Green City Action Plan

for the

City of Khmelnytskyi

December 2022

European Bank for Reconstruction and Development

Sweden Sverige

Khmelnytskyi

ATKINS

BILFINGER

Contents

Contents

Figures

Tables

List of Abbreviations

BOD	Biochemical Oxygen Demand
CAPEX	Capital expenditure
CSO	Civil society organisations
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EU	European Union
GCAP	Green City Action Plan
IDP	Internally displaced people
IFC	International Finance Corporation
IHS	Individual heating substation
LULUCF	Land use change and forestry emissions
MFI	Multi-lateral funding institutions
MBT	Mechanical biological treatment
MRF	Materials recovery facility
MRV	Monitoring, reporting and verification
MSW	Municipal solid waste

NBS	Nature-based solutions
NDC	Nationally Determined Contribution
NEFCO	Northern Environmental Finance Corporation
NGO	Non-governmental organisation
OECD	Organisation for Economic Co-operation and Development
OPEX	Operational expenditure
PSR	Pressure-state-response
PPP	Public-private partnership
RAR	Rapid Assessment Report
RDF	Refuse derived fuel
RES	Renewable energy systems
SEA	Strategic Environmental Assessment
SEP	Stakeholder Engagement Plan
SIDA	Swedish International Development Cooperation
SUDS	Sustainable urban drainage systems
UAH	Ukrainian Hryvnia
UNFCCC	United Nations Framework Convention on Climate Change
USAID	United States Agency for International Development

Message from the Mayor

Dear friends!

Khmelnytskyi was one of the first Ukrainian cities to incorporate the "green path" into their plans for a better future for the city and its residents. Our obligation to the residents of Khmelnytskyi is to solve environmental problems and find solutions that will improve both citizens' quality of life and the environment. We demonstrated our commitment by participating in European initiatives, particularly the EBRD Green Cities Program.

Adopting the Green City Action Plan approach will give us access to funding that will help implement a variety of solutions: improving air and water quality, greening the city, modernizing city transport, and taking care of energy security.

Russia's war presents us with new challenges, but it does not eliminate the old ones. Khmelnytskyi is home to 300,000 residents, as well as a new home for 30,000 internally displaced persons. The city authorities' task is to use all available options to make this home comfortable, safe, and innovative.

Executive summary

Executive summary

Benefits of the GCAP

Cities are dynamic and vital parts of society and the main engines of social, economic and technological development – however cities are sources of important environmental impacts such as pollution and pressure on natural resources and are also often vulnerable to climate change and natural disasters.

There is a need for a holistic and systematic approach to address environmental challenges and to build a better and more sustainable future for cities and their residents. Adopting the Green City Action Plan approach under the EBRD's Green Cities Programme can help identify and deliver the environmental and society benefits needed to realise change, influence decision makers and to unlock necessary finance.

In recent years the city of Khmelnytskyi has made significant progress in developing and implementing strategic policies and programmes within key areas of sustainable development, in line with national and regional priorities on environmental protection, energy efficiency, waste management and digital transformation.

In April 2021, WS Atkins International, in consortium with Bilfinger Tebodin Ukraine, was selected to assist in the development of the GCAP for the city of Khmelnytskyi. Following the EBRD methodology, the aim of the project was to assist Khmelnytskyi to systematically address its environmental issues.

Wide groups of stakeholders were involved in the process of the GCAP development, starting from the very early stage of data collection, up to the final approval of GCAP.

A GCAP follows a systematic process of establishing a Green City Baseline by identifying the priority environmental challenges that need to be addressed.

Environmental challenges

The baseline phase of the GCAP involved collecting relevant data to understand the environmental challenges within Khmelnytskyi. Four major environmental challenges were prioritised in Khmelnytskyi, namely:

- High levels of air pollution
- Contamination of surface water
- Unsustainably high water use
- Insufficient green spaces in central areas.

By identifying and benchmarking sectoral performance in Transport, Energy, Buildings, Industry, Water, Solid Waste and Land use, the GCAP identifies which aspects of economic sectors are responsible for creating the observed environmental challenges.

Green City challenges

By considering environmental issues and sector performance together, particular issues become apparent. These are considered as the Green City Challenges. Directly addressing these Green City Challenges will contribute to improving the overall environmental performance of the city of Khmelnytskyi. Khmelnytskyi Green City Challenges are identified as:

- Governance and planning
- Green zones
- Urban transport
- Energy security
- Water
- Solid waste

Assessing the impact of war

During the development of this GCAP, the EBRD commissioned an assessment of the new challenges and impacts on Internally Displaced People, city infrastructure and the provision of public services resulting from the military invasion of the Russian Federation in Ukraine.

Overall, the influx of IDPs over 35,000 (raising the city population by more than 13%) and the damage to infrastructure caused by the war highlights acute vulnerabilities to critical services

and utility sectors in the city. This also creates an additional burden for the provision of public services like social protection, education, health care and the housing sector and emphasises the need for investment in critical sectors of city services.

The results of the Rapid Appraisal have been incorporated into this GCAP development.

Action plan development

Following the creation of a comprehensive picture of where the city is today and which areas need attention, the Action Plan was developed. This began with agreeing a single, overarching vision for its Green City development.

Green City Vision for Khmelnytskyi

In 15 years the city of Khmelnytskyi will…

Address its priority environmental challenges of water quality and use, air quality and green spaces issues, while ensuring co-benefits to wider ecological improvement. Through collaboration with citizens and international partners, by embracing modern, efficient, digital and technologically advanced infrastructure improvements, the GCAP will ensure environmentally friendly, sustainable, affordable and accessible services for all, thus enabling a sustainable future in greener & healthier environment for the local community.

To support achievement of the Vision, a range of Strategic Goals, Targets and Actions have been developed. A longlist of over 100 potential actions were identified in close collaboration with key city departments, municipal companies and service providers. Through consultation and engagement with multiple public stakeholder groups a shortlist of priority actions were selected and elaborated.

Green City Actions

A total of 21 packaged actions were agreed. This includes costed measures focused on improving appreciable environmental challenges whilst also providing a range of wider socio-economic co-benefits, and addressing the recommendations of the Rapid Appraisal task to address new challenges posed by the war.

These actions form the GCAP investment plan, and equate to a total funding requirement of €694m over the course of 10 years (2023-2032); containing a mixture of policy, pre-investment and investment and other initiatives. The wide range of actions within the GCAP provides options for funding from alternate of sources - the City, IFIs and private financing. The funding would be used for investing into:

- Governance and planning – to embed environmental principles at the heart of city governance and decision making
- Green zones – to expand accessible green spaces for citizens
- Urban transport – to enhance sustainable transport modes and boost active lifestyles
- Energy security – to bolster energy security and reduce the reliance on fossil fuels
- Water quality – to improve and safeguard the quality of the water supply to the city
- Solid waste – to promote environmentally sensitive waste reduction and management

Carbon saving potential

For each action an estimation of potential carbon savings has been developed. The GCAP offers possible GHG reductions of 207,950 tCO_2e per year based on the current emissions profile – an 18.8% reduction on 2020 levels.

Investment and implementation

Throughout 2022 the city has continued its strong performance of developing and implementing sustainable development strategies. In spite of the challenges posed by the ongoing war in Ukraine the city remained committed to ensuring the production of a robust GCAP for the citizens of Khmelnytskyi.

By following the process of challenge identification, objective led planning and action

generation, Khmelnytskyi City Administration has developed an ambitious but achievable action plan, providing clear options and guidance on how to enhance environmental performance and ensure the realisation of "Green City" status.

Through sound investment in innovative technical solutions and the expansion of pre-existing best practice, supported by policy, governance and capacity building measures, the Khmelnytskyi GCAP will embed positive environmental practices well into the future. Doing so will address the identified priority environmental challenges, improve service provision for citizens and will provide long term investment benefits for the city across multiple sectors, demonstrating commitment to the global green agenda.

The city's commitment to implementation of the GCAP is already being demonstrated. Despite the war the EBRD and city have continued coorperation and have been able to leverage opportunities derived from the GCAP as follow-on projects. This includes the ongoing preparation of a trolleybus network investment in the city, which will be finalised in 2023.

The following page provides a summary of the Action Plan.

Sector	#	Action	Policy / investment	Timeframe (2023 -2032)										Smart	Carbon saving (tCO_2e)	Job creation potential	Total cost (€)	Capex (€)	Opex (€)
				23	24	25	26	27	28	29	30	31	32						
Environmental, social and climate governance 	EG-01	Awareness raising campaign, outreach and environmental information	Policy	■	■	■	■	■	■	■	■	■	■	Smart Component	5,000	7 - 15	70,000	20,000	50,000
	EG-02	Improvement to environmental data collection, exchange and management	Policy	■	■	■	■	■						Entirely Smart	-	10 - 35	550,000	500,000	50,000
	EG-03	Integrated urban planning and develop guidelines and tools to realise eco-city aspirations	Policy	■	■	■	■	■						Smart Component	-	7 - 15	1,350,000	1,300,000	50,000
	EG-04	Gender policy enhancements and implementation support	Policy	■	■	■	■	■						Smart Component	-	7 - 15	70,000	20,000	50,000
	EG-05	Climate vulnerability assessment and incorporation of resilience into infrastructure investments	Policy	■	■	■	■	■						Smart Component	-	10 - 35	300,000	200,000	100,000
Green zones 	GZ-01	Monitoring and governance of green zones	Policy	■	■	■	■	■						Smart Component	-	7 - 15	250,000	200,000	50,000
	GZ-02	Enhancement of existing green zones	Investment		■	■	■	■	■					Smart Component	200	7 - 15	300,000	100,000	200,000
	GZ-03	Development of new green zones	Investment		■	■	■	■						Smart Component	50	55 - 70	1,200,000	1,000,000	200,000
Urban transport 	UT-01	Modernisation and enhancement of the public transport system	Investment			■	■	■	■	■	■	■	■	Smart Component	2,700	105 - 205	18,425,000	16,750,000	1,675,000
	UT-02	Demand management through development of a City Parking Strategy	Policy		■	■	■	■						Smart Component	900	25 - 30	1,575,000	1,425,000	150,000
	UT-03	Cycling network investment	Investment		■	■	■	■	■	■	■	■	■	Smart Component	4,000	55 - 60	2,150,000	1,900,000	250,000
	UT-04	Pedestrianisation and car free zones	Investment		■	■	■	■	■	■	■	■	■	Smart Component	2,700	55 - 60	5,600,000	5,100,000	500,000
Energy, Industry & Buildings 	EI-01	Promoting renewable energy generation in buildings	Investment		■	■	■	■	■	■	■	■	■	Smart Component	7,000	15 - 55	3,200,000	2,200,000	1,000,000
	EI-02	Promoting energy efficiency enhancements to building stock	Investment		■	■	■	■	■	■	■	■	■	Smart Component	47,500	45 - 120	82,500,000	75,000,000	7,500,000
	EI-03	Ensuring energy efficiency measures in industry	Investment		■	■	■							Smart Component	22,800	10 - 15	495,000	450,000	45,000
	EI-04	Rehabilitation of the city heating supply network	Investment		■	■	■	■	■	■	■	■	■	Smart Component	30,800	125 - 200	98,800,000	89,800,000	9,000,000
Water quality & availability 	WA-01	Storm / Waste water management	Investment			■	■	■	■	■	■	■	■	Smart Component	1,300	125 - 200	205,450,000	186,750,000	18,700,000
	WA-02	Modernisation of drinking water supply	Investment			■	■	■	■	■	■	■	■	Smart Component	1,500	220 - 300	219,400,000	199,500,000	19,900,000
	WA-03	Achieving good ecological status of the local water bodies	Investment			■	■	■	■	■	■	■	■	Smart Component	0	15 - 40	2,035,000	1,850,000	185,000
Solid waste 	SW-01	Ensure an effective system of MSW collection, temporary storage and treatment	Investment	■	■	■	■	■	■	■	■	■	■	Smart Component	3,100	60 - 120	36,650,000	33,350,000	3,300,000
	SW-02	Improving existing MSW landfilling system	Investment		■	■	■	■	■	■	■	■	■	Smart Component	3,100	60 - 100	13,860,000	12,600,000	1,260,000
Total															132,650	1025-1720	694,230,000	630,015,000	64,215,000


Project context

1. Project context

Cities are sources of important environmental impacts such as pollution and pressure on natural resources and are also often vulnerable to climate change and natural disasters. Such environmental issues are particularly acute in Khmelnytskyi and reinforced by patterns of urbanisation and development.

There is a need for a holistic and systematic approach to maximise benefits, and for successful application. Adopting the Green City Action Plan approach under the EBRD's Green Cities Programme can help identify and deliver the wider co-benefits needed to persuade decision makers and to unlock finance.

In April 2021, WS Atkins International, in consortium with Tebodin Bilfinger, was selected to assist in the development of the GCAP for the City of Khmelnytskyi. Following the EBRD methodology, the aim of the project is to assist the City of Khmelnytskyi to systematically address its environmental issues.

During the development of this GCAP, it was deemed essential to consider the new challenges and impacts on the city infrastructure and the provision of public services resulting from the military invasion of the Russian Federation in Ukraine.

Therefore a Rapid Appraisal was commissioned and its findings are considered in developing this GCAP. The Rapid Appraisal sought to assess the impacts of the war and the influx of over 35,000 forced internally displaced people (IDP) on the city's infrastructure and the provision of public services in the city, including for IDPs.

The Khmelnytskyi GCAP offers the City of Khmelnytskyi the opportunity to align their long-term development goals with an aspirational green growth agenda. This will provide long term investment benefits into the city across multi-sectors, demonstrating commitment to the global and national green agenda

GCAP process

2. Khmelnytskyi GCAP process

2.1. City context

The City of Khmelnytskyi is an administrative regional and district centre, located on both banks of the Pivdennyi Buh (Southern Bug) River, at the confluence of the Ploska River. The city is a significant historical, at the same time modern economic and cultural, centre of Podillya. As of 2019, the city's population was 273,700 people. The area of the city is 9,305 hectares.

Khmelnytskyi as a city occupies a leading position among the most environmentally friendly cities in the country, with a high rate of satisfaction with the quality of services among the population, has international recognition for the active promotion of European values.

The structural subdivisions of the city council, which are directly involved in the preparation of Khmelnytskyi GCAP as part of the Steering Committee and the Expert Group set up to facilitate the development of the GCAP at best, are presented below:

- Department of Economy
- Department of Ecology and Landscaping Control
- Municipal Infrastructure Department
- Transport and Communications Department
- Department of Architecture and Urban Development Land Resources Department
- Legal Support and Representation Unit
- Financial Department

Environmental recognition for Khmelnytskyi

- In 2019, Khmelnytskyi won the championship in the national competition "Eco Triumph", as the most eco-friendly city in the country.
- According to the indicator of satisfaction with the quality of services, the city took 5th place.
- In 2021, Khmelnytskyi became the winner of the highest award of the Parliamentary Assembly of the Council of Europe - the European Prize for 2021 - for the active promotion of European values.

Over 40 municipal companies are subordinate to relevant structural units of the City Council. They provide municipal services to residents and enterprises of Khmelnytskyi city and cover such sectors as generation and consumption of heat and electric energy, municipal waste, public transport, greenery and ecology, water supply and water drainage, the housing sector, property of public ownership, social infrastructure assets, construction, urban development.

The active civil society organisations in the City of Khmelnytskyi are not numerous, especially in areas relevant to topics of the Green City. Among active NGOs and other civil society organisations, there are educational institutions, universities and colleges, Chamber of Commerce and Industry, Council of entrepreneurs as representative of interest of local businesses etc. The city has a practice of cooperation with national and international organisations which conduct information and awareness activities in the city, like Podilskyi Centre “Gendre Council”, Hesed Besht, Espero, and Caritas.

2.1.1. Institutional framework

The city is currently making significant progress in developing actual strategic documents on key general and sectoral areas of sustainable development in line with national and regional priorities, including those on environmental protection, energy efficiency, waste management and digital transformation.

According to the Strategic Development Plan of the Khmelnytskyi City Territorial Community for 2021-2025, the city territorial community seeks to create a comfortable, environmentally friendly space to live, with modern architecture, culture, energy-efficient

infrastructure, favorable for doing business, economic development and new technologies.

In order to create a recognizable, attractive, competitive image of the new community the Strategic Development Plan provides for the implementation of projects on the following prioritized areas: (1) Economically Sustainable Community (2) Comfort and Safety (3) Responsible Community including improvement of municipal management, development of convenient infrastructure, improvement of road transport infrastructure, increase of safety, provision of quality housing and communal services, medical, educational, cultural services to the residents of the community, which are based on the gradual introduction of Smart-technologies and solutions in the daily life of the community.

The GCAP is aligned closely with these goals and objectives and its implementation will directly support the achievement of Strategic Development Plan for Khmelnytskyi.

2.1.2. City International cooperation

The city actively cooperates with international donors and multi-lateral funding institutions (MFIs) in the modernisation of the area of transport and increase of energy efficiency of water supply and water treatment systems, waste management, and in the direction of "Green City".

The city is actively participating in international and European programmes funded by the EU, SIDA, the US Peace Corps in Ukraine, the US Agency for International Development), IFIs and development partners projects such as the EBRD, EIB, IFC, and NEFCO.

According to the Program of International Cooperation and Promotion for 2021-2025, the city is intensifying international community cooperation, ensure community awareness and create a positive investment image at the national and international levels, creating an effective communication strategy, exchanging positive experience in implementing local principles. Increasing the competitiveness of the community for the welfare of its inhabitants. Achieving the goals is provided, including by establishing and maintaining relations with international organisations and investment funds, diplomatic and consular missions, trade and economic missions of other countries in Ukraine and ensuring that investors are aware of the investment opportunities of the community. The city is also actively cooperating with twin cities. Recent cooperation overview can be found at https://khm.gov.ua/uk/twin-cities.

In 2022, the city has cooperated with many donors and international and local organizations to address the challenges of the war and IDPs needs. The Rapid Assessment Report (RAR) provides a detailed overview of such cooperation (detail of the Rapid Appraisal task is provided in section 2.3).

Recent international and national recognitions and rankings of Khmelnytskyi

- 2021 PACE Europe Prize
- Winner of the National Eco-Triumph rankings of UA cities in 2021
- National Investment Attractiveness IBI-Rating invAA- “Excellent Investment Attractiveness”
- No. 1 according to the Forbs 2021 UA cities ranking as of the conditions for business
- No. 1 according to the USAID CEP 2021 UA cities competitiveness ranking
- No.9 2021 Focus UA cities comfort ranking.

The city's progress in the use of smart solutions and the desire for even more strategic approaches should be commended.

2.1.3. Municipal finance

According to the report on Khmelnitsky City Budget implementation in 2021, the revenues reached UAH 3.80 billion and expenditures including loan financing amounted to UAH 3.83 billion. Resultantly, as of 01.01.2022 internal debt was about UAH 36 million and external debt amounted to UAH 15 million.

According to the approved City Budget for 2022 revenues were planned as UAH 3.64 billion and expenditures were expected to amount to UAH 3.68 billion. The development budget formed about UAH 309 million (about 9% of the overall budget).

Due to war conditions and the adoption of the Law of Ukraine "On Amendments to the Tax Code of Ukraine and other legislative acts of Ukraine regarding the effect of norms during the period of martial law", the financial capacity of the City Budget was reduced.

Under martial law, the implementation of the budget of the Khmelnytskyi in 2022 was carried out in a special regime that significantly limits the expenditures, namely, the purchase of certain materials, services and works are limited to an exhaustive list. The introduced changes to the Budget are related to the implementation of measures aimed at strengthening repulsion of aggression and implementing measures of the legal regime of martial law; providing support to internally displaced persons, budgetary institutions and municipal companies (communal enterprises) as well as low-income households of the community to overcome challenges of war time and coming heating season. As a result, the onset of war meant that the city council had to freeze development spending to concentrate on the city's immediate wartime needs.

2.2. GCAP development process

Development of the GCAP followed the EBRD GCAP methodology. This is available online https://www.ebrdgreencities.com/

In line with the EBRD GCAP methodology, this report follows the systematic process of identifying, benchmarking, prioritising and guiding Green City Actions that involves four steps. as summarised below and in Figure 2-1.

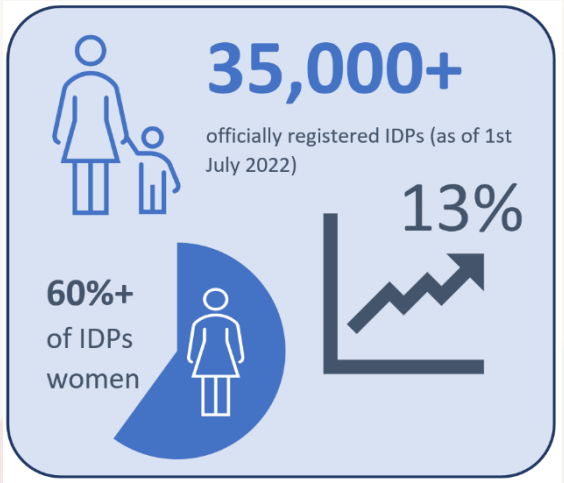
Figure 2-1: GCAP process overview

1. Establishing of the Green City Baseline and identifying the priority environmental challenges that need to be addressed;
2. Articulation of the city's vision, strategic objectives and priority actions and investments to address priority environmental challenges and meet the objectives;
3. Implementation i.e. execution of the GCAP; and
4. Monitoring and Evaluation of the GCAP results.

2.3. Rapid appraisal of war impact

In order for the GCAP to best meet the current and future needs of the city, it was deemed essential to consider the new challenges and impacts on the city infrastructure and the provision of public services resulting from the war in Ukraine. In June 2022, the EBRD commissioned a Rapid Appraisal of the impacts of the war and the influx of forced internally displaced people (IDP) on the city's infrastructure and the provision of public services in the city, including for IDPs.

The Rapid Appraisal aimed to assess the current situation with IDPs, including the demographic picture of IDPs, assessment of social, housing, educational and other needs;



public service provision needs (current and potential), and the impact on city infrastructure capacity due to growing demand.

The Rapid Appraisal report was developed as a standalone document, but relevant findings are included throughout this action plan. The results of the Rapid Appraisal (summarised in section 3.5.1) will support the city to develop its policy regarding displaced persons and address new challenges in a strategic perspective.

2.4. Summary of stakeholder engagement

The methodology of GCAP envisages engagement of key stakeholders identified at key steps of the GCAP development and further implementation, in order to take into account the interests and concerns of the local community. Therefore, stakeholders were informed at every stage of the process and invited to actively participate in designing the green city plan together, including the city council as a local policy maker, the expert community and business, civil society, academia and local community in general.

Green City stakeholders were involved in the process of GCAP development, starting from the data collection and prioritisation of environmental challenges, visioning of Green City and identification of the most important actions up to the final approval of GCAP by decision-makers and its implementation.

The EBRD considers public consultation, stakeholder engagement and information disclosure as an on-going, meaningful and inclusive process, to be started at the earliest stage of the environmental assessment process and to be continued throughout the entire life of the EBRD financed project.

In order to ensure this, stakeholders were encouraged to provide their feedback, expertise, concerns and expectations and possible options to contribute to a common plan shared by the community and aimed to make the city greener, safer and more resilient in challenged future.

The engagement included various methods of consultations, both individual and group activities: workshop sessions, presentations, working group meetings, online surveys, expert discussions, correspondence, public and official assessment at Strategic Environmental Assessment (SEA) stage, general public information disclosure and awareness raising using offline and online tools.

Under the circumstances, the GCAP development was obliged to amend these methods to an online form of engagement and communication due to limitations of the COVID-19 pandemic situation and ongoing war, and did its best to make it efficient and meaningful.

