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Mykolaiv
city on the wave

Assistance to the Development of the Mykolaiv Masterplan

Solid Waste Management
Priority Investment Program
Appendix G to the Road Map Report
Final

April 2024

COWI

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3	2024-04-25	PIP Waste	RNRL, TFN, TO, ABSU, MCA (IK, IN)	ABSU	JKP

Contents

List of Abbreviations

CAPEX	Capital expenditures
CDW	Construction and demolition waste
“OBRIY – DKP”	Municipal service provider “Obriy - DKP”
EIA	Environmental impact assessment
EP	Enabling project
EU	European Union
FS	Feasibility study
IP	Investment project
LTIP	Long-term investment project
LTEP	Long-term enabling project
MCA	Mykolaiv city administration
MOA	Mykolaiv oblast administration
MSW	Municipal solid waste
MTIP	Mid-term investment project
MTEP	Mid-term enabling project
MKT	Municipal service provider “Mykolaivkomuntrans”
MWMP	Municipal waste management plan
OPEX	Operating expenses
PIP	Priority investment program
STIP	Short-term investment project
STEP	Short-term enabling project
SWM	Solid waste management
TBD	To be defined
RWMP	Regional waste management plan
UXO	Unexploded ordnance

1. Introduction

This annex provides Priority Investment Program (PIP) for waste management sector prepared as part of the contribution of COWI to the Mykolaiv Masterplan. The PIP is broken down by investment projects and enabling projects, as well as by short-term, mid-term and long-term projects.

Figure 1-1 below provides the definitions of the terms used.

Figure 1-1 Definitions

A Priority Investment Programme (PIP) comprises several projects, categorized into investment projects and enabling projects. These projects vary in duration, with some being short-term, others mid-term, and yet others long-term.

Investment projects (IP) – these are municipal investment projects aimed at improving and maybe enlarging current infrastructure and, hence, improving municipal services provided to the population.

Enabling projects (EP) – these are projects aimed at ensuring that infrastructure investments may be implemented and operated successfully, not only in the short- to mid- term but also in the long-term.

Short-term projects (ST) – these are projects to be launched and finalised before 2030.

Mid-term projects (MT) – these are projects to be launched and finalised before 2040.

Long-term projects (LT) - these are projects to be launched before 2050.

Chapter 2 includes investment projects while enabling projects are presented in the Chapter 3.

Table 1-1 presents an overview and the timeline for implementation of projects included to the Priority Investment Program for the waste management sector in Mykolaiv. Besides the title, each project has a code composed of abbreviations introduced in the Figure 1-1 above indicating project type (I- investment or E- enabling) as well as project duration (Short-, Mid- or Long-Term).

Table 1-1 PIP Overview

N	CODE	PROJECT NAME	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036-2040	2041-2045	2046-2050	CAPEX*
		INVESTMENT PROJECTS																
1	STIP	Development of a new sanitary landfill																Capex: ~30-35 mln EUR (capacity of 180,000 tpa, 30 Ha)
2	MTIP	Closure of existing landfill																~ 30 mln EUR (800.000 Eur/ha, ca.38 ha)
3	STIP	Demolition and clean-up																Capex: ~500.000-800.000 EUR (project preparation); 20-50 M EUR project implementation (depending on
4	STIP	Construction and demolition waste facility for emergency clean-up																~400.000 - 650.000 EUR (project preparation) Equipment: 1.350.000 to 2.000.000 EUR
5	STIP	Waste separation, collection and transportation in a pilot district																~ 2 mln EUR (further details in the descriptopn of STIP 5)
6	MTIP	Improvement of MW collection and transportation system in Mykolaiv city																~7-10 mln EUR (further details in MTIP 6)
7	STIP	Construction of the sorting line for the recyclables																~250,000 EUR, capacity 10,000 t/year with a possibily for extension with two more lines. OPEX 25 EUR/t
8	MTIP	Construction of MBT facility with RDF production and biostabilisation																Capex: ~35 mln EUR (capacity 95,000 – 100,000 tpa) Opex: 40 EUR/t
9	MTIP	Construction of composting plant for separately collected biodegradable and green waste																Capex: ~1.5 mln EUR for 38,000 tpa Opex: 35-40 EUR/t
		ENABLING PROJECTS																
1	STEP	Support to development Municipal Waste Management Plan for Mykolaiv																Time based. Estimated 60-100.000 EUR
2	STEP	Improvement of regulatory environment to support efficient handling of demolition waste																Time based. Estimated 60-100.000 EUR
3	LTEP	Enhancing capacity and fostering public awareness on MW management																Time based. Estimated 50-100.000 EUR, excluding direct costs related to capacity development (travel,
4	MTEP	Implementation of the EU Waste Acquis at municipal level																TBD

Legend:

Project preparation period | STIP expected duration | MTIP expected duration | MTIP ad-hoc assistance | STEP/LTEP expected duration | STEP/MTEP/LTEP follow-on implementation

2. Investment projects

Proposed investment projects for the waste management sector encompass various initiatives addressing both urgent investments related to the processing of demolition waste resulting from the destruction of buildings and infrastructure, as well as investments targeting general improvements in waste management in the city. These initiatives aim to contribute to the transition to a circular economy and the implementation of the waste management hierarchy: prevention, followed by re-use, recycling, recovery, and, finally, disposal. The proposed investment projects will align with the requirements of the newly adopted law on waste management, support the accession to the environmental requirements of the EU, and ultimately contribute to improving the quality of life for residents in Mykolaiv City.

Following chapters briefly present nine investment projects proposed for implementation in the city in the short- and medium-term. The investment projects presented in this chapter are listed in priority order, with those of the highest priority listed first.

2.1 Development of a new sanitary landfill

Title/Type	**Development of a new sanitary Landfill (STIP 1)**
Sector	Waste
Background	Despite the best efforts at reusing, recycling, and recovering energy from municipal solid waste (MSW), a portion always remains which requires disposal back into the environment. The sanitary landfill continues to be the primary method of handling this residual MSW. These landfills play a crucial role in the solid waste management (SWM) systems at municipal or regional levels, acting as the primary disposal method for certain waste fractions. In Mykolaiv, the use of sanitary landfills is projected to continue well into the future. Mykolaiv's existing landfill is quickly reaching its maximum capacity, making the construction of a new sanitary landfill an urgent necessity. The current landfill is nearing its full capacity and poses threats to both the environment and public health. This makes the construction of a new landfill not just a project, but a crucial response to the pressing problem of waste management. Proper waste management is pivotal as it has a direct impact on environmental health, public safety, and the overall well-being of the community. Neglect in waste management can lead to grave environmental problems such as soil and water contamination and contribute to climate change by releasing greenhouse gases. It can also become a public health hazard, attracting disease-bearing pests, producing harmful emissions, and increasing the risk of fires. It is here that a well-designed sanitary landfill becomes indispensable, providing a solution that ensures a clean, safe, and healthy environment. The advantages of a new sanitary landfill extend to all members of the community. It offers residents a cleaner living environment and provides businesses with a robust waste management system. Additionally, it ensures that the community stays in compliance with environmental and health regulations, thus preventing potential legal and financial penalties.
Objective(s)	• Objective 1: Establish a sanitary landfill to effectively manage and dispose of residual municipal solid waste, ensuring proper containment and disposal methods. • Objective 2: Minimize the environmental impact of waste disposal by implementing measures to prevent soil, water, and air pollution. This includes engineering controls and monitoring systems
Key outputs	The construction of the new sanitary landfill in Mykolaiv will have positive effect on several aspects of community life and environmental health. This project, integrating avant-garde waste management techniques and environmental safeguards, will bring many positive outputs: • The feasibility study (FS), site selection process, and Environmental Impact Assessment (EIA) have been successfully completed. • Technical documents have been prepared.

	• The construction of the new sanitary landfill has been executed. • A set of guidelines has been formulated, and the staff has undergone training accordingly.
Key tasks	• Feasibility Study • Site Selection • Environmental Impact Assessment (EIA) • Design and Engineering Plans • Permitting and Regulatory Approvals • Earth works and construction. • Monitoring and Control Systems • Operational Guidelines • Training and Capacity Building
Expected timeline of project	6 years 2024-2029 including preparatory phase • Project Initiation (Months 4-6) • Design and planning (Months 7-14) • Land Acquisition and preparation (Months 15-20) • Infrastructure Construction (Months 19-30) • Cell Construction (Months 30-40) • Finalization and testing (Months 40-44) • Operational readiness (Months 45-49) • Commencement of Operation (Months 50)
Estimated investment cost (CAPEX)	30-35 mln EUR for a landfill with capacity of 180.000[1] tpa (ca 30 Ha), including 145.000 tpa for municipal waste from households and 35.000 tpa for other non-hazardous waste
OPEX	Ca. 6 EUR/t
Expected environmental impacts	Environmental objective of the EU Taxonomy addressed: • Climate Change Mitigation and adaptation The new sanitary landfill will reduce the release of potent greenhouse gases like methane, significantly reducing our carbon footprint. Additionally, the conversion of landfill gas into renewable energy will contribute to a decrease in our reliance on fossil fuels. • Sustainable Use and Protection of Water and Marine Resources Designed with impermeable liners and leachate collection systems, the sanitary landfill prevents harmful substances from contaminating our water resources. This protects not only our local water bodies but also safeguards marine resources by preventing the migration of pollutants. • Transition to a Circular Economy A new sanitary landfill will be part of Network of modern waste sorting and recycling facilities and/or composting plants, MBT, ensuring that waste is processed in the most environmentally friendly manner. By enabling the extraction of valuable resources from waste, it reduces the demand for virgin materials, encouraging a cycle of use and reuse. • Pollution Prevention and Control The sanitary landfill prevents pollution through efficient waste management and meticulous control measures. Harmful emissions are minimized, and regular monitoring ensures that any potential hazards are swiftly detected and mitigated, ensuring a cleaner environment. • Protection and Restoration of Biodiversity and Ecosystems By managing waste effectively, the sanitary landfill helps protect our local biodiversity and ecosystems. Reducing pollution and contamination safeguards habitats and supports the flourishing of diverse species.

