutral energy sources (solar, sustainable biomass) and replacement of distributed natural gas boilers and air conditioning units with highly efficient heating / cooilng systems (such as distributed solar heating and heat pumps which also provide cooling).

[25] Smart Cities: Digital Solutions for a more liveable future, McKinsey Global Institute 2018

itself, private sector investors or in some cases individual citizens making investments in improving their properties. These are generally through efficiencies such as reductions in operating costs or increased revenue from increased usage of services. This applies to energy efficiency measures (in buildings and the district heating system), a more expansive public transport network, higher ridership of the public transport network increasing revenues to RAT, revenues from bike sharing/rental schemes, release of land value in the redevelopment of brownfield sites, and reductions in lost water. Actions which do not generate an investment tend to be policy measures or tools such as guidance documents or datasets. Of the infrastructure projects it is only walking and cycling infrastructure that do not have clear revenue or cost efficiency benefits (although it could be argued that maintenance of walking and cycling infrastructure could be proportionately lower than road infrastructure if sufficient modal shift could be achieved).

6.3.2 Non-Financial Economic Benefits

Many of the proposed investments will generate wider economic benefits in the area. Cities such as Craiova are competing for investment to grow our economy and create a sustainable economy for our city. Increasingly the quality of the environment as a component of the city's wider "Liveability" is an important factor when people and businesses consider establishing an operation in a city.

There are also more tangible potential benefits resulting from efficiency improvements in the operation of infrastructure. While some of those benefits may be retained by the operators of infrastructure in some cases, in other cases it will be converted to reinvestment in services or reduced tariffs for users (compared to owning and using private cars).

The provision of efficient services, such as public transport, utilities provision or service provision such as waste management, also helps to create a sound enabling environment for economic activity, allowing businesses to run efficiently and reliably.

Furthermore, investments in the residential building stock result in financial benefits (energy savings) as well as increased comfort and potentially improved health outcomes. Investments in the municipal building stock can improve productivity of workers and – in the case where educational facilities are involved – improved educational outcomes.

6.3.3 Employment

Investments may create both short term employment opportunities (for example in the delivery of infrastructure projects) but also create longer term "green jobs" such as installation, servicing and maintenance of small scale renewables technologies or insulation products for buildings, additional jobs in public transport to service additional routes, and management of the bike sharing scheme.

6.3.4 Economic Inclusion

Lower income citizens are likely to benefit from more accessible transport infrastructure, particularly the expansion of public transport services to outlying areas and the development of safe walking and cycling networks which can provide effective mass transit at minimal cost to users.

Financial savings on energy bills which should result from investment in energy efficiency and renewables technologies in residential buildings should also benefit lower income households, although this needs to be balanced against potential capital contributions that apartment owners will need to make to access rehabilitation funds.

Finally lower income households are more vulnerable to climate change. A key consideration in the development of a Climate Vulnerability Plan would be to consider vulnerable groups to ensure that adaptation is planned in a socially and economically inclusive way.

6.3.5 Public Health

Three broad areas of public health benefit have been identified resulting from the Green City Action plan. These include:

- Reduction in reliance on private car use and particularly access to "Active Infrastructure" (e.g. walking and cycling infrastructure) which not only provides cheap, low carbon mass transit, but also has

tangible benefits for users in terms of improved physical health and contribution to improved mental well-being.

- Evidence shows that air pollution at current levels in European cities is responsible for a significant burden of deaths, hospital admissions and exacerbation of symptoms, especially for cardiorespiratory disease[26]. Improvements in air quality resulting from the Green City Action Plan will provide benefit at the population scale, but this is particularly important for vulnerable groups such as children, older people and those with respiratory conditions such as asthma.
- WHO's 2016 Evidence Review of Urban Green Space and Heath identified that urban green spaces can promote both physical and mental health and can reduce morbidity and mortality in urban residents by providing physical relaxation and stress alleviation, stimulate social cohesion, support physical activities, and reduce exposure to noise, air quality and excessive heat. Improvements to green space and green infrastructure in the city will support these health objectives and have been particularly important to people during the current COVID-19 pandemic.

6.3.6 Safety

In general the installation of new infrastructure (such as the thermal plant at Termocraiova II or rollingstock (for example buses and trams) has the potential to improve the safety of users through adoption of safe design and operational standards. Therefore there are safety benefits to be achieved from most of the tangible projects included in the Green City Action Plan.

However, the provision of walking and cycling infrastructure has specific road safety opportunities and benefits. Well-designed schemes would include both protection from interactions with motorised traffic but also provide a safer and more secure environment by reducing risks relating to crime with pedestrian and cycle routes being in locations with good natural surveillance, CCTV coverage and appropriate lighting.

6.3.7 Gender Equality

Gender issues should be given due consideration during the development of each action to ensure that benefits and disadvantages of schemes consider both men and women's needs which may be different. At this strategic level, the following opportunities or benefits are noted.

- New public transport infrastructure is likely to be designed to accommodate a wider range of accessibility needs such as improved access for pushchairs which women are more likely to travel with than men.
- Similarly, pedestrian (and cycleway) facilities would tend to include improved accessibility for items such as pushchairs and may be favoured for short journeys such as walking children to school which are more likely to be undertaken by women.
- Women are particularly vulnerable to attack or sexual assault at locations such as bus stops or walking/cycling routes which are not along main roads. Modern bus stop design standards for such facilities would consider safety features such as improved lighting and visibility, as well as natural surveillance to improve women's security and reduce fear of attack.
- Women are more likely to assume childcare responsibilities and therefore benefit more from access to better quality greenspace, particularly with respect to local facilities such as microparks and interstitial space as considered in Action UG4, including access to toilets. Older women providing childcare would also benefit from the use of benches along walking routes and in parks and greenspaces.
- Female headed households are more likely to be economically marginalised than male headed households and therefore the benefits discussed under 6.3.4 (economic inclusion) are likely to be relevant to this group. . Women in general are also likely to have less access to private cars and more likely to walk and use public transport than men.
- It is important to recognise that traditional design processes have historically been led by men and that many assumptions (for example provision of toilet space or accessibility requirements) do not fully

[26] https://www.euro.who.int/en/health-topics/environment-and-health/air-quality/air-quality

consider women's needs. A more inclusive consultation process as proposed in Action CC2, should help ensure that women's views are considered in the development of projects.

6.3.8 Green Behaviour and Awareness

During stakeholder consultations, citizens taking personal responsibility for their own environmental performance was highlighted as an important component of improving the environmental performance of the city. Several of the actions specifically target raising awareness of environmental challenges in citizens including Action WA2 which establishes awareness campaigns for waste and W1 which sets out a range of measures to encourage people to use less water. Typically building refurbishment projects (for example Action BE2) would also seek to engage users to take more notice of how much energy they are consuming.

6.3.9 Community Involvement

Stakeholders were clear that they wanted greater engagement in planning activities and the GCAP proposes to provide additional support through the establishment of a Citizens Advisory Committee and better online engagement with citizens. This would allow citizens to have a greater input into Green City Planning and decision making. This would be supported by GCAP progress reporting as described in section 5.6.

Appendices

Appendices are included in Volume 2 and are available separately on request – A full version is published on the Primaria Craiova website (in Romanian only)