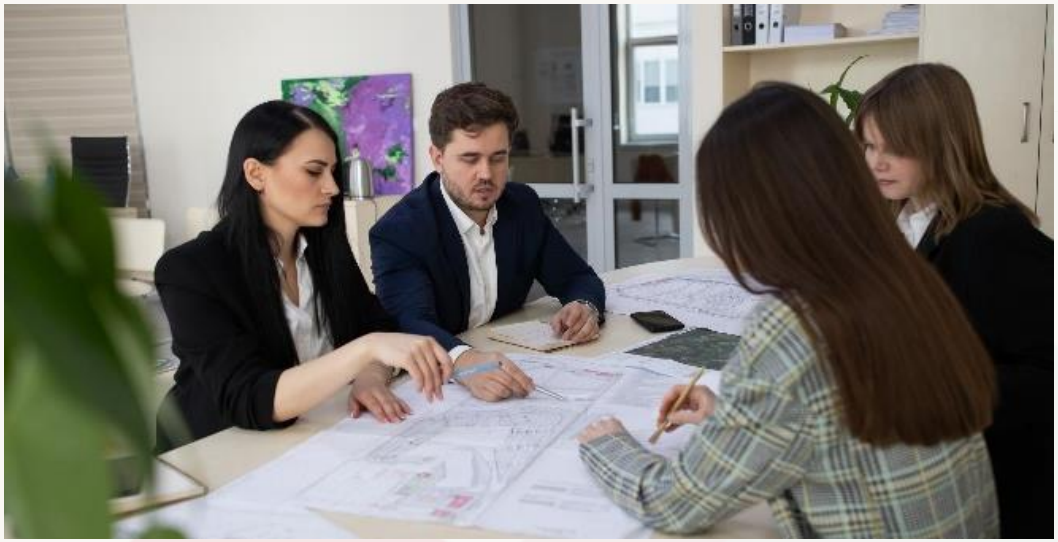


Table 2-1 provides a summary of the public stakeholder engagement held, mostly before the war, as part of the GCAP development process for Khmelnytskyi. Invitations to the workshops were extended to the following:

- The City GCAP Steering Committee and Expert Group
- Relevant City Departments and structural units (including social issues, digitalisation, urban development)
- Public utilities and other municipal organisations providing services
- CSOs representing public/citizens and sectoral interests (waste, water, energy, industry, sustainable transport, sustainable urban development; environment and climate change etc.)
- NGOs
- Representatives of local expert community (universities and research institutions
- International and bilateral organisations conducting similar work in the city)
- Media
- Business support organisations

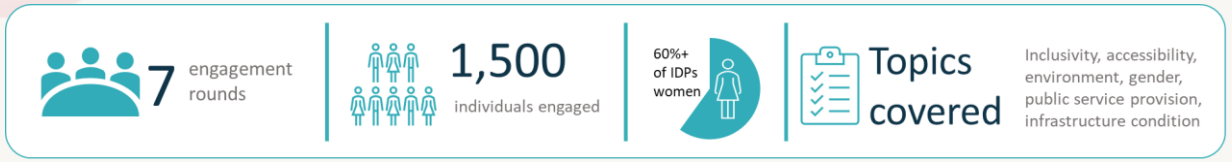


Table 2-1: Overview of stakeholder engagement activities

#	Name	Topic	Date	Attendees	Female %
1	**Workshop #1:** Launch event and 1st Stakeholder engagement	Public launch and initial engagement on environmental challenges in the city	28th April 2021	60	53.3%
2.	**Online public survey**	Evaluation of environmental baseline conditions of the City	June 2021	200	Not available
3	**Survey** within local activists at Green City baselining	Evaluation of social and gender issues at prioritisation of Green City challenges	1st June 2021-31st July 2021	43	55.8%
4	**Workshop #2:** "Prioritisation of Green City challenges"	Presentation of the findings of the Technical Assessment and preliminary prioritisation of green city challenges	26th August 2021	68	55.9%
5	**Workshop #3**: "Vision, goals and actions"	Agreement of Vision and strategic goals, and initial discussion on actions	4th November 2021	56	53.57%
6	**Workshop #4:** "Shortlisted actions"	Presentation of Shortlist of Action Packages	26th January 2022	70	51.43%
7	**IDP Questionnaire**	War impacts, IDP needs and issues*	17th June – 30th June 2022	998	64.2%

* The consultant conducted a survey of IDPs individually through online surveys in June 2022; in parallel, interviews were conducted with 11 IDP support organisations in the city, through which a collective opinion of IDP representatives was obtained


Green City challenges

3. Green City Challenges

3.1. Evaluation of Green City Challenges

Following the EBRD prescribed methodology, data from a wide range of sources, was collected to:

- Evaluate the city's current environmental performance according to traffic light screening performance benchmarks (red, amber, green) referenced to local and international standards as well as considering historical trends where feasible, and
- Inform priority Green City Challenges. The results of all activities in this report constitute the Green City baseline, which documents the City's current environmental performance.

Using available data, an Indicators Database was compiled, comprised of the following indicators:

a) **Environmental assets** cover indicators of quality of air, water bodies, drinking water, water use, soil, availability of resources (green space, biodiversity and ecosystems) and climate change risks (mitigation of GHG emissions, adaptation and resilience to natural disasters).

b) **Sectoral pressure** indicators cover the sectors of transport, buildings, industries, energy, water supply and wastewater, solid waste, and land use.

Figure 3-1: Environmental assets

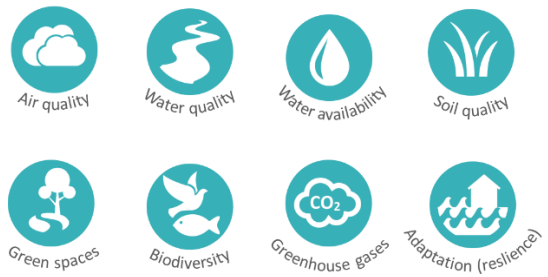


Figure 3-2: Sectoral pressures

The indicators database allowed for a preliminary evaluation of the current condition of the City's environmental assets according to the traffic light approach.

Following this, the preliminary results of the indicators database were supplemented and enhanced through expert knowledge and engagement from stakeholders, to arrive at an agree challenge level, which was deemed accurate and reflective of the true environmental challenges in Khmelnytskyi.

3.2. Environmental condition assessment

The performance of environmental assets was prioritised to rank them in order of the urgency in which they should be addressed.

The following table provides a summary of the main factors influencing each environmental performance.

The **priority** environmental challenges of the city are:

- High levels of air pollution
- Contamination of surface water
- Unsustainably high water use
- Insufficient green spaces in central areas

Table 3-1: Summary of prioritised environmental challenges in Khmelnytskyi

Environmental asset		Challenge level	Comments	Sectors contributing to environmental issues
Air quality		*High*	The main source of air pollution in the city of Khmelnytskyi is private road transport, as well as, during the heating season, heat supply companies that use natural gas for energy production.	
Water quality		*High*	Contamination of surface water with domestic wastewater, surface runoff from the city, agricultural land, and unauthorized landfills, industrial wastewater, untreated filtrate of the landfill leads to deterioration of water quality in surface water bodies	
Water availability		*High*	The low score on the Water Exploitation Index shows that the volume of water use, compared to the available water resources, is quite high	
Green spaces		*High*	The area of public green areas is gradually increasing, however especially in the central part of the city, is insufficient and is reduced due to construction and reconstruction works.	
GHG emissions		*Mid*	The main sources of greenhouse gas emissions in the city are the use of private road transport, consumption of natural gas and electricity in residential buildings, as well as district heating.	
Adaptation and resilience		*Mid*	The most significant factors of the effects of climate change are the vulnerability of urban green areas, heat stress, infectious diseases and allergic reactions, and energy systems.	
Soil quality		*Mid*	For the city of Khmelnytskyi there is no detailed information on soil quality, quantity and location of potentially contaminated areas	
Biodiversity and ecosystems		*Mid*	Data on biodiversity in the city are limited. Preservation of green areas and territories in river valleys is important to avoid the loss of bird species diversity in the future.	

3.3. City sectoral review

What creates current environmental conditions?

The following table expands on the assessment of current environmental conditions in Khmelnytskyi, to understand which aspects of economic sectors are responsible for creating the observed environmental challenge.

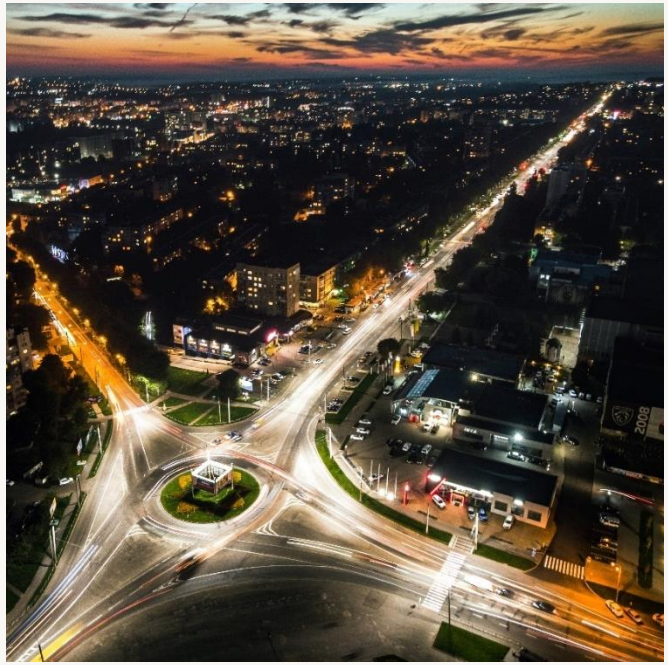


Table 3-2: Summary of sectoral issues in Khmelnytskyi

Sector	Summary of sector issue	Contributes to
	High level of private car use Ageing and low-capacity public transport network Lack of quality and convenient NMT facilities	
	Poor efficiency of building stock Poor level of thermal insulation of buildings. High level of electricity use	
	High energy consumption in industrial processes Low renewables in energy mix	
	Energy security risk Significant wear on heating network Low renewables in energy mix	
	Significant wear of water supply network Insufficient length of storm sewers Widespread unauthorised wastewater discharge	
	Low recycling and composting rates Limited waste treatment processes Landfilling capacity and quality constraints	
	Uneven socio-economic development of city districts Imbalanced development of housing with transport and social infrastructure, green areas	

3.4. Green City Challenges

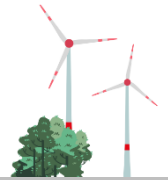
By considering environmental issues and sectoral performance together commonalities and cross-cutting themes can be determined and particular issues become apparent.

These are considered as the Green City Challenges for Khmelnytskyi.

The specific these Green City Challenges are presented in table 3-3.

Addressing these Green City Challenges will improve sectoral performance and directly contribute to improving the priority environmental challenges in the City of Khmelnytskyi.

Table 3-3: GCAP Green City Challenges

Green City Challenges		Issues to be addressed
Governance and planning		• Uneven socio-economic development of city districts, • Gaps in environmental data indicators • Limited resilience to climate change and emergency preparedness
Green zones		• Insufficient areas of green spaces in central part of the city • Imbalanced development of housing with transport and social infrastructure, green areas
Urban transport		• High level of private car use • Ageing and low-capacity public transport network • Lack of quality and convenient NMT facilities
Energy security		• Poor level of thermal insulation of buildings. • High energy consumption in industrial processes • Low renewables in energy mix • Significant wear on heating network
Water		• Significant wear of water supply network • Insufficient length of storm sewers
Solid waste		• Low recycling and composting rates • Limited waste treatment processes • Landfilling capacity and quality constraints

3.5. Issues facing citizens

3.5.1. Impact of war in Khmelnytskyi

In order for the GCAP to best meet the current and future needs of the city, it was deemed essential to consider the new challenges and impacts on the city infrastructure and the provision of public services resulting from the military invasion of the Russian Federation in Ukraine. In June 2022, the EBRD commissioned a Rapid Appraisal of the impacts of the war and the influx of forced internally displaced people (IDP) on the city's infrastructure and the provision of public services in the city, including for IDPs.

This appraisal was based on the obtained quantitative data and qualitative information, taking into account the experience of IDPs in Ukraine for eight years since the occupation of the eastern regions of the country, and the trends observed in the last months of the war, in cooperation with the city.

Key issues:

- Main need is housing. Medium- or long-term housing (rent) is needed - 59% of the interviewed IDPs. Another 8% need temporary shelter. Also, auxiliary premise is needed for persons with disabilities.
- Due to a fact that the majority of IDPs (over 70% of respondents) are considering the option of staying in the city, there is a need for jobs.
- The issue of stigmatization and discrimination of IDPs.
- Low capacity of social service providers and NGOs working with IDPs.
- Insufficient informing of IDPs on social services and opportunities available in Khmelnytskyi City.

3.5.2. Social and gender assessment

To ensure that the GCAP will secure equal representation of men and women, representatives of socially vulnerable groups and social actors, an evaluation of social and gender issues was undertaken.

Municipal sector social inclusion and gender assessments were undertaken to better understand the different needs and perspectives of women and men, and differing socially vulnerable groups, in terms of access to services and infrastructure (by sector).

The findings of the social and gender assessments were presented and discussed at stakeholder workshops and have helped develop recommendations on the design of the GCAP.

The analysis of social and gender aspects is based on a range of documents at both state and city level. This was supported by a survey of GCAP sectoral issues affecting citizens and a Survey of problems related to physical accessibility, Evaluation of issues identified around use of public services due to financial or digital access limitations.

Key issues:

- Practically all Khmelnytskyi-city programs do not sufficiently cpver aspects of gender equality and gender parity or were left without funding.
- Lack of state social standards for public transport services and criteria for assessing the quality of passenger transport services obstructs an objective assessment of the provided services.
- Problems related to physical accessibility, in particular for elderly and disabled people – eg. – lack of comfortable railing, low pavement curbs, tactile tile for people with disabilities. An insufficient rain drainage system on many roads significantly limits people in wheelchairs to cross the road during rain etc.).
- Physical unsafety issue for women: No round-the-clock transport to return home from work under dark time; lack of the lighting of courtyard territories and the city as a whole.
- Unplanned territories near new buildings: territories are used as parking and roadway, which significantly reduces the comfort and safety of women's life (unsafety /discomfort of spending time in the courtyard for children and elderly / low mobility people, no facilities for disabled people etc.).
- Issues related to water quality and water supply: dirty water in the water supply is harmful to children, it results in breakdown of household appliances. The periodic absence of centralized hot water negatively affects women.
- High tariffs for heating for some categories of residents.
- Lack of relevant skills to use public services online, digital access limitations. Pensioners have to come to the Pension Fund in person for several times to take their pensions because they don't have skills for getting it on-line and it is not possible to get proper consultation in place.

3.5.3. How the GCAP will support improvement in the identified issues

- Social housing and preferential programmes can be considered as a solution to the issue of IDPs housing.
- As for jobs, the urgent support to the city with job creation, as well as support to IDPs on entrepreneurship can be a solution of the issue.
- The issue of stigmatization and discrimination of IDPS can be solved with the measures which allow to integrate the IDPs into local community - the City of Khmelnytskyi should have a programme for the integration of IDPs into the city's community. It is necessary that the local authorities disseminate good practices and cases of IDPs success stories, their cooperation with local residents, etc.

- Social and gender issues should be in the focus of municipal policy and targeted programs.
- Review existing municipal programs and budgets and provide documentary record of the gender dimension in the programs and availability of appropriate items in the budget.
- Include measures to create jobs for women and training for women employed in municipal programs.
- Develop programs for increasing digital literacy of the population and employees providing social services.
- To provide training of local government officials, as well as specialists of local executive authorities, local government bodies for the development of gender competencies (regarding the use of gender approach, gender analysis, gender-oriented approach in the budget process, gender audits, gender-legal expertise) and skills.
- Develop socially and environment-focused mobility with regard to short-distance travel in accordance with “The city of short route” models, principles of inter-modality to ensure the best possible interaction of cycling transport with other modes of transport.
- Implement quality control systems for passenger transport including the introduction of instruments to organize public service obligations and socially important passenger transport.
- Introduce criteria for monitoring the passenger rights and quality of passenger transport, as well as incentives for carriers to meet social standards; Regulated mechanism of preferential fares, streamlining of the organization and funding of socially important passenger transport.

Green City Vision

4. Green City Vision

The purpose of the Vision is to guide the city's development and provide a framework for the Green City Action Plan. The Vision aims to address the priority challenges and thematic areas that were identified in the Technical Assessment stage. It takes the form of a Green City strategy statement which provides an image of the city and a general principle that leads development of a GCAP and its implementation.

4.1. Strategic goals, targets and actions

To support achievement of the Vision, a range of strategic goals, targets and actions have been developed to provides a clear framework for the development of measures which will have an appreciable benefit on the city's environmental performance. These form the guiding principles of the GCAP.

Each of these guiding principles are presented in detail for each Green City Challenge in Chapter 5.

- **The Strategic goals -** Which specific areas do we need to address across sectors to achieve this vision?
- **Mid-term targets -** Which targets should we aim to achieve through our actions?
- **Actions -** Which actions do we need to implement to reach our strategic goals for each sector?

The Table 4-1 provides an overview of the strategy goals and targets within each Green City challenge area.

In 15 years the City of Khmelnytskyi will…

Address its priority environmental challenges of water quality and use, air quality and green spaces issues, while ensuring co-benefits to wider ecological improvement. Through collaboration with citizens and international partners, by embracing modern, efficient, digital and technologically advanced infrastructure improvements, the GCAP will ensure environmentally friendly, sustainable, affordable and accessible services for all, thus enabling a sustainable future in greener & healthier environment for local community.

Table 4-1: Challenges, goals and targets

Green City Challenges		Strategic goal	Targets		
			Indicator name	Current	Target
Governance and planning		Enhanced environmental, social and climate governance system into urban development planning to reduce negative impact and increase resilience	Public and non-motorised transport is promoted through awareness campaigns	RED	GREEN
			Industrial material efficiency and waste recycling is regulated and incentivised	YELLOW	GREEN
			Water saving reuse is encouraged through awareness campaigns	YELLOW	GREEN
			Buildings access to wastewater collection and treatment systems is improved	YELLOW	GREEN
			Business and community resilience is encouraged through awareness campaigns	RED	GREEN
			Solid waste reuse, sorting and recycling is promoted through awareness campaigns	YELLOW	GREEN
Green zones		Increased the provision of accessible, well maintained, environmentally sensitive areas of public green zones throughout the city	Open green space area ratio per inhabitant	7.8	>10
			Share of green space areas within urban limits	44.4	50
			Population density on urban developed land	2,950	4,500
Urban transport		Increased travel choice and improved quality and connectivity to reliable public transport and active travel networks	Transport modal share in commuting cars (Private transport %)	50%	40%
			Kilometres of bicycle path per 100,000 population	6.7	18
			Average speed of bus services during peak hour	23	27
			Average age of car and public transport fleets	11	<10
Energy security		Reduced air pollution and GHG emissions from fossil fuel generated energy sources across all kinds of building stock	Proportion of total energy derived from RES	7.3%	15%
			Residential buildings electricity consumption (kWh / m^2)	36.4	22
			Residential buildings heat fossil fuel consumption (kWh / m^2)	135	82.5
			Green Certification (Energy Efficiency Certification of buildings)	169	1,000
			Share of industrial energy consumption from renewable energy	7.3%	15%
Water		Improved quality of drinking water to citizens and ecological status of the local water bodies	Wastewater treated to EU standard	n/a	100%
			Biochemical Oxygen Demand (BOD) in rivers and lakes (mg/L)	8.85	<6
			Ammonium NH4 concentration in rivers and lakes (mg/L)	1.2	<0.5
			The degree of wear of water supply networks	48%	25%
			The degree of wear of storm sewer networks	55%	25%
			Non-production water losses	34%	25%
Solid waste		Implement a sustainable MSW management system in accordance with waste hierarchy	MSW generation per capita	355	<355
			% of separated collected MSW recyclables from MSW generated	0.1%	10%
			Rate of MSW recycling	0.06%	12%
			Energy recovery of MSW at EU standard facility	0.0%	20%
			Proportion of MSW sent to landfill	99.9%	68%
			Compliance of landfill to EU standards	0.0%	100%

Green City Action Plan

5. Green City Action Plan

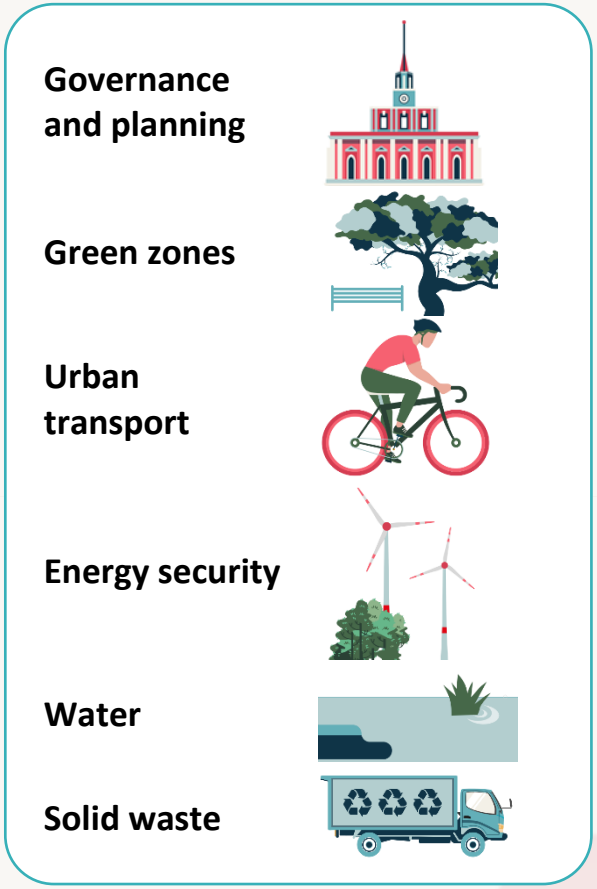
5.1. General overview

The GCAP contains 21 packaged actions containing a mixture of policy, pre-investment and investment and other initiatives:

- Policy: actions concerned with legislative, regulatory or standard-setting measures and include approval and implementation of strategic documents, institutional capacity building and enhanced governance processes related to Green city areas.
- Pre-Investments initiatives: prefeasibility studies and environmental and social assessment of projects for financing by international financing institutions (IFIs), strategy development, outreach campaigns and other efforts that contribute to strategic goals, partnerships with financial and private partners, awareness raising and capacity building.
- Investments projects: actions focused on capital expenditures to improve the environmental performance of local infrastructure. This includes design, procurement of services, equipment, works, construction and other implementation activities.

5.2. Sectoral overview

Actions are presented in the Green City Challenge areas covering sectors and cross cutting components of:



This chapter provides an overview of the recommended action plan Table 5-1 followed by a comprehensive explanation of the investment plan, and a range of individual detailed proformas for each action to provide as much detail as possible on current stage of development. Each proforma provides detailed information including:

- ✓ action description,
- ✓ potential benefits offered,
- ✓ smart technology opportunities,
- ✓ social considerations,
- ✓ estimation of carbon savings,
- ✓ estimation of funding required, and
- ✓ timescales for implementation.

Table 5-1: Overview of Khmelnytskyi Green City Actions

Sector	#	Action	Policy / investment	Timeframe (2023 -2032)										Smart	Carbon saving (tCO_2e)	Job creation potential	Total cost (€)	Capex (€)	Opex (€)
				23	24	25	26	27	28	29	30	31	32						
Environmental, social and climate governance 	EG-01	Awareness raising campaigns, outreach and environmental information	Policy	■	■	■	■	■	■	■	■	■	■	Smart Component	5,000	7 - 15	70,000	20,000	50,000
	EG-02	Improvement to environmental data collection, exchange and management	Policy	■	■	■	■	■						Entirely Smart	-	10 - 35	550,000	500,000	50,000
	EG-03	Integrated urban planning and develop guidelines and tools to realise eco-city aspirations	Policy	■	■	■	■	■						Smart Component	-	7 - 15	1,350,000	1,300,000	50,000
	EG-04	Gender policy enhancements and implementation support	Policy	■	■	■	■	■						Smart Component	-	7 - 15	70,000	20,000	50,000
	EG-05	Climate vulnerability assessment and incorporation of resilience into infrastructure investments	Policy	■	■	■	■	■						Smart Component	-	10 - 35	300,000	200,000	100,000
Green zones 	GZ-01	Monitoring and governance of green zones	Policy	■	■	■	■	■						Smart Component	-	7 - 15	250,000	200,000	50,000
	GZ-02	Enhancement of existing green zones	Investment		■	■	■	■	■					Smart Component	200	7 - 15	300,000	100,000	200,000
	GZ-03	Development of new green zones	Investment		■	■	■	■						Smart Component	50	55 - 70	1,200,000	1,000,000	200,000
Urban transport 	UT-01	Modernisation and enhancement of the public transport system	Investment			■	■	■	■	■	■	■	■	Smart Component	2,700	105 - 205	18,425,000	16,750,000	1,675,000
	UT-02	Demand management through development of a City Parking Strategy	Policy		■	■	■	■						Smart Component	900	25 - 30	1,575,000	1,425,000	150,000
	UT-03	Cycling network investment	Investment		■	■	■	■	■	■	■	■	■	Smart Component	4,000	55 - 60	2,150,000	1,900,000	250,000
	UT-04	Pedestrianisation and car free zones	Investment		■	■	■	■	■	■	■	■	■	Smart Component	2,700	55 - 60	5,600,000	5,100,000	500,000
Energy, Industry & Buildings 	EI-01	Promoting renewable energy generation in buildings	Investment		■	■	■	■	■	■	■	■	■	Smart Component	7,000	15 - 55	3,200,000	2,200,000	1,000,000
	EI-02	Promoting energy efficiency enhancements to building stock	Investment		■	■	■	■	■	■	■	■	■	Smart Component	47,500	45 - 120	82,500,000	75,000,000	7,500,000
	EI-03	Ensuring energy efficiency measures in industry	Investment		■	■	■							Smart Component	22,800	10 - 15	495,000	450,000	45,000
	EI-04	Rehabilitation of the city heating supply network	Investment		■	■	■	■	■	■	■	■	■	Smart Component	30,800	125 - 200	98,800,000	89,800,000	9,000,000
Water quality & availability 	WA-01	Storm / Waste water management	Investment			■	■	■	■	■	■	■	■	Smart Component	1,300	125 - 200	205,450,000	186,750,000	18,700,000
	WA-02	Modernisation of drinking water supply	Investment			■	■	■	■	■	■	■	■	Smart Component	1,500	220 - 300	219,400,000	199,500,000	19,900,000
	WA-03	Achieving good ecological status of the local water bodies	Investment			■	■	■	■	■	■	■	■	Smart Component	0	15 - 40	2,035,000	1,850,000	185,000
Solid waste 	SW-01	Ensure an effective system of MSW collection, temporary storage and treatment	Investment	■	■	■	■	■	■	■	■	■	■	Smart Component	3,100	60 - 120	36,650,000	33,350,000	3,300,000
	SW-02	Improving existing MSW landfilling system	Investment		■	■	■	■	■	■	■	■	■	Smart Component	3,100	60 - 100	13,860,000	12,600,000	1,260,000
Total															132,650	1025-1720	694,230,000	630,015,000	64,215,000

5.3. Investment plan summary

€694m

investment plan*

In total, the 21 packaged actions equate to a total funding requirement of €694m over the course of 10 years (2023-2032) containing a mixture of policy, pre-investment and investment and other initiatives.

