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EU4GREEN RECOVERY EAST

NATIONAL BASELINE REPORT OF WASTEWATER TREATMENT INFRASTRUCTURE

Ukraine

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EU4Green Recovery East – Recovery through a Circular Economy and Pollution Reduction in the Eastern Partnership Countries

(700002623)

Implementing partners:

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Recovery through a Circular Economy and Pollution Reduction in the Eastern Partnership Countries

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ABOUT EU4GREEN RECOVERY EAST

The EU4Green Recovery East Programme is a regional programme supporting the EU's Eastern Partnership countries on their path towards a greener, more resilient and competitive economy.

With an EU contribution of EUR 21.3 million (2025–2028), it builds on the results of a decade of EU support for better water management and green economy adoption and focuses on five key components: (1) promoting a circular economy, (2) ensuring water is managed as a critical resource, (3) advancing legal approximation with EU environmental legislation, (4) strengthening integration into EU-wide environmental cooperation and data exchange and (5) fostering cross-border environmental cooperation.

The programme is implemented by five partners: Expertise France with the French International Office for Water (OiEau), OECD, UNECE, UNIDO and the Environment Agency Austria (UBA), as the consortium coordinator.

https://www.eu4greenrecoveryeast.eu

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BAT	Best Available Techniques
BOD	Biochemical Oxygen Demand
BMZ	Federal Ministry for Economic Cooperation and Development
COD	Chemical Oxygen Demand
CSO	Combined Sewer Overflow
EBRD	European Bank for Reconstruction and Development
EE	Energy Efficiency
EEA	European Environment Agency
EIB	European Investment Bank
ER	Energy Recovery
EPA	Environmental Protection Agency
EoI	Expression of Interest
EPR	Extended Producer Responsibility
EQS	Environmental Quality Standards
EU	European Union
EU4GRE	EU4Green Recovery East Programme
EUR-Lex	EU Legal Database/Portal
GIZ	German Society for International Cooperation
IED	Industrial Emissions Directive
IEP	Integrated Environmental Permit
IS	Information System
JICA	Japan International Cooperation Agency
KfW	Kreditanstalt für Wiederaufbau - German Development Bank
IFI(s)	International Financial Institution(s)
IWRM	Integrated Water Resources Management
KPI(s)	Key Performance Indicator(s)
LEAP	Law and Environment Assistance Platform (UNEP)
MPD	Maximum Permissible Discharge

MPC	Maximum Permissible Concentration
MEEA	Ministry of Economy, Environment and Agriculture
NEFCO	Nordic Environment Finance Corporation
NFPs	National Focal Points
OECD	Organisation for Economic Co-operation and Development
OiEau	International Office for Water (Office International de l'Eau, France)
p.e.	Population equivalent (load unit used by UWWTD)
PFAS	Per- and polyfluoroalkyl substances
QA/QC	Quality Assurance/Quality Control
RBMP(s)	River Basin Management Plan(s)
SWB	Surface Water Body
SME	Small and medium-sized enterprises
SWUP	Special Water Use Permit
TSS	Total Suspended Solids
UBA	Environment Agency Austria (Umweltbundesamt)
UNDP	United Nations Development Programme
UNECE	United Nations Economic Commission for Europe
UNIDO	United Nations Industrial Development Organization
UNICEF	United Nations Children's Fund
UWWTD	Urban Wastewater Treatment Directive
VSD(s)	Variable speed drive(s)
WAREG	European Water Regulators network
WFD	Water Framework Directive
WSS	Water Supply and Sanitation
WW	Wastewater
WWTP	Wastewater Treatment Plant

1 Executive Summary

This report presents a baseline assessment of the wastewater treatment sector in Ukraine, developed under Output 2.3 of the EU4Green Recovery East (EU4GRE) Programme. The assessment aims to establish an understanding of the current status of wastewater generation, treatment infrastructure, operational performance, regulatory framework and institutional capacity of the sector. It further seeks to identify opportunities for improving wastewater treatment performance, enhancing energy efficiency in wastewater treatment plants (WWTPs) and exploring the potential for process optimisation, energy recovery and by-product valorisation where technically and economically feasible.

The preparation of this baseline assessment was significantly constrained by the limited availability of reliable and comprehensive operational data at the level of individual WWTPs, as well as by the absence of a centralised online information system containing key information on individual systems. Although aggregate information is available at national and regional scales, it is primarily focussed on hydraulic data (expressed in m^3) and only to a limited extent on pollution and treatment performance. Detailed facility-level data regarding treatment performance, influent and effluent quality, sludge generation and energy consumption are not systematically collected or centrally stored. The absence of information on wastewater management in rural areas is also hindering the development of a complete nationwide picture of the wastewater situation. Consequently, the assessment relied on fragmented datasets obtained from national reports, river basin management plans (RBMPs), project documentation, stakeholder consultations and direct engagement with water utilities and sector organisations. The findings and proposed measures presented in this report should therefore be interpreted within the context of these data limitations and should be regarded as indicative rather than definitive conclusions.

The assessment indicates that Ukraine possesses a large but ageing wastewater infrastructure network characterised by substantial regional disparities in operational performance and service coverage. As of 2023, approximately 52% of the population was connected to sewer networks and around 33% to centralised wastewater treatment facilities. Urban–rural disparities remain significant, with approximately 73% of the urban population connected to sewer systems compared with only around 3% of the rural population. Approximately 15 million people currently lack access to centralised wastewater treatment services. In many rural and peri-urban areas, wastewater is managed through decentralised and frequently unregulated systems such as cesspools, settling tanks and unlined lagoons, many of which pose risks to groundwater and surface water quality and consequently to public health in those regions.

As of 2023, approximately 41.5% of the centralised sewer network is reported to be dilapidated or damaged, while maintenance and replacement rates remain critically low. Several regions, including Donetsk, Zaporizhzhia, Kharkiv and Kherson oblasts, report particularly severe degradation of sewerage infrastructure. Ukraine currently has 545 centralised WWTPs, excluding the territories temporarily occupied by the Russian Federation and areas affected by ongoing or recent hostilities. The sector is dominated by small- and medium-scale facilities, with approximately 90% of WWTPs serving between 1,000 and 150,000 population equivalents. Approximately 397 WWTPs are reported to require rehabilitation or upgrading, including 82 plants requiring tertiary treatment processes for nutrient removal to align with European Union standards. In 2023, only 17 facilities underwent partial or full reconstruction.

The analysis indicates that biological treatment remains the dominant treatment approach throughout the country, with approximately 93% of collected wastewater undergoing some form of biological treatment. The assessment also highlights substantial gaps in sludge management practices across the sector. National statistics on sludge generation are not systematically collected and most WWTPs lack modern sludge treatment infrastructure.

Ukraine has made substantial progress in establishing the legal and institutional framework for EU approximation, but the texts are numerous and the absence of a single wastewater framework code or law covering the full spectrum of obligations limits the integrated vision needed at national level and by individual actors involved in the system to understand their roles and responsibilities. The adoption of river basin management plans for all nine basin districts in late 2024 represents a major milestone, quantifying a six-year investment need of EUR 7.7 billion and providing a geographic framework for implementation of urban wastewater management. The entry into force of the Law on Integrated Prevention and Control of Industrial Pollution in August 2025 introduces a modern, Best Available Techniques (BAT)-based permitting regime that will progressively consolidate fragmented authorisation systems targeting pollution from large economic activities, whose wastewater is partly collected and treated with urban wastewater. It is also necessary to further develop and clarify key regulatory definitions, including the term used for UWWTD sensitive areas, currently referred to in the legal framework as 'vulnerable zones', as well as the exact definition of population equivalent and the pollution parameters used for organic pollution, nutrients and other relevant pollutants.

Furthermore, significant gaps remain between current national regulations and the requirements of the recast Urban Wastewater Treatment Directive (EU) 2024/3019. Ukraine's framework lacks harmonised agglomeration mapping for agglomerations above 1,000 population equivalent, formal procedures for designating quaternary treatment standards and extended producer responsibility (EPR) mechanisms for micropollutants, mandatory energy efficiency pathways towards energy-neutral operations by 2045 and comprehensive stormwater and combined sewer overflow management requirements.

Similarly, while basic frameworks exist for water reuse and sludge management through ministerial orders and national standards, these instruments predate EU Regulation 2020/741 on water reuse and do not incorporate reclaimed water quality classes, validation procedures, minimum monitoring frequencies, operator-level risk management plans or systematic surveillance of emerging contaminants such as PFAS and microplastics.

Within the EU4GRE Programme, emphasis is placed on improving the operational and energy performance of wastewater treatment facilities, including the promotion of energy-efficiency measures and the exploration of energy recovery opportunities from sewage sludge. Due to the absence of centralised plant-level data on electricity consumption and sludge production, the initial evaluation focused on 50 WWTPs for which at least partial operational information was available. The selection process considered several criteria, including data availability, geographic accessibility, treatment capacity, ongoing donor activities, planned infrastructure expansion, modernisation priorities and the willingness of utility management to engage in programme activities.

Following a criteria-based evaluation process and consultations with national stakeholders, three pilot sites were selected for further feasibility studies under the EU4GRE Programme: Drohobych WWTP, Kremenchuk WWTP and Pustomyty WWTP. These facilities were selected because they represent different operational scales and contextual conditions within Ukraine's wastewater sector, while also demonstrating a clear interest in modernisation and operational improvement initiatives.

Drohobych WWTP was selected due to its comparatively large treatment capacity and documented plans for replacement of energy-intensive equipment, while Kremenchuk WWTP demonstrated strong institutional engagement and identified priorities related to energy-efficiency measures and sludge treatment improvements. Pustomyty WWTP was included to provide representation of smaller-scale treatment facilities within the pilot programme, thereby enabling the evaluation of approaches applicable to small municipal WWTPs, which constitute a significant share of Ukraine’s wastewater infrastructure but are frequently underrepresented in modernisation initiatives.

In parallel with modernisation of centralised infrastructure, the assessment recognises the importance of decentralised and nature-based solutions for smaller communities and rural areas. Constructed wetlands, lagoon systems and other nature-based approaches may provide technically appropriate and lower-cost alternatives for wastewater treatment where centralised sewerage systems are not economically feasible. In addition, the gradual introduction of separate sewer systems and decentralised stormwater management measures, including infiltration systems and green infrastructure, could reduce hydraulic loads on wastewater treatment facilities and nearby surface and groundwater bodies, while generating broader environmental and climate resilience benefits.

The EU4Green Recovery East Programme's support for pilot interventions at three pilot WWTPs, combined with broader capacity-building activities, including the organisation of workshops and information events, assessment of existing or needed training programmes for plant operators and related activities, as well as support for alignment with the EU acquis and OECD support on water pricing, provides a practical pathway for demonstrating feasible improvements in treatment efficiency, energy optimisation and resource recovery. However, success will ultimately depend on establishing the comprehensive facility-level data systems that monitor status and progress related to implemented measures and underpin all other improvements, securing sustained financing through national and international sources, building institutional capacity for modern regulatory implementation and maintaining momentum despite the extraordinary circumstances and impacts of the ongoing Russian war of aggression.

2 Introduction

2.1 Purpose

This report has been developed as a foundational document to support Output 2.3 of the EU4GRE Programme. It supports efforts to advance sustainable wastewater management practices in Ukraine. Furthermore, the report aims to provide a comprehensive baseline assessment of the current state of wastewater generation, treatment and management, as well as the regulatory and institutional frameworks governing these processes. By establishing a clear understanding of the existing infrastructure, operational performance, energy consumption and policy environment, the report serves as a critical reference point for identifying areas requiring intervention. The findings presented herein will guide subsequent technical assistance, policy support and capacity-building actions, ensuring that future interventions are grounded in robust evidence and tailored to the national context.

2.2 Main Objectives

The primary objective of this report is to map and evaluate the status of wastewater treatment systems, the associated regulatory framework and capacity-building needs in the wastewater sector in Ukraine, with a focus on energy efficiency, operational effectiveness and alignment with EU directives. Specifically, the report seeks to:

(i) Assess the condition and performance of existing wastewater treatment plants (WWTPs), including infrastructure and technologies

(ii) Identify critical gaps in governance, capacity and technical capabilities

(iii) Propose actionable recommendations to improve WWTP operations, enhance energy efficiency and support sustainable sludge management practices

The aim is to consolidate data at WWTP level across the country as much as possible to identify potential sites where measures can be suggested to improve process performance, energy efficiency and resource recovery options, including the reuse potential of treated wastewater and sewage sludge. The results of this report are intended to inform decision-making, providing the foundation for targeted interventions and capacity-building programmes as part of the subsequent activities of Output 2.3, aimed at building a resilient and energy-efficient wastewater sector.

3 Scope

The report encompasses a detailed analysis of the current state of wastewater management in Ukraine, with particular attention to treatment efficiencies, by-product handling and reuse and the regulatory framework for wastewater treatment. The report covers the entire wastewater value chain, from generation and collection to treatment, discharge and sludge management. It includes detailed data from WWTPs across Ukraine, with the highest possible level of granularity to support the identification and selection of potential sites for proof-of-concept activities.

The assessment maps the distribution, capacity and performance of WWTPs, identifies predominant treatment technologies, energy consumption and pollutant loads and evaluates operational efficiency. Additionally, the report reviews the national legal and regulatory framework, assessing its compatibility with EU directives such as the UWWTD, Water Framework Directive (WFD) and Industrial Emissions Directive (IED). The analysis extends to institutional arrangements, identifying key barriers and opportunities for sectoral modernisation.

The report also addresses specific topics of interest raised by national counterparts, including the reuse potential of treated wastewater and sewage sludge. Drawing on the available data, it identifies opportunities to enhance the performance and sustainability of existing wastewater treatment processes, as well as areas where targeted improvements can be made. Strategic pathways are outlined to improve energy efficiency and climate resilience, forming the basis for proposing the orientation of case studies under Output 2.3.3. In addition, the report assesses potential options for revising national regulations and strategic planning frameworks to better align with EU standards.

The preparation of this assessment was constrained by the limited availability of reliable operational data at the WWTP level, particularly with regard to treatment performance, energy consumption and sludge production. While much of this information is available at the regional and national levels, systematic reporting and data storage at the facility level are insufficient. This gap significantly limits the ability to comprehensively assess the operational status and performance of WWTP infrastructure across the country.

The findings and proposed measures presented in this report are therefore based on the data that were made available for the assessment. These proposed measures should be considered as recommended options for further investigation rather than final recommendations. Detailed technical recommendations will be developed following comprehensive assessments of the selected pilot plants in the next stage of the project. The pilot sites were selected based on data availability and comparative analysis with other facilities for which information was accessible.