[1] Landfill capacity is calculated for the total MW generation as ca. 10 year will be used for the development of MW treatment infrastructure. With a decrease of the amount of landfilled waste, the lifetime of the landfilled increases.

Critical observation points	• The construction of a sanitary landfill involves various risks, and implementing effective mitigating measures is crucial to ensure the project's success and environmental sustainability. Here are some potential risks associated with landfill construction and corresponding mitigating measures: • Delay of procedure • Geotechnical Risks: Risk: Unforeseen soil conditions, instability, or settlement issues. Mitigation: Conduct comprehensive geotechnical investigations before construction. Implement engineering solutions, such as proper site grading, foundation design, and slope stabilization. • Environmental Contamination: Risk: Potential contamination of soil and water during construction. Mitigation: Implement erosion and sediment control measures. Install liners and leachate collection systems in accordance with environmental regulations. Monitor and address any contamination promptly. • Regulatory Compliance: Risk: Failure to meet or adhere to environmental and regulatory requirements. Mitigation: Engage with regulatory authorities early in the planning process. Develop a robust environmental management plan and adhere to all relevant regulations and permits. • Community Opposition: Risk: Resistance or opposition from local communities due to concerns about environmental impact, noise, or other disruptions. Mitigation: Conduct community outreach and engagement. Address concerns transparently, provide information on the project's benefits, and incorporate community feedback into planning.
Related studies, projects and programmes	• National waste management plan for Ukraine till 2030 • National waste management strategy for Ukraine for 2030 • Kharkiv landfill • Lugansk landfill
Readiness of project documents, including design documents	NA
Funding opportunities	Part of the equipment that will be supplied by JICA2 for the treatment of the DW generated as a result of the aggression from the RF the city is intended to use for the existing landfill (until closed) and for the new one. Despite assistance already provided, substantial investments are required. Swedish EPA is considering a project targeting reduction of greenhouse gases from landfills in four clusters in Ukraine. Consider approaching Danish MFA, Swedish EPA, SIDA, Swedfund, EBRD, EIB, WB or similar for a loan and/or for grant for project preparation.
Interested local companies	
Beneficiary	MCA
Other stakeholders	Private company that will manage gas collection system MKT and “Obriy – DKP”

[2] The list of equipment is included in the Appendix A. Details related to the status with the delivery and the list of items that will be used for the landfill could be obtained from MCA, Krysina Iryna, Head of the Operation Support Department of Housing and Communal Services, krysinairen@gmail.com, +380 989678656

	Population of Mykolaiv

2.2 Closure of existing landfill

Title/Type	**Closure of existing landfill (MTIP 2)**
Sector	Waste
Background	A municipal waste landfill serving Mykolaiv City is situated near Velyka Korenykha Village and has been operational since 1972, with a history spanning over 50 years. The anticipated operational period for the landfill extends until 2026, and it occupies a land plot encompassing 37.93 hectares. Upon completion of the new sanitary landfill construction, it is imperative to initiate and execute a formal procedure for the closure of this existing landfill.
Objective(s)	• Objective 1: establish a secure final cover system, implementing effective leachate and gas management, and ensuring long-term environmental stability through monitoring and post-closure care. • Objective 2: prevent environmental contamination, mitigate potential risks, and promote ecological recovery of the site.
Key outputs	The closure of an old landfill involves several key outputs, each contributing to the successful decommissioning and management of the site. The key outputs of the closure of an old landfill typically include: • The feasibility study (FS), and Environmental Impact Assessment (EIA) have been successfully completed. • Technical documents have been prepared. • The closure of the sanitary landfill has been executed • Environmental parameters are monitored. • Maintenance of the integrity and effectiveness of the final cover
Key tasks	• Geodetic surveys and topographic mapping • Direct reclamation project (ToR has been prepared) • Feasibility Study • Environmental Impact Assessment (EIA) • Design and Engineering Plans • Permitting and Regulatory Approvals • Earth works and closure. • Maintenance of the integrity and effectiveness of the final cover • Operation of the leachate collection system and gas collection system • Monitoring and Control Systems (groundwater monitoring and Gas migration monitoring)
Expected timeline of project	2024 - 2031 • Project Initiation – site selection, investigation and final allocation - 2 years • Design and planning – 2 years • Earth work Preparation, excavation and reshaping – 3 years • Finalization and testing – 1 year • Monitoring/aftercare - up to 30 years
Estimated investment cost (CAPEX)	~30 mln EUR (800.000 EUR/ha, ca.38 ha)
Expected environmental impacts	*Environmental objectives of the EU Taxonomy addressed:* • Climate Change Mitigation Closure mitigates the emission of greenhouse gases associated with the decomposition of organic waste, contributing to climate change mitigation.

	• Sustainable Use and Protection of Water and Marine Resources Closure minimizes the risk of water pollution from leachate, safeguarding local water resources. The established monitoring system is designed to guarantee the prevention of any environmentally harmful releases, maintaining a pollution-free environment. • Pollution Prevention *and Control* Proper closure practices, such as covering and capping, contribute to pollution prevention and control. • Protection and *Restoration of Biodiversity and Ecosystems* The closure of the old landfill allows for the restoration of degraded land and promotes biodiversity. Landscaping efforts and the establishment of green cover contribute to the protection and restoration of ecosystems
Critical observation points	The closure of an old landfill poses various potential risks, and implementing effective mitigating measures is crucial to minimize adverse impacts. Here are some potential risks associated with the closure of an old landfill and corresponding mitigating measures: • Leachate Management: Risk: Escaping leachate from the closed landfill, potentially contaminating soil and water. Mitigation: Implement a comprehensive leachate management system, including proper capping and covering to prevent water infiltration. Regular monitoring and maintenance of leachate collection systems are essential. • Gas Emissions: Risk: The release of methane and other gases generated during the decomposition of organic waste. Mitigation: Implement a gas collection and management system, including gas extraction wells and covers, to capture and control emissions. Monitor and manage gas levels throughout the closure process. • Surface Water Runoff: Risk: Increased surface water runoff leading to erosion and potential pollution. Mitigation: Design and implement effective erosion control measures, such as slope stabilization, vegetation cover, and stormwater management systems. Regular inspections and maintenance are critical. • Community Concerns: Risk: Potential concerns and objections from the local community regarding the closure process. Mitigation: Engage in transparent and proactive communication with the community. Address concerns, provide regular updates, and involve the community in the closure planning process. • Regulatory Compliance: Risk: Failure to meet regulatory requirements for landfill closure. Mitigation: Stay informed about and comply with local, regional, and national regulations governing landfill closure. Work closely with regulatory authorities, obtain necessary permits, and undergo regular inspections. • Post-Closure Monitoring: Risk: Inadequate monitoring of the closed landfill's long-term environmental impacts. Mitigation: Establish a robust post-closure monitoring program to track environmental conditions, including groundwater quality, gas emissions, and surface water runoff. Implement corrective measures as necessary based on monitoring results.
Related studies, projects and programmes	• National waste management plant for Ukraine till 2030 • National waste management strategy for Ukraine for 2030 • Kharkiv, Dergachi landfill rehabilitation

	• Lviv, Hribovichi rehabilitation of existing landfill
Readiness of project documents, including design documents	ToR, tender documentation and assessment of sources for financing for landfill reclamation project covering the following three components: • Environmental impact assessment • Geodetic surveys and topographic mapping • Direct reclamation project Responsible executing agency: Municipal Enterprise Mykolaivkomuntrans
Funding opportunities	Part of the equipment that will be supplied by JICA[3] for the treatment of the DW generated as a result of the aggression from the RF the city is intended to use for the existing landfill (until closed) and for the new one. Despite assistance already provided, substantial investments are required. Swedish EPA is considering a project targeting reduction of greenhouse gases from landfills in four clusters in Ukraine. Consider approaching Danish MFA, Swedish EPA, SIDA, Swedfund, EBRD, EIB, WB or similar for a loan and/or for grant for project preparation.
Interested local companies	
Beneficiary	MCA
Other stakeholders	MKT & "Obriy – DKP" Operator of cogeneration installation Population of Mykolaiv