5.3.1. Generating cost estimates

GCAP investment cost estimates were generated considering existing commitments, previous investments, expert judgement and international comparison. However, all costs are indicative at this stage and the GCAP methodology outlines the need for the city to refine these through detailed feasibility and cost estimation ahead of implementation of specific actions.

The GCAP usually specifies actions to be designed for the next five years. However, the complex nature of projects required for the city means five years is unlikely to be a sufficient period of time to fully realise these actions. Taking a pragmatic view of the processes required for project identification, design and implementation, as well as sustainable long-term financing and operation, we have included an additional 5-year implementation period. This is done also accounting current unpredictable martial law situation in Ukraine impacting the city decision making and financing abilities. Due to the long-term, high value of some actions, we have appraised the investment plan for 10 years to provide clarity on the full investments required. This will support the identification and sourcing of sustainable financing for the GCAP implementation and beyond.

Resultantly this will improve the viability of the action plan overall.

*** Investment Plan financing and implementation responsbilities**

It is important to note that the GCAP presents recommended potential investments across a wide range of sectors, implementing agencies and scales. As such the GCAP should be viewed as a guidance document, outlining potential options to improve environmental performance in the city, from which suitable actions can be chosen and implemented when and where appropriate.

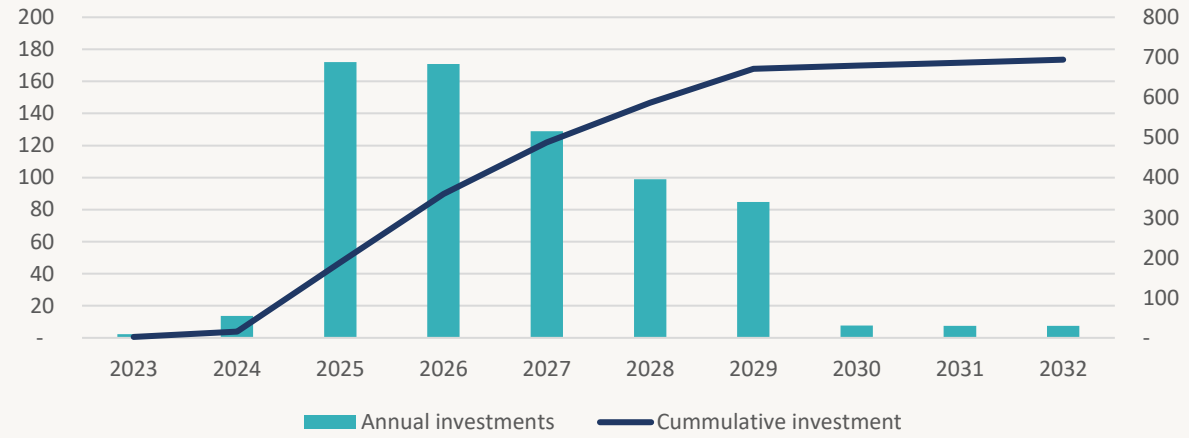
These recommendations are based on technical assessment, expert judgement, stakeholder input and considerations of priority and urgency within an environmental context. However,, there is no obligation on the City to implement the action plan in its entirety, nor should the funding and implementation responsibility be borne by the city alone.

Funding for measures can be secured from and shared through a range of financing mechanisms including donor finance, private sector investments, green and sustainable funds and grants and state support, as well as the municipal budget. These possible funding mechanisms are identified for each action individually, while an overview is provided in section 5.3.3 and indicative summary is presented below.

5.3.2. GCAP cost profile

The GCAP cost profile is presented in Figure 5.1, while Figure 5.2 provides a breakdown by sector. From overall estimated costs, 90% are capital expenditures (CAPEX) and 10% are operational and maintenance expenditures (OPEX). Pre-Investment and Investment

Figure 5-1: Khemlnytskyi GCAP investment profile (€ million)



projects (CAPEX +OPEX) form about 97% of suggested investments.

As a result of the city's ongoing engagement with international funders, a number of the actions and sub-projects presented are already in advanced stages of exploration or negotiation at the city level. This includes but not limited to the EBRD and associated donor's funding for Modernisation and enhancement of the public transport system (UT-01) and Solid Waste Management actions: effective system of municipal solid waste (MSW) collection, temporary storage and treatment (SW-01), Improving existing MSW Landfilling system (SW-02).

5.3.3. Funding sources available for GCAPs

Figure 5-3: Indicative funding by source (€ million, %)

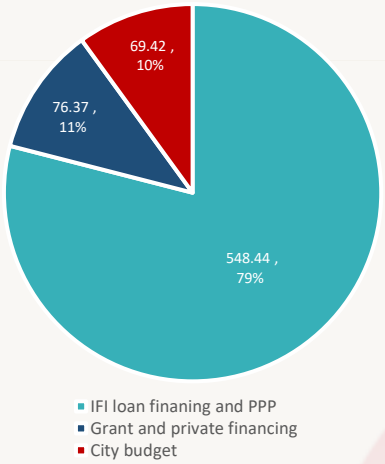
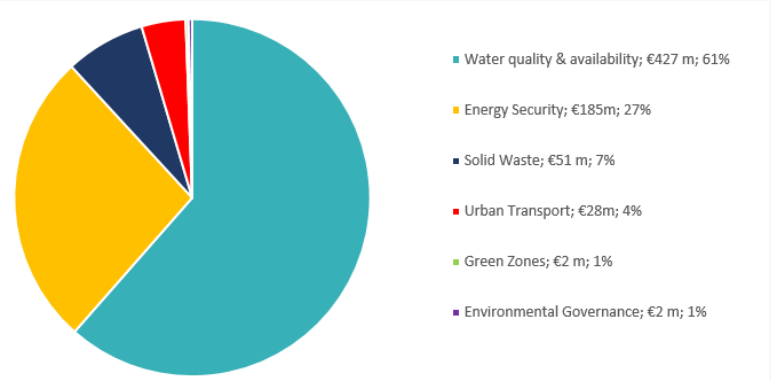


Figure 5-2: GCAP investment profile at a sectoral level



As of sources of financing for Khmelnytskyi GCAP, it is anticipated that approximately 10% will be financed from the City Budget, 10% by grant and private financing and 80% by means of projects of IFIs and development organizations, including PPP options.

For cities in normal conditions the most common sources of finance for infrastructure projects are public funds, these take the form of own revenues and intergovernmental transfers, which has its limitations. The scope and timelines of large-scale infrastructure projects make it difficult to use budget sources, as annual planning cycles and budgeting schedules do not easily accommodate long-term projects. In addition,

political cycles may also disrupt funding and finance. City governments in developing economies need to explore other long-term financing arrangements to allow them to invest in strategic infrastructure initiatives.

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

Green and Climate Funds are part of the international agendas for sustainable development and climate change resilience. Various global funds have been established that provide loans and technical assistance grants to infrastructure projects that fulfil a specific set of eligibility criteria. Such funding is provided to public and private sector entities, as well as civil society organisations and research institutes.

Carbon Finance and Emissions Trading (equity) is an opportunity for City governments to avail of an additional source of grant finance for their infrastructure projects if these lead to a quantifiable greenhouse gas emissions reduction.

Green bonds are income securities issued to raise the necessary capital for a project that contributes to a low carbon, climate resilient economy and have been designed to attract capital from institutional investors, or as a means for governments to direct funding to climate change mitigation.

In usual conditions, the city governments can choose the optimal method based on the city's financing capacity, its expertise in design, build, finance, and operations functions for the specific project, and both its risk management capabilities and desire and readiness for innovation. The government may choose to transfer risk to the private sector where the private sector has specific expertise or in order to achieve more innovation through a private sector procurement model, e.g. at the basis of Public-private partnership (PPP).

In Ukraine for last years the possibility and prevalence of attracting investment resources by the cities on the basis of such instruments as: PPP, leasing, compensation of influence (business obligations), participation of community residents and project financing by private businesses, was quite limited since these tools were quite difficult to use in conditions of high existing regulations limitations and lack of sufficient experience. The most realistic sources of funding remained grant and loan funding from IFIs and development partners (pre-investment and investment stages) and city expenditures for the policy measures, partial financing of CAPEX and OPEX within approved or anticipated programs.

In the conditions of war and post-war recovery the main sources of financing for sustainable and resilient city infrastructure are assumed being international finance institutions and development partners. More details about programmes specific to the war-related challenges, IDPs, gender and business support are given in Rapid Appraisal Report.

5.4. Co-benefits offered

5.4.1. Integrating Smart Solutions into GCAP Actions

GCAPs have the potential to support an array of smart solutions that contribute to cities' green objectives. When generating the GCAP,

each action includes the consideration of smart technologies and the smart maturity assessment for Khmelnytskyi.

This assesses the opportunity to integrate smart solutions to support actions achieve green outcomes and options to leverage smart technologies to optimise the actions' outcomes and support the city green objectives. Each action has therefore been given one of three categories regarding smart technology inclusion, namely:

- Entirely smart - The recommended action/project is entirely smart in nature.
- Smart component - The action/project can be improved through the application of smart technology or through key components being smart in nature.
- No smart - There is no foreseeable smart application at this time.

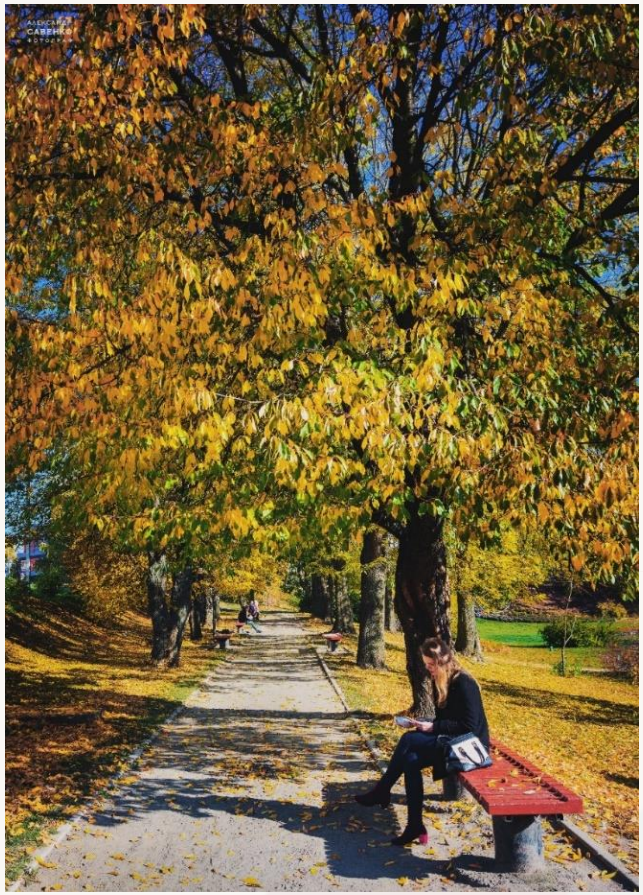
5.4.2. Integrating Social and Gender recommendations into GCAP Actions

The GCAP takes a comprehensive approach to integrating gender equality and economic inclusion throughout its development. Based on the Gender and Social Assessments undertaken as part of the Baseline assessment, each action includes a summary of recommendations and considerations to address gender and inclusion in the City.

5.4.3. Job creation

This GCAP has also considered other impacts that are a consequence of the environmental actions, and those are the potential effects it produces in the labour market. As a result of these actions, it is estimated that there is a potential between **1,025 - 1,720** new jobs. These estimations are calculated based on two different components:

- Jobs required for the development and initial implementation / construction of the actions: engineering, developers, management and consultants. These are circa 715 new jobs but of a temporary nature.
- Longer-term employment created as a result of the activity and that will continue after GCAP is developed. These have been estimated as a range from a minimum (around 310 jobs) where there is an effort to keep resources with current capabilities to a maximum (up to 1,000 new jobs) where all new services/investments required new personnel.



5.4.4. Carbon saving potential

For each action an estimation of potential carbon savings has been developed, where possible. The emissions annual reduction potential, based on implementation of all actions by 2030, is presented in Table 5-2.

Based on the above the GCAP offers possible GHG reductions of 207,950 tCO_2e per year based on current emissions profile – which is an 18.8% reduction on current levels (based on available 2020 data).

Implementation of the GCAP will contribute to the achievement of Ukraine's National Determined Contribution (NDC), which includes the target of a 65% reduction below 1990 levels by 2030 (including land use, land use change and forestry emissions (LULUCF)).

Up to 207,950 tCO_2e

per year

(18.8% reduction based on 2020 emissions)

Table 5-2: GCAP carbon emissions reduction potential

Sector	Carbon savings, tonnes CO_2 eq. per year			Comments
	Min	Mid	Max	
Environmental governance and planning	2,500	5,000	10,000	Emission reductions stemming from improved environmental governance will result from behaviour changes of the residents of the city.
Green zones	125	250	500	Urban greening actions will result in some additional carbon sequestration and do not impact existing GHGs emission levels in the city.
Urban transport	5,150	10,300	20,850	Expected emission reductions in transport sector constitute approximately to 10-15% of current emission levels from private vehicles use within the city. Additional emission reductions will be achieved due to technological changes and replacement of old cars with newer vehicles. However, further growth of the number of cars will drive increase in GHGs emissions. National projections foresees 21% growth of GHGs from automobile transportation by 2030.
Energy, industry and buildings	56,600	108,100	162,800	Industrial NDC projects 16% increase in GHGs emissions in 2030 compared to 2019 due to expected economic growth. NDC for energy generation and distribution sector (which also covers buildings connected to district heating system) foresees 13% decrease in GHGs emissions in 2030 compared to 2018. NDC for buildings sector (not connected to district heating system) foresees 10% decrease in GHGs emissions in 2030 compared to 2019.
Water quality and availability	1,400	2,800	5,000	Assumed to carbon benefits results from 10% reduction in electricity consumption for wastewater treatment. Carbon emissions will be reduced due to decrease in water losses from 35% to 25%. However, additional emissions will be associated with new water supply infrastructure planned to be built.
Solid waste	4,400	6,200	8,800	Sector NDC projects 5% reduction in GHGs emissions from waste sector in 2030 compared to 2018. However, lower national value is expected to take into account extension of waste management services in rural areas and increased volumes of waste processing, which is not applicable to urban areas.
Total	**70,175**	**132,650**	**207,950**	**in tonnes of CO2 equivalent**
	-6.4%	**-12.0%**	**-18.8%**	**in percentage to the estimated total GHGs emissions in the city in 2020**

Khmelnytskyi Green City Actions

Environmental Governance and Planning

Green City Challenge

- *Disproportionate socio-economic development of city districts*
- *Gaps in environmental data indicators*
- *Limited resilience to climate change and emergency preparedness*

Impacts on the following environmental assets:

Strategic goal

Enhanced environmental, social and climate governance system into urban development planning to reduce negative impact and increase resilience

Mid-term targets

Indicator name	Current value		Target value
Public and non-motorised transport is promoted through Information and awareness campaigns	RED	↗	GREEN
Material efficiency of new built industrial facilities and waste recycling is regulated and incentivised through fiscal instruments	YELLOW	↗	GREEN
Water saving reuse is encouraged through awareness campaigns	YELLOW	↗	GREEN
Buildings access to wastewater collection and treatment systems is improved through plans and investment	YELLOW	↗	GREEN
Business and community resilience is encouraged through awareness campaigns	RED	↗	GREEN
Solid waste reuse, sorting and recycling is promoted through information and awareness campaigns	YELLOW	↗	GREEN

Actions

EG-1: Awareness raising campaigns, outreach and environmental information

EG-2: Improvement to environmental data collection, exchange and management

EG-3: Integrated urban development planning

EG-4: Gender policy enhancements and implementation support

EG-5: Climate vulnerability assessment and incorporation of resilience into infrastructure investments

6.1.1. Awareness raising campaigns, outreach and environmental information

Action Code	EG-01	Investment / Policy	Policy

Description

Creation of awareness raising campaigns and dissemination of information on environmental conditions and implementation status of measures included in the GCAP, as well as promoting of environmentally and climate-friendly lifestyle among the city's residents. Information campaign could be implemented with the involvement of the broad circle of stakeholders, including, establishing cooperation with local NGOs, higher education institutions, schools, kindergartens and the media. Priority thematic areas for the information campaigns could include:

- the accessibility and usefulness of green areas (e.g. for adaptation to climate change, air purification, water accumulation, erosion protection, biodiversity, etc.);
- improving the energy efficiency of buildings and systems;
- utilization and reuse of waste;
- protection of water resources;
- environmentally and climate-friendly behavioural changes; and
- social services, including for vulnerable groups of population.

Components of awareness raising campaigns and dissemination of environmental information will include:

- **Developing and implementation of communication plan on environmental aspects**: including events, press-conferences, thematic publications and other communication activities dedicated to environmental aspects that could be performed by environmental department in cooperation with local media.
- **Dedicated section of the website**: extending environmental section of the website of municipal city council with publication of information on rules and regulations, links to environmental data, news, events, etc.
- **Mechanism for submitting complaints and suggestions on environmental issues**: establishment of a mechanism for submitting complaints to collect and process inquiries and complaints from the population about the state of the environment and measures in this area (air pollution, tree felling, etc.), using information technology.

Measures within this activity will include information support for the implementation of all initiatives included in the GCAP in cooperation with relevant divisions of the city council and other interested stakeholders, in particular:

Action Code	EG-01	Investment / Policy	Policy

- **City Sustainable Travel Awareness Campaign** - Development of campaign to promote sustainable travel options in the city – particularly promoting cycling and public transport as viable alternatives to car use for commuting trips. Includes development of information brochures, posters and training to encourage and promote safe cycling in schools and offices.
- **Solid waste awareness raising** - production and placement of information leaflets, environmental advertising, videos, etc. on the topic: "Smart waste management"; work in schools to develop skills in separate collection of solid waste; conducting scientific and technical conferences and seminars, organizing exhibitions, festivals and other events to promote environmental protection, publishing printed products on environmental issues, etc.; measures to implement the Khmelnytsky Smart Environment Project. Waste prevention issues.
- **Water quality educational campaign**: Reducing the amount of phosphorus entering water bodies by conducting an informational and educational campaign on the use of detergents that do not contain phosphorus compounds.
- **Water saving campaign:** develop an awareness raising programme to encourage efficient water use and help the public to take water-saving measures at home.
- **Energy and industry awareness raising:** a) Development and conducting of awareness campaign among SMEs for promotion of energy saving measures; b) Development and conducting of awareness campaign among enterprises for promotion of ISO50001 standard implementation / development of energy management system based on ISO50001.
- **Stakeholder engagement and participatory planning of green zone development**: ensure disclosure of information about existing and planned green zones and inviting broad stakeholder participation at various stages of green zones development planning.

Benefits

- Improved awareness about environmental conditions in the city and environmentally friendly lifestyles and reduced environmental pressures in the city.
- Enhanced support of GCAP implementation by the residents and more active participation in the implementation of activities foreseen in the GCAP and other sustainable initiatives of the city.

War impact and IDP critical measure support

Wide ranging IDP Social Services Information Campaigns needed including:

- Information campaign about transport scheme and payment options, plans to improve urban transport in the city
- Supporting programmes for business and private entrepreneurship
- Cooperation with the city public organizations
- Capacity Building for the City Coordination Centre and trainings for the City Social services on tolerance and conflict mitigation
- Trainings for IDPs (culture of the region, Ukrainian language courses)

Action Code	EG-01	Investment / Policy	Policy

- Programmes of cooperation with other cities in Ukraine (connected by origin of IDPs) and cities-members of Green City Action Programme to improve Social Governance
- Capacity building training on cooperation with IFIs and donors on best practice on social governance
- Capacity building training on cooperation with IFIs and donors on best practice public climate governance

Smart Benefits – Smart Component

By utilising digital platforms (such as the city's open data portal and geoportal) for collecting, analysing and further visualizing environmental data, the city council will be able to make more effective management decisions. Among other things, it will promote effective communication with residents. This activity will also help to continue the implementation of the "Strategic Approach" in the direction of "Smart Leadership and Governance". An effective next step could be the creation of a "Smart City Committee" - a team created to promote the digital development of the municipality. In Khmelnytskyi, such a committee can be made with existing initiatives, for example, in the "Working Group for the Development of Open Data". Many cities have adopted such committees as a means to manage their digitization initiatives, including London, Singapore and Amsterdam[1].

Social-economic benefits / Gender considerations

More conscious attitude of population to environmental and climate issues, raising environment-responsible behaviour among younger generation
Information campaign aiming integration of IDPs to local communities will prevent conflicts in the community of Khmelnytskyi.
Potential job creation: 7-15

Carbon savings per annum

5,000 tonnes CO_2 eq. per year

GHGs emission reductions have been estimated based on the assumption that every person is able to reduce personal carbon emissions at least by 500 kg CO_2 due to behavioural changes (e.g. more efficient use of electric and heat energy, choice of transportation mode, lower waste generation volumes, etc.), as well as efficient coverage of at least 10 000 residents by information campaigns.

Priority Environmental Challenges addressed

Targets addressed

- Support in achieving of most goals of the GCAP

Link to other GCAP Actions

- All other GCAP Actions

CAPEX Estimate (€)	OPEX Estimate (€)
20,000 – additional expenses for personnel,	

[1] https://www.london.gov.uk/what-we-do/business-and-economy/supporting-londons-sectors/smart-london/smart-london-board

Action Code	EG-01	Investment / Policy	Policy
	50,000 – awareness raising campaign to support GCAP implementation (technical assistance / grant projects with the involvement of external consultants and service providers)		
Source of funding Municipal budget, grants, projects implemented by international organizations and development partners[2]		**Implementation timeline** From year 1 to end of plan	
Action owners and stakeholders • KMCE"KhmelnytskyiInfoCenter" • Department of Ecology and Landscaping Control • Energy Management Department • Department of Culture and Tourism • Department of Youth and Sport • Smart Environment Khmelnytskyi • Organization and informational work department • Labor and Social Protection of Population Department • Department of education and science • NGOs • Educational institutions • External consultants and service providers • Media			

[2] Hereby development partner means foreign state, government of organizations authorized by the government of a foreign state, foreign municipal authority or international organization, which provide international technical assistance in line with the international agreements of Ukraine

6.1.2. Improvement to environmental data collection, exchange and management

Action Code	EG-02	Investment / Policy	Policy and investments

Description

Enhancement of online platforms and improved data collection to create an open database at the official geoportal of the city (https://gis.khm.gov.ua/) with the inclusion of geospatial data on biodiversity, environment (for instance on green zones, soil quality, etc.), utilities, infrastructure and other data to ensure effective monitoring and evaluation for planning and management. This measure will increase the availability of environmental information among the residents of the city and other interested stakeholders.