4 Country Overview

4.1 Geographic Overview

Ukraine is the second-largest country in Europe by area, covering approximately 603.6 thousand km². Located in Eastern Europe, it shares borders with seven countries. The landscape is predominantly flat, with vast fertile plains (steppe) and plateaus. The Carpathian Mountains lie in the west, while the Crimean Mountains are located in the south. Major rivers include the Dnieper, Dniester and Southern Bug, which are important for transport, agriculture and energy.

More than 85% of the available water resources in the country are concentrated in surface waters; hence, maintaining good water quality is essential for Ukraine's water supply. The northern and western parts of the country are significantly richer in water resources than the regions in the east, south and centre. Rivers primarily flow from north to south, draining into the Black Sea and the Sea of Azov. A few rivers in the north-western regions (comprising approximately 10% of Ukraine's territory) are tributaries to the Vistula and Pripyat rivers, which ultimately flow into the Baltic Sea. In Ukraine, the Dnieper River Basin is the largest and most significant basin, providing approximately 60% of the country's water abstraction needs[1].

The country is divided into nine river basins (Figure 1). Seven river basins are transboundary, among which three are shared with EU countries (Vistula, Danube and Dniester). The basins of the Southern Bug and the Crimean rivers are entirely located within Ukraine. A total of 470 surface water bodies (SWBs) are monitored for quality (5% of total SWBs)[2]. In total, more than 20 million Ukrainians (50% of the population) lived in water-stressed areas before the war. Consequently, effective management and sustainable use of water resources were essential to sustain national economic activities.

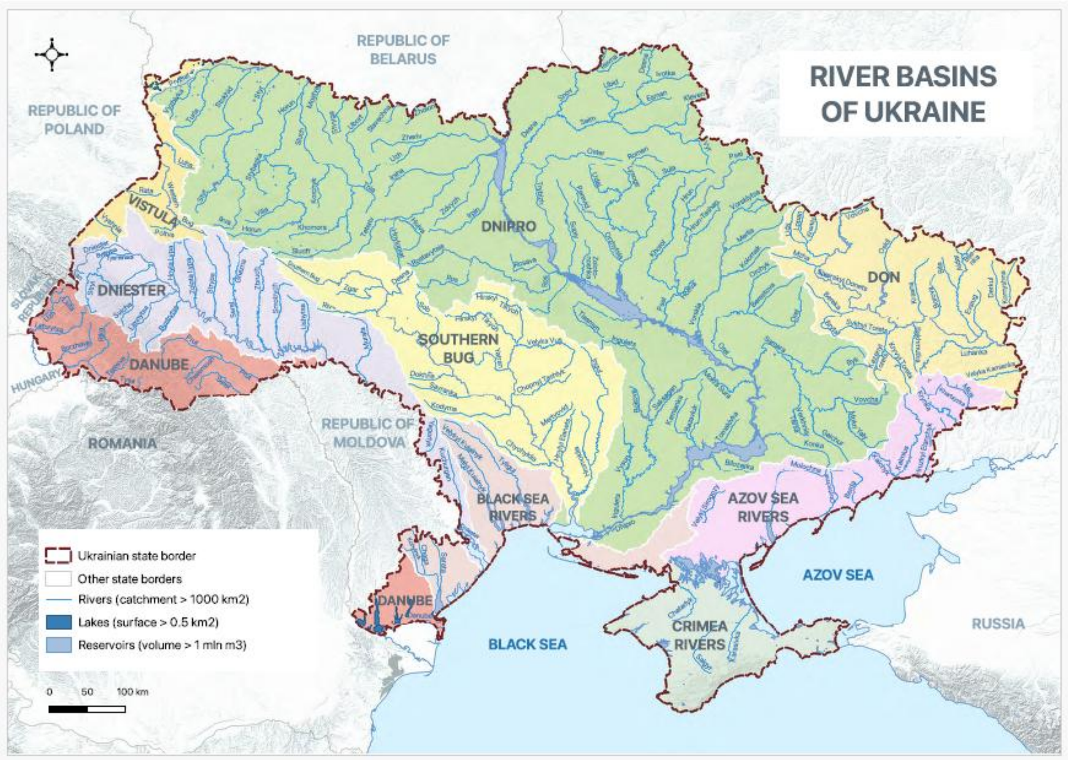

Figure 1: Map of River Basins of Ukraine[2]

4.2 Institutional Roles and Responsibilities

Ukraine's Law on Wastewater Disposal and Treatment, adopted in January 2023, establishes a comprehensive framework for the management of wastewater (WW), the protection of water resources and the safeguarding of environmental standards and consumer rights. The law clearly delineates the responsibilities and powers of institutions at different administrative levels to ensure effective governance and compliance (see also Chapter 7.1).

At the national level, the Ministry of Communities and Territories Development of Ukraine is responsible for formulating and implementing policies on drainage and sewage treatment, establishing regulations and standards, overseeing the allocation of financial and technical resources for infrastructure development and ensuring nationwide compliance with environmental legislation. At the regional and municipal levels, local administrations are tasked with implementing and enforcing national regulations within their jurisdictions. The structure of regional administration is a two-tier system that combines state executive power (regional state administrations and district state administrations) and local self-government (regional, district and territorial communities and councils).

Their responsibilities include managing local drainage networks and sewage treatment facilities, conducting inspections, ensuring compliance with environmental standards, monitoring and reporting on the state of water resources and sewage systems and carrying out environmental impact assessments for drainage and wastewater projects[1].

Dedicated environmental authorities, including the Ministry of Economy, Environment and Agriculture of Ukraine, the State Agency of Water Resources of Ukraine, the State Ecological Inspectorate of Ukraine and the State Geological Survey of Ukraine, play a regulatory and oversight role, conducting environmental impact assessments, issuing permits for the construction and operation of sewage treatment plants, monitoring water quality and the ecological impacts of drainage systems and ensuring that all activities comply with national legislation and align with EU environmental standards.

4.3 Industrial and Other Economic Activities

Ukraine's industrial and economic landscape is characterised by a very high number of diverse large-scale industries and small and medium-sized enterprises (SMEs), many of which contribute significantly to wastewater generation and pollution loads discharged into existing sewer networks or into the environment. They are subject to specific discharge rules (see Chapter 7.1). The most wastewater-intensive sectors include the food industry (particularly dairy), metallurgy, livestock farming, mining and machine building, along with energy generation and oil refining[3]. These sectors are not only major water users but also significant contributors of industrial effluents with high concentrations of suspended solids, organic matter, nutrients and chemicals, including hazardous substances such as heavy metals and persistent organic pollutants.

Industrial activities are heavily concentrated in the eastern regions of Ukraine, particularly in Dnipro, Kryvyi Rih, Mariupol, Zaporizhzhia and Kharkiv, where large metallurgical complexes, mining operations and chemical plants are located (Figure 2). These industrial hubs account for a substantial share of the country's industrial wastewater discharges. In many cases, on-site pretreatment systems are either outdated or underperforming, resulting in elevated pollutant loads entering municipal networks, being discharged directly into surface water bodies or leaching into soil and groundwater.

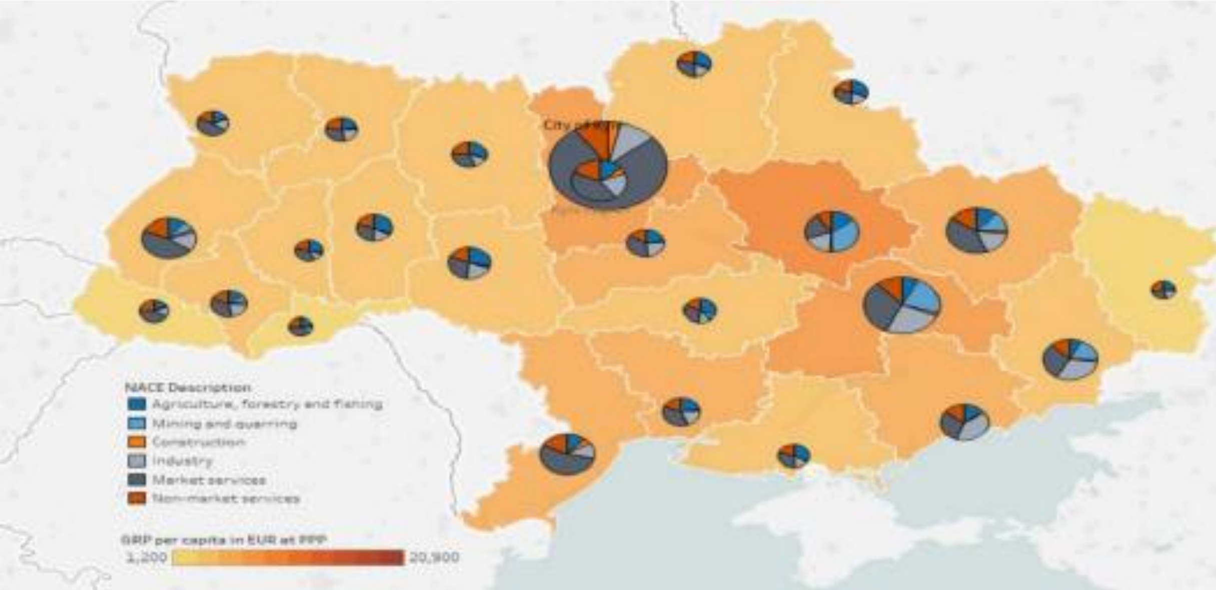

Figure 2: Gross Regional Product per Capita in Ukraine[1]

4.4 Population Overview

As shown in Table 1 below, Ukraine has a population of approximately 41.1 million people (excluding the territories temporarily occupied by the Russian Federation and parts of the territories where hostilities have been ongoing as of 2022). Population distribution across the country is highly uneven, influencing both the scale and complexity of municipal infrastructure needs, particularly wastewater management. The population distribution by oblast is shown in Table 1. The most populous regions include Donetsk (over 4.0 million), Dnipropetrovsk (3.1 million), Kharkiv (2.6 million) and Kyiv City (2.9 million), all of which are also major centres of industrial activity. These densely populated and industrialised areas generate disproportionately high volumes of municipal wastewater, placing significant pressure on existing sewer networks and treatment facilities and subsequently on the environment. In contrast, several regions, such as Chernivtsi (889,928 residents) and Kirovohrad (902,275 residents), have relatively small populations and lower levels of urbanisation, resulting in smaller overall volumes of wastewater.

Table 1: Population Distribution in Administrative Regions of Ukraine[4]

Administrative Region	Population	% of Population
Vinnytska	1,507,738	3.67
Volynska	1,020,770	2.48
Dnipropetrovska	3,093,151	7.52
Donetska	4,056,405	9.86
Zhytomyrska	1,177,564	2.86
Zakarpatska	1,243,721	3.02

Zaporizka	1,636,322	3.98
Ivano-Frankivska	1,350,565	3.28
Kyivska	1,795,542	4.38
Kirovohradska	902,275	2.19
Luhanska	2,101,653	5.11
Lvivska	2,476,113	6.02
Mykolaivska	1,090,492	2.65
Odeska	2,349,749	5.71
Poltavska	1,350,564	3.28
Rivnenska	1,140,902	2.77
Sumska	1,034,364	2.52
Ternopilska	1,020,953	2.48
Kharkivska	2,596,250	6.31
Khersonska	1,000,370	2.43
Khmelnytska	1,227,474	2.98
Cherkaska	1,159,200	2.82
Chernivetska	889,928	2.16
Chernihivska	957,665	2.33
Kyiv City	2,950,702	7.17
Total	41,130,432	100

As of 2022, Ukraine's population was distributed across 357 cities (19.6 million residents), 571 townships (2.3 million residents) and 24,447 villages (10.3 million residents)[5]. Urban areas dominate industrialised oblasts such as Dnipropetrovsk and Kharkiv, where the urban population significantly outweighs the rural population. This urban concentration amplifies the demand for modern, energy-efficient wastewater treatment infrastructure, while rural areas require cost-effective decentralised or nature-based solutions to address wastewater challenges (see also Chapter 6.2).

The volume of municipal wastewater depends directly on population size. The distribution of the population between urban and rural areas also influences wastewater volumes and treatment capacities. The disparity between urban and rural population distribution further shapes wastewater management challenges. Urban populations, concentrated primarily in the industrialised eastern and central regions, typically generate larger volumes of wastewater with more complex pollutant profiles, requiring advanced treatment processes. Conversely, rural populations produce lower volumes of wastewater, much of which is untreated due to limited sewer connectivity, leading to localised environmental impacts.[6]

5 Wastewater Generation

5.1 Wastewater Volumes

Figures on wastewater identified in the documents used for this report are generally expressed in m^3/day. While this metric is relevant for the hydraulic dimension of wastewater management, it does not distinguish between the types of wastewater generated, transported and discharged, such as industrial, domestic and cooling water, and is insufficient to cover the pollution component. In principle, wastewater refers to water that is of no further immediate value for the purpose for which it was used or produced; however, wastewater from one user may still represent a potential supply for another user.[51] It should be noted, however, that Eurostat excludes cooling water from wastewater statistics due to the volumes it can represent, which can significantly distort the statistics. The UWWTD (91/271/EEC) uses 'population equivalent' (p.e.) to express wastewater pollution in a standardised way. Under Article 2(6), one p.e. means the organic biodegradable load with a five-day biochemical oxygen demand (BOD_5) of 60 g of oxygen per day. This metric is also used to describe the treatment performance of biological treatment based on two key organic pollution parameters: BOD_5 and COD.[52] To observe and understand the status of all wastewater facilities (load generated by agglomerations, load transported by sewers and treated in treatment plants and loads discharged to aquatic environment), it is strongly recommended to enhance the information system by also collecting information on pollution generated, transported and discharged.

In 2020, approximately 63% of the water abstracted in Ukraine was discharged as wastewater, and only part of it was effectively treated, highlighting the significant burden on the country's treatment infrastructure. A notable exception is Kherson Oblast, where less than 5% of abstracted water was discharged as wastewater, reflecting the region's high reliance on irrigation, which accounts for most water use. In 2022, the volume of domestic wastewater produced was estimated at 1.47 km^3, equivalent to 1,470 million m^3 corresponding to an average of 96 litres per person per day.[1]

The largest contributors to wastewater generation and pollution loads are urban centres with populations exceeding 500,000, where dense populations and concentrated industrial activity drive high wastewater loads.[1] The total volume of wastewater collected in 2023 amounted to 1,136.29 million m^3, with significant regional disparities.[7] The volume of wastewater collected from the respective administrative regions is given in Table 2. Kyiv City, Dnipropetrovsk Oblast and Kharkiv Oblast were the largest contributors, reflecting their high population density and industrial activity. Conversely, less populated regions such as Khersonska and Chernihivska contributed marginally to national totals. Although Donetska and Lvivska regions have large populations, they were not identified as producing high volumes of wastewater when compared with other regions.