2.3 Demolition and clean-up

Title	**Demolition and clean-up (STIP 3)**
Sector	Waste (Demolition Waste)
Background	The Mykolaiv Oblast and the city were subjected to shelling from the very beginning of Russia's full-scale aggression against Ukraine and numerous buildings and infrastructure facilities are damaged to various extend generating large amounts of construction and demolition waste (CDW). Accumulation of construction waste mixed with household waste, dead animals, landmines, and unexploded ordnance (UXO) etc. pose a serious risk to human health and safety while also holding resources to rebuild the city. The destroyed buildings and structures therefore need to be assessed, repaired or demolished, cleaned, sorted and recycled properly. Implementation of suggested[4] system for demolition, clean-up and a recycling facility includes three stages addressed by three projects in this PIP. This enabling project (STEP 2) and two investment projects (STP 3 and STIP 4) that are closely related and must be coordinated: • Improvements to regulatory and administrative system for CDW treatment (STIP 2) • **Demolition and clean-up (STIP 3)** • Establishment of a CDW facility (STIP 4) This project focuses on the stage of demolition of damaged buildings and clean-up of the sites. The project will build upon the achievements of the enabling project that will clarify legal and regulatory issues and will prepare the foundation to establishment of CDW facility.
Objective(s)	Organise the process of demolition and clean-up to:

[3] The list of equipment is included in the Appendix A.For the contact detail - see footnote 2 for STIP 1
[4] The report *"Assistance to the Development of the Mykolaiv Masterplan"* produced by COWI (2023).

	• Reduce/to remove the environmental impact due to accumulation of waste at each site • Enable commencement of re-construction or re-building at each site • Enable the recycling of valuable CDW resources at a temporary CDW facility
Key outputs	• Safe and efficient demolition and clean-up of war-damaged buildings in Mykolaiv City • Stable supply of DW to a temporary CDW facility
Key tasks	Project Preparation: • Damage assessment and prioritization of buildings (tasks related to the damage assessments are foreseen to be conducted by the municipality administration supported by specialists and legal advisors as required) • Development of tender documents • Tendering • Contracting • Project follow-up Implementation: • Demolition and clean-up work • Local transport
Expected timeline of project	2024-2027, including: project preparation: 1 year project implementation: 2-3 years
Estimated investment cost (CAPEX)	Estimated cost: • Project preparation: 500.000 to 800.000 EUR • Project implementation: 20-50 M EUR[5]
Estimated operation and maintenance costs (OPEX)	*NA*
SDGs affected	The following environmental objectives of the EU Taxonomy are addressed: • transition to a circular economy and • pollution prevention and control Logos of the SDGs affected by this project are provided.  Target 8.8: Protect labour rights and promote safe working environments Target 11.6: Reduce the environmental impacts of cities Target 12.4: Responsible management of chemicals and waste Target 12.5: Substantially reduce waste generation
Critical observation points	**Observation:**

[5] Estimated cost for project implementation depend on the result of the detailed damage assessment. The estimate does not include related costs such as cleaning, screening and removal of hazardous waste and UXO, local transport and partial demolition, protection and repair of the slightly damaged buildings, etc.

	• Risk of delaying recovery of recycles from construction and demolition waste if the issues of ownership are not clarified and regulative and institutional system is not in place **Mitigation:** • Representatives and technical advisors on the ground that can lead coordination and collaboration with local government and private sector stakeholders, ensures timely kick-off and roll out of projects • Coordination with enabling project (STEP 2 "Improvements of regulatory and administrative system for demolition and clean-up activities")
Related studies, projects and programs	Swedish Environmental Protection Agency (SEPA): guidance and training for handling of demolition waste, and its potential for recycling (short to medium-term); Neo-Eco Ukraine, and UA Damage, supported by the Danish NGO Mission East, have carried out a CDW assessment in 70 small towns in Mykolaiv Oblast and there are plans for development of a treatment facility in Shevchenkivska municipality serving Mykolaiv and Kherson oblasts[6]. A pilot project on demolishing and processing 15,000 tons of construction waste and recycled 93% of debris into new construction materials[7] in Hostomel, Ukraine carried out by Neo-Eco. Among the items Neo Eco can recycle are concrete and brick which would be turned into aggregates; wooden doors to be turned into particle board; plaster to be turned into plasterboard; and glass and PVC to be turned into glass cullet, aluminium and PVC.[8]
Readiness of project documents, including design documents	• Background note, social infrastructure - Strategic framework for Danish assistance to rebuilding Ukraine, COWI, April 2023 • Assistance to the Development of the Mykolaiv Masterplan - Construction and Demolition Waste Report, COWI, November 2023 • Macro-economic waste study for the reconstruction of the Mykolaiv region, Neo-Eco & Mission East, October 2023 • 70 rural settlements in Mykolaiv, Debris volumes, costs and potential, Neo-Eco. Damage UA & Mission East, June 2023
Funding opportunities	JICA[9] supplies equipment[10] for treatment of the DW generated as a result of the aggression from the RF. Most of the equipment is for the treatment of the DW, while demolition and clean-up will require a lot of manual work and proper organisation of the demolition of the damaged buildings. Danish organisation Mission East is involved in DW project in Mykolaiv Oblast together with Neo-Eco, France. Important to coordinate activities related to DW between the Oblast and the City. Consider approaching IFIs/donors that support Mission East (main donor is the Danish MFA) together for funding similar activities.
Interested local companies	To be coordinated with Neo-Eco & Mission East that have identified number of private companies that would be interested in buying products generated by treatment of the DW
Beneficiary	• Mykolaiv City Administration. • The population of Mykolaiv city
Other stakeholders	Stakeholders include:

[6] Garbage reform on the way to the EU: how the Mykolaiv region learns to cope with waste according to new standards — NikVesti — News of Mykolaiv
[7] From dialogue meeting with Neo Eco, October 2023
[8] https://www.international-construction.com/news/ukraine-war-what-will-reconstruction-of-damaged-buildings-and-infrastructure-cost-/8027864.article
[9] Signing of Record of Discussions on Technical Cooperation for Development Planning with Ukraine: Contributing to the emergency recovery and reconstruction of damaged infrastructure | Press Releases | News & Features | JICA
[10] See footnote 2 for STIP 1

	• Mykolaiv City Administration • Mykolaiv Oblast • Local communities • Local transport companies • Local/international contractors

2.4 Construction and demolition waste facility

Title/type	**Construction and demolition waste facility for emergency clean-up (STIP 4)**
Sector	Waste sector
Background	The Mykolaiv Oblast and the city were subjected to shelling from the very beginning of Russia's full-scale aggression against Ukraine and numerous buildings and infrastructure facilities are damaged to various extend generating large amounts of construction and demolition waste (CDW). Accumulation of construction waste mixed with household waste, dead animals, landmines, and UXO, UXetc. pose a serious risk to human health and safety while also holding resources to rebuild the city. The destroyed buildings and structures therefore need to be assessed, repaired or demolished, cleaned, sorted and recycled properly. Suggested[11] system for demolition, clean-up and a recycling facility includes following three stages addressed in this PIP by the following two investment and one enabling project, that are closely related and must be coordinated: • Improvements to regulatory and administrative system for CDW treatment (STIP 2) • Demolition and clean-up (STIP 3) • **Establishment of a CDW facility (STIP 4) consisting of:** ✓ Phase 1 - A temporary CDW facility to handle the waste as an emergency handling; ✓ Phase 2 - A permanent CDW facility, to be established after the cease of the war actions, to handle the waste generated in the building and construction sector. This particular project will establish a facility for handling CDW and converting it to valuable resources. With the temporary facility for emergency clean-up, the objective is to swiftly implement a semi-mobile system in accordance with the Ukrainian legislation. After completion of the hostilities and handling of the accumulated CDW has been finally handled, a more long-term set-up shall be established.
Objective(s)	Establishment of a CDW treatment facility that will handle CDW converting it to valuable resources, thus ✓ Contributing to a circular economy in the city by utilizing the recycling potential of CDW ✓ Reducing amount of waste and required area for landfilling ✓ Supporting business activities in the city
Key outputs	• A construction and demolition facility has been established and recyclable materials have been processed. • An institutional setup has been established for management and operation of the overall waste management system. • A market has been identified for use of recycled materials.
Key tasks	**Project preparation:** • Feasibility study (including estimation of CAPEX, OPEX, market analysis, institutional setup, etc.) • Localisation of CDW Facility • Development of Tender Documents for provision of machinery and equipment • Procurement • Contracting

[11] The report *"Assistance to the Development of the Mykolaiv Masterplan"* produced b by COWI (2023).