Components of creation of the central data portal will include activities aimed at improvement of environmental monitoring and availability of the data on the state of the environment, as well as collection of relevant data from other sources, their analysis and publication at the geospatial portal of the city, in particular:

- **Improve air quality monitoring system**: develop an air quality monitoring system through modernization of the existing stationary monitoring points and acquisition of a mobile laboratory for air quality monitoring for regular collection of data on the concentration of fine particles; determining the list of points near the areas of greatest potential pollution for regulatory monitoring.
- **Develop a water quality monitoring system in the city's surface water bodies**: development and implementation of an annual water quality monitoring program in the city's surface water bodies (in particular, in small rivers and other small water bodies) to support implementation of the Environmental Protection Program of the Khmelnytsky city territorial community for 2021-2025 and similar future programs.
- **Regular collection of information needed to estimate the amount of greenhouse gas emissions** in the city and update the emissions inventory: determine the procedure for ensuring data collection (in particular, on the consumption of electricity, natural gas and other fuels by different categories of consumers) and the annual calculation of greenhouse gas emissions in the city for the register (in cooperation with utilities and companies, statistical service and other data providers).
- **Data sharing arrangements with relevant state authorities and institutions**: establishing data sharing agreements or procedures (e.g. regular official requests for information) for collection of data on baseline environmental conditions with relevant state authorities and institutions (e.g. State Environmental Inspection of Ukraine, universities, State Service of Ukraine on Food Safety and Consumer Protection, etc.)
- **Establish regular monitoring surveys of birds' species diversity** and, if possible, diversity of other species of flora and fauna: regular birds' surveys in cooperation with local scientists and educational institutions will provide reliable information on the dynamics of birds population in the city; implementation of additional biodiversity monitoring measures (for instance, within municipal biodiversity monitoring and protection program).
- **Standardisation and energy efficiency and resource-efficiency indicators**: introduction of a centralised system for collecting information on energy and resource consumption (water, electricity, gas) for different types of buildings (residential, commercial, etc.) with the option of anonymity.

Action Code	EG-02	Investment / Policy	Policy and investments

- **Smart libraries project**: further digital development and training in digital literacy and competence of community residents through the network of libraries (HUB) in the Khmelnytskyi Territorial Community.

Additional measures include advocating of changes in the statistical data collection system at the national level, in particular energy efficiency indicators, and bringing it in line with EU energy efficiency statistics and GCAP indicators, as well as intensification of the process of harmonization of state standards of Ukraine (DSTU) with EU standards with subsequent accession to the European Committee for Standardization (CEN).

Benefits

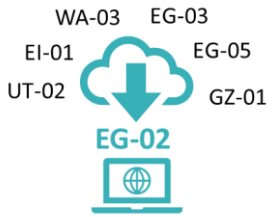
- Improved environmental data transparency for informed and data-based policy making and investments.
- Improved awareness about environmental conditions in the city, monitoring and use of data.
- Allow more informed, targeted and effective investment
- Strengthened inter-municipal cooperation through joined planning, decision making and implementation processes;
- Increased cybersecurity and strengthened capacities of municipal enterprises to face growing challenges.

War impact and IDO critical measure support

Public safety and security support through increase of cybersecurity and cyber-preparedness of the City and municipal enterprises

Smart Benefits – Entirely Smart

Use of information technologies for the development of official geo-portal of the city will underpin the successful realisation of many other actions in the GCAP, including EG-03, EG-05, GZ-01, UT-02, EI-01, WA-03. It will also maximise the potential smart technology aspects of these measures.



Modern data storage systems will allow the city to move from the "Episodic" to the "Strategic" approach and implement more mature SMART solutions. In the process of implementing the activity should take into account: scalability, security and "ownership" of data. City council teams will have to weigh trade-offs between physical and centralized storage solutions or cloud solutions, where there are three broad categories of systems: public, private, and hybrid. A good clue is the "Smart Architecture Reference Architecture" described by the Deloitte team[3].

Social-economic benefits / Gender considerations

Adaptation of tools used for the collection and publication of information for different categories of residents (taking into account the age, needs of people with visual impairment during web-sites development, etc.

[3] https://www2.deloitte.com/content/dam/Deloitte/us/Documents/public-sector/us-fed-building-the-smart-city.pdf

Action Code	EG-02	Investment / Policy	Policy and investments

Potential job creation: 10 - 35

Carbon savings per annum

Lack of direct impact on greenhouse gases emissions volumes. The action will improve monitoring of GHGs emission volumes.

Priority Environmental Challenges addressed

Targets addressed

The action will enable monitoring of progress for the following targets, for which the city currently has no or limited information for efficient monitoring:

- Concentration of PM2.5
- Concentration of PM10
- Biochemical Oxygen Demand (BOD) in rivers and lakes
- Ammonium NH4 concentration in rivers and lakes
- Annual CO2e emissions per capita
- Abundance of bird species
- Abundance of other species

Link to other GCAP Actions

EG-03, EG-05, GZ-01, UT-02, EI-01, WA-03

CAPEX Estimate (€)

100,000 – modernization of two stationary air quality monitoring points and procurement of one mobile air quality monitoring point
100,000 - equipment for water quality monitoring, infrastructure and equipment for collection, processing and use of electronic data
300,000 – Development of online, open access, centralised data collection and management system

OPEX Estimate (€)

20,000 – additional expenses for personnel,
30,000 – technical assistance project to enhance digital data collection and use, including regular birds monitoring surveys and enhancement of geoportal of the city, with the involvement of external consultants and service providers

Source of funding

Municipal budget, grants, projects implemented by international organizations and development partners

Implementation timeline

From year 1 to 5

Action owners and stakeholders

- Department of Ecology and Landscaping Control
- Energy Management Department
- Department of Culture and Tourism

Action Code	EG-02	Investment / Policy	Policy and investments

- Department of Youth and Sport
- Municipal Company 'KhmelnytskInfoCenter'
- Smart Environment Khmelnytskyi
- Organization and informational work and Control Department
- NGOs
- External consultants and service providers

6.1.3. Integrated urban planning and develop guidelines and tools to realise eco-city aspirations

Action Code	EG-03	Investment / Policy	Policy

Description

The aim of the activity is the creation of pre-conditions for integrated and sustainable urban planning taking into account national legislation and best practices on environmental protection, construction norms and standards, infrastructure and transport network development. Planning of urban development based on not only economic efficiency but also environmental impacts (water pollution, air emissions, emissions of GHGs, impact on ecosystem services).

Components of integrated urban development planning will include:

- **Control and enforcement of development planning**:
  - Effective development control and enforcements of building permits: ensure inclusion of environmental protection requirements into city planning conditions and restrictions issued for the receipt of construction permits, restrictions of construction in green zones and water protection areas, requirements for the height and density of construction, etc.
  - The activity will include preparation of the guidance for developers with key information on principles, recommendations, procedures and rules for execution of construction works on the territory of the city taking into account environmental legislation and goals of GCAP.
  - The guidance will take into account the provisions of City Master Plan and detailed plans of the territories of relevant city districts, as well as indicators included in the GCAP that relate to land use and urban planning.
- **Activities related to balanced and effective development of territories**:
  - Build upon existing mixed development to strengthen the concept of 20-minute neighbourhoods to encourage mixed use, reduction of traffic congestion and carbon emissions; such measures benefit social inclusion, provision of daily services (food shopping, education, community facilities, recreation, local jobs, business services) within walking distance across the city (especially in the suburban areas).
  - Promotion of compact city initiatives – urban regeneration and brownfield development for intensification of development (e.g. brownfield areas / old industrial site, derelict buildings, etc.); consider options for transit-oriented development taking into account available modes of public transportation.
  - Improving accessibility of green zones: taking into account the issues of accessibility of green areas during the design of public transport facilities, infrastructure of bicycle and pedestrian traffic in compliance with national requirements for the accessibility of green areas of public use.
- **Development of strategic documents and strategic planning**:
    - **War impact and IDP critical measure support:** Development of the City Social Housing Programme including estimation of needs and financing options (such as co-financing with IFIs and state programs, preferential loans etc)

Action Code	EG-03	Investment / Policy	Policy

- Development of the social housing concept with application of EE solutions
- Reconstruction and re-purpose of social and municipal property into social housing for IDPs
- Programmes with other cities for supply second-hand/ second-life interior and exterior equipment and refurbishment elements
- Pilot housing projects

- **Development a Sustainable Urban Mobility Plan**: Develop a strategic plan for transformation of Khmelnytskyi`s current urban transport system following the concept of sustainable urban mobility planning. The SUMP will aim to develop a sustainable urban transport system by improving the efficiency and cost-effectiveness of the transport network, reducing the impact of transport on the environment, ensuring accessible transport options for all citizens, ensuring personal safety and security within the transport system and improving of the overall quality of life for the citizens. This will be a wholistic plan involving policies, traffic model development and software procurement, and measures to address multimodal transport across the entire urban agglomeration including public and private operators, passenger and freight, zoning and parking and door to door mobility.
- **Development and approval of updated Sustainable Energy and Climate Action Plan**: Updating climate target under the Covenant of Mayors Initiative. Aligning list of projects and initiatives with recent developments and activities planned under GCAP implementation. Incorporation of climate vulnerabilities assessment and climate adaptation actions.
- Consider options for **promoting circular economy** in the city: encouraging circularity in the built environment of the city to coordinate and streamline building design and use, material sourcing and reusability, as well as structural waste in the sector.
- **Energy transition** - integrating urban planning with the energy, transport, and buildings sectors to better enable solar PV, battery storage, electric mobility, charging stations (parking spots, EV readiness requirements in buildings, street light conversions).
- **Industrial land** - Khmelnytskyi Industrial Park: consider incorporation of eco-industrial park principles during the development of Khmelnytskyi Industrial Park (e.g. environmental mitigation measures, circular economy principles, green technologies).
  War impact and IDP critical measure support: Development of an industrial park concept to account for green and EE/ AE solutions, circular economy introduction, facilitation for relocation of business and job creation (incl. women entrepreneurship). Include capacity building for the City Economic Department and Industrial Park Management Company as of sustainability requirements, eco-industrial parks and women entrepreneurship facilitation

- **Participation in environmental assessment procedures**:
  - Participation in environmental impact assessment procedure: participation of municipal authorities in EIA procedure for project within the boundaries of the city by provision comments on the requirements for the scope of EIA report, in particular, by requiring execution of field tests for soil quality, air quality, and water quality and provision of other relevant comments within EIA process.

Action Code	EG-03	Investment / Policy	Policy

- Participation in strategic environmental assessment procedures with respect to land planning documents and other state planning documents.

- **Capacity building and public participation**: Implementation of integrated and sustainable urban planning approach will require enhanced capacity of local authorities, including by increased number of personnel and training including:
  - Revision of decrees on structural divisions of local authorities and description of roles and responsibilities of relevant specialists with the inclusion of additional tasks and areas of responsibility, which are foreseen by the GCAP and will support its implementation.
  - Ensure inclusion of information on GCAP implementation and other environmental and climate related aspects in the reports of the heads of structural divisions and general municipal management.
  - Organizing discussion and preparation of recommendations on changes in legislation and regulatory acts on the national level to support sustainable development of the city (for instance, inclusion of environmental conditions in the city planning conditions and restrictions at the state construction portal).
  - Public participation in the monitoring of GCAP implementation and its activities.

Implementation of the measures described above will require significant expertise in the area of sustainable development and environmental protection for the decision making and development of projects and plans, therefore, additional measures within this component should include capacity building activities for the personnel of city council and extension of their responsibilities, in particular:

- Extension of environmental division of municipal city council: strengthening organizational capacity by extending the environmental department with the involvement of additional specialists in the area of environmental protection and sustainable development to ensure coordination between divisions of city council within activities under GCAP implementation and other environmental protection activities; incorporation of relevant changes in the description of roles and responsibilities.
- Capacity building activities for the personnel of city council and municipal enterprises: conducting workshops, seminars, conferences and other capacity building activities on environmental aspects in cooperation with international organizations and local NGOs; ensuring participation of personnel in sectoral events (e.g. conferences and exhibitions).
- Strengthening of international cooperation: consider the possibilities to join international initiatives for local communities and other subnational entities (for instance, C40, ICLEI, CitiesWithNature, etc.), participation in EBRD's Corporate Climate Governance (CCG) Client Advisory Facility.

Benefits

- Sustainable development of the city and improved living conditions for the residents
- Improved quality of life (e.g. infrastructure availability, convenience, reduced pollution)
- Reduction of bureaucratic burden and inconsistencies during planning and implementation of investment programs and projects.

Action Code	EG-03	Investment / Policy	Policy

War impact and IDO critical measure support

- Development of the City Social Housing Programme
- Update of the industrial park concept to account for green and EE/ AE solutions

Smart Benefits – Smart Component

This activity definitely has a SMART component and is directly related to other activities. A good example of a SMART solution that can be implemented in the next stages in this direction are the so-called digital material passports of buildings. Also potential exists to leverage external tools to run simulations based on the data gathered (pilots with urban planning Software as Service providers could be considered). As with some other topics, in the case of "Urban Development / Improvement" the implementation of the planned activity will implement the "Strategic" approach and take into account the environmental component in the activities of departments responsible for urban development. Additionally, potential exists to integrate development plans into an unified database or GIS.

Social-economic benefits / Gender considerations

- Improved infrastructure and accessibility for people with reduced mobility
- Ensuring consideration of interests of different categories of residents during adoption of the decision on city development
- Supporting job creation including women entrepreneurship

Potential job creation: 7 - 15

Carbon savings per annum

No direct impact on GHGs emissions volumes, the action will contribute to GHGs emissions reductions in transport, industry, energy and other sectors.

Priority Environmental Challenges addressed

Targets addressed

Support in achieving of most goals of the GCAP.

Link to other GCAP Actions

All other GCAP Actions

CAPEX Estimate (€)

Development of the City Social Housing Programme - 600,000
Development of a Sustainable Urban Mobility Plan – 350,000
Develop and implement Capacity building programme – 150,000

OPEX Estimate (€)

50,000 – office equipment (e.g. PCs, printers, etc.) and supply materials for divisions involved in the implementation of the activity

Action Code	EG-03	Investment / Policy	Policy
200,000 – technical assistance projects for the development of strategic documents with the involvement of external consultants and service providers			
Source of funding Municipal budget, grants, projects implemented by international organizations and development partners		**Implementation timeline** From year 1 to 5	
Action owners and stakeholders • Department of architecture and Urban Development • Department of Land Resources • Department of Ecology and Landscaping Control • Labour and Social Protection of Population Department • Smart Environment. Khmelnytskyi • Department of Municipal Infrastructure • Department of Economy of Khmelnytsky City Council • LLC Management Company City Industrial Park of Khmelnytskyi • Transport and Communications Department • External consultants and service providers			

6.1.4. Gender policy enhancements and implementation support

Action Code	EG-04	Investment / Policy	Policy

Description

- **Review existing municipal programmes and budgets and provide documentary record of the gender dimension** in the programmes and availability of appropriate items in the budget.
- **Include measures to create jobs for women and training for women employed in municipal programmes**. Women entrepreneurship Programme (relevant to the City strategy + IT + green business)
- **Ensure the consistency of development programmes** "Strategic Plan of the local community and business development program for 2019-2021 Khmelnytskyi city" and comprehensive programme "Pikluvannia" for 2017-2021 and transfer the best social and gender practices to the new programming documents.
- **War impact and IDP critical measure support:** Develop IDPs support and integration programmes for their inclusion in the social life of the Khmelnytskyi city community. This to include capacity building for the City Coordination Centre and trainings for the City Social services on tolerance and conflict mitigation and trainings for IDPs (culture of the region, Ukrainian language courses)
- **Develop programmes for increasing digital literacy** of the population and employees providing social services.
- **Provide training of local government officials, local executive authorities and other local government bodies for the development of gender competencies** (regarding the use of gender approach, gender analysis, gender-oriented approach in the budget process, gender audits, gender-legal expertise) and skills of analysing the needs of various target groups of girls and boys, women and men in accordance with the State Strategy for Ensuring Equal Rights and Opportunities for Women and Men for the period up to 2030.
- **War impact and IDP critical measure support:** Capacity building training on cooperation with IFIs and development partners as well as with NGO on best practice on environmental/ climate and social governance.

Benefits

- Improving the access of women and socially unprotected groups to financial resources
- Increasing of the city's economic growth due to the development of programmes to promote women's entrepreneurship
- Implementation of the interests of all community members due to the involvement of women to decision-making processes

War impact and IDO critical measure support

- Develop IDPs support and integration programmes for their inclusion in the social life of the Khmelnytskyi city community
- Capacity building training on cooperation with IFIs and development partners as well as with NGO on best practice on environmental/ climate and social governance
- Women entrepreneurship Programme

Smart Benefits – Smart component

Improving digital literacy of citizens will support access to services for women and marginalised groups

Action Code	EG-04	Investment / Policy	Policy

Social-economic benefits / Gender considerations

The process toward gender parity in Khmelnytskyi will be accelerated, women will be empowered having better access to education, financial and digital services, as well as greater legal protection and reduction of non-remunerated work will be ensured.

Potential job creation: 7 - 15

War impact and IDP critical measure support: Women entrepreneurship Programme (relevant to the City strategy + IT + green business) will help to achieve wider supporting programmes for business and private entrepreneurship

Carbon savings per annum

None

Priority Environmental Challenges addressed	Targets addressed
	Support in achieving of most goals of the GCAP.
	Link to other GCAP Actions All other GCAP Actions
CAPEX Estimate (€) 20,000 – equipment and supply materials for divisions involved in the implementation of the activity	**OPEX Estimate (€)** 50,000 – additional expenses for personnel, external consultants and service providers
Source of funding Municipal budget, grants, projects implemented by international organizations and development partners	**Implementation timeline** From year 1 to 5

Action owners and stakeholders

- City Council
- Department of Organizational and Information Work and Control
- Labour and Social Protection of Population Department
- NGOs
- External consultants and service providers

6.1.5. Climate vulnerability assessment and incorporation of resilience into infrastructure investments

Action Code	EG-05	Investment / Policy	Policy

Description

Carry out a detailed assessment of climate vulnerability, taking into account the previously identified major climate risks and vulnerabilities to identify the most vulnerable areas and critical infrastructure. This work can be linked to the development of contingency plans, climate resilience plans, pilot projects on climate adaptation measures and development of guidelines for the authorities.

Components of climate vulnerability assessment and implementation of climate adaptation measures will include:

- **Development of a system for monitoring indicators to assess the indicators of the Green City Action Plan** related to the impact of climate change.
- **Ensuring collection and analysis of information on natural disasters**, which could be related to climate change, their impact on the community (for instance, information of physical and economic damage due to strong winds or heavy precipitation).
- **Carry out a climate risks and preliminary flood risk assessment** in line with the international and national methodologies to identify areas that have potentially significant flood risks and minimize the negative effects of flooding that affect human health and life, the environment, the economy, cultural heritage, and so on. In case of confirmation of risks, mapping of territories taking into account the risk of flooding, indicating households and livelihoods of the population at risk of flooding. Making conclusions to the database of PDZM indicators and city development plans.
- **Consideration of climate adaptation measures during planning and implementation of infrastructure projects**, in particular:
  - Requirements for road surface pavement materials, restriction of truck movement during the heat waves, accounting for precipitation level changes during the design of stormwater systems, use of uncorrosive materials, adjusting maintenance program and working hours, etc.
  - In district heating development projects (e.g. accounting for reduced heat energy demand and heat load, increased need for demand driven heat energy generation control, reduction of heat carrier losses for more efficient use of water resources, etc.);
  - Modernization of water supply and wastewater discharge and treatment systems.
- **Integrate climate change consideration in budgeting planning and planning of municipal capital expenditures**; incorporation of relevant recommendations of the Task Force on Climate-related Financial Disclosures on climate risks assessment, disclosure, strategy development, risk management and governance.

War impact and IDP critical measure support: Increase of cybersecurity and cyber-preparedness of the City and municipal enterprises.

- Inventory of needs
- Capacity building and awareness raising trainings
- Upgrade of software of the city and municipal enterprises
- Upgrade of hardware of the city and municipal enterprises

Action Code	EG-05	Investment / Policy	Policy

War impact and IDP critical measure support: Increasing the level of emergency preparedness:

- Development/ update of emergency action plans in case of power and heat supply interruptions
- Estimation of needs and securing of emergency stocks of materials, components, and equipment
- Improvement of emergency preparedness of the municipal utility company Khmelnytskteplokomunenergo and Khmelnytskvodokanal covering urgent needs for equipment to ensure quick performance of emergency repair/replacement of networks/ equipment
- Information campaign for the city population how to act in certain situations when electricity and heat are interrupted
- Trainings for the city officials, critical infra enterprises personnel and population

Benefits

- Improved resilience for climate change impacts and enhanced climate risks management
- Improved access to financial resources (e.g., climate finance from IFIs)
- Improved planning, awareness raising reduce risk of natural disasters
- Implementation of preventative measures will increase resilience, thus decreasing economic losses and environmental damage
- Improved early response mechanisms through improved institutional capacity and coordination

War impact and IDO critical measure support

Increase of cybersecurity and cyber-preparedness of the city and municipal enterprises
Increasing the level of emergency preparedness

Smart Benefits – Smart Component

Data generated in this task will feed the central data platform developed in EG-02, and will help to qualitatively and quantitatively identify challenges, make forecasts and assess further policy steps. Successful such initiatives have been described by The Rockefeller Foundation team in their report Asian Cities Climate Change Resilience Network (ACCCRN) (2013)[4]

Building on previous actions of awareness raising, data collection, integrated planning, this actions recommends the use of data generated by other activities to make decisions on adaptation and resilience to climate change will allow the implementation of the "Strategic" approach to the topic "Environment".

[4] https://www.rockefellerfoundation.org/wp-content/uploads/ACCCRN-Final-Evaluation-Reissued-Dec-2016.pdf

Action Code	EG-05	Investment / Policy	Policy

Social-economic benefits / Gender considerations

- Increasing resilience should support the needs of different categories of residents, including vulnerable groups, and those people facing infrastructure damage, people in affected area that have vision and mobility impairment, elderly people, people with limited access to information, people with mental health conditions, single parents etc.
- Make sure the early warning system is addressing the identified vulnerable communities

Potential job creation: 10 - 35

Carbon savings per annum

There is no direct impact on GHGs emissions volumes, however the action foresees significant benefits for climate change adaptation.

Priority Environmental Challenges addressed

Targets addressed

- The action will enable monitoring of progress for the following targets, for which the city currently has no or limited information for efficient monitoring:
- Percentage of public infrastructure at risk %
- Percentage of households at risk %

Link to other GCAP Actions

All other GCAP Actions

CAPEX Estimate (€)

200,000 – technical assistance project for climate vulnerability assessment and mapping, as well as adaptation measures development with the involvement of external consultants and service providers

OPEX Estimate (€)

100 000 – additional expenses for personnel, external consultants and service providers

Source of funding

Municipal budget, loans, grants, financing from development partners, private investment.

Implementation timeline

From year 1 to 5

Action owners and stakeholders

- Department of Ecology and Landscaping Control
- Smart Environment. Khmelnytskyi
- Municipal Infrastructure Department
- Department of Economy
- Financial Department

Action Code	EG-05	Investment / Policy	Policy
• Municipal utility companies • NGOs • External consultants and service providers			

Green Zones

Green City Challenge

- *Insufficient areas of green space in central part of the city*
- *Imbalanced development of housing with transport and social infrastructure, green areas*

Impacts on the following environmental assets:

Strategic goal

Increased provision of accessible, well maintained, environmentally sensitive areas of public green zones throughout the city

Mid-term targets

Indicator name	Current value		Target value
Open green space area ratio per inhabitant	7,8	↗	>10
Share of green space areas within urban limits (the ratio of the area of greenery and undeveloped areas, including water areas, within the city to the total area of the city in%)	44.4	↗	50
Population density on urban developed land	2,950	↗	4,500

Actions

- GZ-1: Monitoring and governance of green zones
- GZ-2: Enhancement of existing green zones
- GZ-3: Development of new green zones

6.2.1. Monitoring and Governance of Green Zones

Action Code	GZ-01	Investment / Policy	Policy

Description

Creation of conditions for effective governance of green zones of the city (parks, squares, gardens, baulevards, forest park areas and other green zones that have free access for recreation), including inventory and monitoring of existing green zones, development of land planning documentation and incorporation of greening requirements in permitting and approval documents. Components of monitoring and governance of green zones will include:

- **Accounting and monitoring of green areas and conducting an inventory of trees**: ensuring the accounting of green public areas and other green areas with the preparation of cartographic materials and information certificates; implementation of tree inventory using modern tools and platforms (e.g. i-TreeEco) with the involvement of local NGOs and the use of collaborative approaches to mapping trees and green areas of the city with information on location, type, condition, physical damage, etc., as well as including information on new tree planting sites; monitoring the conditions of old and damaged trees.
- **Development of land planning documentation for green zones and water protection areas**: development of land planning documentation in line with the national requirements, including environmental and land use restrictions; incorporation of relevant information in the State Land Inventory of Ukraine, and drawing boundaries in kind with the establishment of boundary marks. Priority measures should include the development of land management documentation for the coastal protective strips of the city's largest rivers (Pivdenny Bug, Kudryanka, Ploska) and all existing green areas of the city.
- **Identification of opportunities to conserve, protect and enhance urban nature,** including via acitivities during management of existing green zones and blue spaces, development of new green zones, as well as other urban planning and development activities. The analysis should take into account results of biodiversity monitoring activities foreseen under action EG-02 and analysis of threats for biodiversity and potential mitigation measures

Benefits

- Higher quality of green zones and improved recreational experience of the residents;
- Relevant conditions for well-managed green spaces will contribute to better social communications of the residents;
- Enhanced biodiversity protection.
- Improved quality of life for citizens due to contribution of green zones to improved physical health, noise protection, air quality improvement, etc.;
- Economic benefits due to higher value of properties near green zones, tourism development in the city, employment opportunities;
- Enhancement of natural environment due to creation of new habitats and protecting existing urban ecosystems

War impact and IDO critical measure support

Land use and public green space support measures including safety and improvement of play yards

Smart Benefits – Smart Component

Use of GIS platform, satellite imagery and remote sensing for monitoring of green zones and development of tree inventory. The use of various data sources, including from the private sector, will allow for quality accounting, monitoring and management of green areas and trees.