Table 2: Volume of Wastewater Collected in Ukraine by Region[7]

Administrative Region	Volume of WW Collected (million m³/ year)	% of WW Collected
Vinnytska	28.5	2.5
Volynska	20.2	1.8
Dnipropetrovska	222.3	19.6
Donetska	15.2	1.3
Zhytomyrska	24.1	2.1
Zakarpatska	32.1	2.8
Ivano-Frankivska	36.0	3.2
Zaporizka	37.1	3.3
Kyivska	36.3	3.2
Kirovohradska	16.5	1.5
Lvivska	28.2	2.5
Mykolaivska	24.1	2.1
Odeska	74.6	6.6
Poltavska	42.0	3.7
Rivnenska	18.3	1.6
Ternopilska	17.3	1.5
Kharkivska	137.7	12.1
Khersonska	8.4	0.7
Khmelnytska	32.9	2.9
Cherkaska	24.7	2.2
Chernivetska	17.4	1.5
Chernihivska	13.2	1.2
Kyiv City	229.3	20.2
Total	1,136.3	100

Over recent years, there has been a gradual decline in the total volume of wastewater generated and discharged, including polluted and insufficiently treated discharges. This reduction is largely attributable to decreased industrial production, which resulted in reduced volumes of wastewater discharged from industries during the COVID-19 pandemic (2020–2021) and the subsequent disruptions caused by the ongoing conflict following the full-scale invasion by the Russian Federation in 2022. Despite these reductions, wastewater remains a significant environmental challenge. In 2024, a total of 3,121.881 million m³ of wastewater was discharged into surface water bodies, of which 328.622 million m³ (10.53%) was polluted wastewater, 1,095.134 million m³ (35.08%) was treated in compliance with regulatory standards and 1,698.125 million m³ (54.39%) was discharged without treatment despite meeting regulatory discharge conditions.[5]

Although the overall volume of wastewater entering treatment facilities has decreased, this trend has resulted in higher concentrations of pollutants in the wastewater streams.[7] Elevated levels of organic matter, nitrogen, phosphorus and synthetic surfactants pose additional challenges for treatment plants, increasing operational demands and costs while highlighting the need for process optimisation and enhanced energy efficiency.

5.2 Sewer Network Connections

Most cities in Ukraine rely on combined drainage systems, which frequently bypass municipal treatment plants during rain events, discharging untreated or partially treated effluents directly into surface waters. This long-standing practice significantly contributes to pollutant loads in rivers and other water bodies. The overall state of Ukraine's sewer infrastructure is poor and deteriorating, with substantial portions of the system requiring urgent rehabilitation[1]. As of 2023, the centralised sewage network (excluding the territories temporarily occupied by the Russian Federation and parts of the territories where hostilities have been ongoing) spans 35,279 km, of which 41.5% (14,628 km) is classified as dilapidated or damaged.[5] The war has led to a redirection of priorities, meaning that maintenance and replacement rates remain critically low: only 105 km (0.7%) of the network was replaced in 2023.

The most severely degraded centralised sewerage networks are concentrated in Donetsk (67.4% requiring replacement), Zaporizhzhia (64.4%), Kharkiv (63.2%), Kherson (61.4%), Volyn (56.4%), Kirovohrad (55.3%) and Zhytomyr (50.6%) oblasts. In contrast, Kyiv City reported relatively lower levels of deterioration, with 23–29.8% of its network needing replacement.[5] Network replacement rates remain low nationwide, with the highest percentages achieved in the Chernivtsi (4.7%), Kyivska (3.4%) and Zakarpattia (3.2%) oblasts, while Vinnytsia and Kherson recorded no network replacement activities in 2023.[7]

According to the public database (WHO/JMP in 2022), approximately 52% of the population is connected to the sewer network and 33% to centralised WWTPs. Significant urban–rural disparities persist in sewerage coverage and wastewater collection. According to the UNEP report, 97% of towns and cities are served by centralised drainage systems, while coverage drops sharply to 64% in smaller towns and just 1.8% in rural settlements.[1] While the WHO/JMP report states that 73 % of the population in urban areas is connected to sewer networks, in rural areas it is only 3% (Figure 3). The discrepancies between various data sources show the importance of proper monitoring and reporting systems in the wastewater sector. In underserved areas, households and businesses rely on decentralised, unregulated systems such as settling tanks, cesspools and unlined lagoons, which often lack waterproofing and sealing. These systems pose a high risk of groundwater contamination and surface water pollution due to leakage and uncontrolled discharge.

Additionally, 18 cities across 10 oblasts, including Siversk, Sviatohirsk, Toretsk, Zalizne (Donetsk Oblast), Huliaipole (Zaporizhzhia Oblast), Berestechko and Ustilug (Volyn Oblast), Blahovishchenske (Kirovohrad Oblast) and several smaller cities in Lviv, Ternopil, Cherkasy, Chernivtsi and Chernihiv oblasts, currently lack any centralised drainage system, further exacerbating localised environmental and public health challenges.[7]

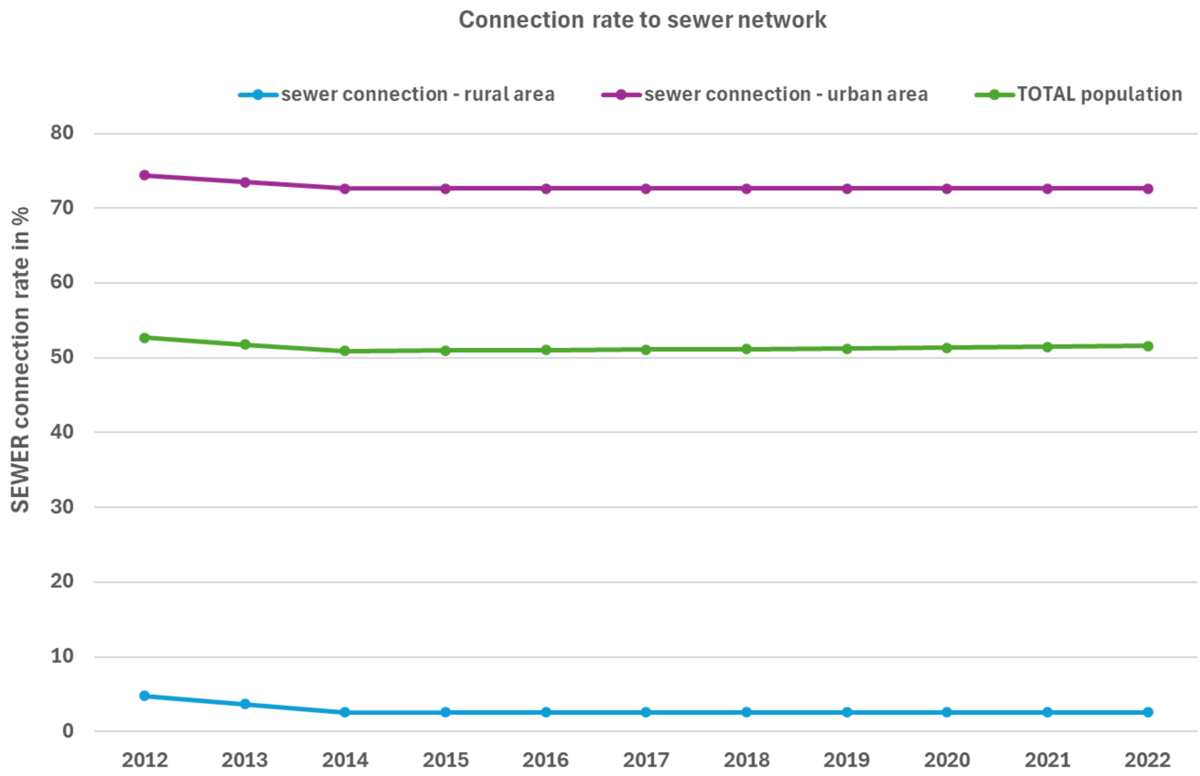

Figure 3: Development of Sewer Connection Rate in Urban and Rural Areas in Ukraine Between 2012 and 2022 (Source: WHO/JMP 2023)

It should be noted that the discharge of untreated or poorly treated wastewater generally entails both environmental and health risks. The health risks are related, among other facts, to access to safe drinking water: poor management of wastewater may contaminate groundwater or surface water used as a drinking water source, as well as aquatic environments used by people for leisure, navigation, etc. On the environmental side, wastewater discharged untreated leads to an increase in the amount of organic matter in surface water, which may generate issues with dissolved oxygen (odours, fish kills and shifts in aquatic biodiversity) and enrichment in nutrients, which in turn creates eutrophication and contamination by harmful substances.

The RBMPs (see Chapter 6.6) all identify a significant proportion of surface water as having bad chemical status and a proportion of water bodies as having less than good ecological status. As a first priority in the programme of measures, they identify the improvement of sanitation, both in terms of collection and treatment.

6 Wastewater Management

6.1 Wastewater Treatment

According to the national report, in 2023, a total of 1,136 million m³ of wastewater was collected across Ukraine, of which 99.2% (1,127 million m³) underwent some form of treatment.[7] Within this volume, 1,061 million m³ (93.4%) received biological treatment, while 91 million m³ (8%) underwent additional treatment processes (such as tertiary treatment). Region-specific data on WW treatment are shown in Table 4. The difference between the volume of wastewater collected and the volume received at least initial treatment can be attributed primarily to losses occurring within the sewerage network, most likely as a result of leakages. A full cycle of biological treatment (also referred to as secondary treatment under the UWWTD) for all wastewater collected was achieved in Volynska, Donetska, Ivano-Frankivska and Khmelnytska oblasts, and in Kyiv City, demonstrating complete compliance with national treatment standards in these regions. Other oblasts with notably high levels of biological treatment included Zaporizhzhia (99.9%), Rivne (99.5%), Kherson (98.9%), Poltava (98.6%) and Mykolaiv (98.3%). In contrast, Dnipropetrovsk Oblast recorded the lowest biological treatment rate, at 80%, underscoring significant regional disparities in treatment performance and highlighting the need for targeted investments in process upgrades and operational optimisation to achieve compliance across the country. The current war and associated significant destruction of all or part of this infrastructure have also led existing services, working with remaining staff and available technical resources, to prioritise urgent maintenance and repair works over renovation or infrastructure upgrades.

Table 3: Regional Distribution of Treated Wastewater Volumes (2023)[7]

Administrative Region	Volume Collected (million m³/year)	Volume Treated (million m³/year)	Biologically Treated (million m³/year)	Additionally Treated (million m³/year)
Vinnytska	28.5	27.6	27.4	0.1
Volynska	20.2	21.7	21.7	n/a
Dnipropetrovska	222.2	220.2	177.9	1.3
Donetska	15.2	15.2	14	0.6
Zhytomyrska	24.1	23.3	22	n/a
Zakarpatska	32.1	31.9	27.8	n/a
Ivano-Frankivska	36.0	36.0	36.0	n/a
Zaporizka	37.1	37.1	37.1	0.4
Kyivska	36.3	36	34.4	0.3
Kirovohradska	16.5	16.2	14.0	11.5
Lvivska	28.2	27.6	26.1	2.4
Mykolaivska	24.1	24.1	23.7	n/a

Odeska	74.6	73.8	71.0	0.3
Poltavska	42.0	41.8	41.4	25
Rivnenska	18.3	18.2	18.2	n/a
Ternopilska	17.3	17.3	15.6	15.5
Kharkivska	137.7	137.2	133.1	0.6
Khersonska	8.4	8.4	8.3	n/a
Khmelnytska	32.9	32.9	32.9	n/a
Cherkaska	24.7	24	22.6	21.1
Chernivetska	17.4	14.4	14.1	n/a
Chernihivska	13.2	13.2	12.7	12.3
Kyiv	229.3	229.3	229.3	n/a
Total	1,136.3	1,127.3	1,061.3	91.5

Most WWTPs in Ukraine continue to provide biological treatment, focusing on carbon removal and managing biosolids through dewatering and stabilisation. Biological treatment produces high quantities of sludge, which can, after dewatering, be used for energy recovery processes. Nutrient removal (nitrogen and phosphorus) remains rare, resulting in treated effluents with elevated nutrient concentrations. These discharges contribute to algal blooms and the eutrophication of receiving water bodies. However, the 91.48 million m^3 of wastewater that receives tertiary treatment shows the potential for treated water reuse.

The settlements are divided into cities, townships and villages, with cities and townships considered urban areas and villages considered rural areas. Among the country's 357 cities, 339 (95%) are connected to centralised wastewater treatment systems, ensuring nearly full coverage in major urban centres. However, depending on the oblast, a significant share (5–40%) of the population is still not connected to a treatment plant, as illustrated in Table 5 below. In townships, the coverage rate drops to 381 out of 571 (66.7%), while in villages, only 429 of 24,447 (1.8%) have access to centralised sewage services.[5] Notably, Mykolaivska Oblast is the only region where all townships are fully covered, a level of service not observed in any other oblast.

Despite high levels of urban coverage, a substantial share of the population remains unserved. In 2023, approximately 15 million people lacked access to centralised wastewater treatment services.[5] The urban population (cities and townships combined) connected to such services did not exceed 77% between 2022 and 2023, while access for the rural population was extremely limited, at just 3.6% in 2023.[5]

Region-specific data on the coverage of settlements and population with centralised wastewater treatment services are presented in Table 5, highlighting significant disparities across oblasts. While urban areas show relatively high coverage rates, particularly in cities, the data underscore the limited access in rural areas.