	• Project follow-up **Implementation and Operation:** • Provision of equipment and machinery • Setting up a CDW facility • Crushing and sorting at CDW facility • Promotion and sale of recyclables
Expected timeline of project	2024-2028 Project preparation: 1 year Implementation and operation: 3-4 years[12]
Estimated investment cost (CAPEX)	Estimated cost[13] [14] [15]: • Project preparation: 400.000 to 650.000 EUR • Estimated cost for project Implementation and operation 1.350.000 to 2.000.000 EUR
Expected environmental impacts	The expected impacts are listed below with inspiration from the EU taxonomy. A full screening and assessment of the project's compliance to the EU taxonomy objectives have not been performed. *(1) Climate change mitigation, and (4) transition to a circular economy:* the CDW facility's main goal is increased recycling and substitution of virgin products. The system thereby helps conserve resources and prolong the lifespan of materials. The system is further contributing to the overall objective of optimizing the capacity of controlled landfills and sanitary landfills, as valuable materials for recycling and reuse will be diverted from the landfill areas. The CDW facility contributes to the overall objective of reducing CO_2 as the exploitation of virgin materials are one of the major contributions to generation of CO_2. *(3) Sustainable use and protection of water and marine resources, (5) pollution prevention and control, and (6) protection and restoration of biodiversity and ecosystems:* Accumulation of construction waste mixed with household waste, dead animals, landmines, and UXO, etc. pose a serious risk to the environment, and human health and safety. Mykolaiv is a historical industrial harbour city. By recycling the CDW waste effectively instead of leaving it in the streets or in landfills, reduces the risk of leaching contaminants into nearby water bodies and helps protect the local marine waters. Reducing pollution and contamination safeguards habitats and supports the flourishing of diverse species. Lastly, the CDW system in Mykolaiv can, once implemented, function as a pilot project applicable in all other cities and areas of Ukraine that have been affected by the war in similar ways. Providing available capacity of the CDW facility, inter-municipal cooperation can be established to assist in the cleaning-up of the neighbouring municipalities.
Critical observation points	**Observation:** • Demolition and clean-up of the damaged buildings shall be carried out in the efficient way • Location must be agreed with the MCA and coordinated with MOA • Importance of cooperation between the city and oblast • Similar projects are being implemented in the Oblast

12 The timing is only for the phase 1 (emergency clean-up).
13 The costs are estimated based on the assumption that all war related DW will be processed. Estimated volume is presented in the Construction and Demolition Waste Report
14 The estimated costs are only for the phase 1.
15 The estimated costs do not take costs for equipment provided by JICA into account

	• There is a risk of high operation costs if transport distance to the chosen location for the CDW facility is too long • Risk of shortage of local transport companies due to high OPEX **Mitigation:** • Coordinate with Demolition and Clean-up project (STIP 4) and enabling project addressing legal and regulatory issues and ownership issues (STIP 2) • Focus on collaboration between the city and the oblast to obtain economy of scale by increasing the volume of the operation and reducing the costs of operation • Choose a CDW facility location that reduces transport costs and allow covering most affected by shelling areas in the city and the oblast • Ensuring that the logistics is part of the tender (provision of trucks) • Engaging with regulatory authorities early in the planning process to ensure compliance with legislation. Develop a robust environmental management plan and adhere to all relevant regulations and permits • Representatives and technical advisors on the ground that can lead coordination and collaboration with local government and private sector stakeholders, ensures timely kick-off and roll out of projects reduces the risks
Related studies, projects and programmes	Swedish Environmental Protection Agency (SEPA): guidance and training for handling of demolition waste, and its potential for recycling (short to medium-term); Neo-Eco Ukraine, and UA Damage, supported by the Danish NGO Mission East, have carried out a CDW assessment in 70 small towns in Mykolaiv Oblast and there are plans for development of a treatment facility in Shevchenkivska municipality serving Mykolaiv and Kherson oblasts[16]. A pilot project on demolishing and processing 15,000 tons of construction waste and recycled 93% of debris into new construction materials[17] in Hostomel, Ukraine carried out by Neo-Eco. Among the items Neo Eco can recycle are concrete and brick which would be turned into aggregates; wooden doors to be turned into particle board; plaster to be turned into plasterboard; and glass and PVC to be turned into glass cullet, aluminium and PVC.[18]
Readiness of project documents, including design documents	• Background note, social infrastructure - Strategic framework for Danish assistance to rebuilding Ukraine, COWI, April 2023 • Assistance to the Development of the Mykolaiv Masterplan - Construction and Demolition Waste Report, COWI, November 2023 • Macro-economic waste study for the reconstruction of the Mykolaiv region, Neo-Eco & Mission East, October 2023 • 70 rural settlements in Mykolaiv, Debris volumes, costs and potential, Neo-Eco. Damage UA & Mission East, June 2023
Funding opportunities	JICA supplies equipment[19] for treatment of the DW. Preliminary assessment of COWI team suggest that provided equipment will serve the purpose described by this project. Danish organisation Mission East is involved in DW project in Mykolaiv Oblast together with Neo-Eco, France. Neo-Eco is intended to use funds provided by the Danish MFA for leasing similar equipment for similar activities in the Shevchenkivsky district.

[16] Garbage reform on the way to the EU: how the Mykolaiv region learns to cope with waste according to new standards — NikVesti — News of Mykolaiv
[17] From dialogue meeting with Neo Eco, October 2023
[18] https://www.international-construction.com/news/ukraine-war-what-will-reconstruction-of-damaged-buildings-and-infrastructure-cost-/8027864.article
[19] List of equipment id included to Appendix A. For the contracts in MCA - see footnote 2 for STIP 1

	Important to coordinate activities related to DW between the Oblast and the City. For further funding, consider approaching GIZ and/or KfW, as equipment donated by JICA is German.
Interested local companies	To be coordinated with Neo-Eco & Mission East
Beneficiary	Mykolaiv City Administration.
Other stakeholders	Stakeholders include: • Mykolaiv City Administration • Mykolaiv Oblast • Local communities • Local waste processing companies

2.5 Waste separation, collection and transportation in a pilot district

Title/Type	**Waste separation, collection and transportation in a pilot district (STIP 5)**
Sector	Waste
Background	Ukraine is ranked 9th among countries with the highest amount of waste and holds one of the lowest recycling ratios. To tackle this issue, the new law, "On Waste Management," introduces the concept of the waste management hierarchy - prevention, followed by re-use, recycling, recovery, and, finally, disposal. However, legislative changes alone will not resolve the problem, as the core issue lies in the lack of understanding of the importance of waste sorting among the population. This project aims to identify optimal for Mykolaiv physical infrastructure for waste separation, collection, and transportation. It will propose and test some proven facilities and models, along with innovative solutions, in pilot districts to promote the circular economy and implement the waste management hierarchy: prevention, followed by re-use, recycling, recovery, and, finally, disposal. After evaluating the results, the most effective techniques can be implemented throughout the rest of the city. This initiative will address the need to encourage new habits among the population and enhance the currently limited capacity for promoting such development among key stakeholders. Initially, both projects will focus on pilot districts, with the successful achievements subsequently disseminated to the rest of the city. The project will serve as a preparation to the project for STIP 6 “Improvement of MW collection and transportation system in Mykolaiv city” and will be supported by and implemented in collaboration with an enabling project, LTEP-3: “Enhancing capacity and fostering public awareness for recycling.”
Objective(s)	The project objective is to identify most effective system of waste separation, collection, and transportation in the pilot area, serving as a model for other districts in Mykolaiv
Key outputs	• The containers sites established and equipped • Containers are installed for collection of mixed waste and recyclables • Waste collection is planned and organised • Drop-off centres for recyclables and other types of MW generated by population has been designed and built • Truck with low CO_2 emission (at least EUR 5) trucks are procured and operating in pilot districts
Key tasks	• Design of various optional setups for waste separation, collection and transportation • Procurement and installation of containers • Establishment of containers sites • Design and construction of a drop-off centre • Procurement of vehicles for waste collection • Evaluation of the results and reporting
Expected timeline of project	2024-2028, including project preparation and startup

Estimated investment cost (CAPEX)	Estimated 2 mln EUR (to be further specified after the size of the pilot districts will be identified and agreed with Mykolaiv City Administration). Based on preliminary agreement with two service providers in the city the following pilot districts were suggested for further consideration: • Micro district "Namyv" of Zavodsky District (15.000 persons in multistore buildings) • Korabelny District – private households (15.000 persons) • Micro district "Solyanykh[20]" in the Centralny Disctrict (15.000 persons)
Expected environmental impacts	Environmental objective of the EU Taxonomy addressed: • transition to a circular economy • pollution prevention and control
Critical observation points	• Prompt identification of the location and the size of the pilot districts • Cooperation between Mykolaiv City Administration and authorities in the pilot district • Coordination of the investment and enabling projects • Availability of financing • Public awareness and communication with population
Related studies, projects and programmes	• Sydhavn Recycling Centre and similar facilities in Denmark • Drop-off centres in Khmelnitsky and Lutsk cities
Readiness of project documents, including design documents	The scheme of the sanitary cleaning of the city approved by the MCA (indicating, among others, number of defined containers and vehicles could serve as the basis for further consideration)
Funding opportunities	No funding opportunities have been identified. Consider approaching Danish MFA, Swedish EPA, SIDA, Swedfund, AFD, NEFCO, EBRD or similar for a loan and/or grant for project preparation
Interested local companies	
Beneficiary	Mykolaiv City Administration Pilot districts' administrations
Other stakeholders	UC "Obriy-DKP", UC "Mykolaivkomuntrans" Local companies that will procure secondary raw materials Population of the pilot districts

2.6 Improvement of MW collection and transportation system

Title/Type	**Improvement of MW collection and transportation system (MTIP 6)**
Sector	Waste
Background	In 2022 about 20 vehicles were used for MW collection and transportation by Utility companies of Mykolaiv city. In the end of 2023, the city received additionally 10 used vehicles. The average level of depreciation of the vehicles is about 72% and some of them are from 2003. Only 63% of population of the city is covered by the MW collection and part of MW ends up in wild/unauthorised dumps within the city. According to the good practices in average vehicle should be changed after 10-12 years of operation. This means that most of waste trucks of the city should be replaced by new ones of at least EUR5 standard. There are not enough containers for MW separate collection implementation and part of existing container fleet require upgrading. Implementation of the project will improve the quality and coverage of MW collection and transportation service in Mykolaiv city. This project is a follow up on the project STIP 5 "Waste separation, collection and transportation in a pilot district". Estimated number of necessary containers and vehicles excludes those suggested/procured for the STIP 5.
Objective(s)	Improve the Municipal Waste (MW) collection system in Mykolaiv city, including a separate collection and transportation system.