Sharing of information via the city's open data portal for transparency to citizens.

Action Code	GZ-01	Investment / Policy	Policy

Also it is possible to consider new solutions, such as tools to attribute a monetary value to each tree (and trace how this value evolves).

Social-economic benefits / Gender considerations

Higher quality of green zones will improve recreational experience of the residents and their health

Potential job creation: 7 - 15

Carbon savings per annum

There is no direct impact on GHGs emissions volumes, however the action will contribute to carbon emission reductions due to development of existing green zones and creation of new green zones.

Priority Environmental Challenges addressed

Targets addressed

Main:

- Open green space area ratio per capita (m2/capita)
- Share of green space areas within urban limits %

Additional:

- Abundance of bird species (Annual % of change)
- Abundance of other species (Annual % of change)

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, GZ-02, GZ-03, WA-03

CAPEX Estimate (€)

150,000 – land planning documentation development with the involvement of external service providers

50,000 – technical assistance projects on the improved monitoring and governance of green zones, including digital mapping and documentation development

OPEX Estimate (€)

50,000 – additional expenses for personnel and managing of tree inventory

Source of funding

Municipal budget, funds of private enterprises and residents of the city

Implementation timeline

From year 1 to 5

Action owners and stakeholders

- Department of Architecture and Urban Development
- Department of Land Resources
- Department of Ecology and Landscaping Control
- Municipal Infrastructure Department
- NGOs
- External consultants and service providers

6.2.2. Enhancement of existing green zones

Action Code	GZ-02	Investment / Policy	Investment

Description

This action focuses on investments in existing green areas (parks, squares, gardens, boulevards, river valleys, etc.) to support nature restoration and biodiversity protection, as well as to enhance natural environmental nature, support restoration of biodiversity, and ensure compliance with national legislation and state building codes (in particular, the level of landscaping for the main structural elements of green areas for various purposes, accessibility of public and engineering infrastructure, quality of green areas for citizens and for the environment). This will be secured through the application of best practices management of green areas, including 112.7 ha of parks, squares and other green zones mentionied in the inventory of the draft Master Plan of the City, as well as other green zones designated during recent years along the valleys of the rivers, in the forest park zones and other locations. Priority should be given to areas with a low share of green areas per capita. Components of development and maintenance of existing green zones will include:

- **Implement nature enhancement and protection measures in the existing green zones and blue zones**, in particular, restoration and creation of habitats, increasing vertical vegetation structure by planting and maintaining native trees and shrubs, use of approproate lighting fixtures / lights and limit unnecessary lighting with motion sensors, avoiding use of pesticides and herbicides
- **Development and implementation of the Programme of Urban Green Zones Monitoring, Preservation and Development**. The programme should include updated inventory of public green zones and the list of activities required for each location included in the inventory. The focus of the programme should include fostering biodiversity in the city by restoring, protecting, enhancing and creating new habitats. Priority should be given to areas with a low share of green areas per capita, as well as to the protecting and reintroducing endangered and indigenous (native) flora.
- **Development and enforcement of rules for the maintenance and development of green areas and trees in the city**: the city council should adopt rules to be followed by utilities and other entities responsible for maintaining green areas or engaging in relevant work. The rules are designed to ensure proper care for newly planted and existing greenery. Requirements should be set for pruning, mowing, watering, use of anti-icing agents, selection of species composition for new plantings, etc. The rules should also include a separate section with requirements for organizations involved in the maintenance of greenery.
- **Publication of information on green zones management** activities (scope of work, implementing partners, grievance procedures, etc.) including development and publication of detailed instruction on the cutting of trees and other greenery on the territory of the city with the description of eligible conditions and necessary approvals, as well as publication on the web-site and, if possible, on the city's geo-portal, if information on all issued approvals for tree cutting.
- **Promotion of best practices on managing of blue zones and green zones,** including those near residential buildings (e.g. workshops for household owners associations and asset management companies, organization of a contest among household owners associations and other interested

Action Code	GZ-02	Investment / Policy	Investment

parties for the best practices in managing green areas, recommendations and guidances). Such capacity building and awareness raising activities should cover aspects related to biodiversity protection and nature enhancement

- **Inviting public participation in increasing the area and quality of green zones** with the definition of sites for potential tree planting, protecting and reintroducing endangered and indigenous (native) flora (or tree spieces), development of recommendations on tree species and requirements of seedings, provision of support in organizing of tree planting events and maintenance of planted trees, as well as establishing mechanisms for incentivizing residents to plant trees (e.g. provision of prizes or discounts in cooperation with businesses operating in the city).
- **Improving the infrastructure of green zones** (for instance, children's playgrounds, benches, public toilets, waste bins, flower beds, etc.).

Development and maintenance of existing green zones should be performed taking into account the provisions of state construction norms on planning and development of human settlements and their maintenance (in particular, ДБН В.2.3-5:2018 Streets and Roads of Human Settlements, ДБН Б.2.2-5: 2011 Maintenance of the Territories, ДБН Б.2.2-12:2019 Planning and Development of the Territories), State Sanitary Rules on Planning and Development of Human Settlements (ДСП 173).

Benefits

- Higher quality of green zones and improved recreational experience of the residents
- More well-managed green spaces within the urbanized areas will contribute to better adaptation to the climate change and improved health of local residents (e.g. Mitigation of the urban heat island effect)
- Improved environmental, nature conservation conditions and enhanced biodiversity protection
- Reduced air pollution

War impact and IDO critical measure support

Land use and public green space support measures including safety and improvement of play yards

Smart Benefits – Smart Component

Using of information technologies for dissemination of information and ensuring public participation in the planning of green zones development. This should leverage existing city tools such as the open data platform and GIS. This could eventually benefit from an application to report issues in green areas or encourage citizen-led initiatives in/for green areas.

This activity is a logical continuation of the previous one. Using the already existing elements of smart governance, generated data, experience in working with stakeholders and the public, the city council will be able to effectively develop and maintain existing green areas.

Social-economic benefits / Gender considerations

- New green spaces will be designed accounting for the needs of different categories of residents, including vulnerable groups, during planning of green zones development.

Action Code	GZ-02	Investment / Policy	Investment

- Economic benefits due to higher value of properties near improved green zones, tourism development in the city, employment opportunities
- Access to green spaces strengthens social conditions of the citizens and reduces health related risks of the citizens
- War impact and IDP critical measure support: Safety and improvement of the play yards will encourage wider use of green zones and provide social, health and well-being benefits for children.

Potential job creation: 7 - 15

Carbon savings per annum

200 tCO2e

The action will support increased carbon sequestration by green zones due to their improved conditions. For forest – steppe area of Ukraine, the average biomass growth rate for forest areas is approximately 4 tonnes per ha. Taking into account the average carbon content in biomass at the level of 50%, carbon sequestration potential of trees is approximately 2 tonnes of carbon per ha per year, which corresponds to sequestration of about 7 tonnes of CO2 per ha per year. The assessment is broadly in line with the average carbon sequestration density per unit of urban tree cover of 0.226 kg C/m2 (2.26 t C/ha) reported in the IPCC 6th Assessment Report (corresponds to 8.3 t CO2/ha sequestration density). Existing green zones reduce emissions by approximately 2 000 tonnes of CO2 per year. Improving the conditions of green zones and avoiding destruction of green zones and tree cutting will support GHGs emissions reduction by at least 200 tonnes of CO2 per year.

Priority Environmental Challenges addressed

Targets addressed

Main:

- Open green space area ratio per capita (m2/capita)
- Share of green space areas within urban limits %

Additional:

- Abundance of bird species (Annual % of change)
- Abundance of other species (Annual % of change)

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, GZ-01, GZ-03

CAPEX Estimate (€)

100,000 - expenditures for planting of new trees on the territories of existing green zones. Approximately 1,500 trees (the quantity could vary and could be increased depending on the tree seedlings type, size and age)

OPEX Estimate (€)

200,000 – additional operational expenses for the management of green zones, external service providers and consultants

Source of funding

Municipal budget, funds of private enterprises and residents of the city

Implementation timeline

From year 1 to 5

Action Code	GZ-02	Investment / Policy	Investment

Action owners and stakeholders

- Department of Architecture and Urban Development
- Department of Land Resources
- Department of Ecology and Landscaping Control
- Municipal Infrastructure Department
- Municipal enterprises:
  - Municipal enterprise Construction, Repair and Maintenance of Roads
  - Municipal enterprise Parks and Squares of Khmelnytskyi city
  - Municipal enterprise on green construction and landscaping in the city
  - Municipal enterprises managing multi-apartment residential buildings
- External consultants and service providers

6.2.3. Development of new green zones

Action Code	GZ-03	Investment / Policy	Investment

Description

Increasing the share of green areas by developing new green zones in the city to support nature restoration and biodiversity protection, as well as improve quality of life for citizens. Development of inventory of land plots to be converted or restored into green zones and roadmap for the development of green zones (e.g. land planning documentation procedures, ownership aspects, investment required, etc.). Priority should be given for areas with low ratio of green zones per person.

Components of activities on development of new green zones will include:

- **Sustainable urban drainage systems (SUDS)** for protecting and enhancing the environment (e.g through contribution to improved water quality, increased water retention capacity, creation of new habitats, etc.): implement pilot projects on SUDS arrangement, such as swales, bioretention areas, infiltration or detention basins, ponds and others; development of such projects could be performed both during the development of new green zones and within reconstruction of buildings, streets and engineering networks, as well as in cooperation with private developers during construction activities
- **Nature based solutions for environmental challenges**: implement pilot projects using natural based solutions for various environmental challenges (e.g. green walls, urban gardens, green roofs, insect hotels, rain gardens (and other natural SUDS/sponge city concepts), green public transport stops, urban greenhouses, green street furniture, etc.) in cooperation with international organizations, schools, local NGOs and communities.
- Provide green **infrastructure and establish green corridors to create a network of green spaces to enhance biodiversity**: providing connections between existing green areas by creating green boulevards, organizing pedestrian streets and routes, bicycle paths, etc. Taking into account the scheme of the ecological network of the City of Khmelnytsky (approved by the decision of city council №37 dated 09.10.2019) when planning the development of green areas of the city. While planing green corridors and green infrastructure development, consideration should be given to building tunnels or overpasses to enable movement of animals throughout the city

Development of new green zones should be performed taking into account the provisions of state construction norms on planning and development of human settlements and their maintenance (in particular, ДБН В.2.3-5:2018 Streets and Roads of Human Settlements, ДБН Б.2.2-5: 2011 Maintenance of the Territories, ДБН Б.2.2-12:2019 Planning and Development of the Territories), State Sanitary Rules on Planning and Development of Human Settlements (ДСП 173).

Benefits

- Higher quality of green zones and improved recreational experience of the residents
- More well-managed green spaces within the urbanized areas will contribute to better adaptation to the climate change and improved health of local residents – including storm water management through nature based solutions.
- Enhanced biodiversity protection

Action Code	GZ-03	Investment / Policy	Investment

- Improved environmental and nature conservation conditions
- Sequestration of GHG emissions
- Strengthened social conditions of the citizens
- Reduced health related risks of the citizens

War impact and IDP critical measure support

Capacity building training on cooperation with IFIs and donors on best practice public climate governance to enhance green spaces and increase climate adaptation

Smart Benefits – Smart Component

Using of information technologies for dissemination of information and ensuring public participation in the planning of green zones development. Smart considerations of GZ-01 and GZ-02 can be fully applied in the development of new green areas.

Social-economic benefits / Gender considerations

- Higher share of green zones in the city will improve recreational experience of the residents and their health and quality of life in general
- Increased number of children playgrounds
- Increased number of options for social integration of elderly people and people with disabilities
- Improved urban mobility infrastructure and increased number of citizens using alternative transport modes

Potential job creation: 55 - 70

Carbon savings per annum

50 tCO2e

Additional CO2 sequestration by new green zones is estimated at the level of 1000 tonnes CO2 for 20 years period of tree growth (assumptions on 15 000 new trees and carbon sequestration at the level of 3.5 kg per tree per year were used)

Priority Environmental Challenges addressed

Targets addressed

Main:

- Open green space area ratio per capita (m2/capita)
- Share of green space areas within urban limits %

Additional:

- Abundance of bird species (Annual % of change)
- Abundance of other species (Annual % of change)

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, GZ-01, GZ-02, WA-01

CAPEX Estimate (€)	OPEX Estimate (€)

Action Code	GZ-03	Investment / Policy	Investment
1,000,000 – expenditures for planting of 15,000 new trees and creation of new green zones	200,000 – additional operational expenses for the management of green zones, external service providers and consultants (assuming the tree density of 800 trees per ha and total number of new trees as 15,000 and total area of new green zones of approximately 187,500 m2 (18,75 ha), as well as the maintenance costs of approximately 1 Euro per ha)		
Source of funding Municipal budget		**Implementation timeline** From year 2 to 3	

Action owners and stakeholders
• Department of Architecture and Urban Development
• Department of Land Resources
• Department of Ecology and Landscaping Control
• Department of communal infrastructure
• Municipal enterprises:
  ○ Municipal enterprise Parks and Squares of Khmelnytskyi city
  ○ Municipal enterprises managing multi-apartment residential buildings
• External consultants and service providers			

Urban Transport

Green City Challenge

- *High level of private car use*
- *Ageing and low-capacity public transport network*
- *Lack of quality and convenient NMT facilities*

Impacts on the following environmental assets:

Strategic goal

Increased travel choice and improved quality and connectivity to reliable public transport and active travel networks

Mid-term targets

Indicator name	Current value		Target value
Transport modal share in commuting cars (Private transport %)	50%	↘	40%
Kilometres of bicycle path per 100,000 population	6.7	↗	18
Average daily travel speed of bus services on primary thoroughfares during peak hour (km/h)	23	↗	27
Average age of car and public transport fleets	11	↘	<10

Actions

- UT-1: Modernisation and enhancement of the public transport system
- UT-2: Demand management through a City Parking Strategy
- UT-3: Cycling network investment
- UT-4: Pedestrianisation and car free (low emission) zones

6.3.1. Modernisation and enhancement of the public transport system

Action Code	UT-01	Investment / Policy	Investment

Description

Modernisation and extension of zero-emission public transport management system, introduction of e-ticketing to improve travel times and improve quality of citywide public transport services. Includes modernisation and upgrading of bus stop facilities across the city to improve passenger waiting conditions and facilities including information panels, as well as improved accessibility and safety conditions to increase service quality for passengers. There are a number of key components including:

- **Development a Sustainable Urban Mobility Plan**: Develop a strategic plan for transformation of Khmelnytskyi`s current urban transport system following the concept of sustainable urban mobility planning. The SUMP will aim to develop a sustainable urban transport system by improving the efficiency and cost-effectiveness of the transport network, reducing the impact of transport on the environment, ensuring accessible transport options for all citizens, ensuring personal safety and security within the transport system and improving of the overall quality of life for the citizens. This will be a wholistic plan involving policies, traffic model development and software procurement, and measures to address multimodal transport across the entire urban agglomeration including public and private operators, passenger and freight, zoning and parking and door to door mobility.
- **City public transport fleet Renewal Programme**: Further renewal of rolling stock of public transport, including those adapted for transportation of persons with disabilities. The introduction of new electric trolleybus fleet vehicles and supporting infrastructure will help to significantly reduce emission levels and improve operational efficiency. Investments should include new high-capacity vehicles, rehabilitation of electricity supply and distribution network for trolleybuses, improvements to depots and maintenance facilities and other support infrastructure (e.g. bus stops). In terms of quality of the 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. Consideration of battery electric buses to allow route flexibility.

  War impact and IDP critical measure support: Initial replacement of depreciated and grey transport with second-life transport means from EU with better environmental performance. This offers short-term, lower cost fleet replacement option to replace the oldest and most inefficient vehicles in the current fleet, whilst broader replacement strategy and procurement support is developed.
- **Bus Priority Measures**: To support the above, this measure is aimed at improving reliability of bus and electric trolleybus routes, opening new routes. Feasibility study (and subsequent implementation) for the development of dedicated bus priority lanes and facilities for buses/trolleybuses or other measures to improve journey times and service reliability for city bus services. This also includes bus vehicle access at stops across the city (e.g. bus boarders / Kassel kerbs etc.) When linked along a route, priority for buses can contribute towards reducing urban congestion, especially if supported by traffic control, new traffic management measures, parking controls etc. Options to be considered include bus-only lanes and streets, bus gates which provide short sections protected for bus movement, bus priority at junctions, as well as bus stop protection and priority. In considering the type and scale of design and infrastructure to use it is important to consider the impact on other road users. Such

Action Code	UT-01	Investment / Policy	Investment

measures can be integrated with city centre traffic management schemes (such as low emission zones) to provide priority for electric vehicles including buses in response to local air quality problems.

War impact and IDP critical measure support: Information campaign about transport scheme and payment options, plans to promote investments, sensitise public and improve urban transport use in the city.

Benefits

- Higher frequency/capacity will improve the level of service and travel options for passengers encouraging a modal shift away from private cars.
- New services will provide improved connectivity and travel opportunities for residents with no access to private transport. Modal shift towards greater use of public transport will enable more priority to be provided for NMT across the city to reduce traffic congestion and improve air quality.
- Improved reliability of citywide services, particularly on the main corridors, will improve the attractiveness of public transport and promote a modal share aware from car use.
- Increased use of public transport will decrease greenhouse gas emissions and improve air quality

War impact and IDO critical measure support

Urban transport enhancements needed for increased city population including:

- Initial replacement of depreciated and grey transport with second-life transport
- Information campaign about transport scheme and payment options

Smart Benefits – Smart Component

Modernization and improvement of the public transport system has great potential for SMART solutions: smart ticket sales, parking management, traffic management, information for passengers and more. The fleet upgrade, combined with a new sensor infrastructure, mobile applications for residents, such as real-time traffic, will create a new level of convenience for residents and visitors. An interesting example of SMART solutions is the Connected Boulevard project in Nice, France, where the "smartest" street in the world with 200 sensors has been implemented

- 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.
- New bus vehicles will deliver improvements such as air conditioning / heating and cooling system, Wi-Fi equipment, traffic management system, passenger audio-video information system, passenger counting system, 7-camera video surveillance system, USB sockets for charging various devices.
- Plans exist to expanding e-ticketing and equipping all bus stops with screens displaying information on schedules and routes.

Action Code	UT-01	Investment / Policy	Investment

Social-economic benefits / Gender considerations

- City trolley-bus and bus expansion will improve accessibility to the public transport network (also expansion of the timetable to include evening/night services will increase availability of services for shift workers and those evening/night-time employment.
- New vehicles will be designed to be more accessible to vulnerable groups (e.g. people with disabilities, elderly, children).
- Passenger safety and security improvements at stops including improved lighting, introduction of CCTV cameras and emergency contact points will reduce potential for harassment or assault.
- Improvement of public awareness about existing and planned transport system in the City

Potential job creation: 105 - 205

Carbon savings per annum

2,700 tCO2e

Achieving the target of reducing private transport share in commuting from 50% to 40% corresponds to approximately 25000 people switching to public transport or removing at least 10,000 cars from the roads of the city during peak hours. Assuming the roundtrip commuting distance of 10 km per day (estimated based on the size of the city and regional statistical data on transportation using trolleybuses) and commuting during 250 days per year, this action will result in replacing 25 million km travel by car (with 2 person per car on average) with 2.5 million km travelled by public transport (with 25 person per vehicle on average). The assumed emission factor is 180 g / km for personal vehicles and 900 g / km for public transportation buses using diesel fuel.

Priority Environmental Challenges addressed

Targets addressed

- Increasing average daily travel speed of bus services on primary thoroughfares during peak hour
- Reducing the average age of car and public transport fleets
- Increasing the share of public transport fleet run by alternative fuels.
- Increasing public satisfaction with City public transport services

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, UT-02, UT-03, UT-04

CAPEX Estimate (€)

16,750,000

New trolleybuses (44 units) – 15,250,000

Trolleybus infrastructure rehabilitation – 1,500,000

OPEX Estimate (€)

New vehicles and infrastrucure operating and maintenance costs = 1,675,000 (10% of capex)

Source of funding

Implementation timeline

From year 1 to end of the plan

Action Code	UT-01	Investment / Policy	Investment
Municipal budget, grants, projects implemented by international organizations and development partners			
Action owners and stakeholders • Transport and Communications Department • Municipal enterprises • External consultants and service providers			

6.3.2. Demand management through development of a City Parking Strategy

Action Code	UT-02	Investment / Policy	Policy

Description

Building on recent public research on parking in the city, development of a study and action plan to define a new citywide parking policy to control and manage traffic demand/movement in the city. This includes introduction of parking charges and regulations that take into account the needs of residents and businesses in the central area and residential districts of the city. Dedicated parking facilities for logistics and freight deliveries and residential requirements will also be provided.

- **City Parking Strategy and Implementation**: It is important to establish and implement a strong parking policy including car park and on street parking charges, development of access restrictions in the city centre and reducing the availability of long stay parking in the city centre. Effective demand management plays a key role in this approach to help manage the continued growth in traffic levels, whilst recognising the need for access for some local residents and businesses. As part of a new strategic approach to parking policy in the city elements can include: using pricing controls and new regulations in the urban centres to manage and control demand for both on and off-street parking activity including freight parking; establishing new residential parking schemes to control parking activity in residential and community areas; introducing new parking regulations where necessary and enforcing these regulations effectively. The introduction of priority parking for EVs including roadside charging points/infrastructure.
- **Khmelnytskyi Park & Ride Scheme**: Feasibility study to investigate the potential to establish Park & Ride (P&R) facilities linked to intermodal interchange sites on the approaches to the city centre. These facilities will intercept car traffic before they reach the city centre, facilitating a transfer to fast, frequent public transport services to reduce the amount of car traffic in the central area of Khmelnytskyi (reducing traffic congestion, and air quality issues). P&R works best as part of a wider package of complementary measures, including demand management and parking controls with the introduction of charges and Controlled Parking Zones (CPZs) aimed at controlling access to city centres and encouraging city-centre bound travellers (especially commuters) to transfer onto high quality P&R services. The FS should consider a range of important criteria for P&R including the acceptability of different sites in policy terms; the location and design of the facilities, anticipated patronage and ability to encourage modal shift as part of an overall business case; links to the availability and cost of central area parking; and links to other proposals within Khmelnytskyi including the development of public transport services and routes.

Benefits

- Restrictions on parking along main corridors and bus/trolleybus routes will reduce congestion, improve transit times, increase attractiveness of public transport services for all city residents, resulting in modal shift and greater patronage.
- Contribution of new parking policies and measures to helping revitalise city centres with thriving town centres, significant reductions in private car trips, reductions in air pollution and improved quality of life
- Reallocation of road space to create additional space for public transport priority lanes as well as pedestrian and cycle routes and infrastructure, supported by additional on-street parking controls. This will facilitate modal shift towards greater use of sustainable travel modes improving air quality and noise levels across the city.