Table 4: Percentage of Population and Settlement Connected to Centralised Wastewater Treatment Services[7]

Administrative Region	% Population Connected to Centralised WWT			
	Total	Cities	Townships	Villages
Vinnytska	37.4	71.4	61.2	2.2
Volynska	63.8	72.9	71.4	9.9
Dnipropetrovska	60.6	74.1	37.6	4.8
Donetska	56.5	61.2	21.4	2.6
Zhytomyrska	38.5	65.8	45.3	4.0
Zakarpatska	27.6	83.5	38.9	1.3
Ivano-Frankivska	37.1	84.6	38.3	5.7
Zaporizka	64.8	73.4	1.9	2.9
Kyivska	64.4	99.6	92.3	9.7
Kirovohradska	63.7	77.1	62.3	2.7
Lvivska	56.0	94.5	42.0	2.0
Mykolaivska	61.0	79.4	69.8	21.3
Odeska	57.3	87.6	36.4	2.5
Poltavska	38.8	66.7	16.6	2.0
Rivnenska	31.3	72.4	40.1	1.5
Sumska	51.0	77.4	22.7	2.3
Ternopilska	41.4	96.1	58.7	0.3
Kharkivska	64.0	83.3	21.3	5.4
Khersonska	52.9	98.2	24.1	7.6
Khmelnytska	40.2	71.8	36.0	1.2
Cherkaska	36.3	60.9	16.8	1.5
Chernivetska	30.5	65.8	31.5	0.0
Chernihivska	37.0	56.8	27.3	1.2
Kyiv City	n/a	n/a	n/a	n/a

While the collection and treatment situation presented above is highly diverse and the number of people without wastewater collection is significant (15 million), it is clear that significant effort will be necessary to improve wastewater management. In this respect, it should be noted that in an urban context, the usual approach in many countries, and probably also in Ukraine, has been to collect rainwater runoff together with wastewater. However, in the recent past, increasing variability in rainfall and rainfall intensity has led many European countries and cities to develop separate sewer systems and reduce impervious areas in cities as much as possible, while managing rainwater through a set of nature-based solutions such as infiltration ponds, rain trees and rain gardens. Most soils are able to infiltrate water from typical rainfall events, allowing rainwater to be managed locally with various benefits, including the creation of green spaces, reduced heat in summer and enhanced biodiversity, while also reducing the burden on the sewer networks and WWTPs. Many of these techniques require mainly hydraulic adjustments for rainwater collection and gardening skills that are often already available within municipal services. In parallel, wastewater service managers should also regularly investigate and track sewers to ensure they do not drain shallow groundwater or are improperly used to drain ponds or other clean water tanks and swimming pools.

The introduction of separate sewer systems is recommended, as rainwater does not require treatment and diverting it from the wastewater network can significantly reduce hydraulic loads and lower operational costs. Too much rainwater or clean water mixed with wastewater is likely to create operational difficulties for biological treatment processes, which require sufficient organic load to function effectively. Therefore, measures to reduce rainwater and clean water introduction into sewers should accompany any long-term planning for sewer separation and treatment system upgrades.

6.2 Wastewater Treatment Plants

As of 2023, Ukraine (excluding the territories temporarily occupied by the Russian Federation and parts of the territories where hostilities have been ongoing) had a total of 545 centralised WWTPs (Figure 4). The majority of these facilities are small-scale plants, reflecting the decentralised and fragmented nature of wastewater treatment infrastructure across much of the country. Out of the total 545 WWTPs, 300 (54%) have a design capacity of up to 700 m³/day, 188 WWTPs (33.9%) operate with capacities ranging from 700 to 17,000 m³/day, 34 WWTPs (6.1%) are medium-to-large facilities with capacities of more than 17,000 to 40,000 m³/day and 23 WWTPs (4.1%) are large-scale plants with design capacities exceeding 40,000 and up to 130,000 m³/day.[7] The sector is dominated by small- to medium-sized facilities, with 90% of plants serving between 1,000 and 150,000 population equivalents (p.e.), while only 30 plants are designed to treat loads exceeding 150,000 p.e.[1]

Figure 4: Distribution of Wastewater Treatment Plants According to HYDROWASTE Database (2023)[1]

According to the report by the Ministry for Communities and Territories Development of Ukraine, the physical condition of these facilities is critical, with approximately 397 WWTPs requiring reconstruction or modernisation. Out of these, only 17 plants (4.3% of those requiring upgrades and 2.4% of the total stock) underwent partial or full reconstruction in 2023. Among the plants in need of modernisation, 82 require the addition of tertiary treatment systems for nitrogen and phosphorus removal to align with European Union discharge standards.[7]

The combined actual treatment capacity of all WWTPs stood at 1,375 million m³/year, while their design capacity totalled 3,999 million m³/year, which is nearly three times greater than the current volumes being processed. Regionally, the distribution of WWTPs and their capacities varies considerably (see Table 6). The largest treatment capacities are found in Kyiv City (229 million m³/year), Vinnytska (148 million m³/year) and Kharkivska (142 million m³/year) oblasts, while Khersonska (8 million m³/year) and Cherkaska (10 million m³/year) have the smallest operational capacities.

Table 5: Regional Distributions of Wastewater Treatment Plants, Their Capacity and Energy Consumption (2023)[7]

Administrative Region	Number of WWTPs	Volume of WW Treated per Oblast (Million m³/year)	Energy Consumption of WWT Service per Oblast (Million kWh/year)	Specific Energy Consumption (kWh/1,000 m³ of wastewater)
Vinnytska	34	147.7	20.5	719.3
Volynska	7	21.7	14.6	719.7
Dnipropetrovska	55	182.8	162.1	729.2
Donetska	21	31.4	54.9	n/a
Zhytomyrska	54	66.6	21.0	917.9
Zakarpatska	16	71.8	10.6	331.3
Ivano-Frankivska	26	36.0	10.9	301.6
Zaporizka	6	37.8	19.2	518.0
Kyivska	50	36.1	24.0	661.0
Kirovohradska	26	17.8	12.7	767.1
Lvivska	53	44.1	47.2	n/a
Mykolaivska	46	39.4	23.8	988.0
Odeska	37	70.5	n/a	n/a
Poltavska	32	51.0	25.2	599.0
Rivnenska	29	10.8	11.2	610.5
Sumska	35	24.8	14.7	858.0

Ternopilska	24	21.3	13.7	792.0
Kharkivska	59	142.5	51.3	372.0
Khersonska	2	8.2	2.2	259.0
Khmelnytska	36	32.9	23.0	699.0
Cherkaska	19	9.9	11.0	445.3
Chernivetska	26	36	6.7	386.8
Chernihivska	22	18.8	12.6	954.6
Kyiv City	1	229.3	129.1	563.0

To date, the main document that publishes the results of wastewater monitoring is the National *Report on the Quality of Drinking Water and the State of Drinking Water Supply and Sewage in Ukraine*. The wastewater data collection system in the country relies on the Research, Design and Technology Institute of Urban Economy in Kyiv to collect and consolidate information from individual wastewater treatment plants for inclusion in national reports. Although aggregate data on wastewater treatment are available at the national and regional levels through published reports, detailed data at the level of wastewater treatment plants remain largely unavailable in Ukraine. A nationwide monitoring for wastewater with explicit requirements in terms of frequency and parameters does not appear to exist in Ukraine at present, and the situation seems to be known mostly by local authorities. To overcome these limitations, data for this baseline assessment were compiled from multiple sources, including RBMPs, project documentation from various development initiatives, direct engagement with the Ukrvodokanalekologiya Association (Ukrainian Water Utility Association) and Expression of Interest (EoI) forms submitted by water utilities.

Through the consolidation of information from multiple sources, basic operational details were compiled for 50 WWTPs across Ukraine. While design treatment capacity data were available for all facilities, ranging from 2,200 to 1,200,000 m³/day, the dataset shows notable gaps, including information on the actual volume of wastewater treated. Treatment performance status was documented for only 28 plants and modernisation plans were available for 29 plants. Modernisation plans refer to improvement measures identified by WWTP authorities that are intended to be implemented in the near future, subject to the availability of financial resources. No information was found on energy consumption, influent or effluent water quality parameters or sludge generation for any of the facilities. The absence of these key data points significantly limits the ability to conduct a quantitative assessment of energy optimisation and resource recovery potential. The consolidated baseline inventory of the 50 WWTPs is summarised in Table 7. This table shows that many treatment plants have an actual hydraulic load far below design capacity: only nine have an actual hydraulic load above 60% of the maximum volume of wastewater it can treat. Four plants are operating very close to their design capacity, which could create performance issues now or in the near future. For the remaining 38 plants operating below 60% of design load, maintaining stable treatment performance throughout the year can be challenging. Low hydraulic loading often results in oversized equipment, longer retention times and suboptimal biological conditions, all of which can negatively affect process stability. The extent of these impacts depends strongly on the plant configuration, whether it has a single treatment line or multiple flow pathways that allow operators to reduce effective hydraulic capacity by taking units out of service during low-flow periods.

Table 6: List of WWTPs, Including Modernisation Plans

WWTP	Administrative Region	Design Capacity (million m^3/year)	Actual Volume of WW Treated in 2024 (million m^3/year)	Treatment Performance	Modernisation Plans
WWTP Kyiv	Kyiv	438.0	238.3	n/a	n/a
WWTP Kharkiv	Kharkiv	365.0	113.1	n/a	n/a
WWTP Zaporizhzhia	Zaporizhzhia	73.0	34.7	n/a	n/a
WWTP Dnipro	Dnipro	127.6	68.9	n/a	n/a
WWTP Lviv	Lviv	127.8	102.2	n/a	n/a
WWTP Cherkasy	Cherkasy	109.5	16.8	Insufficient	n/a
WWTP Kherson	Kherson	18.3	8.9	n/a	n/a
WWTP Rivne	Rivne	36.5	12.9	n/a	n/a
Infoxvodokanal	Odesa	136.9	69.5	n/a	n/a
WWTP Sumy	Sumy	18.3	10.0	n/a	n/a
WWTP Vinnytsia	Vinnytsia	54.8	22.9	n/a	n/a
WWTP Khmelnytsky	Khmelnytskyi	36.5	18.2	n/a	n/a
WWTP Zhytomyr	Zhytomyr	27.4	13.4	n/a	n/a
WWTP Drohobych	Lviv	36.5	10.7	Sufficient	Replace energy-intensive equipment with energy-efficient equipment

WWTP Chernihiv	Chernihiv	34.3	12.9	n/a	n/a
Vodoecotehprom	Ivano-Frankivsk	54.8	28.1	Sufficient	Capacity increase
WWTP Kamianets-Podilskyi	Khmelnytskyi	18.3	6.4	Sufficient	n/a
WWTP Chernivtsi	Chernivtsi	36.5	12.8	n/a	n/a
WWTP Mykolaiv	Mykolaiv	32.9	n/a	n/a	n/a
WWTP Kropyvnytskyi	Dnipro-Kyrovograd	21.9	n/a	Insufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Poltava	Poltava	47.5	21.4	n/a	n/a
WWTP Uzhhorod	Zakarpattia	18.3	18.5	Sufficient	Capacity increase
WWTP Kremenchuk	Poltava	17.5	17.7	Sufficient	Repair of bioreactor aeration system, air blower, pumping station, upgrade to SCADA system, installation of rooftop solar plant, energy efficiency of administrative building and sludge treatment
WWTP Lutsk	Volyn	43.8	16.3	n/a	n/a
WWTP Izmail	Odesa	15.3	n/a	Sufficient	Capacity increase

WWTP Uman	Cherkasy	5.5	2.4	Sufficient	Replace energy-intensive equipment with energy-efficient equipment
WWTP Fastiv	Kyiv	11.3	n/a	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Mukachevo	Zakarpattia	9.7	n/a	Sufficient	Capacity increase
WWTP Novovolynsk	Volyn	8.3	n/a	Sufficient	Capacity increase
WWTP Kovel	Volyn	3.7	2.4	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Kolomyia	Ivano-Frankivsk	7.3	6.3	Sufficient	Capacity increase
WWTP Shepetivka	Khmelnytskyi	6.2	n/a	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Zhmerinka	Vinnytsia	5.8	n/a	Insufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Nizhyn	Chernihiv	1.8	1.5	n/a	Construction of sludge site maps, sewage treatment plant

					and dehydration unit
WWTP Kamianske	Dnipropetrovsk	4.9	n/a	n/a	Infrastructural development (tertiary treatment and pumping station)
WWTP Khust	Zakarpattia	4.9	n/a	Insufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Mohyliv-Podilskyi	Vinnytsia	4.0	n/a	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Khmilnyk	Vinnytsia	0.7	0.7	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Slavuta	Khmelnytskyi	1.1	0.7	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Korosten	Zhytomyr	3.7	n/a	Sufficient	Capacity increase
WWTP Bilhorod-Dnistrovskyi	Odesa	3.1	n/a	Insufficient	Capacity increase
WWTP Zolochiv	Lviv	2.7	0.7	n/a	n/a

WWTP Podilsk	Odesa	2.7	n/a	Insufficient	Capacity increase
WWTP Dubno	Rivne	1.8	1.1	Insufficient	Capacity increase
WWTP Zolotonosha	Cherkasy	1.5	n/a	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Chortkiv	Ternopil	1.5	n/a	Insufficient	Capacity increase
WWTP Ovruch	Zhytomyr	1.4	n/a	Sufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Horodok	Lviv	1.0	0.3	n/a	Replacement of aeration pipes of the first aeration line
WWTP Kaniv	Cherkasy	1.8	0.9	Insufficient	Infrastructural development (tertiary treatment and pumping station)
WWTP Pustomyty	Lviv	0.8	n/a	Insufficient	Replacement with modern energy-saving equipment and reconstruction of wastewater networks

The data indicate a diverse portfolio of wastewater treatment facilities across Ukraine’s regions, with overall capacity disproportionately concentrated. Treatment performance, defined as the degree to which treated effluent meets nationally regulated parameter limits, was available for 28 facilities. Of these, 19 demonstrated sufficient performance, while nine reported insufficient treatment outcomes. Where modernisation plans are documented, they commonly focus on capacity expansion, infrastructural upgrades (particularly tertiary treatment processes and pumping stations) and equipment replacement to improve energy efficiency. Several facilities also identified targeted energy-related interventions, such as aeration system upgrades and the development of sludge-handling infrastructure, which are priority areas that align closely with the objectives of the programme.

Although the analysis above does not examine the situation of smaller communities in detail, these communities should not be overlooked, as proper wastewater management is necessary to protect the quality of surface and groundwater. In the European context, this part of wastewater management remains in the hands of national and local authorities, as the UWWTD only requires that collected wastewater be treated before discharge into surface water (including when it is collected in smaller communities with fewer than 1,000 p.e.) and that all necessary measures are taken to protect the aquatic environment from the adverse effects of any wastewater discharges. In other words, individual households and small communities should use so-called 'appropriate treatment' for their wastewater before discharge. In this respect, and particularly in rural areas where sufficient space is available, nature-based solutions for treating urban wastewater could be an interesting option, as they require less complex infrastructure and are generally easier to maintain. Various types of constructed wetlands can be used, such as combinations of anaerobic pretreatment (baffled reactors or septic tanks) with horizontal- or vertical-flow reed beds, vertical-flow reed beds combined with secondary vertical- or horizontal-flow reed beds, or a set of natural or aerated lagoons. A polishing pond can also be used as a final stage of treatment. This type of infrastructure is far less resource-intensive and can be maintained by trained local stakeholders, as it mainly requires limited maintenance, mostly regular cutting of reed beds, pumping of sludge in lagoons and control of water flow through the system.