[20]The district has been suggested by OneWorks as Innovation district and may be added to the two other locations on a later stage

	Sub-objectives for project components: • Purchase the necessary number of containers (for mixed MW, recyclables, and biowaste) • Acquire the necessary number of vehicles • Upgrade the workshop of Utility Companies for the maintenance of the vehicles. • Establish and maintain container locations • Set up seven reception/collection centres (one per 50,000 people), in addition to the three centres assumed to have been established by STIP 5
Key outputs	• Feasibility Study is completed • The necessary equipment (containers, vehicles, etc.) is procured • The containers sites are established and equipped • The workshops of the Utility companies are upgraded • 10 drop-off centres for waste are established (including 3 established by STIP 5) • Trucks with low CO_2 emission/electric trucks are procured and operating • MW separate collection works high efficiency and cover step by step biowaste separate collection in pilot districts of the city
Key tasks	• Assess the amount of assets requiring upgrading • Purchase necessary assets • Maintain workshops, container sites and drop-off centres
Expected timeline of project	8 years 2026-2033, including 1 year for the project preparation (to be coordinated with STIP 5)
Estimated investment cost (CAPEX)	Estimated CAPEX 7-10 mln EUR The estimate is based on the unit costs for: • Drop-off centres: 90,000 -100.000 EUR/unit, expected number – 7 centres • Vehicles – 100.000 EUR/unit – expected number – 50 vehicles • Containers – 400 EUR/unit (1,1 m³) – cf. Sanitary scheme foresee ca. 12.000 units, which seems to be too high. TBD • Containers – 45 EUR/unit (240 l) - cf. Sanitary scheme foresee ca. 16.500 units, which seems to be too high TBD • Workshop maintenance is excluded Estimate does not include maintenance of workshops. Costs for that project have to be adjusted on a basis of experience from STIP "Waste separation, collection and transportation in a pilot district" and coordinated with the MWMP – STEP 1.
Expected environmental impacts	Environmental objective of the EU Taxonomy addressed: • climate change mitigation - Upgrading vehicle fleet allow reduce carbon emissions (EUR 5 vehicles at least) • transition to a circular economy • pollution prevention and control: Introduction of MSW separate collection after its sorting will allow saving raw materials/ • protection and restoration of biodiversity and ecosystems- Improving MW collection and transportation service will result in reducing of the wild dumps amount in the city and soil pollution
Critical observation points	• Project follows the conclusion of the project STIP 5 "Waste separation, collection and transportation in a pilot district" and coordinated with the project LTEP 3: "Enhancing capacity and fostering public awareness for recycling". Coordination between th three is of outmost importance • Conclusions from the pilot district must be taken into consideration • Mykolaiv sanitary scheme defining number of required containers and vehicles. Before clarifying number of containers and vehicles, detailed planning of MW separate collection will be needed. Crosscheck the recommendation of the Sanitary scheme with findings of the FS

Related studies, projects and programmes	• National waste management plan for Ukraine till 2030 • National waste management strategy for Ukraine for 2030
Readiness of project documents, including design documents	Mykolaiv sanitary scheme
Funding opportunities	No funding opportunities have been identified. Consider approaching the Danish MFA, Swedish EPA, SIDA, Swedfund, AFD, NEFCO, EBRD or similar for a loan and/or grant for project preparation.
Interested local companies	
Beneficiary	MCA
Other stakeholders	Companies implementing MW collection: "Obriy – DKP", MKT Population of the city

2.7 Construction of sorting line for recyclables

Title/Type	**Construction of sorting line for recyclables (STIP 7)**
Sector	Waste
Background	For the 2022 less than 1% of MW generated has been separately collected. More than 99% of generated MW including recyclables is landfilled. Time of the landfill operation is less than 5 years. Construction of the sorting line will reduce the amount of landfilled waste and allow implement good practices on recyclables management in the Mykolaiv city saving the primarily resource for local economy.
Objective(s)	Save raw materials within circular economy initiatives and divert waste from landfilling in Mykolaiv city
Key outputs	• Feasibility Study is completed • Design documentation is drafted • The landplot for the sorting line is allocated (size and location TBD) • EIA is completed and permit for sorting is obtained • Construction works competed • Sorting line for the recyclables with the capacity 10.000 tpa (one shift)[21] is in operation • Separately collected recyclables from MW delivered to the sorting line • In 2029 6.500[22] t of MW diverted from the landfilling in Mykolaiv city and used for production of other products in paper mills, glass production companies and plastic production companies of Ukraine
Key tasks	• Develop Feasibility Study • Develop design documentation • Allocate a landplot • Conduct EIA • Obtain a permit • Provide construction works, buy and maintain sorting line equipment • Implement MW separate collection within the MTIP 6 "Improvement of MW collection and transportation system"

[21] Capacity of the sorting line will increase from 10.000 t in the year 2029 to 20.000 t in the year 2035 to the 30.000 t in the year 2041
[22] Maximum MW diverted from the landfilling in 2041 is ca. 20.000 t

Expected timeline of project	2024-2028, including: 2 years for project preparation (feasibility study, design documentation, allocation of the landplot); 3 years for construction works for phase 1 (sorting line of capacity of 10.000 t/year) Possible extension with two more sorting lines
Estimated investment cost (CAPEX)	Total: 250.000 EUR for the capacity of 10.000 t/year Cost of equipment: 80% of CAPEX Cost of civil works: 20% of CAPEX
OPEX (indicative)	Ca 25 EUR/t
Expected environmental impacts	Environmental objective of the EU Taxonomy addressed: • *Climate change mitigation. Diverting recyclables from the landfill Sorted* secondary raw materials will reduce impact from the landfilling. • *Transition to a circular economy.* Recyclables after sorting will be used instead of raw material for paper, glass, plastic production closing by this way material loop in production process • *Pollution prevention and control.* Using secondary raw materials (recyclables after sorting) will allow economise using of energy and other consumables during the production processes of paper, metals, glass production.
Critical observation points	*Risks/Mitigation measures* • sorting line overcapacity could impact negatively economic indicators of the project/Detailed feasibility study that will consider staged in the construction that will reflect increase of separately collected recyclables • Subcontractor (construction company and/or supplier of equipment) causing delay of the construction/Clear contractual agreements and planning • No/ low demand for the sorted recyclables/ market assessment for the secondary raw materials during feasibility study • Problems with obtaining of permit if the sorting line is not included in regional waste management plan/ Participate in RWMP development to make sure that the project is included to the RWMP ref to the project STEP 1 • “Support to development Municipal Waste Management Plan for Mykolaiv” • RWMP foresee that the sorting line will be used for the recyclables from other municipalities of the cluster/ This should be taken into account during clarification of the sorting line capacity
Related studies, projects and programmes	• National waste management plan for Ukraine till 2030 • National waste management strategy for Ukraine for 2030
Readiness of project documents, including design documents	MCA have ordered "Technical and Economic Feasibility Study for construction of MWT complex in Mykolaiv City" that is considering various technical options, providing a detailed cost comparison, and defining the facility's capacity. The FS should have been finalised by the end of March 2024. According to the MCA big part of the work has been completed. However, due to lack of funds in the city budget, payment to the consultant has been delayed and no documentation is submitted. Content of the FS is included in the Appendix B. Further details regarding the status could be obtained from MCA[23]
Funding opportunities	Consider approaching Danish MFA, Swedish EPA, SIDA, Swedfund, AFD, NEFCO, EBRD or similar for a loan and/or grant for project preparation

[23] krysinairen@gmail.com; nabatov456@gmail.com

Interested local companies	
Beneficiary	MCA
Other stakeholders	• Companies using secondary raw materials for the production Companies providing MW separate collection: "Obriy – DKP", MKT • Population of the city