Action Code	UT-02	Investment / Policy	Policy

- Improved cycling and pedestrian route functionality and amenity due to removal of blockages which improves attractiveness and safety, that will support a greater uptake of these modes for daily trips.
- Charged parking can generate revenue to support further activities (i.e. investment in more sustainable transport infrastructure and services).
- Smart parking measures can help match supply with demand to reduce vehicles searching for parking, supported by stronger enforcement for violations (especially in vehicle-restricted areas of the city and at public transport stops and facilities).
- There is scope to promote EVs by providing dedicated parking facilities (with charging infrastructure) at lower levels of charges to attract new customers.

War impact and IDO critical measure support

Urban transport enhancements needed for increased city population

Smart Benefits – Smart Component

The use of mobile applications with information about available parking spaces is common. A good example of video data analysis to identify the economic potential of parking cities realised in Kyiv, with city wide parking integration with segregation of zones:

- Existing technology innovation can provide parking information and management systems within city environments offering benefits for both motorists, freight and car park operators.
- Potential SMART options including parking space monitoring, car park counting systems, fixed and mobile automatic number plate recognition (ANPR), guidance signage and payment meters.
- Consider options for EV readiness in parking spaces, include in buildings as well as investigate the potential to retrofit streetlights to include charge points potentially linked to EV-only parking.

Social-economic benefits / Gender considerations

- People with disabilities and mobility needs will be considered in terms of parking regulations and provision (including dedicated priority spaces and reduced/discounted parking fees.)
- Restrictions in residential areas will include provision for disabled parking bays.
- Disability-friendly parking should include clear signage, good lighting and ease of access.
- The introduction of controlled parking zones will not adversely affect vulnerable residents (elderly/disabled/low incomes) with special parking permits that grant holders the right to use dedicated parking bays through partial or total exemption from charges or penalties.

Potential job creation: 25 – 30

Carbon savings per annum

900 tCO2e

GHGs emission reduction will be achieved due to switch to public transport (assumed to be captured in action UT-01), avoided use of auto transport by switching to foot transportation, bikes, scooters, etc., as well as reduced travel distance while searching for parking lots. It is assumed that 20 000 car users

Action Code	UT-02	Investment / Policy	Policy

will reduce their travel distance by 1 km per day during 250 days per year leading to 5 million km of avoided travel distance and 900 tonnes CO2 emission reductions (emission factor 180 g / km).

Priority Environmental Challenges addressed

Targets addressed

- To reduce the transport modal share in commuting cars (Private transport %)
- To increase total kilometres of bicycle path per 100000 population Increasing the average daily travel speed of bus services on primary thoroughfares during peak hour (km/h)
- Reducing the average age of car and public transport fleets
- Increasing the share of public transport fleet run by alternative fuels.
- Increasing public satisfaction with City public transport services

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, UT-01, UT-03, UT-04

CAPEX Estimate (€)

	Price per unit (€)	Units	Total (€)
Parking masterplan	400,000	1	400,000
Improvement of parking spaces and system control	625,000	1	625,000
New charging points	4,000	100	400,000
Total CAPEX			1,425,000

OPEX Estimate (€)

	Price (€)	Units	Total (€)
New operators to control parking system	30,000	5	150,000
Total OPEX			150,000

Source of funding

Municipal budget, grants, projects implemented by international organizations and development partners

Implementation timeline

From year 1 to 4

Action owners and stakeholders

- Transport and Communications Department
- Municipal enterprises
- External consultants and service providers

6.3.3. Cycling network investment

Action Code	UT-03	Investment / Policy	Investment

Description

The action involves development of a coherent, integrated citywide cycle network that links residential areas with the city centre and key destinations (schools, employment etc.) Many cyclists often prefer to see the development of off-road cycle routes which offer safe, fast journey times, where cyclists do not need to share the space with any other users. Street space is often limited and there is a need to consider other road users including pedestrians, car users, public transport etc. A route 'hierarchy' should be developed to consider different types of users (such as commuters/ those interested in leisure etc.) destinations to be served and facilities required to attract greater numbers of cyclists. There are a number of key attributes that cycle routes / networks should accommodate including: convenience (linking with key destinations), coherence (linking trip origins and destinations in an integrated way), safety of route and infrastructure to reduce risks of accidents/injury, comfortable to use in terms of width, gradient and surface quality, and attractive (design/lighting/signing) to encourage greater levels of cycling activity. Supporting elements include the following:

- **Citywide cycle parking facilities**: Installation of new cycle parking facilities (including secured/covered cycle parking) across the city including park areas, public institutions, markets and retail areas – all linked with the cycle route network to attract new cyclist activity in the city. Key requirements for cycle parking facilities across the city include the following: a need for convenient, visible, accessible, convenient and easy to use parking facilities; safety and security – facilities should be located in areas that are overlooked and lit; 'Fit-for-Purpose', the type and amount of cycle parking used should serve the needs of the users and the local land use; facilities should be attractive with designs should be appropriate to the surrounding area and match other urban street furniture; Coherent – cycle parking should sit within the context of a cycle route network connecting main origins and destinations. Cyclists having to dismount between a cycle route and parking is a deterrent; and facilities should be well-managed and well-maintained – systems should be efficient to use, clean and free from damaged or abandoned bicycles.
- **Citywide Bike Hire Scheme**: Development of a new City Bicycle Rental Scheme across the city to encourage greater take-up of cycling as a regular mode of transport for commuting and leisure trips. Schemes have been introduced in other cities across Ukraine including Lviv, Ivano-Frankivsk, Vinnytsia, Odesa https://www.nextbike.ua/en/ Bike-hire schemes are A commonly used tool across the world to promote and encourage greater uptake of cycling. The provision of high-quality bikes for hire on an hourly or daily basis, supported by dedicated cycle docking/parking stations across Pristina will help encourage a greater uptake of this mode of travel in the city. In addition to the development of the citywide cycle route network a new citywide bike-hire scheme will enable people to have access to bikes and safe, secure facilities that are provided across the city. 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.
- There is also the option to consider local pilot projects for shared scooters and other micro-mobility modes based on the outcome of further feasibility studies.

Action Code	UT-03	Investment / Policy	Investment

Benefits

- There are a range of positive attributes of cycling include the following:
  - A bicycle requires very little space, both for riding and parking.
  - Physical activity improves mental and physical health.
  - A bicycle is one of the quickest transport modes in urban areas.
  - Costs for purchase and maintenance of a bicycle are low and cycling can reduce external costs, transport costs and time related costs.
  - Bicycles are free of emissions and noise.
- The improvement of cycling infrastructure and services (via the bike-hire scheme) provides an opportunity to develop and promote affordable transport for people without access to private transport.
- Combined with greater levels of on-street traffic enforcement and investment in dedicated infrastructure (on and off-road cycle lanes and routes) there will be an increase in the attractiveness of cycling as an alternative to car use, especially when routes are integrated with key destinations such as residential areas, employment sites and schools, as well as green space and parks, resulting in an increase in the modal share of cycling.
- There is scope to incorporate electric bikes (e-bikes) within the overall bike share scheme alongside traditional push bikes, with associated charging infrastructure and docking stations distributed across the city.
- **War impact and IDP critical measure support:** Investments in cycling infrastructure can be aligned to emergency roads and pavements repair

War impact and IDO critical measure support

Urban transport enhancements needed for increased city population where investments in cycling infrastructure can be aligned to emergency roads and pavements repair

Smart Benefits – Smart Component

The City Council can publish data on the location of infrastructure for cyclists (equipped paths, steam rooms, etc.). In addition, the city can run mobile applications for bicycle rental, as is now very active with electric scooters.

E-bike sharing exists elsewhere in Ukraine but it is important to address licensing and regulatory requirements. Existing technology allows for the application of SMART to citywide bike-hire schemes to manage and hire bikes – this includes the provision of user facilities to access to bikes through an easy-to-use system that enables cyclists to book, pay for and manage the daily cycling needs effectively. Over time the city can utilise data from cycling apps to determine cycling pattern in the city and develop route planning tools.

Smart ticketing can allow integrated ticketing for shared bicycles/ebikes with the overall public transport ticketing.

Social-economic benefits / Gender considerations

- Improved, affordable, safe, convenient mobility for users of all genders, ages and abilities – supported by the introduction of electric bikes.
- Provision of safe and accessible infrastructure - removal of obstructions, dropped kerbs, improved lighting to facilitate safe and convenient cycling.
- There are options to combine with greening of cycle routes and corridors to provide shade during summer months.

Action Code	UT-03	Investment / Policy	Investment

- Provision of a network of secure storage facilities will support the development and implementation of the citywide cycle network in respond to user demand.

Potential job creation: 55 - 60

Carbon savings per annum

4,000 tCO2e

It is assumed that significant improvement of cycling network will trigger increasing the number of regular users of bicycles for short-distance travel (less than 3 km) by at least 10,000 users reducing the use of private cars and public transport. The average emission factor for private and public transport is assumed to be 54 g CO2 per person per km. Assuming avoided travel distance of 7.5 million km (3 km per day during 250 days per year), carbon emission reductions will constitute 4050 tonnes CO2.

Priority Environmental Challenges addressed

Targets addressed

- To reduce the transport modal share in commuting cars (Private transport %); and
- To increase total kilometres of bicycle path per 100000 population.

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, UT-01, UT-02, UT-04

CAPEX Estimate (€)

1,900,000

- 1,200,000 - Cycle route network implementation (unit costs typically >100k Euro//km (3km per year)
- 500,000 Cycle parking implementation (cycle stands €2,500 per unit)
- 200,000 - Cost of Citywide bike-hire scheme in range of €0.5m-€1m (depending on scale of application and number of bikes/docking stations).

OPEX Estimate (€)

250,000

Annual maintenance of system can typically cost on average between €1,200 and €1,500 per bike per year.

Source of funding

Municipal budget, grants, projects implemented by international organizations and development partners

Implementation timeline

From year 2 to end of the plan

Action owners and stakeholders

- Transport and Communications Department
- Municipal enterprises
- NGOs
- External consultants and service providers

6.3.4. Pedestrianisation and car free zones

Action Code	UT-04	Investment / Policy	Investment

Description

This action includes the development of a prioritised pedestrian route network linked to public transport stops and destinations such as schools, offices and retail outlets. 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.

- **Feasibility study for low emission zones (LEZs) and clean air zones. C**an provide a response to tackle related problems of air pollution, greenhouse gas emissions and congestion in urban centres. The development of any LEZ should be considered as a central part of a city-wide strategy to promote access to and use of public transport, walking and cycling modes compared to private motorised transport. New dynamic vehicle control can manage access to and from the city centre, with priority given to pedestrians as well as 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. There is an action to investigate the feasibility for introducing a clean air zone / car free zones) in the city centre that will create an attractive and vibrant urban central streetscape and reduce the presence of motorised vehicles in favour of low emission vehicles. Management of the city access restrictions can support the expansion of pedestrianised streets in the heart 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 discriminatory parking and minimizing conflicts with pedestrians and other road users in the city centre. This feasibility study will include the consideration of a pilot study for the use of solar PV, energy storage and electric mobility.
- **The development of an expanded pedestrianised zone** together with new pedestrian route network concept will help to ensure that good quality pedestrian facilities are provided on key routes in Khmelnytskyi based on functionality (i.e. supporting commuting trips) and scale of use. In identifying particular routes and standards the following issues would need to be taken into consideration: pedestrian volumes; accidents, age and type of footway and character and traffic use of adjoining carriageway. 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.

Benefits

- Pedestrianisation will improve the air quality by avoiding the use of cars within certain streets, integrated the development of a complementary parking strategy to manage and control vehicular access.
- City pedestrianisation schemes have revealed a wide range of benefits in terms of supporting healthy lifestyles, as well as supporting economic growth by generating higher pedestrian footfalls in retail areas that supports economic growth.

Action Code	UT-04	Investment / Policy	Investment

- Creating safe, high quality pedestrian areas (and access restrictions) which are car free resulting in improved air quality in the city centre. Protecting public health by improving air quality and safety in the core city area with car-free access. This includes reduction in particulate matter (PM2.5, PM10) and NO2.
- 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.
- Improved access and travel times for specific modes of transport – public transport, sustainable logistics vehicles and local residential transport by removing city centre traffic and prioritising access for 'green' modes.
- Encourage the use of shared transport and active travel options to/from the city centre.
- Accelerating the adoption of lower emission vehicles such as electric vehicles.

War impact and IDP critical measure support: Investments in pedestrian infrastructure can be aligned to emergency roads and pavements repair . Results of the feasibility study for solar PV & storage can result in the development of a source of energy independent from fossil fuels.

War impact and IDO critical measure support

Urban transport enhancements needed for increased city population where investments in pedestrian infrastructure can be aligned to emergency roads and pavements repair. Results of the feasibility study for solar PV & storage can result in the development of a source of energy independent from fossil fuels.

Smart Benefits – Smart Component

- 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.
- 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.

Social-economic benefits / Gender considerations

- Pedestrianization has proven that it will increase the share of active travel. This will provide health benefits for the citizens. Another social benefits will be that this measure will create a safe environment for pedestrians and will motivate people to use other transport modes than the private car.
- Pedestrianised areas should be designed for people of all abilities, and consider the removal of street furniture (railings, poles and other blockages), low pavement curbs and installing tactile surfacing to support use by elderly people, disabled people and visually impaired people.

Potential job creation: 55 - 60

Carbon savings per annum

2,700 tCO2e

Action Code	UT-04	Investment / Policy	Investment

It is assumed that significant improvement of pedestrian infrastructure will trigger its increased use for short-distance travel (less than 2 km) by at least 10,000 users reducing the use of private cars and public transport. The average emission factor for private and public transport is assumed to be 54 g CO2 per person per km. Assuming avoided travel distance of 5 million km (2 km per day during 250 days per year), carbon emission reductions will constitute 2700 tonnes CO2.

Priority Environmental Challenges addressed

Targets addressed

- Increasing average daily travel speed of bus services on primary thoroughfares during peak hour
- Reducing the average age of car and public transport fleets
- Increasing the share of public transport fleet run by alternative fuels.
- Increasing public satisfaction with City public transport services

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, UT-01, UT-02, UT-03

CAPEX Estimate (€)

5,100,000

- 100,000 LEZ feasibility study
- 5,000,000 pedestrianisation and improvement of crossings
  - Costs of implementing pedestrian route/footway improvements are typically €300/meter of standard footway excluding crossings etc. [Therefore a total of 10km of footway construction/upgrade would require €3million.]
  - Estimated that scheme upgrade and extension could typically cost between €500k – €1million (investment)

OPEX Estimate (€)

500,000 operating costs (including staffing)

Source of funding

Municipal budget, grants, projects implemented by international organizations and development partners

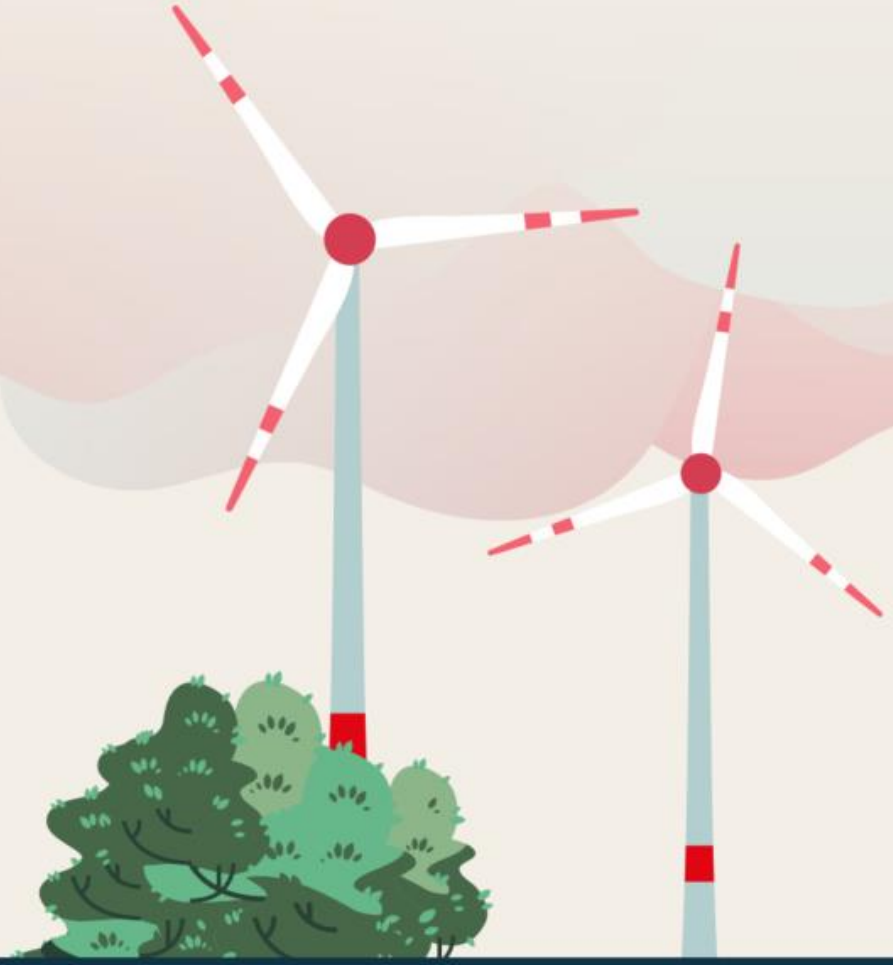
Implementation timeline

From year 2 to end of the plan

Action owners and stakeholders

- Transport and Communications Department
- Municipal Infrastructure Department
- Municipal enterprises
- NGOs
- External consultants and service providers

Energy, Buildings and Industry



Green City Challenge

- *Poor level of thermal insulation of buildings*
- *High energy consumption in industrial processes*
- *Low renewables in energy mix*
- *Significant wear on heating network*

Impacts on the following environmental assets:

Strategic goal

Reduced air pollution and GHG emissions from fossil fuel generated energy sources across all kinds of building stock

Mid-term targets

Indicator name	Current value		Target value
Proportion of total energy derived from RES as a share of total city energy consumption in TJ	7.3%	↗	15%
Residential buildings electricity consumption (kWh / m^2)	36.4	↘	22
Residential buildings heat fossil fuel consumption (kWh / m^2)	135	↘	82.5
Green Certification (Energy Efficiency Certification of buildings)	169	↗	1,000
Share of industrial energy consumption from renewable energy	7.3%	↗	15%

Actions

EI-1: Promoting renewable energy generation

EI-2: Promoting energy efficiency enhancements to building stock

EI-3: Ensuring energy efficiency in industry

EI-4: Rehabilitation of the district heating system

6.4.1. Promoting renewable energy generation in buildings

Action Code	EI-01	Investment / Policy	Investment

Description

The production and use of renewable energy in buildings is a promising direction of decentralisation of energy supply, reduces the burden on existing networks and losses in them. Components of the action include:

- **Development of an open database of buildings where solar thermal collectors and PV panels can be installed** for hot water and heating needs. This is to consider all both residential and municipal buildings including both buildings connected to the district heating system and those with individual building level boiler houses.
- **Conducting typical technical and economic assessments of potential projects (feasibility studies) for the installation of solar thermal collectors and heat pumps** and the publication of these studies in an open database. Search for potential projects for the installation of solar collectors and PV panels. Building level boilers should be the first priority for local solar thermal and heat pumps.
- **Restoration of project documentation for 180 public buildings** (technical passports, heat and water supply schemes, plans, etc.) of public buildings.
- **Creation of an energy cooperative for the production of energy from renewables** (RES) (solar, geothermal energy, large scale central heat pumps). The creation of an energy cooperative will allow to attract citizens' funds in financing energy generation from RES and use existing public buildings and facilities of heat supply enterprises for such generation.
- **Pilot investments**. Stimulation of contracts for mutual settlements / offsets between municipal electricity producers with RES and the electricity supplying organization

War impact and IDP critical measure support: Energy transition and upgrade of the city critical infrastructure: installation of alternative fuel boilers and reconstruction of heat generation and supply:

- Inventory and assessment of locations for installation
- Projects preparation, e.g. FS and studies on alternative fuel availability
- Implementation of Pilot/ Demonstration Projects (e.g. solar electric station at a boiler house, CHP plant at boiler house with straw as alternative fuel)

Benefits

- Renewable energy sources, such as solar collectors, help produce clean energy near energy consumers. This prevents air pollution during the production and transportation of hot water to the consumer. The use of roofs of buildings for this purpose is a simple and proven solution.
- The restoration of project documentation helps to understand the condition of buildings, develop investment solutions and assess the volume of necessary investments.

War impact and IDO critical measure support

Energy insecurity and heat supply system collapse is a critical area of support needed. This action will promote energy transition and upgrade of the city critical infrastructure

Action Code	EI-01	Investment / Policy	Investment

Smart Benefits – Smart Component

The creation of a specialized database (linked to action EG-02), which will reveal the potential of buildings for the installation of equipment used to generate electricity, will provide a significant impetus for investment (such as crowdfunding initiatives) in this area in the city.

Opportunities for local photovoltaic schemes on municipal and residential buildings can be utilised for electric vehicle charging.

Social-economic benefits / Gender considerations

- Energy sources mix and flexibility increase, Continuous supply of hot water for residents of buildings during tests and accidents in hot water supply networks
- Reducing the financial burden on residents through the use of renewable energy
- Joint commitment of public and private partners for implementation of RE/ AE projects
- The increased application of EE and RE measures will decrease energy consumption saving money for citizens, increase energy security, decrease GHG emissions and increase employment opportunities.

Potential job creation: 15 - 55

Carbon savings per annum

7,000 tCO2e

Estimated based on the assumption that 180 public buildings will be accessed and for 50% of them feasibility of PV system installation will be confirmed. Average assumed capacity of the PV system would be 50 kW. More detailed assessment could be performed based on the results of the feasibility study.

Priority Environmental Challenges addressed

Targets addressed

Main:

- Consumption of fossil fuels by residential buildings for heating and cooling

Additional:

- Electricity consumption in residential buildings
- Consumption of fossil fuels for heating buildings

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05

CAPEX Estimate (€)

€2,200,000

- Development of an open database + b) Feasibility studies for the installation of solar collectors = €200,000

OPEX Estimate (€)

1,000,000 operating costs

Action Code	EI-01	Investment / Policy	Investment
• Restoration of project documentation for public buildings = €10,000 * 180 buildings = €1,800,000 • d) Creation of an energy cooperative for the production of energy from renewables = €200,000			
Source of funding Funds of the city budget Grant funds Private funds Projects of international organizations and development partners		**Implementation timeline** From year 2 to end of the plan	
Action owners and stakeholders • City Council / Energy Management Division • Municipal Infrastructure Department • Municipal enterprises • Educational and academic institutions • External consultants and service providers • NGOs (incl. Khmelnytskyi Energy Cluster NGO)			

6.4.2. Promoting Energy Efficiency enhancements to building stock

Action Code	EI-02	Investment / Policy	Investment

Description

This action is aimed at improving the level of energy efficiency of the construction fund through thermal modernization, automation and reconstruction Components of the action include:

Residential buildings:

- **Awareness raising of energy efficiency support to apartment residents.** The strategic aim is the dissemination of information and maximum involvement of condominiums of the city to participate in the program of the State Institution Energy Efficiency Fund "Energodim" + additional financing of the city in the amount of 10% and interest reimbursement (in case of a loan)
- **Raising funding for the municipal energy saving fund** including financial assistance mechanism to low-income citizens**:** aimed at providing financial assistance to those residents who do not have the opportunity to co-finance energy-efficient measures in apartment buildings.
- **Accelerating the transition from various forms of ownership of apartment buildings to condominiums**, which contributes to increasing the interest of co-owners in the modernization of residential buildings. The lack of condominiums is a barrier to participation in many energy efficiency programs and almost makes it impossible to use various financing mechanisms (for example, ESCO).

Public buildings:

- **Energy audits:** Conduct energy audits for public buildings (up to 180) to support Energy Management Department and identification of potential energy efficiency measures.
- **Comprehensive thermal modernization of public buildings:** energy efficiency and thermal modernisation throughout, for between 5 and 10 buildings per year
- **War impact and IDP critical measure support:** Development of new/ adjustment of existing building norms for the design and operation of public buildings considering the requirements for energy efficiency and alternative energy solutions.
- **Installation of recovery systems in public buildings**. Recuperators allow you to return about 80% of the thermal energy of heated air inside buildings during ventilation.