A general approach to identifying locally suitable nature-based solutions, such as constructed wetlands for wastewater treatment or rain gardens and other runoff management solutions, is available in the *Catalogue of Nature-based Solutions*, published by the EU4Environment – Water and Environmental Data Programme in 2024.[53]

Under the current EU4GRE project, a regional framework note for the implementation of nature-based solutions is expected to provide guidance on implementing such projects, particularly for wastewater treatment. This note will be developed in the coming year.

6.3 Energy Consumption

In 2023, wastewater treatment systems across Ukraine (excluding Luhanska Oblast) consumed approximately 763.15 million kWh of electricity for the treatment of 1,126.92 million m^3 of water, corresponding to a specific energy consumption of 0.67 kWh per cubic metre of wastewater.[7] Energy use varies considerably across regions, which may be influenced by differences in treatment volumes, plant size, operational efficiency and process configurations (see Table 6). The highest electricity consumption was recorded in Kyiv City (129.1 million kWh/year) and Dnipropetrovska Oblast (162.1 million kWh/year). Conversely, oblasts with smaller populations and lower treatment capacities, such as Khersonska (2.2 million kWh/year) and Chernivetska (6.7 million kWh/year), demonstrate significantly lower energy demand. However, because no information on treatment performance, pollutant removal or effluent quality is available, it is not possible to draw any conclusions about the energy efficiency of the wastewater treatment plants. The reported value reflects only the energy consumption per cubic metre and does not indicate how effectively the plants treat wastewater.

Regional differences in specific energy consumption (kWh per 1,000 m³) could indicate opportunities for optimisation. Several oblasts exhibit particularly high energy intensities, including Zhytomyrska (917.9 kWh/1,000 m³), Mykolaivska (988 kWh/1,000 m³) and Chernihivska (954.55 kWh/1,000 m³).

Regional-level energy consumption data offer only a generalised picture. High consumption at one facility may be offset by low consumption at another within the same oblast, resulting in an averaged value that masks individual plant performance. As such, regional data alone are insufficient for identifying specific facilities with high energy demand where efficiency improvements would have the greatest impact. To enable accurate assessment and prioritisation of energy-efficient interventions, plant-level energy consumption data for each WWTP are essential. Unfortunately, this level of data is not stored in any centralised databases, making it necessary to conduct plant-level assessments to obtain this information.

6.4 Sludge Management

Sludge management remains a significant challenge within Ukraine's wastewater treatment sector due to limited data availability, ageing infrastructure and insufficient investment in modern treatment technologies. Although a legal framework exists to some extent (see Chapter 7.1.4), micropollutant contamination resulting from discharges from economic activities into sewers, together with limited sludge-drying equipment, restricts possible uses. In addition, the current legal framework imposes certain limitations on agriculture use and will need to be strengthened to align with the EU framework. Sludge drying beds across many facilities are reported to be overloaded, reflecting broader systemic constraints.[1] National statistics on sludge generation are not formally collected. However, for 2023, the volume of freshly generated sludge was estimated based on total wastewater treated nationwide and reported in the *National Report on Quality of Drinking Water and the State of Drinking Water Supply and Wastewater Treatment in Ukraine (2023)*. This report indicates approximately 338,000 tonnes per year of sludge at 97% moisture content.[7] At this level of moisture content, the quantity of dry sludge would be only 10,140 tonnes/year, i.e. less than the amount reported by Luxembourg (12,500 tonnes of dry sludge in 2022) with 645,000 inhabitants in 2022, which is a very low value considering the volume of wastewater reported as treated in the country. The total accumulated volume of sludge stored at wastewater treatment facilities remains unknown, though expert assessments suggest it may range between 50 and 80 million cubic metres, highlighting the scale of legacy management issues.[7]

In recent years, sludge handling has received increased attention, and several utilities, including Cherkasyvodokanal, Kharkivvodokanal, Ternopilvodokanal and Vinnytsia Oblvodokanal, have incorporated sludge treatment investments into their modernisation plans. In 2022, three national targets were approved to support improved sludge management: (i) encouraging business entities to adopt modern sludge treatment technologies, (ii) reducing the volume of sludge produced and (iii) carrying out reclamation of land currently used for sludge storage. The development of an integrated sludge management system, emphasising advanced treatment, resource recovery and safe disposal, has also been included in the national recommendations for improving centralised wastewater treatment.

However, progress remains limited. Insufficient financing has constrained the adoption of modern wastewater and sludge treatment technologies, meaning that processes such as nitrification–denitrification and phosphorus removal are still not widely implemented. Currently, no centralised WWTPs in Ukraine operate fully integrated treatment workflows that include all key stages of wastewater and sludge management.[5] Nonetheless, some facilities have advanced individual sludge treatment initiatives. ME 'Chornomorskvodokanal' previously implemented a sludge dewatering system, though by 2023 the equipment required repair due to corrosion. Modernisation of sludge treatment is planned within the reconstruction of the Bortnytska Aeration Station in Kyiv and thermal treatment upgrades are anticipated at ME 'Zhytomyrvodokanal'. Additionally, modular sludge dewatering stations (screw dehydrators) were installed at ME 'Vodokanal Uzhhorod' and ME 'Lutskvodokanal' during 2022–2023, demonstrating incremental progress toward improved sludge-handling capacity.

6.5 Opportunities for Improvement

Within the framework of the EU4GRE Programme, emphasis is placed on enhancing energy efficiency and exploring opportunities for energy recovery at wastewater treatment facilities, including through by-product valorisation such as biogas production from sewage sludge.

The programme aims to identify two to three WWTPs that can receive targeted support for energy-efficiency improvements and climate resilience measures. However, the site selection process faces substantial challenges stemming from systemic data deficiencies across Ukraine's wastewater treatment sector. Critical operational parameters, including pollutant concentrations at plant inlets and outlets, energy consumption profiles and quantitative and qualitative characteristics of sludge production, are not available at the WWTP level. Although data are available at the regional level, they do not support in the selection of pilot sites. These data gaps significantly constrain evidence-based decision-making and complicate the identification of facilities with the greatest potential for energy efficiency and recovery interventions.

To address these challenges, a comprehensive site selection strategy has been formulated to ensure a transparent and equitable selection process. The primary objective is to identify locations where proof-of-concept activities can be implemented within the coming two years, demonstrating practical measures for improving energy efficiency (EE) in overall WWTP operations and enabling energy recovery (ER) from sewage sludge. The strategy encompasses two principal components.

First, clear selection criteria have been established to evaluate and shortlist eligible WWTPs, ultimately identifying two to three pilot sites nationwide. These criteria account for data availability, geographic consideration, treatment capacity, operational status and potential for replication of successful interventions at other facilities.

Second, active engagement with key stakeholders in Ukraine's wastewater sector has been prioritised to leverage existing knowledge, coordinate interventions and identify potential synergies. Several coordination meetings were conducted with other stakeholders engaged in activities related to the wastewater sector in Ukraine. The stakeholders included the Ukrvodokanal Association, the UNICEF Water Supply and Sanitation (WSS) working group, the Life-U-Spring project and UNIDO partners working with the BMZ project. The programme objectives and pilot site selection approach were also presented at the Lviv Ecoforum 2025 to raise awareness among potential beneficiaries and solicit broader sector engagement. An Expression of Interest (EoI) was disseminated to facilitate the identification of interested facilities and gather additional operational information to inform the selection process.

6.5.1 Criteria for Site Selection

The establishment of clear selection criteria serves two essential purposes: ensuring fairness and transparency in the decision-making process and guaranteeing that all WWTPs in Ukraine receive equitable consideration for external support aimed at operational improvements. The following criteria were applied systematically to identify pilot sites from the initial inventory:

- **Data availability**

The unavailability of facility-level data was one of the major challenges encountered during the data collection phase and was therefore considered the most critical criterion for pilot site selection. Due to the large number of WWTPs across the country, individual contact with every facility for comprehensive data collection was not feasible. Without at least basic information, such as treatment capacity, it is impossible to assess whether a site would serve as a suitable candidate for programme interventions. Basic parameters, including capacity, treatment performance status and modernisation plans, were compiled from RBMPs and other project documentation. Based on this information, 50 potential sites were shortlisted from the entire national inventory of WWTPs (see Table 7).

- **Geographic consideration**

Due to the current security situation in Ukraine, geographic location represents a critical selection factor. It is essential that potential pilot sites are located in non-disputed regions that enable safe intervention and provide a conducive working environment for programme experts. Among the 50 sites initially shortlisted as potential candidates, five were located in disputed regions and were consequently excluded from further consideration. The regional wastewater treatment data indicate that most large cities operate proper treatment facilities, often including biological and even tertiary-level processes. This suggests that wastewater treatment plants in major urban areas receive greater attention and investment. To ensure balanced national progress, it is important to include smaller towns as well, so that adequate and fair consideration is given to improving wastewater management across the entire country.

- **Other ongoing projects**

Numerous development projects are currently active in Ukraine's wastewater sector, with support from organisations including the European Investment Bank (EIB), European Bank for Reconstruction and Development (EBRD), Swedfund, Kreditanstalt für Wiederaufbau (KfW – German Development Bank), German Society for International Cooperation (GIZ), Japan International Cooperation Agency (JICA) and Nordic Environment Finance Corporation (NEFCO). Many large WWTPs already benefit from external assistance, while smaller facilities are sometimes overlooked.

NEFCO and Denmark are specifically providing technical advice and funding for improving wastewater infrastructure and capacity building, such as in Lviv and Mykolaiv. Facilities currently receiving support from other development programmes or international organisations were excluded from consideration to ensure equitable distribution of support and avoid duplicating interventions. Project documentation from various initiatives was reviewed, and coordination meetings were conducted with stakeholders, including the United Nations Children's Fund (UNICEF), the Life-U-Spring project and partners of the German Federal Ministry for Economic Cooperation and Development (BMZ) project, to identify WWTPs already engaged in other programmes.

Among the 50 shortlisted plants, 13 facilities are participating in ongoing projects (see Table 8), with most of the country's largest WWTPs included in this category.

Table 7: Ongoing Projects in the Shortlisted WWTPs

WWTP	Ongoing Project
WWTP Kyiv	JICA
WWTP Dnipro	EIB
WWTP Lviv	NEFCO
WWTP Kherson	UNICEF
WWTP Rivne	EIB
WWTP Sumy	GIZ/EBRD
WWTP Vinnytsia	Swedfund
WWTP Khmelnytsky	NEFCO/DSIF
WWTP Chernihiv	EIB
WWTP Chernivtsi	EU/KfW
WWTP Mykolaiv	EBRD/NEFCO
WWTP Poltava	GIZ
WWTP Lutsk	EIB

- **Plans for capacity expansion**

Many WWTPs were constructed decades ago, and increasing population, coupled with higher per capita water consumption, has resulted in greater wastewater generation, necessitating capacity expansion at numerous facilities. When WWTP details were extracted from RBMPs, planned capacity increases in the near future were clearly indicated for several facilities.

Since the EU4GRE Programme focuses on energy optimisation and feasibility studies for energy recovery, these studies would become obsolete if treatment process configurations were substantially modified during capacity expansion or reconstruction. Therefore, it is not prudent to select plants that are scheduled to undergo major modernisation involving capacity increases. A total of 11 plants with planned capacity expansion, as indicated in Table 7, were excluded from the shortlisted sites.

- **Plans for energy efficiency and sludge treatment**

The RBMPs also included information on future modernisation plans for individual facilities. Some plants had clearly articulated objectives to optimise treatment processes to reduce energy consumption and to implement proper sludge handling or treatment systems. Among the 50 shortlisted plants, four facilities have such plans identified, as shown in Table 7.

This criterion is particularly relevant to the programme's focus on energy efficiency and by-product valorisation. When facilities already have plans to implement actions aligned with these objectives, there is a higher likelihood that plant management will be receptive to programme interventions and that feasibility studies will be actively utilised to secure funding for actual implementation.

- **Proactivity of WWTP management**

Proactivity by WWTP management was considered a valuable selection factor, as it facilitates implementation of activities in later programme stages. This includes the willingness of management to cooperate with activity implementation and adapt to recommended changes. To raise awareness and ensure WWTP management is fully informed of opportunities available through the programme, an overview of EU4GRE was presented at the Lviv Ecoforum 2025. An EoI was also disseminated during the event to collect detailed information from interested WWTPs. Only Kremenchuk WWTP submitted a response through this channel.

- **Treatment capacity**

Beyond the criteria outlined above, treatment capacity represents a major selection consideration. Treatment capacity emerged as a primary criterion because both sludge production and energy consumption scale with the volume of wastewater treated. Most WWTPs in Ukraine have relatively high capacities exceeding 1,000 m^3/day. During the selection process, it was ensured that the different pilot sites would be representative of varying treatment capacity ranges so that they can serve as models for other similarly sized WWTPs. This approach is important because the optimal options for energy efficiency (EE) and energy recovery (ER) differ significantly based on plant scale.

The project focuses on three pilot WWTPs where facility-level studies and proposals for improving energy efficiency will be developed. At this stage, however, only limited technical information is available for these sites. This creates both a challenge and an opportunity: before meaningful energy-efficiency measures can be identified, it is essential to first understand and, where necessary, optimise the treatment performance itself. Pollution reduction, hydraulic stability and compliance with effluent standards must take precedence, as energy efficiency can only be meaningfully addressed once the core treatment processes are functioning effectively. Within the project, performance assessment will therefore be a central step, and any recommendations for energy-efficiency improvements will be developed in parallel with, or subsequent to, the evaluation of treatment effectiveness. Where the available data allow, targeted measures to reduce energy consumption, such as process optimisation, equipment upgrades or operational adjustments, will be proposed. In cases where performance information remains insufficient, EU4GRE will outline the additional monitoring and data collection needed to enable future energy-efficiency planning. This approach ensures that the proposed improvements are realistic, technically sound and aligned with both environmental and operational priorities.

6.5.2 Selection of Pilot Sites

As part of the EU4GRE Programme, three pilot WWTPs in Ukraine were to be selected to conduct feasibility studies on the process optimisation, EE and ER options. The criteria mentioned in the previous section were used to shortlist the potential sites. Due to the challenges and limitations in data availability, the 50 sites for which at least capacity data were available were considered the starting point for shortlisting. Each criterion was used to set filters for further shortlisting and final selection of three WWTPs for detailed assessments.

Facilities located in disputed regions, as well as those already engaged in other development projects and those with planned capacity expansion were excluded from consideration to further narrow the pool of potential sites. Following application of these exclusionary criteria, 22 WWTPs remained under consideration.

Special weight was given to plants with documented plans for energy efficiency improvements or sludge treatment infrastructure, as well as those demonstrating proactivity through engagement with the programme. The remaining facilities were sorted by treatment capacity from largest to smallest to ensure representation across different plant scales. After systematically applying all selection criteria, four WWTPs emerged as strong candidates for pilot site designation (see Table 9).