2.8 Construction of MBT facility for mixed waste with RDF production and biostabilisation

	Construction of mechanical biological treatment facility (MBT) for mixed waste with RDF production and biostabilisation (MTIP 8)
Sector	Waste
Background	For the 2022 more that 99% of generated MW is landfilled without any pretreatment. Non stabilized organic waste cause negative impact on air (CH_4, CO_2 emissions). Landfilling of whole waste amount require land for the new landfill. MBT construction will allow to reduce amount of landfilled waste and landfill only stabilized biowaste.
Objective(s)	• Implement EU requirement on MW pretreatment before landfilling • Use additional energy potential from MW • Divert waste from landfilling in Mykolaiv city
Key outputs	• Feasibility Study for different MBT options is completed • Negotiations with cement plant is conducted and the specification for RDF is defined • Design documentation is developed • The landplot for the MBT plant is allocated • EIA is completed and permit for MBT is obtained • Construction works are provided, and equipment is installed • MBT facility with the capacity 95 tpa is in operation • Only treated mixed waste after biostabilisation is landfilled • 31.000 t of MW diverted from the landfilling in Mykolaiv city and used for cement production as source of energy
Key tasks	• To develop Feasibility Study for different MBT options • To conduct negotiations with cement plant or another RDF user and define specification for RDF • To develop design documentation • To allocate a landplot • To proceed with EIA • To obtain a permit • To provide construction works, buy and maintain equipment
Expected timeline of project	2024-2030 • Preparatory works: feasibility study, design documentation, allocation of the land plot (3 years) • Construction works (4 years)

Estimated investment cost (CAPEX)	*Total: ca. 35 mln EUR* Cost of equipment: 60% of CAPEX Cost of civil works: 40% of CAPEX.
OPEX (indicative)	*About 40 EUR/t*
Expected environmental impacts	Environmental objectives of the EU Taxonomy addressed: *Climate change mitigation.* Biostabilised within MBT organic waste will not have negative impact after its delivery to the landfill Diverting recyclables from the landfill Sorted secondary raw materials will reduce impact from the landfilling. *Transition to a circular economy.* Energy potential of RDF produced from municipal waste will be used in cement kilns. Also, nonsignificant part of recyclables which has not been separately collected by people from mixed waste will be used too. This will allow cluse energy and materials loops in production processes. *Pollution prevention and control.* Impact on air in case of using by cement plants RDF produced from waste will be significantly less than in case of MW landfilling. Using secondary raw materials (recyclables after sorting of mixed municipal waste) will allow economise using of energy and other consumables during the production processes of paper, metals, glass production. Landfilling of biostbilised municipal waste will reduce negative impact of the landfill *Protection and restoration of biodiversity and ecosystems.* Propes MW treatment allows reduce landfilling and the area for the landfill
Critical observation points	Risks/Mitigation measure • Nonproper RDF quality (content and calorific value) - Deep negotiation of RDF specification with cement plant should be conducted. Additional monitoring of RDF “on the gate” should be implemented. As additional measure closure of the container cover should be implemented within the city which will have direct impact on the moisture content. In parallel the separate collection system of hazardous waste generated from households should be introduced. • Subcontractor (construction company and/or supplier of equipment) causing delay of the construction/Clear contractual agreements and planning • Problems with obtaining of permit if the MBT system is not included in regional waste management plan/ Participate in RWMP development to make sure that the project is included to the RWMP ref to project STEP 1 “Support to development Municipal Waste Management Plan for Mykolaiv” • Increasing of the capacity is possible in case of construction of regional scale facility (for the whole cluster) which is in line with National waste management policy of Ukraine
Related studies, projects and programmes	• National waste management plan for Ukraine till 2030 • National waste management strategy for Ukraine for 2030 • MBT facility for Lviv city is under Construction and for Khmelnitsky city is on a planning stage but design and technology could be different from those in Mykolaiv city.
Readiness of project documents, including design documents	The Mykolaiv City ordered implementation of “A technical and economic feasibility study for the object: New construction of MW treatment complex in Mykolaiv City”[24] with the SE "Scientific-research and design-technological institute of urban economy". According to the ToR the FS will analyse different technical options for MW treatment facility and assess the costs of various options. The FS should be finalised in March 2024.

[24] https://prozorro.gov.ua/tender/UA-2023-10-26-010324-a

Funding opportunities	No funding opportunities have been identified. Consider approaching Swedish EPA, Swedfund, SIDA, AFD, NEFCO, EBRD, WB or similar for a loan and/or grant for project preparation
Interested local companies	
Beneficiary	MCA
Other stakeholders	• Companies using secondary raw materials for the product s production • Companies providing MW collection UC "Obriy-DKP", *UC "Mykolaivkomuntrans"* • Landfill operator - *UC "Mykolaivkomuntrans"* • Mykolaiv cement plant

2.9 Construction of composting plant for separately collected biodegradable and green waste

Title/Type	**Construction of composting plant for separately collected biodegradable and green waste (MTIP 9)**
Sector	Waste
Background	For the 2022 more that 99% of generated MW is landfilled without any pretreatment. Organic waste cause negative impact on air (CH_4, CO_2 emissions). Landfilling of whole waste amount require land for the new landfill. MBT construction will allow to reduce amount of landfilled waste and landfill only stabilized biowaste.
Objective(s)	• Implement EU requirement on biowaste management • Use resource potential of organic waste as additional organic matter for public parks and gardens • Divert waste from landfilling in Mykolaiv city
Key outputs	• Feasibility Study is completed • Design documentation is developed • The landplot for the compost plant is allocated • EIA is completed and permit for composting is obtained • Construction works is provided, and equipment is installed • Composting facility with the capacity up to 40,000/year tpa[25] is in operation • Separate collection of organic waste is introduced in Mykolaiv city • 40.000 t of biodegradable waste diverted from the landfilling in Mykolaiv city and 12.000 t compost produced from this waste in composting plant used in public parks
Key tasks	• To develop Feasibility Study • To develop design documentation • To allocate a landplot • To proceed with EIA • To obtain a permit • To provide construction works, buy and maintain equipment • To implement separate collection of biodegradable waste
Expected timeline of project	Duration of project implementation 6 years 2025-2029

[25] The facility will be commenced in oases. Starting from 10.000 tpa in 2024

	• Preparatory works: feasibility study, design documentation, allocation of the landplot (2 years) • Construction works (3 years)
Estimated investment cost (CAPEX)	Total: Ca. 1.5 mln EUR Cost of equipment: ca. 60% of CAPEX Cost of civil works: ca. 40% of CAPEX
OPEX (indicative)	Ca. 35-40 EUR/t
Expected environmental impacts	Environmental objectives of the EU Taxonomy addressed: *Transition to a circular economy.* Biodegradable waste will be used for compost production. This will allow close material loop and use compost for soils reclamation *Protection and restoration of biodiversity and ecosystems.* Using the produced compost will improve the park's soils quality.
Critical observation points	*Risks/ Mitigation measure* • Overcapacity – Detailed FS study shall consider operation on several stages along with increasing efficiency of organic waste separate collection • compost like output (CLO) allowed for the landfilling only produced instead of good quality compost allowed for using in parks and gardens - Regular awareness arising campaign should be launched on biowaste separate collection to ensure pure input material for the composting plant. Separate collection of biodegradable waste should be introduced in parallel with composting plant operation • Subcontractor (construction company and/or supplier of equipment) causing delay of the construction/Clear contractual agreements and planning • Problems with obtaining of permit if the composting plant system is not included in regional waste management plan/ Participate in RWMP development to make sure that the project is included to the RWMP ref to project STEP 1 "Support to development Municipal Waste Management Plan for Mykolaiv"
Related studies, projects and programmes	• National waste management plan for Ukraine till 2030 • National waste management strategy for Ukraine for 2030 • Composting plant for Lviv city is already in place and operation
Readiness of project documents, including design documents	NA
Funding opportunities	No funding opportunities have been identified. Consider approaching Swedish EPA, Swedfund, SIDA, AFD, NEFCO, EBRD or similar for a loan and/or grant for project preparation
Interested local companies	
Beneficiary	MCA
Other stakeholders	Companies providing MW collection: "Obriy – DKP" and MKT • MKT, as a landfill operator • Landscaping city service (potential users of the compost)

3. Enabling projects

Four enabling projects that are presented in the tables below will support establishment of favourable environment for successful implementation of the investment projects.