Benefits

This measure helps to increase the level of energy efficiency of the construction fund. By improving domestic efficiency DH operating temperatures can be reduced and more renewable and waste heat sources can be introduced (see actions EI-01 and EI-04). The event also helps to raise awareness and knowledge of consumers about:

- Energy and water saving measures in buildings;
- Benefits of saving energy and water;
- Improving the energy demand of city buildings will decrease GHG emissions and improve air quality;

Action Code	EI-02	Investment / Policy	Investment

- Lower air pollution will improve citizens health

War impact and IDP critical measure support

Energy insecurity and heat supply system collapse is a critical area of support needed.
Securing electrical power resilience of the city critical social and utility infrastructure is essential
This action will promote the development of new/ adjustment of existing building norms for the design and operation of public buildings

Smart Benefits – Smart Component

Installation of smart systems for accounting for energy consumption - Existing status of billing concept and implementation of efficient monitoring system should be envisaged in order to enable energy efficiency schemes in residential buildings to be implemented.
Potential to widen the monitoring system of energy consumption in the community institutions "ENERHOPLAN"
Installation of systems for automatic regulation of heating systems in weather conditions

Social-economic benefits / Gender considerations

Improving the level of energy efficiency of residential and municipal buildings will lead to increased comfort inside buildings, reduce the incidence of residents and workers, extend the life of buildings, and reduce heating costs.
The fund will include a specific provision aimed directly at low-income citizens
Measures will target those most in need of support ensuring cost savings, supporting poverty reduction for citizens.
Potential job creation: 45 - 120

Carbon savings per annum

47,500 tCO2e
Assumed to be 15% reductions from the estimated average GHGs emissions from heat energy and natural gas consumption in public and private buildings during last 5 years. The assumption is aligned with the targeted reduction of residential buildings heat fossil fuel consumption from 99 kWh / m^2 to 82.5 kWh / m^2.

Priority Environmental Challenges addressed

Targets addressed

- Main:
- Consumption of fossil fuels by residential buildings for heating and cooling

Additional:

- Electricity consumption in residential buildings
- Consumption of fossil fuels for heating buildings

Action Code	EI-02	Investment / Policy	Investment
		Link to other GCAP Actions EG-01, EG-02, EG-03, EG-04, EG-05	

CAPEX Estimate (€)
75,000,000
• Raising funding for the municipal energy saving fund:
  ○ Pre-investment: creation of municipal energy saving fund (2025): €200,000
  ○ Capex: up to €3,000,000 (financial assistance mechanism to low-income citizens
• Installation of recovery systems 180 public buildings * €10,000 = €1,800,000
• Comprehensive thermo-modernisation (7 buildings annually at 1 million euros per building) = 70,000,000 euros
		OPEX Estimate (€)
		7,500,000 operating costs (including staffing)	

Source of funding Funds of the city budget Grant funds Private funds Projects of international organizations and development partners		**Implementation timeline** From year 1 to end of the plan	
Action owners and stakeholders • Energy Management Division • Municipal Infrastructure Department • Municipal enterprises • Private Investors • External consultants and service providers			

6.4.3. Ensuring energy efficiency measures in industry

Action Code	EI-03	Investment / Policy	Investment

Description

This action is aimed at simplifying the access of enterprises to specific measuring equipment (thermal imagers, gas analysers), assistance to enterprises in finding non-production executions of energy resources, popularization of such energy saving measures among the city's enterprises. The expected number of enterprises that will be covered by the event is 160 (the target group is medium-sized enterprises).

Components of the action:

- **Facilitating conducting thermal imaging surveys of enterprises**. The event involves the use of a thermal imager to search for leaks of thermal energy from steam / hot water pipelines, enclosing structures, gas-using equipment, etc. Using this information, enterprises will be able to direct funds to eliminate such leaks.
- **Analysis of the efficiency of gas-using equipment of enterprises**. The event provides for the use of a gas analyser to determine the efficiency of gas-using equipment. Using this information, enterprises will be able to adjust the equipment in the most efficient way and reduce natural gas consumption.
- **Awareness raising among enterprises about ISO50001 standard / Processing of the mechanism of encouraging private organizations to develop energy management system in accordance with ISO50001 standard** (for example, dissemination of information about such enterprises by information channels of the city administration). Energy management will allow enterprises to implement the best world practices of energy management
- **Raising awareness of enterprises in the field of energy saving, energy efficiency and energy management**. Dissemination of information on local enterprises of suppliers of energy-efficient equipment (Conducting training activities on implementation of energy management systems at enterprises; Conducting training events in order to raise awareness of enterprises in the field of implementation of resource efficient production, secondary use of resources).

Benefits

- Reducing non-production losses of energy resources by enterprises, and, as a result, reducing the level of greenhouse gas emissions from burning fossil fuels to the needs of heat supply to enterprises.
- Decreased energy consumption and increased use of renewables in the industrial buildings through energy performance, efficiency and auditing

War impact and IDO critical measure support

Energy insecurity and heat supply system collapse is a critical area of support needed.
Securing electrical power resilience of the city critical social and utility infrastructure is essential,
This action will promote energy saving, security and resilience to energy supply shortages

Action Code	EI-03	Investment / Policy	Investment

Smart Benefits – Smart Component

By installing heat and imaging sensors in combination with the data of the enterprises themselves, one can expect a significant improvement in the indicators of resource use at the enterprises of the city.

Social-economic benefits / Gender considerations

- Reducing air pollution
- Raising the culture of energy resource use

Potential job creation: 10 - 15

Carbon savings per annum

22,800 tCO2e

Assumed to be 5% from the estimated average GHGs emissions from electricity, heat energy and natural gas consumption by industrial sector during last 5 years.

Priority Environmental Challenges addressed

Targets addressed

Main:

- Electricity consumption in industry per unit of industrial GDP
- Consumption of thermal energy in industry per unit of industrial GDP

Additional:

- Burning fossil fuels in industrial processes per unit of industrial GDP
- Share of energy consumption from renewable sources by industry

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05

CAPEX Estimate (€)

450,000

- Conducting thermal imaging surveys of enterprises: €100,000
- Analysis of the efficiency of gas-using equipment of enterprises: €100,000
- Processing of the mechanism of encouraging private organizations to receive certification in accordance with ISO50001 standard: €250,000

OPEX Estimate (€)

Estimation of a 10% from CAPEX: 45,000

Source of funding

Implementation timeline

From year 1 to 3

Action Code	EI-03	Investment / Policy	Investment
Grants,projects of international organisations and development partners, private initiatives			
Action owners and stakeholders • City Council / Energy Management Division • Infrastructure Department • Chamber of Commerce and Industry of Khmelnytskyi • External consultants and service providers • Local manufacturers of energy and resource efficient equipment			

6.4.4. Rehabilitation of the city heating supply network

Action Code	EI-04	Investment / Policy	Investment

Description

This action supports improving the capacity of the municipal company MKP "Khmelnytskteplokomunenergo", responsible for the city-wide district heat supply network, to realise rehabilitation of district heating supply network, inclusion of biomass/renewables within the heat generation mix, to secure resilience and energy transition. This includes:

- **Development of the city's heat supply scheme and determination of priority investments.** The development of a new heat supply scheme will allow to develop and detail the directions of investment in the infrastructure of the city's heat supply system, taking into account the prospects for development. Completion of reform of heat supply companies;
- **Modernisation of central heat points, installation of individual heating substation (IHS).** This measure will reduce heat consumption by houses and structures by regulating the amount of thermal energy supplied to the building depending on weather conditions, improve the quality of heat supply services.
- **Replacement of outdated meters and installation of new ones. Installation of a system for monitoring and accounting of heat consumption.** Replacement of outdated house-wide heat and hot water meters with the possibility of centralized collection of information on heat consumption will enable MKP "Khmelnytskyteplokomunenergo" to quickly receive information on the volume of heat energy consumption, improve accounting accuracy, identify and respond promptly to uncharacteristic deviations in consumption volumes, as well as improve the quality of customer service and their awareness of consumption volumes.
- **Development of energy management system and certification of the enterprise in accordance with the requirements of ISO50001**. Development of energy management system and certification of the MKP “Khmelnytskteplokomunenergo” according to ISO50001 Energy Management standard will allow the enterprise to implement the best world practices of energy management;
- **War impact and IDP critical measure support:** Investments in MKP "Khmelnitskyteplokomunenergo" (modernization and reconstruction of enterprise facilities (boiler houses, central heating stations, etc. - if necessary) - replacement of outdated inefficient pumps and burners / boilers, replacement of heating networks - will allow the company to reduce consumption of natural gas and electricity through the use of modern more economical pumps and burners
- **Pilot project: Growing biofuels** on abandoned hromada lands and using them by enterprises for their own needs. The implementation of this measure will allow heat supply companies to avoid dependence on fluctuations in prices for solid biofuels. It is proposed to introduce this measure using the available resources of the municipal utility for landscaping. If the pilot project is successful, the expansion of heat generation capacities on solid biofuels.

Benefits

Improving network condition and end user efficiency will allow District Heating operating temperatures to be reduced and more renewable and waste heat sources introduced – this will drive significant carbon emissions reductions.

Action Code	EI-04	Investment / Policy	Investment

The measure has a major impact on greenhouse gas emissions and air quality in the city. This is due to the fact that heat supply companies are the second largest source of air pollution in winter. Since the volume of heat production is directly related to the volume of heat consumption, the decisive role is played by saving heat at the consumer level.

War impact and IDO critical measure support

Energy insecurity and heat supply system collapse is a critical area of support needed.
Securing electrical power resilience of the city critical social and utility infrastructure is essential
This action will provide urgent investments at Khmelnytskteplokomunenergo (as detailed above)
The action will also support installation of alternative fuel boilers of the city critical infrastructure

Smart Benefits – Smart Component

Installation of smart systems for accounting for energy consumption including possible pilots on, or roll out of, smart heat meter at the appartment level
Installation of systems for automatic regulation of heating systems in weather conditions.
Installation of modern automation on boilers and pumps of heat supply enterprises.
Consider an upgrade of the SCADA system and the establishment of an hydromodel of the system
During capital investment and significant modernization of the city's infrastructure, the parallel integration of modern sensors and thermal imaging provides significant data collection potential.

Social-economic benefits / Gender considerations

Improving the quality and reliability of heat supply to residential and municipal buildings will lead to increased comfort inside buildings, reduce the incidence of residents and workers, extend the life of buildings, reduce heating costs.
Potential job creation: 125 - 200

Carbon savings per annum

30,800 tCO_2e
Estimated based on the assumption of improving overall efficiency of the district heating systems to approximately 83% (e.g. indicative targets of 92% generation efficiency and 10% losses during heat energy transportation), as well as increasing renewable energy share in heat energy generation to 15% (in line with the GCAP target of the proportion of total energy derived from RES as a share of total city energy consumption.

Action Code	EI-04	Investment / Policy	Investment

Priority Environmental Challenges addressed

Targets addressed

Main:

- The share of the population that has access to heating, cooling
- The share of total energy generated from RES as a share of the city's total energy consumption

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05

CAPEX Estimate (€)

89,800,000

- Development of the city's heat supply scheme and determination of feasibility study to determine priority investments = 250,000
- IHS: 60 x €12,500 per individual heating substation = 750,000
- c) Replacement of outdated meters and installation of new ones. Installation of a heat consumption control and accounting system = EUR 1,300,000 (1,000 hot water meters per 500 houses. 600 heat meters)
- Reconstruction of boiler houses, CHP and thermal networks = EUR 87,500,000 (estimate of 140 km of reconstruction of the heating network at EUR 625,000 per km. the final investment must be determined by the feasibility study)

OPEX Estimate (€)

Estimation of a 10% from CAPEX:
9,000,000

Source of funding

Funds of the city budget
Credit funds of MFI

Implementation timeline

From year 1 to end of the plan

Action owners and stakeholders

- City Council / Energy Management Division
- Municipal Infrastructure Department
- MKP "Khmelnytskteplokomunenergo"
- NGOs (incl. Khmelnytskyi Energy Cluster NGO)
- External consultants and service providers

Water Availability and Quality

Green City Challenge

- *Significant wear of water supply network*
- *Insufficient length of storm sewers*

Impacts on the following environmental assets:

Strategic goal

Improved quality of drinking water to citizens and ecological status of the local water bodies

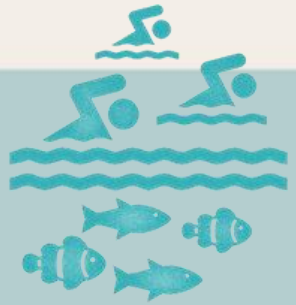
Mid-term targets

Indicator name	Current value		Target value
Wastewater treated to EU standard	n/a	↗	100%
Biochemical Oxygen Demand (BOD) in rivers and lakes (mg/L)	8.85	↘	<6
Ammonium NH4 concentration in rivers and lakes (mg/L)	1.2	↘	<0.5
The degree of wear of water supply networks	48%	↘	25%
The degree of wear of storm sewer networks	55%	↘	25%
Non-production water losses	34%	↘	25%

Actions

WA-1: Storm / Waste water management

WA-2: Modernisation of drinking water supply



WA-3: Pollution reduction and restoration of natural water bodies

6.5.1. Storm / Waste water management

Action Code	WA-01	Investment / Policy	Investment

Description

This action focuses on the expansion and reconstruction of the domestic foul and storm sewer network to account for climate change. Sub-actions and components include:

- **Construction and reconstruction of domestic and industrial sewerage network.**
  - Construction of the new drinking water treatment facilities with a capacity of 60,000 m^3/day in Khmelnytskyi (Vinnytske Highway, 135), on the territory of existing treatment plant №2, which meets modern requirements for the feasibility of implementation of all stages of wastewater treatment and removal of sediments.
  - Construction and reconstruction of sewage water networks.
  - Reconstruction of sewage pumping stations
  - Construction of sewage pumping stations and domestic wastewater drainage systems in Dubove, Grechany, Lezneve, individual housing estate "Kationivskyi"
  - Elimination of illegal connections to the sewage network from the population and facilities (including car washes) where this is practical and cost efficient to do so.
- **Equipping the laboratory for the control of wastewater quality of Khmelnytskvodokanal** with modern devices and equipment to general physicochemical parameters (portable pH meter conductivity meter, oximeter, spectrophotometer), metals (atomic emission spectrometer with inductively coupled plasma) or (atomic absorption) spectrometer (or) mass spectrometer with inductive bound plasma), organic micro-pollutants (specific and priority) (liquid chromatograph with mass spectrometer, gas chromatograph with triple quadrupole mass spectrometer).
- **Construction and reconstruction of storm water networks and structures**
  - Overhaul (the length of the networks to be repaired is 8.7 km) and expansion of the existing storm sewer network.
  - Construction of pumping stations and storm sewer networks. It is planned to build 2 stations with a capacity of 80 and 150 m3/h.
  - Construction of a storage pond for the accumulation of storm water in the Ozerna district. It is planned to build 2 ponds with a volume of 9,000 m3 and 12,000 m3.
  - Establishment and working out of the protocol of detection and elimination of illegal connections into the system of storm sewers of the city.
  - Construction of local treatment facilities for surface runoff in water protection zones using phytotechnology.
  - Modernisation of the sluice bridge on the Southern Bug River along Kamianetska Street and update of the operating rules of the reservoir on the Southern Bug River.
  - Construction of storm sewage treatment plants, first of all, in accordance with the existing projects: raion Ozerna, Trudova street - Starokostiantynivske highway and in the area of the drain collector into Southern Bug River on the street Svobody.

Action Code	WA-01	Investment / Policy	Investment

Benefits

- The investment will reduce high network wear, which will reduce the frequency of accidents.
- Supporting efficient network operation, providing capacity to meet future needs, and meeting higher requirements for treatment plants.
- Reduction of pollution of water bodies due to reduction of accidents on the sewage network.
- Improved wastewater treatment will reduce pollution and improve the ecological and chemical status of the water bodies.
- Reconstruction and construction of a storm sewer network on the territory of Khmelnytskyi will reduce local flooding.
- Creating a sustainable network that will meet the needs of climate change (increasing rainfall).
- The wastewater treatment facilities ensure the proper level of technological equipment, facilities, electrical and technical equipment and ensure compliance with current Ukrainian norms. The need for the construction of new sewage treatment plants that meet modern state norms and environmental standards is ecologically and economically feasible for the city.

War impact and IDO critical measure support

Technical and environmental risks related to the obsolescence of assets of the City utility infrastructure including impact on services quality and supply will be supported with these actions

Smart Benefits – Smart Component

Similar to other capital investments in significant modernization of specialized infrastructure, it can include the parallel installation of real-time sensors for further monitoring of equipment condition, wastewater volumes, automated laboratory reporting. These data can also be used by utility representatives for various types of analytics and forecasting.

Social-economic benefits / Gender considerations

- This measure will improve the health conditions due to the reduction of water pollution, accidents and floodings services
- Improved surface water management will reduce interruptions in public transport services for population.

Potential job creation: 125 - 200

Carbon savings per annum

1,300 tCO2e

Assumed to carbon benefits results from 10% reduction in electricity consumption for wastewater treatment. Additional carbon benefits from reduced methane emissions could be assessed at a project level taking into account organics (in kg of biological oxygen demand (BOD)) in untreated wastewater, organics removed with sludge during treatment, and volumes of wastewater treated or discharged into water bodies without treatment.

Action Code	WA-01	Investment / Policy	Investment

Priority Environmental Challenges addressed

Targets addressed

Main:

- Improving wastewater treated to EU standard
- Reducing the degree of wear of sewer networks;
- Reducing of non-production water losses.

Additional:

- Reducing of the Biochemical Oxygen Demand (BOD) concentration in rivers and lakes
- Reducing of the Ammonium NH4 concentration in rivers and lakes.

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05

CAPEX Estimate (€)

186,750,000

- **Construction and reconstruction of domestic and industrial sewerage network**
  - Reconstruction of sewerage networks - 220 km, including 17 km of main collectors (1,500 EUR per km), 31 km of pressure collectors (700 EUR per km), 175 km of gravity collectors (500 EUR per km) - Investment = 134,700,000
  - Reconstruction of 12 pumping sewage stations - Investment = 4,800,000 euros (400,000 euros / station)
  - Construction of new modern sewage treatment plants for domestic wastewater - Investment = 40,000,000 euros
- **Equipping the laboratory for the control of wastewater quality of Khmelnytskvodokanal** - Feasibility study = €150,000; Investment = €700,000
- **Construction and reconstruction of storm water networks and structures**
  - Overhaul and expansion of the existing storm sewer network - Investment = €2,500,000
  - Construction of storm sewer pumping stations and storm sewer networks - Investment = €150,000
  - Construction of a storage pond for the accumulation of storm water in the Ozerna district - Investment = €1,000,000
  - Construction of local treatment facilities for storm water in water protection zones using phytotechnology - Investment = €800,000
  - Modernization of the sluice bridge on the Southern Bug River - Investment = €150,000
  - Construction of storm sewage treatment plants, first of all, in accordance with the existing projects - Investment = €1,800,000

OPEX Estimate (€)

18,700,000

Related to components:

- Construction and reconstruction of sewage network and treatment plants = €18,000,000
- Equipping the laboratory for the control of wastewater quality = €70,000
- Construction and reconstruction of storm water networks and structures = €630,000

Action Code	WA-01	Investment / Policy	Investment
Source of funding • Budget of Khmelnytsky city territorial community • Budget of the Environmental Protection Fund • National budget • Budget of Khmelnytsky Regional State Administration • Grants, projects implemented by international organizations and development partners		**Implementation timeline** From year 1 to end of the plan	
Action owners and stakeholders • MKP Khmelnytskvodokanal • Department of communal infrastructure • Department of Ecology and Landscaping Control • Department of Municipal Infrastructure • KP "BRED" (Construction, Repairing, and Exploitation of Roads) • External consultants and service / equipment providers			

6.5.2. Modernisation of drinking water supply system

Action Code	WA-02	Investment / Policy	Investment

Description

Modernization of drinking water supply networks, including the inter-house network including:

- **Preparation of an expert report on the development of a drinking water supply network** for 13 villages of Khmelnytsky United Territorial Community.
- **Construction of water supply network**
  - New construction and overhaul of the urban water supply network (in the city of Khmelnitsky, the length of water supply networks requiring reconstruction or capital repair is 332 km, as well as 24 villages of the Khmelnytsky United Territorial Community, of which for 11 villages the length of the network in need of repair and construction is 77 km, for 13 villages the length is not defined).
  - Promoting the proper maintenance of inter-house and outdoor urban water supply networks to prevent secondary pollution.
  - Completion of the construction of the second line of the Chernelivsky water supply system (the need for completion is 14 km out of 34 km of total length).
- **New construction of water treatment facilities** with a capacity of 60,000m^3 per day.
- **Carrying out an inventory of the existing network of groundwater wells** in order to assess their condition and potential as an alternative source of drinking water supply.
- **Equipping the laboratory for the control of drinking water quality** of Khmelnytskvodokanal with modern devices and equipment for general physicochemical parameters (portable pH meter conductivity meter, oximeter, spectrophotometer), metals (atomic emission spectrometer with inductively coupled plasma) or (atomic absorption) spectrometer (or) mass spectrometer with inductive bound plasma), organic micro-pollutants (specific and priority) (liquid chromatograph with mass spectrometer, gas chromatograph with triple quadrupole mass spectrometer).

Benefits

- The biggest problem of the water supply sector, as for the majority of settlements in Ukraine, for Khmelnytsky is the state of the water supply and water drainage systems.
- Improving the condition of local urban water supply networks will improve the quality of drinking water throughout the city, which will ensure equal rights, such as access and availability, to clean drinking water and reduce costs for citizens.
- Reduction of failures and water losses in the water supply network.
- The second line of the Chernelivsky water supply system will allow to ensure the uninterrupted water supply of the Khmelnytsky and settlements of the Khmelnytsky district and reduce water losses.
- During the construction of the water supply system, the latest technologies of water transportation will be introduced, which will avoid the problems of rapid siltation and corrosion of pipelines in the future, and preserve the quality of drinking water.
- Using the potential of a network of groundwater wells as an alternative source of drinking water

Action Code	WA-02	Investment / Policy	Investment

War impact and IDO critical measure support

Technical and environmental risks related to the obsolescence of assets of the City utility infrastructure including impact on services quality and supply will be supported with these actions

Smart Benefits – Smart Component

Similar to other capital investments in significant modernization of specialized infrastructure, including the parallel installation of automated and real-time sensors for further monitoring of equipment and water quality. This can include flow/pressure meters at district level to detect water leakage and identify their locations, and deployment of smart meters for consumption based billing. Opportunity to develop a digitalisation roadmap with the relevant actors, including development of a digital twin (network model) of the system to observe and simulated real-time information. These data can also be used by utility representatives for various types of analytics and forecasting.

Social-economic benefits / Gender considerations

- This measure increase the health of the citizens by improving the condition of local water supply networks will improve the quality of drinking water throughout the city, which will ensure equal rights to clean drinking water and reduce costs for citizens, including quality of life for IDPs.
- The needs of the people facing water supply-based challenges should be driven by the social perspectives and integrate the targeted benefits on improved gender equality and decreased vulnerability of certain vulnerable groups;
- Awareness raising activities should utilise the capacities of NGOs to reach different social groups and vulnerable citizens facing different water supply challenges

Potential job creation: 220 - 300

Carbon savings per annum

1,500 tCO2e

Assumed to carbon benefits results from 10% reduction in electricity consumption for water supply. Carbon emissions will be reduced due to decrease in water losses from 35% to 25%. However, additional unavoidable emissions will be associated with new water supply infrastructure planned to be built.

Priority Environmental Challenges addressed

Targets addressed

- Reducing the degree of wear of water supply networks;
- Reducing of non-production water losses.