Table 8: Final Shortlisted WWTPs

WWTP	Design Capacity (m^3/day)	Plans for Energy Efficiency	Proactivity
Drohobych WWTP	100,000	Energy-saving equipment	Details shared by the Ukrvodokanal association
Kremenchuk WWTP	48,000	Energy optimisation of administrative building and sludge treatment	Contacted via EoI submission
Uman WWTP	36,000	Energy-saving equipment	n/a
Pustomyty WWTP	2,200	Energy-saving equipment	n/a

The shortlist reveals sites with similar commitments to energy efficiency improvements but with significant differences in treatment capacity. Among the four WWTPs, Drohobych stands out as the largest facility, with moderate proactivity demonstrated through engagement via the Ukrvodokanalekologiya association. Kremenchuk is a medium-large plant that shows the strongest stakeholder engagement, having proactively initiated contact through the EoI submission.

The remaining two WWTPs, Uman and Pustomyty, have not demonstrated proactive engagement and share similar approaches focused on energy-saving equipment replacement. The principal differentiating factor between these facilities is the volume of wastewater treated. The capacity difference is substantial, with Uman WWTP treating approximately 16 times the wastewater volume of Pustomyty WWTP (36,000 m^3/day versus 2,200 m^3/day).

It is noteworthy that Uman and Kremenchuk WWTPs fall within a similar capacity range (36,000–65,000 m^3/day) when compared with the other shortlisted facilities. Given the programme's objective to develop replicable models across different plant scales, Pustomyty represents a valuable opportunity to demonstrate how smaller facilities can also benefit from activities under Eu4GRE. Including Pustomyty in the pilot selection ensures that the programme addresses the needs of Ukraine's numerous small- to medium-sized WWTPs, which collectively serve a significant proportion of the population but often lack access to technical and financial support for modernisation.

6.6 Situation Reported and Actions Listed in the RBMPs

The following text provides an overview of the various RBMPs adopted and the basic measures identified for their individual Programmes of Measures (PoMs) to reduce impacts from wastewater sources. As seen in particular in Chapter 7.1.1, the country has identified nine river basin districts and prepared an RBMP for each. Overall, sanitation dominates at national level, with 71% of all measures included in the respective RBMPs for the period 2025–2030, and hydromorphological measures account for 23%, while agriculture, industry and others account for less than 3% each. The total cost for all measures is estimated at EUR 7.7 billion, with the Dnipro RBMP accounting for 46% of the total.

1. **The Dnipro RBMP 2025–2030** covers 19 oblasts and has five sub-basins. For the sanitation component, it identifies a large set of basic measures for a total cost of EUR 3.5 billion, representing 97% of the PoM cost. This entails the construction or reconstruction of sewer networks and wastewater treatment plants in many agglomerations, as well as the modernisation of stormwater sewerage networks and/or treatment plants and the construction of a technological line for the treatment and use of sludge for the Kyiv agglomeration.

2. **The Dniester RBMP 2025–2030** covers seven oblasts. For the sanitation component, it identifies a large set of basic measures for a total cost of EUR 517 million, representing 85% of the PoM cost. This entails the construction or reconstruction of sewer networks and wastewater treatment plants in many agglomerations, as well as the reconstruction and repair of a dyke crossing the sewer collector, the treatment of rainwater runoff before discharge into a river and measures beyond wastewater management, such as addressing environmental pollution by household waste.

3. **The Danube RBMP 2025–2030** covers four oblasts. For the sanitation component, it identifies a large set of basic measures for a total cost of EUR 364 million, representing 79% of the PoM cost. This entails the construction or reconstruction of sewer networks and wastewater treatment plants in many agglomerations, as well as stormwater drainage networks.

4. **The Southern Bug RBMP 2025–2030** covers seven oblasts. For the sanitation component, it identifies a large set of basic measures for a total cost of EUR 517 million, representing 85% of the PoM cost. This entails the construction or reconstruction of sewer

networks and wastewater treatment plants in many agglomerations, as well as the construction and reconstruction of stormwater drainage networks and treatment facilities.

5. **The Don RBMP 2025–2030** covers three oblasts. For the sanitation component, it identifies a large set of basic measures for a total cost of EUR 794 million, representing 97% of the PoM cost. This entails the construction or reconstruction of sewer networks, including pumping stations, and wastewater treatment plants in many agglomerations, as well as the construction and reconstruction of stormwater drainage networks and treatment facilities and industrial wastewater treatment facilities.

6. **The Vistula RBMP 2025–2030** covers two oblasts. For the sanitation component, it identifies a large set of basic measures for a total cost of EUR 486 million, representing 97% of the PoM cost. This entails the reconstruction of the Lviv wastewater treatment plant and sewer network, including pumping stations, and also the construction or reconstruction of sewer networks and wastewater treatment plants in many agglomerations, as well as the construction of a sewage sludge mechanical dewatering facilities, the construction of a sewage sludge thermal use unit and the construction of stormwater treatment facilities.

7. **The Crimea RBMP 2025–2030** covers two oblasts and was prepared based on 2013 data. It does not specify the measures needed.

8. **The Black Sea RBMP 2025–2030** covers three oblasts. For the sanitation component, it identifies a large set of basic measures for a total cost of EUR 483 million, representing 85% of the PoM cost. This entails the construction or reconstruction of sewer networks and wastewater treatment plants in many agglomerations.

9. **The Azov Sea RBMP 2025–2030** covers four oblasts. For the sanitation component, it identifies three basic measures for a total cost of EUR 527 million, representing 97% of the PoM cost. The first measure is the need to reconstruct sewer network and wastewater treatment plants for a set of main agglomerations. The second measure is the construction of sewer network and wastewater treatment plants for another set of agglomerations. The third measure is the construction of sewer network and wastewater treatment plants for smaller agglomerations.

7 Existing Legal and Regulatory Framework

7.1 National Laws and Regulations

7.1.1 Adherence to the EU Water Directive Framework (WFD, UWWTD and IED)

7.1.1.1 Water Framework Directive (WFD)

Ukraine has incorporated the river basin approach into national law, creating basin districts, councils, a state water monitoring framework and RBMPs. By late 2024, the Cabinet of Ministers had adopted RBMPs for all nine districts, covering major river basins. This milestone, supported by the EU4Environment – Water and Environmental Data programme, advances substantial alignment with the EU WFD and estimates a six-year investment need of EUR 7.7 billion, mainly for sanitation.

For 2025, a State Water Monitoring Programme will operate across 547 sites spanning seven major basins, focusing especially on areas affected by war and bringing practices closer to WFD standards. Ukraine shifted in 2025 from plan adoption to implementing RBMP measures, including nutrient reduction, wastewater controls, hydromorphological restoration and strengthening chemical monitoring and financing.[8]

7.1.1.2 Urban Wastewater Treatment Directive (UWWTD)

The new EU UWWTD 2024/3019 sets out a broader and more stringent framework. Ukraine's sewerage and wastewater framework, based on the Water Code, the *Law On Drinking Water and Drinking Water Supply* and the *Law On Wastewater Disposal and Treatment*, as well as a 2024 government procedure on sewerage and treatment assessment, covers service provision, connections and discharge permits. However, it does not yet incorporate key new EU UWWTD 2024/3019 elements such as harmonised agglomeration mapping from 1,000 p.e., broader tertiary treatment, quaternary treatment for micropollutants with extended producer responsibility, energy neutrality pathways and the new data and reporting architecture.

However, these texts partially comply with Council Directive 91/271/EEC of 21 May 1991 concerning urban wastewater treatment and the country's ambition to become an EU member will push authorities to progressively align the legal legislation fully. Alignment with the new UWWTD is not yet in place, including among EU Member States, which still have to transpose the new UWWTD.[9] [10] [11]

Approaching UWWTD compliance must be closely aligned with implementation of the WFD: the largest part of reducing water pollution listed under the RBMP measures (see Chapters 7.1.1.1 and Chapter 7.1.1.4) gives priority to urban treatment plants in all nine river basin districts.

A major challenge for the success of implementing these measures is also the need for better education and training of staff at all levels, from the sector's strategic management to individual utility operations. Better educated and skilled staff must receive higher wages. The financial sustainability of the sector depends on stepwise tariff reforms that follow public awareness work explaining the benefits of these public services and the needed monitoring and control of both effective collection and treatment (see also Chapter 7.1.2 and Chapter 7.1.3).

7.1.1.3 Industrial Emissions Directive (IED)

Ukraine has adopted a framework law establishing an IED-style integrated environmental permitting regime based on Best Available Techniques (BAT). Law No. 3855-IX *On Integrated Prevention and Control of Industrial Pollution*, fully in force since 8 August 2025, makes the integrated environmental permit (IEP) the core instrument for new IED-scope installations and sets transition paths for existing ones. It merges separate air, water and waste permits into a single site-specific IEP with BAT-based conditions, monitoring and compliance duties.[12 13]

Since early 2025, key by-laws have been adopted, including procedures for conciliation meetings on IEP issuance, uniform requirements for the 'conclusions' supporting decisions and, on 15 July 2025, the official IEP form, to be handled digitally via a Unified State Register. Authorities have also ruled that any 'legacy' single-media permits issued after the law's effective date will expire by 8 August 2029, accelerating the shift to integrated permitting.[13 14]

Fiscal amendments effective from 1 October 2025 align tax rules with the new regime; the permit fee is fixed in Law No. 3855-IX at 30 subsistence minima (about UAH 90,840 at 2025 rates). Full IED approximation will still depend on timely sectoral BAT timelines, stronger inspectorate and laboratory capacity and investment in industrial retrofits. [13 16 17 18 19 20 21]

7.1.1.4 Cross-cutting Observations and Implications

The nine RBMPs provide the strategic roadmap and an investment envelope focused on sanitation; the new EU UWWTD 2024/3019 defines new technical and energy benchmarks for urban systems; and the IED regime ensures integrated BAT-based control of major industrial dischargers. Immediate priorities are to complete UWWTD transposition, implement RBMP measures with realistic financing and sequencing and finalise IED secondary legislation while operationalising the digital IEP register and risk-based inspections. Core legal bases, namely the Water Code, the Law *On Drinking Water and Drinking Water Supply* and the Law *On Wastewater Disposal and Treatment*, and the 2024 procedure on sewerage and treatment, underpin further approximation to the new EU UWWTD 2024/3019 and alignment with Law No. 3855-IX.[22]

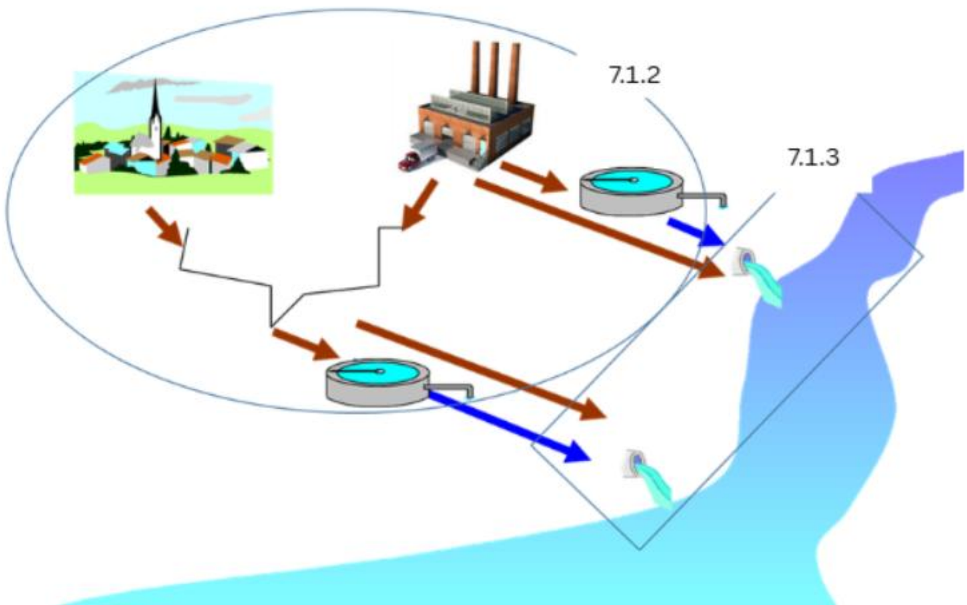

Figure 5: Illustration of Discharge into Sewer and Aquatic Environment (7.1.2) and Discharge into Surface Water Bodies or Groundwater (7.1.3)

7.1.2 Discharge Permit Requirements for Industries and Other Economic Activities – Into Sewer and Aquatic Environment

The national legal backbone combines the Water Code of Ukraine, which governs 'special water use' and maximum permissible discharge (MPD) standards, the Law No. 2887-IX *On Wastewater Disposal and Treatment*, which regulates centralised and non-centralised wastewater systems, and Cabinet of Ministers of Ukraine Resolution No. 690/2019, which sets the service and connection rules for centralised water supply and wastewater disposal, as well as Resolution No. 1066 of the Cabinet of Ministers of Ukraine, dated September 1, 2025, *On Approval of the Procedure for Connection to Centralised Water Supply and/or Centralised Wastewater Networks*, which determines the procedure and conditions for connecting construction sites or existing sites to centralised water supply and/or centralised wastewater networks. Implementing acts specify sewer acceptance rules and charging for excess discharges, while long-standing norms continue to structure the protection of surface waters and the methodology for setting MPDs. Since 8 August 2025, Law No. 3855-IX *On Integrated Prevention and Control of Industrial Pollution* has introduced the IEP, based on BAT, which progressively replaces separate single-media permits. [15] [16] [17] [18] [19] [13]

Where industrial discharges go to a centralised sewer, there is no separate state 'sewer discharge permit'. Instead, the operator must sign a service/connection contract with the sewerage utility under CMU 690/2019, meet any technical connection conditions and comply with 'local rules for acceptance' under Order No. 316/2017. These rules set maximum admissible concentrations at the discharge point, require pretreatment and fixed sampling points, define self-monitoring duties and establish over-limit charges. Breaches allow the utility to levy surcharges, claim damages and ultimately suspend the connection. NEURC licensing and tariff decisions frame utility activities but the core instrument remains the contract backed by CMU 690 and local rules.[22] [17] [19] [20] [23] [24]