3.1 Support to development of Municipal Waste Management Plan for Mykolaiv

Title/Type	**Support to development of Municipal Waste Management Plan (MWMP) for Mykolaiv (STEP 1)**
Sector	Waste
Background	As a candidate for the EU, Ukraine is actively adjusting its legislation. Since July 2023, a new law "On Waste Management" has come into effect. The law, among other things, introduces the concept of waste management hierarchy (prevention, followed by re-use, recycling, recovery, and finally disposal) and requires consistency in waste management planning at three levels - national, regional, and municipal. The law requires, among others, that the Regional Waste Management Plan (RWMP) specify the division of the region into clusters and describe planned waste management infrastructure, including prescribing specific locations for various facilities such as landfills or treatment plants, that will have impact on the development of MWMP. Therefore, the law mandates that the development of both RWMP and MWMP must be coordinated and prescribes that each plan should be developed within one year. The MOA began the development of the RWMP in August 2023 and requested some data from the MCA. However, as of January 2024, the city has not been invited to participate in the development process.
Objective(s)	Establishment of a framework for planning of municipal waste management system at the level of the territorial community of the city of Mykolaiv.
Key outputs	Coordination between MOA and MCA on development of RWMP and MWMP Final draft MWMP with amendments from SEA
Key tasks	• Analysis of the basic situation • Supporting MCA in its participation in the development of RWMP • Establishment of a working group for development of the MWMP • Drafting MWMP, including key performance indicators • Submission for SEA and assistance in organising of public hearings • Incorporating of comments of SEA and views expressed in the process of public hearing
Expected timeline of project	2024 - 2025
Estimated investment cost (CAPEX)	Time based: estimated 60-100.000 EUR
Estimated operation and maintenance costs (OPEX)	NA
SDGs affected	SDGs affected by this project:  11.a; 11.b; 11. c;  12.4; 12.5; 12.6; 12.8,

	 17.9; 17.14; 17.16; 17.17;
Critical observation points	**Risks:** • Lack of cooperation between the city and oblast authorities during development and approval of RWMP and MWMP • Targets set by draft MWMP shall not be lower than targets set by the RWMP • Availability of suggested locations for the WM treatment infrastructure **Mitigation:** Participation of experts from MCO in the working group developing RWMP
Related studies, projects and programs	• National WMP • National WM strategy till 2030 • Regional WMP (in the process of development from October 2023) • HOUSEHOLD WASTE MANAGEMENT SYSTEM PLANNING IN THE POLTAVA REGION[26] • Improving regional cooperation on waste and resource management in the Poltava region (giz.de)
Funding opportunities	No funding opportunities have been identified. Consider approaching Swedish EPA, SIDA, Danish MFA or similar for a loan and/or grant for project preparation
Interested local companies	
Beneficiary	MCA
Other stakeholders	MOA Population of Mykolaiv City and Oblast

3.2 Improvements of regulatory and administrative system for demolition and clean-up activities

Title/Type	**Improvements of regulatory and administrative system for demolition and clean-up activities (STEP 2)**
Sector	Waste
Background	The Mykolaiv Oblast and the city were subjected to shelling from the very beginning of Russia's full-scale aggression against Ukraine and numerous buildings and infrastructure facilities are damaged to various extend generating large amounts of construction and demolition waste (CDW). Accumulation of construction waste mixed with household waste, dead animals, landmines, and UXO, etc. pose a serious risk to human health and safety while also holding resources to rebuild the city. The destroyed buildings and structures therefore need to be assessed, repaired or demolished, cleaned, sorted and recycled properly. Implementation of suggested[27] system for demolition, clean-up and a recycling facility includes three stages addressed by three projects in this PIP. This enabling project (STEP 2) and two investment projects (STP 3 and STIP 4) that are closely related and must be coordinated: • **Improvements to regulatory and administrative system for CDW treatment (STEP 2)** • Demolition and clean-up (STIP 3) • Establishment of a CDW facility (STIP 4)

[26] 9.pdf (lpnu.ua)
[27] The report *"Assistance to the Development of the Mykolaiv Masterplan"* produced by COWI (2023).

	This particular project focuses on legal, regulative and ownership aspects of the demolition and clean-up of war-damaged buildings and is a precondition for successful implementation of the two investment projects addressing treatment of the CDW.
Objective(s)	Create the conditions for efficient demolition and clean-up activities including necessary adjustments to: • clarification of the approach to various types of ownership in the process of demolition and clean-up including buildings, materials and constructions. • Development of legal and regulatory basis for demolition and clean-up and recycling of various building materials, etc.
Key outputs	• Clear understanding and agreement on regulations related to sorting, demolition and recovery of demolition and construction waste in Mykolaiv city • Clear understanding and agreement on responsibilities between parties related to sorting, demolition and recovery of demolition and construction waste in Mykolaiv city • Legal and regulatory barriers for the smooth implementation of two investment projects STIP 3 and STIP 4 are removed thus supporting the process of demolition and clean-up of war-damaged buildings in Mykolaiv
Key tasks	• Legal consultations • Drafting new regulations and development of administrative instruments • Workshops
Expected timeline of project	Project preparation: 1 year Development of new regulations and instruments: 1-2 year
Estimated investment cost (CAPEX)	Approx. 60,000-100,000 EUR for consultants and external experts/legal advisors
Estimated operation and maintenance costs (OPEX)	*NA*
SDGs affected	Environmental objectives of the EU Taxonomy addressed are: • transition to a circular economy and • pollution prevention and control. Logos of the SDGs affected by this project are provided.  Target 8.8: Protect labour rights and promote safe working environments Target 11.6: Reduce the environmental impacts of cities Target 12.4: Responsible management of chemicals and waste Target 12.5: Substantially reduce waste generation
Critical observation points	**Observation:** • Risk of delaying demolition and recovery of recyclables from construction and demolition waste due to unclear ownership issues and/or gaps in the regulative and institutional system. **Mitigation:** • Representatives, legal advisors and technical advisors on the ground to support clarification of the ownership of each specific construction and supporting

	collaboration with owners, local government and private sector stakeholders to ensure timely kick-off and roll out of projects. • To ensure compliance with legislation, the project must engage with regulatory authorities early in the planning process. Develop a robust environmental management plan and adhere to all relevant regulations and permits. • Coordinate with suggested project STEP 1 “Support to development Municipal Waste Management Plan”
Related studies, projects and programs	The Swedish Environmental Protection Agency (SEPA) assesses the opportunities for long-term support to the Ukrainian Ministry of Environmental Protection and Natural Resources and other Ukrainian partners working with waste management. This includes, among others, guidance and training for handling and recycling of demolition waste. UNDP work on mine action coordination, emergency explosive ordnance clearance and debris removal by contributions from the European Union and the Governments of Croatia, Denmark, France, Japan, New Zealand, and Sweden. UNDP has a programme emphasizing on environmental sustainability and local empowerment: taking the debris of buildings destroyed in the war and recycling them for reuse in other projects.
Funding opportunities	No funding opportunities have been identified. Consider approaching Swedish EPA, SIDA, Danish MFA or similar for a loan and/or grant for project preparation
Interested local companies	Coordinate with Mission East and NeoEco
Beneficiary	MCA
Other stakeholders	MOA Population of Mykolaiv city Owners and tenants of the damaged buildings Local communities

3.3 Enhancing capacity and fostering public awareness on MW management

Title/Type	**Enhancing capacity and fostering public awareness on MW management (LTEP 3)**
Sector	Waste
Background	Ukraine is ranked 9th among countries with the highest amount of waste and holds one of the lowest recycling ratios. To address this issue, the new law "On Waste Management" introduces the concept of the waste management hierarchy - prevention, followed by re-use, recycling, recovery, and, finally, disposal. However, legislative changes alone will not resolve the problem, as the core issues lie in the limited capacity of the authorities to enforce the implementation of the new law and in the lack of understanding of the importance of waste sorting among the population. In addition to the absence of public infrastructure for separate collection, the primary obstacles hindering the development of good practices in Municipal Waste (MW) management in Mykolaiv include the need to cultivate new habits among the population and to enhance the capacity for promoting such development among key stakeholders. The project will support/enable successful implementation of an investment project – STIP- 5 “Waste separation, collection and transportation in a pilot area” and STIP 6 “Improvement of MW collection and transportation system in Mykolaiv city”. The project will: • Support capacity development among the staff in the city and district administrations, municipal service providers, and the most active NGOs, thereby facilitating

	prevention of waste generation and promotion of MW separate collection practices; and • design and carry out a public awareness campaign, comprising a series of proven initiatives aimed at promoting recycling and changing traditional views among the public • initially focus on the pilot district with further dissemination of the results to the whole city
Objective(s)	Objective of the project is twofold: • Enhancing the capacity for promoting separate collection and recycling among key stakeholders in the city of Mykolaiv; and • Increasing public awareness about separating of waste and recycling in first among citizens of the pilot district and later in the whole city
Key outputs	• Selection the pilot district in coordination with the STIP 5 “Waste separation, collection and transportation in a pilot district” • Baseline assessments and ex-post reports • Defined indicators for increase due to the project activities of recycling ratio and decrease of the waste disposed to the landfill based on the outcome of the baseline assessment • 100 representatives of the city and the pilot district administration, municipal service providers, and NGOs have been trained online • 10 people among the staff in the city and the pilot district administration, municipal service providers, and NGOs participated in the study tour to Denmark • A working group has been established and developed a program promoting public awareness MW good practices • 500 citizens participated in "brainstorming" session, webinars, seminars, etc. • 50%[28] schools, kindergartens and other institutions are involved in programs promoting waste separate collection and recycling • 10% citizens have installed “Recycling app” • 20% more households in the city (including 80% in the pilot area) are actively engaged in waste separation • Increase of the recycling rate in the city and reduction of the waste delivered to the landfill
Key tasks	• Baseline assessment and reporting, including targets definition of the recyclable ratio and reduction of MW landfilled • Targeted online training of the staff from municipality and service providers • Planning and implementation of the study tour to Denmark for key staff the city administration, municipal service providers, and NGOs • Promoting partnership between relevant organisations in Mykolaiv city and Danish organisations (https://cirkulaer.dk/, e.g. Ålborg or Odense Municipalities (TBD) • Based on the experience from the study tour to establish a working group responsible for the design and implementation of a public awareness campaign consisting of but not limited to the following: ✓ Conduct an online "brainstorming" session for a wide range of the population to ensure a high level of participation