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05

CAPEX Estimate (€)	OPEX Estimate (€)
199,500,000	19,900,000

Action Code	WA-02	Investment / Policy	Investment

- **Construction of water supply network:** feasibility study = 300,000 euros; Investment: water supply network - 332 km (500,000 EUR per km); 5 basic VNS units (300,000 EUR each); 8 booster pumping stations units (100,000 EUR each) = 168,300,000 euros
- **Completion of the construction of the second line of the Chernelivsky water supply system** - Investment = 8,000,000 euros
- **New construction of water treatment facilities –** Investment (including feasibility study) = 22,000,000 euros;
- **Carrying out an inventory of the existing network of groundwater wells and assessing their condition and potential** – feasibility study of 150,000 euros
- **Equipping the laboratory for quality control of drinking water -** feasibility study = 50,000 euros; Investment = 700,000 euros.
-

Related to:

- Operation of water supply network = €17,600,000.
- Operation of new water treatment facilities = €2,200,000
- Equipping the laboratory for the control of drinking water quality = €100,000

Source of funding

- Budget of Khmelnytskyi city territorial community
- Budget of the Environmental Protection Fund
- National budget
- Budget of Khmelnytskyi Regional State Administration
- Grants, projects implemented by international organizations and development partners

Implementation timeline

From year 2 to end of the plan

Action owners and stakeholders

- MKP Khmelnytskvodokanal
- Department of communal infrastructure
- Department of Ecology and Landscaping Control of Khmelnytskyi City Council
- Municipal Infrastructure Department of Khmelnytskyi City Council
- Southern Bug River Basin Water Resources Authority
- External consultants and service/ goods providers
- Eco -NGOs (incl. RIVERS OF KHMELNYTSKYI, VEL (Khmelnytskyi affiliate)/ Khmelnytskyi University (Chair of Biology)

6.5.3. Achieving good ecological status of the local water bodies

Action Code	WA-03	Investment / Policy	Investment and Policy

Description

This action focuses on pollution reduction and restoring the natural hydromorphological characteristics of the water bodies to achieve improved ecological status of the local water bodies. Sub-actions include:

- **Pollution elimination and revitalization of local surface water bodies with conservation of their natural hydromorphological characteristics**
  - Purchase of an amphibious vehicle for clearing riverbeds and reservoirs.
  - Revise and update the measures from Section III "Project of restoration and maintenance of favorable hydrological regime and sanitary condition of the Pivdennyi Buh, Kudryanka, Ploska Rivers" of the Program for the development of a network of drainage collectors, canals and drains (cleaning of the Pivdennyi Buh, Kudryanka, Ploska Rivers, overhaul and construction of new drainage collectors, canals and drains in the Khmelnytskyi city) for the reception and drainage of rain and snow wastewater into water bodies of Khmelnytskyi and Khmelnytskyi region, approved by decision No. 35 of 23.02.2022 by the Khmelnytskyi City Council
- **Revitalization of the riverbeds of Southern Bug, Kudryanka, Ploska and other local surface water bodies**
  - Inventory of unauthorized discharges of untreated wastewater into rivers and application of administrative sanctions.
  - Carrying out works to remove silt from riverbeds and lakes while preserving their natural morphological characteristicsPreparation of land management projects for the establishment of water protection zones and coastal strips of surface water bodies
  - Control over limited management in the coastal protective strips of rivers
  - Repair of open drainage canals and repair of tubular crossings on the Southern Bug River.
  - Installation of aeration fountains on reservoirs (approximately 20 units).
- **Water resources management and monitoring of water bodies**
  - Creation of a communal enterprise responsible for the maintenance of water bodies in the City of Khmelnytskyi and the Khmelnytskyi urban territorial community.
  - Ecological and chemical status assessment of surface water bodies.
  - Development and submission of proposals for measures to improve the good ecological and chemical status of the Southern Bug and other water bodies within the Khmelnytskyi OTG (Amalgamated Territorial Community) to the Southern Bug River Basin Management Plan 2025-2030.
  - Water quality monitoring of local surface water bodies
- **Information campaign and awareness raising**
  - Reducing the amount of phosphorus entering water bodies by conducting an informational and educational campaign on the use of detergents that do not contain phosphorus compounds.

Action Code	WA-03	Investment / Policy	Investment and Policy

Benefits

- Restoration and maintenance of favourable hydrological regime and sanitary status of the Southern Bug, Kudryanka, Ploska rivers.
- Reduction in quantity of blue-green algae that pose a risk to human health.
- Improving the improvement and sanitary condition of the city.
- Improving the state of the natural environment.
- Possibility to use water bodies for recreational purposes (e.g. swimming/bathing, jogging, and cycling paths).

War impact and IDO critical measure support

Technical and environmental risks related to the obsolescence of assets of the City utility infrastructure including impact on services quality and supply will be supported with these actions.

Smart Benefits – Smart Component

There are smart components to be developed (installation of sensors, aggregation of data from national registers, etc) due to the inventory, monitoring and control over the quality of the natural water bodies. This will allow a better and quicker identification of issues in the future and ease the identification of the sources of the problem. This data will be made available on open data platform and integrated in EG-02.

Social-economic benefits / Gender considerations

Restoration and maintenance of favourable hydrological regime and sanitary status of the target rivers, reduction of blue-green algae will ensure the possibility to use water bodies for recreational purposes and reflects the improvement of human health.

Potential job creation: 15 - 40

Carbon savings per annum

No significant impact is expected. Impact from improved wastewater treatment is accounted for in action WA-01.

Priority Environmental Challenges addressed

Targets addressed

- Reducing of the Biochemical Oxygen Demand (BOD) concentration in rivers and lakes
- Reducing of the Ammonium NH4 concentration in rivers and lakes.

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, GZ-01, GZ-02, GZ-03

CAPEX Estimate (€)

1,850,000

- **Pollution elimination and revitalization of natural hydromorphological characteristics**
  - Purchase of an amphibious vehicle for clearing riverbeds and reservoirs. *Investment = €100,000*

OPEX Estimate (€)

185,000

- Pollution elimination and revitalization of natural

Action Code	WA-03	Investment / Policy	Investment and Policy
○ Revise and update the measures from Section III "Project of restoration and maintenance of favorable hydrological regime and sanitary condition of the Pivdennyi Buh, Kudryanka, Ploska Rivers" of the Program approved by decision No. 35 of 23.02.2022 by the Khmelnytskyi City Council. *Investement = € 45,000* ○ Clearing of the Southern Bug, Kudryanka, and Ploska rivers, other local surface water bodies. *Investment = €1,200,000* ○ Preparation of land management projects for the establishment of water protection zones and coastal strips of surface water bodies. *Investment = €150,000* ○ Repair of open drainage canals and repair of tubular crossings on the Southern Bug River. *Investment = €100,000* ○ Installation of aeration fountains on reservoirs. *Investment = €45,000* • **Water resources management and monitoring of water bodies -** *Investment = €200,000* • **Information campaign and awareness raising -** *Investment = €10,000*			hydromorphological characteristics = €160,000 • Water resources management and monitoring of surface water bodies = €25,000

Source of funding	Implementation timeline
• Budget of Khmelnytsky city territorial community • Budget of the Environmental Protection Fund • National budget • Budget of Khmelnytsky Regional State Administration • Grants, projects implemented by international organizations and development partners	All years of GCAP implementation

Action owners and stakeholders

- MKP Khmelnytskvodokanal
- Department of communal infrastructure
- Department of Ecology and Landscaping Control of Khmelnytskyi City Council
- Southern Bug River Basin Water Resources Authority
- Regional Office of Water Resources in Khmelnytskyi
- Municipal Infrastructure Department of Khmelnytskyi City Council
- External consultants and service/ goods providers
- Eco -NGOs (incl. RIVERS OF KHMELNYTSKYI, VEL (Khmelnytskyi affiliate)/ Khmelnytskyi University (Chair of Biology)

Solid Waste Management

Green City Challenge

- *Low recycling and composting rates*
- *Limited waste treatment processes*
- *Landfilling capacity and quality constraints*

Impacts on the following environmental assets:

Strategic goal

Realise a sustainable MSW management system in accordance with waste hierarchy

Mid-term targets

Indicator name	Current value		Target value
MSW generation per capita	355	↘	<355
% of separated collected MSW recyclables from MSW generated	0.1%	↗	10%
Rate of MSW recycling (recycling of the separated collected recyclables and composting)	0.06%	↗	12%
Energy recovery of MSW at EU standard facility	0.0%	↗	20%
Proportion of MSW sent to landfill	99.9%	↘	68%
Compliance of landfill to EU standards	0.0%	↗	100%

Actions

SW-1: Develop an effective system of MSW collection, temporary storage and treatment

SW-2: Improve existing MSW landfilling system

6.6.1. Ensure an effective system of MSW collection, temporary storage and treatment

Action Code	SW-01	Investment / Policy	Investment

Description

Ensuring an effective system of MSW collection, temporary storage and treatment could be achieved by implementation of the next measures:

- **Improving MSW collection and separation system**
  - Increasing the capacity and reliability of the waste collection system through the purchase of new containers and collection vehicles.
  - Development of design and estimate documentation and installation of underground containers for MSW, with enhanced maintenance of container storage locations.
  - Maintenance of on-street MSW containers and locations
  - Installation of containers for MSW separate collection including containers for the separate collection of organic waste (from 2027)
  - Construction of four reception/collection centres (i.e. civic amenity sites, recycling yards)
  - Implementation of a pilot project on EPR on waste packaging
- **Improving the system of bulky waste collection from the population**
  - Installation of video cameras on public sites to prevent unauthorized storage of bulky waste
  - Development of a clear schedule for the bulky waste collection to provide clarity and confidence to users.
- **Improving conditions for the temporary storage of already collected hazardous waste as a part of MSW**
  - Arrangement of premises for temporary storage of hazardous waste as part of household waste which has been collected at Khmelnytskyi recycling centre and by Ecobus. In this document places for temporary storage means places where bigger amount of collected by different means hazardous waste will be stored to be sent to the licensed treatment/disposal companies
- **Creation of MSW treatment infrastructure**
  - Construction of materials recovery facility (MRF) facility (which is a part of a mechanical biological treatment (MBT) facility), including the separate composting site for organic waste and two parallel sorting lines (for mixed and separately collected MSW)
  - Construction of the separate MBT module on refuse derived fuel (RDF) production

Benefits

- Will allow to provide MSW collection services of better quality by new vehicle fleet and containers
- Will allow to collect separately more recyclables and deliver them for further recycling, while saving primary resources
- Will allow to prevent hazardous waste as a part of MSW at the landfills and ensure their proper treatment by licensed treatment/disposal companies
- Will allow to treat more mixed waste
- Will allow reduce landfilling of MSW and landfill only treated MSW residues

War impact and IDO critical measure support

Technical and environmental risks related to the obsolescence of assets of the City utility infrastructure including impact on services quality and supply will be supported with these actions

Action Code	SW-01	Investment / Policy	Investment

Smart Benefits – Smart components

Consider the use of software systems that allow:

- optimize routes for MSW collection and carry out constant monitoring of consumables;
- to carry out online monitoring of waste movement in the chain "collection - recovery plant - landfill"

In this activity, several projects can be implemented, which can even be completely SMART. The City Council, for a start, may introduce open data according to the standards described in the Cabinet of Ministers Resolution no.835 “Data on the location of municipal containers (by category), container sites, hazardous waste collection sites, secondary raw materials” and “Data on the location of municipal facilities waste management, their areas and revenues”. Consider the implementation of hardware solutions (Internet of Things) such as sensors, for all stages of the waste management process.

Also, the construction of an extensive network of sensors will facilitate advanced solutions for optimizing the routes of garbage trucks in real time.

Social-economic benefits / Gender considerations

- It is important to follow the rules of sanitary cleaning scheme of settlements when installing containers. The number of containers should be calculated in such a way as to avoid of containers overloading.
- When implementing separate collection, in particular in the long term perspective of organic waste, it is necessary to conduct awareness campaign in parallel (differentiated for different age groups of population), and the informal sector should be taken into account.
- The additional costs of improving the quality of MSW collection service, in particular separate collection, may be negatively perceived by the population. Therefore, this issue requires systematic awareness raising measures and transparency in providing information on money spent.
- During the construction of MBT plant, a positive effect is expected from the creation of new jobs.
- A full list of possible social impacts during the construction of the MBT plant is contained in the SEAP. The implementation of SEAP measures and regular monitoring of their implementation is an important aspect to prevent possible negative social impacts.

Potential job creation: 60 - 120

Carbon savings per annum

3,100tCO2e

Strategic environmental impact assessment report for the Regional Waste Management Plan for Khmelnytskyi region estimates potential GHGs emission reductions at 14%. The same assumptions has been applied for GHGs emission reduction in Khmelnytskyi city due to improved waste management system (the actions foreseen in GCAP are in line with the RWMP of Khmelnytskyi region).

Action Code	SW-01	Investment / Policy	Investment

Priority Environmental Challenges addressed

Targets addressed

Main:

- Rate of MSW recycling (recycling of the separately collected recyclables and composting)
- Energy recovery of MSW at EU standard facility
- % of separately collected MSW recyclables from MSW generated

Additional:

- MSW generation per capita
- Proportion of MSW sent to landfill

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, SW-02

CAPEX Estimate (€)

33,350,000

- Improving MSW collection and separation system – €3,320,000
- Improving the system of bulky waste collection from the population – €15,000
- Improving conditions for the temporary storage of already collected hazardous waste as a part of MSW – €15,000
- Creation of MSW Treatment infrastructure – €30,000,000

OPEX Estimate (€)

Indicative estimates includes operation and maintenance costs - 3,300,000

Opex may be covered by a MBT facility tariff of approx. 30-50 euro per ton of solid waste (inclusive of landfilling tariff) covering both operational costs and returns on investment

Source of funding

Municipal and regional budget, communal enterprises financing, grants, projects by international organizations and development partners

Implementation timeline

From year 2 until of the plan

Action owners and stakeholders

- Department of Ecology and Landscaping Control
- Smart environment. Khmelnytskyi
- KhKP Spetskomuntrans
- Municipal Infrastructure Department of Khmelnytskyi City Council
- SES
- For the pilot project implementation on EPR the partial responsibility will be assigned to the EPR organization

6.6.2. Improving existing MSW landfilling system

Action Code	SW-02	Investment / Policy	Investment

Description

This action will improve the existing MSW landfilling system. This will be achieved by implementation of the following measures:

- **Rehabilitation of existing cells of the landfill and equipping the landfill with all necessary equipment, installations and systems to ensure proper operation of the landfill**
  - Recultivation (implementation of reconstruction works) of the existing cells of the landfill
  - Relocation of the high-pressure gas pipeline from the landfill
  - Installation of a leachate collection and treatment system
  - Purchasing of a new equipment for the landfill to ensure proper operations of the new landfill
  - Development of the project and execution of works «New construction of the self-flowing sewer collector of the Khmelnytsky landfill
- **Construction of two new cells of the sanitary landfill in accordance with EU requirements** (including development of design documentation during the first year of action implementation)
- **Preparation for construction of a new landfill**
  - Work on the allocation of land for the regional landfill, which will be used by the city after the end of the new phase of the existing landfill

Benefits

- Will allow for new sections of the landfill to be in compliance with EU standards and ensure operation of the landfills in accordance with European standards:
  - The leachate from the landfill will be properly collected and treated by reverse osmosis technology
  - After the end of operation of each cell of the landfill, it will be rehabilitated
- Will allow to reduce the negative impact on the environment from the landfill on water, air, soil, human health
- Will allow to show people that there can be real sanitary landfills in Ukraine

War impact and IDP critical measure support

Technical and environmental risks related to the obsolescence of assets of the City utility infrastructure including impact on services quality and supply will be supported with these actions

Smart benefits – Smart components

It makes sense to consider the use of software systems that allow to carry out online monitoring of waste movement in the chain "collection - recovery plant - landfill".

Potential innovation and smart solutions include the use of robotic systems with AI, computer vision and automation to improve sorting and recovery of recyclable materials.

Action Code	SW-02	Investment / Policy	Investment

Social-economic benefits / Gender considerations

- The construction of new landfill cells can meet the bigger resistance from the population, so it is important at all stages from planning and design to construction and commissioning to conduct appropriate communication with population and implement all measures provided by the ESAP (social and environmental actions plan)
- The construction of new landfill cells and the landfill arrangement (leachate collection and treatment system) and its rehabilitation are expected to reduce the negative impact of the facility on the environment and human health.
- Employement opportunities for both contruction and recultivation works, and throughout operation of current and future landfill.

Potential job creation: 60 - 100

Carbon savings per annum

3,100 tCO2e

National projections used during NDC preparation foresees 5% reduction in GHGs emissions from waste sector in 2030 compared to 2018. However, lower national value is expected to take into account extension of waste management services in rural areas and increased volumes of waste processing, which is not applicable to urban areas.

Priority Environmental Challenges addressed

Targets addressed

Compliance of landfill to EU standards

Link to other GCAP Actions

EG-01, EG-02, EG-03, EG-04, EG-05, SW-01

CAPEX Estimate (€)

12,600,000

- Reclamation (Reconstruction of works) of the landfill and removal of the high-pressure gas pipeline – EUR 5,200,000
- Construction of two new sections of the sanitary landfill – EUR 5,000,000
- Arrangement of the landfill with the necessary equipment, installations and systems to ensure its proper operation – EUR 2,400,000

OPEX Estimate (€)

Indicative estimates of tariffs includes operation and maintenance costs, and investment recovery - 1,260,000

Opex may be covered by a landfill tariff of approx. 20-25 euro per ton

Source of funding

Municipal and regional budget, communal enterprises financing, grants, projects by international organizations and development partners

Implementation timeline

From year 2 until end of the plan

Action owners and stakeholders

- Department of Ecology and Landscaping Control

Action Code	SW-02	Investment / Policy	Investment

- Smart environment. Khmelnytskyi
- Municipal Infrastructure Department of Khmelnytskyi City Council
- KhKP Spetskomuntrans

Monitoring plan

7. Monitoring plan

7.1. Reporting format and frequency

Continuous monitoring of all projects and measures in the GCAP is an integral part of implementation. By regularly and methodically tracking all Green City actions and their impacts on the environment, the city of Khmelnytskyi can determine whether the GCAP is progressing as planned and contributing as expected to the established goals.

Successful monitoring requires two key components:

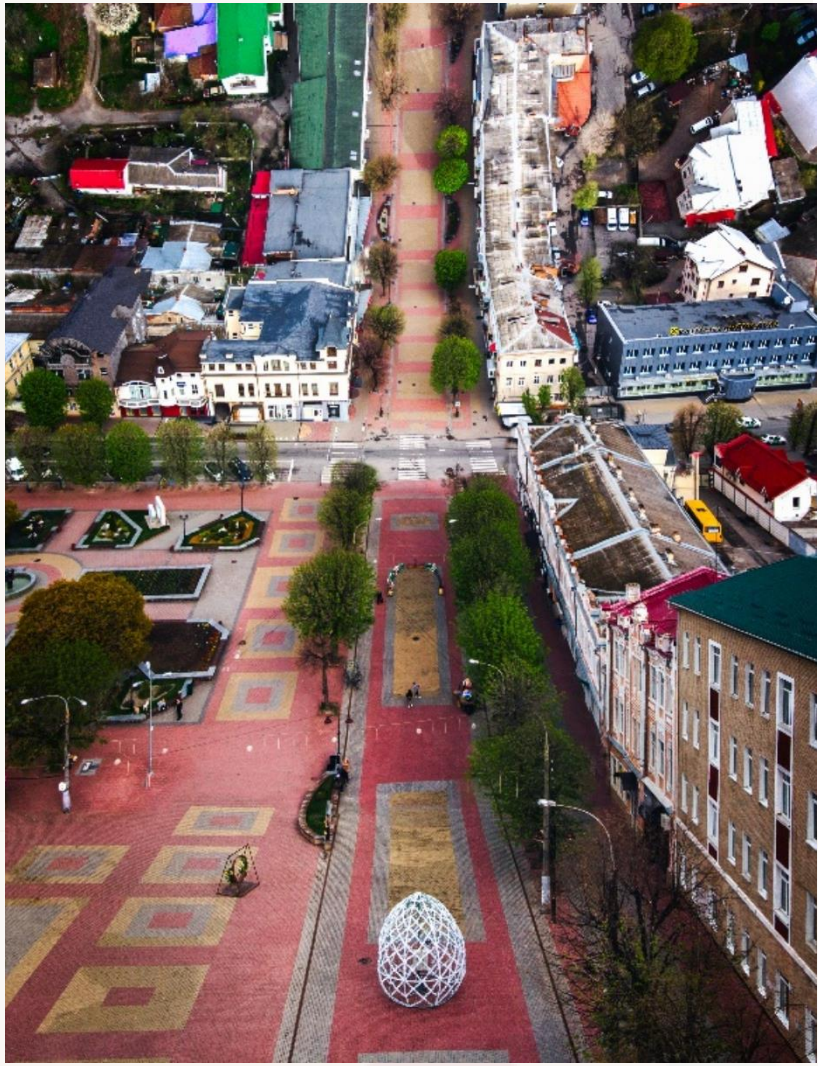
- Implementation monitoring plan: This tracks the status and progress of the GCAP projects being implemented.
- Impact monitoring plan: This measures the impact of the GCAP project and policies on the City's environmental and resilience performance. Part of the impact-monitoring plan should be the continuous observation of the risk and vulnerability landscape and the extent to which the Green city actions are contributing towards resilience.

7.2. Progress Monitoring Plan

In addition to these two reports, the Indicators Database will continue to be used to collate and present data collected alongside global benchmark values. Any additional reporting requirements will be set by the GCAP Co-ordinator in Step 3 of the GCAP process ('Green City Implementation'). The City Administration will circulate these reports internally to inform internal decision-making and communicate them with other stakeholders as appropriate.

7.3. Impact Monitoring Plan

The Smart Environment Khmelnytskyi team have been instrumental in the development of the GCAP and will continue to be responsible for ensuring the timely monitoring of the GCAP and submission of related reports. From within the Smart Environment Khmelnytskyi team a Monitoring, Reporting and Verificaiton Co-ordinator will be assigned and tasked with delegating the data collection, analysis and reporting tasks to senior-level officials from across the City Administration.



7.4. Monitoring, Reporting and Verification process

This 'MRV Co-ordinator' role will involve the delivery of the activities outlined in Figure 7-1 and detailed further below.

Figure 7-1: Stepped MRV process

1. Liaise with the GCAP Co-ordinator, to confirm the data collection requirements (including frequency and quality) for assessing the implementation and impact of GCAP actions, as well as associated timescales and budget, and ultimately of the GCAP as a whole. This should include a review of the targets and constituent indicators that each GCAP action will contribute towards achieving, as well as the objectives that each action and policy addresses, which are presented in Chapter 5. This step will also be used to support the identification of synergies with other city, and wider domestic, processes and protocols as well as of the specific stakeholders responsible for each;

2. Identify and assign an official 'MRV Sector Expert' within each of the departments responsible for the implementation of a GCAP action(s) to monitor and report on the action(s). It is likely that this would be a head of department and in most instances, if not all, be the same official responsible for the implementation of the relevant GCAP action ('GCAP Action Owner') from the relevant department within the City Administration. The selected officials will be responsible for monitoring, reporting and verifying data relating to a) the implementation progress of each action, b) the budget, scope and implementation programme of each action, and c) the impact of each action in relation to the relevant targets;

3. Identify and designate an official 'Data Collection Officer' with responsibility for the collection and review of data to inform each GCAP indicator;

4. Establish formal communication channels between the MRV Sectoral Experts and the relevant Data Collection Officers;

5. Communicate regularly with officials with designated MRV responsibilities to ensure that they are suitably informed, trained and otherwise supported to conduct their role effectively, efficiently and in a transparent and consistent manner. This will include the development and dissemination of guidance to facilitate appropriate and consistent MRV that meets the requirements of the GCAP methodology. This communication should also be conducted to ensure that the tasks of the MRV Sector Experts and Data Collection Officers are being executed to the specified quality, time and budget, as set by the MRV Co-ordinator;

6. Set and enforce deadlines for regular reports relating to each GCAP action and indicator;

Table 7-1: Potential departments responsible for MRV

GCAP sector	Department responsible for MRV
Environmental governance	Legal Support and Representation Unit
Green spaces	Department of Ecology and Landscaping Control
Transport	Transport and Communications Department
Energy	Municipal Infrastructure Department
Water	Municipal Infrastructure Department
Solid waste	Municipal Infrastructure Department

7. Assimilate inputs from MRV Sector Experts to report on each GCAP action, as well as on the progress and impact of the GCAP as a whole, and cascade the findings to the GCAP Co-ordinator, who will in turn share findings with other stakeholders, notably internal and external actors who are responsible for making decisions based on the findings. The MRV Sector Experts, as appointed by the MRV Co-ordinator to take responsibility for the MRV of actions in specific GCAP sectors, will be required to:

a) Acquire an in-depth understanding of the targets and indicators relevant to their GCAP action(s) and about how the data to inform each is derived and validated. This will require consultation with the MRV Co-ordinator and relevant Data Collection Officers;

b) Communicate regularly with the official responsible for the implementation of each GCAP action ('GCAP Action Owner'), and if different, also the official responsible for reviewing, and if necessary, revise the budget, scope and planning of each action;

c) Familiarise themselves with the required method and frequency of data collection for each data item. In terms of the monitoring of the implementation of GCAP actions, data collection will, in all instances, be continuous throughout the implementation period. There will be more variation in the frequency of the data collection for each indicator;

d) Liaise with Data Collection Officers to ensure that any factors that might compromise the quality or availability of data to meet deadlines set by the MRV Co-ordinator are identified in time to identify an alternative approach;

e) Adopt responsibility for the validation of all data in relation to each GCAP action, reviewing data received to ensure that it is complete, consistent and otherwise robust;

f) Analyse and assimilate the inputs of Data Collection Officers and GCAP Action Owners to report on the progress and impact of each GCAP action, and report on the findings; and

g) Cascade the results to the MRV Co-ordinator.

Хмельницький