Where wastewater is discharged directly to the aquatic environment, the activity is deemed 'special water use' and requires a Special Water Use Permit (SWUP). Issued by the State Agency of Water Resources, SWUPs (valid for 3–25 years) set pollutant-specific MPD/NDS values, discharge regimes and monitoring duties, based on CMU No. 1100/1996 and CMU No. 465/1999. For IED-scope installations, Law No. 3855-IX has, since 8 August 2025, required a single IEP consolidating water, including MPDs, air, waste, monitoring and BAT-based compliance. New or substantially modified installations must obtain an IEP; existing ones migrate by sectoral timelines. Legacy single-media permits issued after 8 August 2025, including SWUPs, remain valid during the transition but lapse by 8 August 2029. The IEP fee is 30 subsistence minima (about UAH 90,840 at 2025 rates), with fiscal and registry changes from 1 October 2025 aligning eco-tax administration. [22] [17] [19] [20] [23] [24] [12]

Enforcement relies on utility surcharges and contractual measures for over-limit sewer discharges and administrative sanctions plus damage assessments for SWUP violations, with the State Environmental Inspectorate applying approved methodologies. While sewer acceptance rules and SWUPs remain the main tools in the near term, approximation to the EU acquis, notably the recast Urban Wastewater Treatment Directive, with broader treatment and micropollutant controls, will progressively tighten sewer interface limits and MPDs for direct discharges. In short: sewer discharge requires contractual acceptance by the utility; direct discharge requires an SWUP with MPD based limits; and for large IED-scope installations, the IEP has become the central instrument, with legacy authorisations set to expire by 8 August 2029.[15] [16] [19] [18] [19] [13]

7.1.3 Discharge Permit Requirements for Wastewater Discharge into Environment – Surface Water Bodies and Groundwater

The Water Code requires a SWUP and compliance with maximum permissible discharge standards; Cabinet of Ministers' procedures set pollutant-specific limits and rules for protecting surface waters from return waters; and, for large industrial sites, an IEP consolidates all water-related conditions on a BAT basis. In parallel, river basin planning under the EU WFD has introduced ambient environmental objectives that increasingly determine how strict individual emission limits must be. Together, emission limits, ambient quality objectives and BAT-based permitting define substantive requirements at discharge points to rivers, lakes, coastal waters and, under stricter rules, groundwater.[15 24 10]

At permit level, each outfall receives pollutant-specific limits, either historical 'MPD/NDS' values in SWUPs or BAT-based emission limit values under an IEP, covering conventional parameters (BOD, COD and suspended solids), nutrients, general physico-chemical indicators and relevant hazardous substances. The Cabinet's methodology requires authorities to consider upstream quality, receiving water hydrology, mixing zones, protected status and basin objectives. The 1999 Rules on return waters add design and operational safeguards against visible pollution, sanitary impacts and uncontrolled bypasses. These conditions must align with river basin objectives. The RBMPs for all nine basins quantify sanitation-related measures and investments and guide ambient compliance and nutrient reduction priorities.[15 25 22 24]

Compliance is checked at two scales: operators must meet emission limits at a fixed control point before the mixing zone and, beyond that zone, discharges must not cause exceedances of ambient standards or undermine basin objectives (including for bathing, drinking water and nature sites). Approximation to the EU WFD chemical status regime, drawing on EU Environmental Quality Standards and the updated priority substances list, reinforces this ambient check, especially for persistent or bioaccumulative pollutants. Since 2025, a State Water Monitoring Programme with 547 stations across seven major basins has strengthened the evidence base for status assessment, trend analysis and permit revision, tightening the link between individual outfalls and basin scale outcomes.[25 15 24]

Industrial requirements are shifting to an integrated BAT footing. Law No. 3855-IX *On Integrated Prevention and Control of Industrial Pollution* (in force since 8 August 2025) makes the IEP the single controlling instrument for new IED-scope installations and sets transitional pathways for existing ones. 'Legacy' single-media permits issued after that date, including discharge permits, remain valid only until replaced by an IEP and in any case no later than 8 August 2029; the IEP fee is 30 subsistence minima (approximately UAH 90,840 at 2025 rates). As secondary by-laws are adopted, IEP water conditions for large dischargers are expected to reflect BAT-associated levels and to be updated in line with RBMP objectives.[19 15]

Urban wastewater systems follow a parallel track. The new EU UWWTD 2024/3019, adopted by the European Parliament on 12 December 2024, extends collection and treatment to smaller agglomerations, broadens nutrient removal in eutrophication-sensitive areas, introduces quaternary treatment for micropollutants at large plants under extended producer responsibility and sets energy neutrality targets for 2045. Although full transposition lies ahead, these provisions are already influencing sewer acceptance limits and MPD/ELV values for direct dischargers in sensitive catchments, complementing the fact that Ukraine is partially aligned with the 1991 UWWTD in law and regulation.[16 15]

Groundwater is subject to a stricter regime. Direct discharges of wastewater to groundwater is generally prohibited, except in narrowly defined cases that pass hydrogeological review and demonstrate no risk of deterioration or sanitary harm. The Water Code imposes duties to prevent subsoil water pollution and to monitor groundwater where activities could affect aquifers. Sanitary rules ban injection of return waters into protected underground horizons. Any managed infiltration or soil aquifer treatment requires a permit with stringent pretreatment, upgradient and downgradient monitoring and immediate corrective measures when triggers are exceeded and is often refused near drinking water abstractions.[16 15]

Enforcement and adaptive management link permits to ambient outcomes. Authorities may restrict, suspend or terminate discharges that exceed MPD/ELV values, apply administrative sanctions and calculate damages under approved methodologies. RBMP updates, deteriorating monitoring results or new sensitive uses downstream can trigger mid-term permit revisions, progressively aligning emission limits with basin objectives while the IEP regime embeds integrated, BAT-based control that reflects both technology and the receiving water's capacity. Finally, transparency and data integration are improving. Monitoring increasingly requires accredited laboratories, electronic reporting and consistency with basin classifications. As more plants operate under IEPs and the new EU UWWTD 2024/3019 public reporting and risk-based surveillance methods take hold, stakeholders gain clearer visibility of outfall performance and contributions to RBMP targets across the nine basins.[15 8 25 26 22 24 23 15]

7.1.4 Regulations on Wastewater Reuse and Sludge Disposal and Valorisation

Ukraine already has a basic legal framework for safe reuse of treated urban wastewater and for sewage sludge management, disposal and valorisation. The sector law *On Wastewater Disposal and Treatment* (Law No. 2887-IX, 12 January 2023) empowers the government to define technical and sanitary conditions for reuse and sludge handling in centralised systems, while the framework law *On Waste Management* (Law No. 2320-IX, in force since 9 July 2023) applies an EU-style waste hierarchy when sludge is managed as waste rather than as a product for land application or energy recovery. In practice, the wastewater law provides the sectoral pathway; the waste law adds horizontal obligations on classification, record keeping and environmentally sound treatment or disposal. [16 27]

The central instrument for reuse is the Ministry's Procedure *On the reuse of treated wastewater and sewage sludge subject to compliance with maximum permissible concentrations (MPCs)*, approved by Order No. 341 of 12 December 2018 and updated in November 2023 (consolidated text effective from 25 January 2024 – Ministry of Regional Development, Construction and Housing). It defines when and how treated effluent from centralised systems may be reused (e.g. for irrigation) and sets documentary, sanitary and monitoring requirements, including conditions for sludge reuse subject to demonstrated quality and sanitary clearance (Order No. 341, available on zakon.rada.gov.ua). Quality criteria and agronomic safeguards are further detailed in DSTU 7369:2013 *Wastewater. Requirements for wastewater and its sediments for irrigation and fertilisation*, which specifies parameter lists and limit values for conventional indicators and selected metals, hygienic controls and field use conditions, forming the technical backbone for decisions under Order No. 341.[28]

Project design is anchored in DBN V.2.5 75:2013 *Sewerage. External networks and structures. Basic design provisions*. This code requires sludge stabilisation, conditioning or other processing before land application or disposal and, at larger plants, enables biogas capture and use from anaerobic digestion, with safeguards for soil and groundwater during storage and handling. It is the main reference for designers and permitting authorities on siting, lining, drainage and emissions control for sludge and reuse infrastructure. Since 2024, MinInfra Order No. 643 of 17

July 2024 has introduced a uniform accounting baseline, requiring operators to record sludge generation, treatment, storage, reuse, energy valorisation and disposal using standardised forms intended to feed future electronic registries.[29 30]

Health protection rules add two key constraints: reuse schemes are prohibited in inner sanitary protection zones for drinking water sources and strictly limited in outer belts; and any sludge intended for land application needs a positive sanitary epidemiological conclusion in addition to compliance with DSTU 7369:2013. Public health bodies issue guidance summarising these requirements for operators and municipalities.

There is also a restriction in Article 39 of the *Law of Ukraine on Land Protection*: the use of sewage sludge is prohibitied at nature reserves and other nature conservation, health and recreational lands, water fund lands and other territories subject to special protection and on land plots used for grazing livestock, growing vegetables and fruits, as well as on land plots where the content of any toxic substance exceeds the maximum permissible concentration.

Where valorisation is pursued via energy recovery, national technical rules already allow anaerobic digestion and on-site energy use at wastewater treatment plants. Support for biogas-based electricity has shifted from ‘green tariffs’ to auction-based mechanisms for new entrants since 1 January 2023, while existing projects keep legacy terms until the end 2029, influencing the bankability of sludge-to-energy schemes and favouring combined heat and power self-consumption models. If reuse or energy recovery is not viable, sludge must be managed as waste under the 2022 *Waste Management Law*, typically at engineered landfills operating under strengthened technical, monitoring and aftercare rules aligned with EU practice and limiting certain streams, including sewage sludge, to reduce environmental risk.[31]

The reclaimed water procedure predates Regulation (EU) 2020/741 and does not yet include reclaimed water quality classes for agricultural irrigation, minimum monitoring frequencies, validation or formal risk management. Approximation would require amending Order No. 341 to introduce water classes (A–D), explicit *E. coli* and other parameter targets by crop and irrigation method, operator-level risk management plans and harmonised monitoring and reporting templates consistent with the Regulation. For sludge, Ukraine relies on DSTU 7369:2013 and sanitary clearance, which provide a workable baseline. Full transposition of the EU Sewage Sludge Directive (86/278/EEC), codifying metals limits, application rates and use restrictions by crop and soil in binding regulation, would improve nationwide consistency and enforcement, and the regime will need to evolve to address emerging contaminants such as PFAS and microplastics through targeted monitoring and possible product controls.[31]

In sum, Ukraine has an operative framework for treated wastewater reuse and for the safe reuse, energy valorisation and, where needed, disposal of sewage sludge. The core pillars are Order No. 341 on reuse, DSTU 7369:2013, DBN V.2.5 75:2013 and the 2024 sludge accounting procedure. Completing EU approximation will mean embedding reclaimed water classes and risk-based monitoring per Regulation (EU) 2020/741, consolidating sludge use parameters in a binding act aligned with Directive 86/278/EEC and integrating sludge flow data into basin-scale planning and permitting so that, together with existing sanitary and waste law safeguards, the system converges on the evolving European model while supporting safe circular economy outcomes.[29 32 31 15]

7.2 National Strategy

7.2.1 National Support Activity on the EU Acquis

Ukraine's approximation and implementation of the EU water acquis is now guided by a basin-led strategy linking laws, institutions, investments and data, with milestones for 2025–2030. The key anchor was the approval of RBMPs for all nine basin districts in November–December 2024 (see also Chapter 6.6 above). These plans represent a major milestone by quantifying six-year investment needs and prioritises sanitation. Prepared with EU support (eu4waterdata.eu), these RBMPs form the geographic and financial backbone for implementation and sequence regulatory updates, permits and projects. Coordination runs across the Cabinet and Verkhovna Rada, with the Government Office for European and Euro-Atlantic Integration aligning the acquis timetable. The Ministry of Environmental Protection and Natural Resources (MEEA) leads on WFD, UWWTD recast and IED approximation; the State Agency for Water Resources (SAWR) manages basins and special water use permitting; the Ministry for Communities and Territories Development steers utility policy; the energy and utilities regulator links tariffs to investment programmes; and public health authorities are integrated in line with the new EU UWWTD 2024/3019 focus on surveillance and sanitary risk management.[8 16 15 33]

The legislative pipeline mirrors this architecture. Under the WFD, the emphasis has shifted from planning to execution via the State Water Monitoring Programme adopted in 2025, which establishes 547 monitoring sites across major basins, bringing practice closer to EU status assessment standards. For urban wastewater, Ukraine is preparing an approximation package to Directive (EU) 2024/3019, which in the EU extends obligations above 1,000 p.e., phases in tertiary treatment in eutrophication-sensitive waters, requires quaternary treatment for micropollutants under extended producer responsibility and introduces energy neutrality trajectories, transparency and enhanced reporting. In parallel, Law No. 3855-IX on integrated industrial pollution control, fully in force since 8 August 2025, makes the IEP the single controlling tool for IED-scope installations.[26 16 15]

Technical assistance and capacity building are aligned with these milestones. The EU4Green Programme, funded by the EU, now focuses on RBMP implementation, data governance and economic analysis. Beyond the current report, an analysis of training needs will be conducted. Under another programme activity, the OECD is supporting authorities in addressing the economic aspects of water management by providing assessments and facilitating discussions with authorities on water pricing policies and potential reforms to the existing system.

In addition, twinning and TAIEX support secondary legislation for the UWWTD and IED and transfer know-how to basin authorities, permit writers and inspectors to improve sector management and the setting of emission limits linked to ambient objectives. International financial institutions like the World Bank, international organisations including UNICEF and bilateral partners such as Denmark support project preparation and design for tertiary and quaternary treatment, energy-efficiency upgrades, sludge-to-energy projects and laboratory strengthening.

Training increasingly covers industrial pre-treatment at the sewer interface, BAT-associated emission levels for water and quaternary treatment design and operation. Financing tools match the regulatory ambition: budget funds, the State Environmental Fund and municipal co-financing are blended with IFI loans and grants to launch early RBMP measures, while tariff-linked investment programmes are conditioned on demonstrable performance and open reporting. An extended producer responsibility scheme for micropollutants is being developed to co-finance quaternary treatment and upstream substitution, while energy neutrality targets are driving green credit lines and performance-based incentives for WWTP energy audits, process controls, on-site renewables and biogas combined heat and power (CHP), all phased to remain affordable through targeted subsidies and basin prioritisation.[34 33]

Progress also hinges on better registers and data flows. Basin information systems are being populated with RBMP measures, status classes and monitoring results; an urban wastewater register based on harmonised agglomeration mapping (for agglomerations above 1,000 p.e.) will track treatment levels, non-compliance, sludge flows and energy and GHG indicators; and the digital IEP register will consolidate industrial discharges, monitoring and inspection data. Enhanced monitoring and laboratory accreditation aim to raise data quality, while public dashboards will turn UWWTD transparency duties into accessible compliance reporting, strengthening the feedback loop between permitting, investments and environmental outcomes.