[28] There are about 68 schools and 74 kindergartens are in Mykolaiv for 2023

	✓ Continue waste sorting education activities in schools and kindergartens started in 2026 and halted after the full-scale aggression from the RF ✓ Organise public awareness campaign for various groups of population together with the city administration and municipal service providers ✓ Development of an App promoting recycling practices ✓ 3D tours of local landfill to raise awareness on local needs ✓ Webinars on the Zero Waste concept (for City Administration, business and public) • Ex-post evaluation and reporting
Expected timeline of project	2024 – 2030, including 1 year for project preparation and follow-up period after 2030
Estimated investment cost (CAPEX)	Time-based: Estimated 50-100.000 EUR for local and international experts Direct costs examples: • Study tour for 10 participants: Estimated 35 -40.000 Euro per trip • Training sessions, seminars and IT (app development, 3 -d tour to the landfill, etc.) – estimated 5-20.000 Euro/year • Twinning arrangements
Estimated operation and maintenance costs (OPEX)	NA
SDGs affected	 11.a; 11.b; 11. c;  12.4; 12.5; 12.6; 12.8,
Critical observation points	• Ability to travel to Denmark during the war • Coordination with STIP 5 “Waste separation, collection and transportation in a pilot district “, 4-MTEP “Improvement of MW collection and transportation system in Mykolaiv city” • Active involvement of the stakeholders, also after completion of the project • It’s important to ensure delivering of separately collected recyclables to the consumers of recyclables before sorting line maintaining
Related studies, projects and programs	• Zero waste Europe[29] • Zero waste Europe, Lviv[30] & Kharkiv[31] • Zero waste alliance Ukraine[32] • Strategic cooperation between municipalities using green approach to improve WM in Poltava region, GIZ[33] • No Waste Recycling Station[34] • Hazardous waste[35]

[29] Zero Waste Europe
[30] Про Zero Waste Lviv - zerowastelviv
[31] ZeroWaste Kharkiv – ZeroWaste organization Kharkiv
[32] Zero Waste Alliance Ukraine - Zero Waste Europe
[33] Strategic cooperation between municipalities using green approaches to improve waste management in the Poltava Region, Ukraine (greentechknowledgehub.de)
[34] Україна без сміття. No Waste Ukraine – Україна без сміття
[35] Hazardous waste - КР «Kyivkomunservis» (kks.kiev.ua)

	• Ecola[36] • Batteries[37] • Recycle Map[38]
Funding opportunities	No funding opportunities have been identified. Consider approaching Swedish EPA, SIDA, Danish MFA or similar for a loan and/or grant for project preparation
Interested local companies	
Beneficiary	MCA
Other stakeholders	• Citizens of Mykolaiv • MKT • Civil society organisations

3.4 Implementation of the EU Waste Acquis at municipal level

Title	**Implementation of the EU Waste Acquis at municipal level (MTEP 4)**
Sector	Waste
Objective(s)	• Contribute to implementation of the EU Waste Acquis in Ukraine • Facilitate successful implementation of the EU Waste Acquis in Mykolaiv City
Key outputs	• Guide on EU Waste Acquis highlighting key directives and enforcement mechanism • Gap analysis focusing on service levels and legal and regulatory framework • Training programme targeting Department of Housing and Municipal Services within Mykolaiv City Administration, as well as service providers in Mykolaiv (Mykolaivkomuntrans and “Obriy – DKP”) • Ad-hoc assistance in data collection, processing and reporting to assess progress made in implementation of the EU Waste Acquis on Mykolaiv City
Key tasks	• Development of Guide on EU Waste Acquis • Deep dive into the key directives within the EU Waste Acquis focusing on service levels and legal and regulatory framework • Development and execution of training programme (preferably, modular training programme) • Development of guide on data collection, processing and reporting, including templates, and ad-hoc assistance implementing this guide
Expected timeline of project	2024-2032
Estimated investment cost (CAPEX)	TBD
Estimated operation and maintenance costs (OPEX)	No
SDGs affected	

[36] Здати сміття на переробку - Ecola (ecolaglobal.com)
[37] Batteries, give up! – new website of the movement (batareiky.ua)
[38] Recycle Map

Critical observation points	Availability of staff within Department of Housing and Municipal Services within Mykolaiv City Administration and service providers in Mykolaiv (Mykolaivkomuntrans and "Obriy – DKP")
Related studies, projects and programs	NA
Funding opportunities	No funding opportunities have been identified. Consider approaching Swedish EPA, SIDA, Danish MFA or similar for a loan and/or grant for project preparation also applying for project support in connection with discussing funding of other projects
Interested local companies	
Background	Implementation of the EU Waste Acquis as part of the accession process of Ukraine to the EU constitutes a major challenge, not least because of the many heavy cost investments to be made, changes in legal and regulatory framework and altered work procedures. Lessons learned at the municipal level may make the challenges and, not least, actions to address the challenges clear and, hence, enlighten the actions at national level.
Beneficiary	Department of Housing and Municipal Services within Mykolaiv City Administration Contact person: Serhii Korenev, Deputy Mayor
Other stakeholders	Service providers in Mykolaiv (Mykolaivkomuntrans and "Obriy – DKP"), as well as Ministry of Infrastructure of Ukraine

Appendix 1 List of equipment supplied by JICA

As part of the cooperation between Mykolaiv and JICA, a joint decision has been agreed upon and accepted regarding the provision of assistance from JICA for treatment of Demolition Waste

1 Backhoe (20t) PC210LC-10M0 (Komatsu), SH210-6 (Sumitomo), ZX210LCH-5A (Hitachi）
2 Breaker attachment (20t) JWHB230B (Komatsu), FXJ225 (Furukawa), TOP-205J (Okada aiyon）
3 Scissors breaker attachment (20t) VM-19ER (EUR Furukawa), OSC-200B (Okada aiyon)
4 Dumt truck (Midle) FL42R818A/DD10-100 (Isuzu/Kyokuto)
5 Wheel loader (23t) WA470-6 (Komatsu), ZW310-5A (Hitachi)
6 Wheel excavator JS175(JCB) PW180-11E0 (Komatsu)
7 Trommel sorting machine for soil Phoenix 2100 Wheeled (Power Screen)
8 Truck weigh scale ZAK-07W-10(Nippon Koki）
9 Mobile primary jaw crusher(400t/h) MC110(i)EVO2 (Kleemann), JR1165 (Parker）
10 Mobile secondary impact crusher(350t/h) MR110(i)EVO2 (Kleemann), HS1312 (Parker）
11 Sieve Machine (Screen)(500t/h) MSC953(i)EVO (Kleemann), ST225 (Parker)
12 Bulldozer D65EX-16 (Komatsu）
13 Single cabin truck (2t) NQR90L(isuzu)
14 Asbestos analyzer Thermofisher PH

Appendix 2 Content of the FS for "New construction of a complex for processing household waste in the city of Mykolaiv"

The Department of Housing and Utilities of the Mykolaiv City Council has commissioned a Technical and Economic Feasibility Study for the project titled: "New construction of a complex for processing household waste in the city of Mykolaiv."

Based on the results of the conducted technical and economic feasibility study for the aforementioned project, the following main aspects were identified:

1. Analysis of Key Decisions
1.1. Description of Available Technological Solutions for Managing Household Waste
1.1.1. Block I – Formation, Collection, Transportation
1.1.2. Block II – Mechanical-Biological Treatment
1.1.3. Block III – Thermal Treatment of Waste as Fuel
1.1.4. Block IV – Landfilling
1.2. Key Performance Indicators of an Effective Waste Management System
1.3. Current State of the Waste Management System in Mykolaiv
1.4. Modeling of the Optimal Waste Management System in Mykolaiv
1.5. Justification of a Step-by-Step Plan to Improve the Household Waste Management System in Mykolaiv
2. Brief Object Description
2.1 General Information
2.2 Climatic Data
2.3 Engineering Survey Data
2.4 Current State of Household Waste Management (HW)
2.5 Data on (Projected) Design Capacity
2.6 Material Balance of the Complex in Mykolaiv
3. Main Technological Solutions
3.1 General Data
3.2 Description of Technological Equipment
3.3 Equipment for Administrative, Sanitary, and Domestic Premises
3.4 Comparison of Household Waste Treatment Options
4. Main Construction and Architectural-Planning Solutions
4.1 Brief Description and Justification of Architectural and Construction Solutions for Main 5. Buildings and Structures
6. Technical and Economic Indicators
7. Analysis of international experience in handling household waste, including methods of processing household waste
8. Analysis of Existing Waste Processing Complexes and Relevant Construction Projects in Ukraine
9. Risk Analysis of Implementing the New Project Construction of a Household Waste Processing Complex in Mykolaiv
11. Assessment of Environmental Impacts
12. Main Provisions on Construction Organization
12.1 General Data
12.2 Justification of Combining Construction, Installation, and Special Construction Works
12.3 Methods of Performing Specific Types of Work