Stakeholder engagement runs through basin councils that involve local governments, utilities, industry and civil society in sequencing measures and designating sensitive areas. National guidance and templates on sewer acceptance rules, self-monitoring, energy roadmaps and data reporting support consistent implementation, while communication strategies explain the rationale and timetable for tertiary and quaternary upgrades and their tariff and grant implications.[35]

7.2.2 Core Components

Ukraine's national strategy uses a basin-led architecture that turns EU acquis alignment into a sequenced programme linking law, permitting, investments, data and finance. Execution is basin-centred: councils bring together utilities, industries and municipalities to adjust priorities each year to affordability, sequence nutrient load reductions and industrial controls at hotspots and integrate nature-based restoration where it supports ecological status objectives.[36]

Permitting and compliance translate these anchors into site-specific obligations. For large industrial dischargers, the IEP consolidates water, air and waste conditions on a Best Available Techniques basis, aligns emission limit values with basin objectives and local mixing-zone rules and is issued and monitored via a national e-register, with staged sectoral migration so the most water-sensitive installations are prioritised before the 2029 deadline. At the sewer interface, industrial pretreatment remains critical: utilities apply contractual 'acceptance rules', mandatory sampling points and self-monitoring duties grounded in the national service framework, with remedies from surcharges and damage recovery to suspension of connection (CMU 690/2019). In parallel, the urban wastewater pathway is being structured around harmonised agglomeration mapping from 1,000 p.e., a national urban wastewater register, sensitive area designation and contracting of the first tertiary treatment upgrades in high-load agglomerations, with quaternary treatment piloted then scaled at large plants in risk-sensitive contexts, co-financed through an extended producer responsibility scheme for micropollutants.[35]

Energy performance and resilience are treated as core objectives. Large plants are completing energy audits and management plans, tightening aeration control, expanding biogas recovery and CHP and adding on-site renewables where feasible so that specific energy use declines in line with the directive's trajectory. Critical facilities are being strengthened with backup power, islanding capability and flood protection. Economic regulation links tariff approvals to verifiable outcomes on effluent quality, energy intensity and combined sewer overflows so that capital expenditure yields measurable performance without eroding affordability.[37]

The circular economy strand covers sludge and reclaimed water. A national accounting baseline for sludge flows has been in place since 2024 and a sludge strategy is being developed to clarify stabilisation and hygienisation requirements, land application criteria aligned with EU practice, including pathways for PFAS and microplastics, and biogas-to-energy options at medium and large plants. On reuse, the existing procedure must be updated to mirror Regulation (EU) 2020/741 by introducing reclaimed water classes, minimum monitoring frequencies, validation and operator-level risk management plans, with pilots demonstrating safe agricultural and urban uses.

Public health integration, stakeholder engagement and risk management support legitimacy and resilience. Wastewater-based epidemiology pilots in major cities build data links to health authorities as envisaged in the new EU UWWTD 2024/3019; national guidance and model documents help utilities and industries implement consistent sewer acceptance rules, self-monitoring, energy roadmaps and reporting; and Basin Councils institutionalise participation in sensitive area designations and the sequencing of tertiary and quaternary upgrades. Contingency measures, including mobile treatment, emergency contracting and supply redundancy, are built in to maintain service and environmental protection under wartime disruption. A results framework ties each strand to fixed legal dates: RBMP approvals in late 2024 provide the baseline for tracking nutrient and organic load reductions; the 2025 monitoring expansion supplies the ambient evidence base; entry into force of integrated permitting on 8 August 2025 starts the migration clock; and the 8 August 2029 sunset for legacy permits fixes consolidation under IEPs. Together, these elements are designed to ensure that each approximation step delivers verifiable gains in receiving water status, operational performance and public accountability.[38 8]

7.3 EU Regulatory Framework

For Ukraine, approximation means: (i) revising the reuse regime to mirror Regulation (EU) 2020/741, including water classes, validation, risk management plans and minimum monitoring linked to UWWTD performance; (ii) updating sludge and nutrient strategies to reflect circular economy provisions, future phosphorus reuse targets and monitoring of emerging contaminants, while remaining compatible with Directive 86/278/EEC; and (iii) legislating energy audits and a national path to energy-neutral plants ≥10,000 p.e., with investments in process efficiency, biogas/CHP, heat recovery and renewables. This would integrate reuse, by-product valorisation and energy efficiency into a single, RBMP-coherent compliance framework aligned with the new EU UWWTD 2024/3019.

7.4 Policy Gaps: EU and National Regulations

Ukraine has established the foundations of a modern wastewater management system, particularly through basin planning and improved monitoring, but significant gaps remain when measured against the requirements of the WFD, IED, Regulation (EU) 2020/741 on water reuse and especially the new EU UWWTD 2024/3019. RBMPs for all nine districts and a State Water Monitoring Programme with 547 sites bring Ukraine closer to WFD practices, but effective implementation still requires alignment of discharge permitting with basin objectives, stronger self-monitoring, risk-based inspections and full operationalisation of laboratories and digital systems.[33 15 11 8 25]

Relative to the new EU UWWTD 2024/3019, Ukraine's framework remains closer to the 1991 directive and lacks key provisions. Missing elements include harmonised agglomeration mapping from 1,000 p.e., formal designation of sensitive areas with tertiary treatment deadlines, national triggers and benchmarks for quaternary treatment and an extended producer responsibility mechanism to co-finance micropollutant control. Ukraine has designated 176 'vulnerable zones' described as areas sensitive to eutrophication due to urban wastewater discharge (see the 2019 decree fixing criteria for designating these areas: Link). These appear to correspond to the UWWTD sensitive areas according UWWTD 91/271/EEC and its recast 3019/2024. However, in EU terminology, 'vulnerable zones' usually refer to areas sensitive to eutrophication stemming from diffuse nitrate pollution under the EU Nitrates Directive (91/676/EEC). The terminology should therefore be clarified.

Energy-related requirements, including mandatory audits, efficiency milestones, renewable integration and standardised counting rules, are not yet legislated or embedded into tariff regulation. Stormwater and combined sewer overflow rules also fall short of EU expectations for monitoring, reporting and progressive reduction to safeguard RBMP objectives.[11]

In the areas of water reuse and sludge management, existing procedures (Order No. 341; DSTU 7369:2013; Order No. 643/2024) provide a baseline but predate EU Regulation 2020/741 and the Sewage Sludge Directive. They lack reclaimed water classes, validation requirements, minimum monitoring requirements and operator risk management plans. They also lack consolidated limits for metals, application rates, use restrictions and surveillance of emerging contaminants such as PFAS and microplastics.[28 31 29]

Data, transparency and financing also represent major gaps. Ukraine has begun building digital systems, including ambient monitoring, sludge accounting and an IEP e-register, but does not yet have a national wastewater register from 1,000 p.e., standardised electronic reporting for operators or near real-time publication of compliance, loads, overflow events, sludge use and energy/GHG metrics, as required under the new EU UWWTD 2024/3019. Multi-year investment needs are identified in the RBMPs, but stable funding for tertiary and quaternary treatment, laboratory upgrades and energy-efficiency improvements is not secured and an EPR revenue stream for micropollutants is still absent.[12 38 39 14 25 41]

Overall, Ukraine's policy framework is advancing, strong in basin planning, improving in monitoring and more integrated on industrial permitting, but key EU obligations remain untransposed or insufficiently implemented. Full alignment will require adoption of the provisions of UWWTD 2024, stronger enforcement capacity, modernised reuse and sludge rules, comprehensive digital reporting and predictable financing mechanisms to ensure measurable environmental improvements before 2030.[42]

7.5 Information System

The current situation arising from the war has led the country to implement laws forbidding public access to information on infrastructure (National Commission for State Regulation in the Energy and Utility Services Sector, Resolution No. 349 of 26 March 2022). This explains, to some extent, the difficulties to access relevant and reliable information on the wastewater sector described in Chapter 6. Decision-makers in Ukraine, however, require robust information to make regulatory and operational decisions, support long-term planning, risk management and transparent communication with the public. A reliable database, even if fully secured and not publicly accessible, is therefore necessary, and some key elements of this are described in this chapter.

7.5.1 Collection of Information on Wastewater

Today, the main document in which the results on the status of the water supply and sanitation sector are published is the *National Report on the Quality of Drinking Water and the State of Drinking Water Supply and Wastewater Treatment in Ukraine*, which is prepared annually by the Ministry of Development of Communities and Territories of Ukraine based on official materials provided by all bodies involved in its preparation. The national report is prepared in accordance with the *Procedure for the Preparation and Publication of the National Report on the Quality of Drinking Water and the State of Drinking Water Supply in Ukraine*, approved by Resolution of the Cabinet of Ministers of Ukraine No. 576 of 29 April 2004.

The national report is based on official data on the condition of surface and groundwater sources of drinking water, centralised drinking water supply and centralised sewerage systems, drinking water quality based on monitoring results, the composition of wastewater discharged into water bodies and its impact on the environment, the results of state sanitary supervision of drinking water supply systems, emergencies in centralised water supply and centralised sewerage systems, their causes, consequences and measures taken, the status of reform and development of drinking water supply and centralised sewerage systems, the introduction of new forms of enterprise management, improvement of the regulatory, legal, financial and economic framework of drinking water supply and centralised sewerage enterprises, ways of interacting with the public, the experience of leading enterprises in the industry and data on the economic activities of enterprises providing centralised water supply and centralised sewerage services.

The report, however, is not linked to any online information system presenting the main datasets used to prepare it or the organisation in charge. Some assessments present the ideal targeted information system with the data to be collected (plant operations, industrial discharges, basin monitoring, sludge and reuse accounting, energy and greenhouse gas metrics, finance, tariffs and public health indicators) as well as the background reference system to develop, namely a geo-referenced register that includes maps of agglomerations, p.e. assigned, receiving waters, networks and treatment facilities. However, the lack of data and information identified in the current report shows that this is not fully operational yet and is far from what is needed for decision-making. Further effort is still needed to develop an efficient system.[43]

Similarly, a framework exists for non-domestic inputs to sewers: utilities should apply the national service framework (CMU Resolution No. 690/2019) and local 'rules for acceptance' (Order No. 316/2017), defining connected users, sampling points, admissible concentrations, self-monitoring datasets and incident/surcharge records. For direct discharges, operators should operate under Special Water Use Permits and IEPs under Law No. 3855-IX, which specify outfall coordinates, emission limits, monitoring plans and reporting schedules: monthly reporting for core parameters and quarterly to semi-annual reporting for hazardous substances, with permit reviews every three to five years. It was, however, not possible to identify access to a centralised system gathering all this information and presenting a national overview. It is therefore not possible to assess whether this system is implemented in practice or whether only the framework under which operators should work currently exists.[17 38 12 18]

For sludge and reuse, the situation should progressively improve, as a dedicated accounting and quality framework has been delineated recently: since July 2024, Order No. 643/2024 standardises sludge mass balance reporting and quarterly consolidation of quantities and destinations, but the very low amount reported at national level shows that the system is not yet working.[28 31]

While an information system on wastewater and sludge or some of its necessary components may exist, it has not been possible, through the investigation conducted for this report, to identify whether the country has started to develop a centralised information system for gathering and sharing information on wastewater management.

Water and environmental information is presently fragmented, which undermines the utility of data and hinders an effective and coherent policy response.

Within the institutional infrastructure, data are generated and accessed by different institutions, and information is often siloed within and across these institutions, with uneven standards and practices that complicate discovery, access and coordination. This fragmentation makes it difficult to obtain a comprehensive overview of environmental conditions or to respond rapidly to new and emerging challenges.

Furthermore, the absence of common standards for sharing, access and quality measurement of information impairs the efficient utilisation and reuse of data. In the absence of common protocols, interoperable formats and clear responsibilities, institutions struggle to integrate datasets, validate findings and translate evidence into policy. This is compounded by the practice of requiring payment to access data. The result is duplication of effort, coverage gaps and reduced confidence in what constitutes an objective and fair analysis for public decision-making.

7.5.2 Key Rules for the Information System

With Ukraine modernising its environmental management systems and moving towards alignment with EU standards, there is an increasing national need to develop robust information systems for wastewater monitoring and control. Such systems are critical not only for regulatory compliance but also for the practical management of resources, risk prevention, policy evaluation and public involvement. The reliability and effectiveness of these systems are contingent on transparent, enforceable rules regarding what information should be gathered, how it should be managed, who is responsible for it and how it should be made available. Transparency and digital reporting should be anchored in law by mandating national electronic registers for agglomerations, treatment systems, industrial discharges, sludge flows and reuse projects, as well as machine-readable reporting by operators. The next step needed would be to prepare public dashboards that disseminate aggregated and plant-level performance data, while economic regulation would explicitly reference environmental and energy indicators, so that tariff decisions reflect progress towards RBMP and UWWTD targets.

7.5.3 Alignment with the UWWTD

Alignment with the UWWTD remains a challenge for Ukraine.

A coordinated national strategy is necessary to establish uniform data governance across the public sector, set standards for data collection, metadata, interoperability and security and define responsibilities for data stewardship across the data life cycle. It would also incentivise capacity development across institutions to facilitate efficient data sharing and reuse, promote open-by-default principles where appropriate and establish mechanisms for regular cooperation between agencies. Through the alignment of practices and expectations, Ukraine could transform dispersed datasets into an integrated information infrastructure that enables more effective planning, improved regulation, better risk management and a more informed public.

In sum, the path forward lies in building a cohesive framework that treats water and environmental data as a strategic national asset.

7.6 Conclusion of Chapter 7

The legal and regulatory framework is progressing rapidly in the right direction. However, the diversity of texts and the absence of a single clear law or wastewater code that logically brings together all obligations related to wastewater management and treatment make it difficult to understand the current effective situation and therefore to set the necessary priorities to progress towards implementation of the UWWTD.

The fact that it was not possible to gather a complete or accurate picture of wastewater management and treatment in the current document, in particular from the perspective of pollution generation and discharge, shows that the situation is not well known. The absence of a reliable central information system backed by shared terminology and obligations for operators to report data on the UWWTD situation and progress and for authorities to regularly assess and report publicly on the situation is a significant threat to the correct implementation of national legislation and, by extension, of the UWWTD.

A priority should be to modernise and consolidate the urban wastewater regulatory package. Secondary legislation could be structured as a coherent UWWTD approximation set that defines harmonised mapping of agglomerations from 1,000 p.e., assigns responsibilities for maintaining these maps and links them to differentiated collection and treatment obligations based on agglomeration size and the sensitivity of receiving waters. Wastewater regulation will also need to integrate explicit energy-efficiency and climate performance obligations.

Procedures for designating and periodically reviewing sensitive areas, such as eutrophication-prone surface waters and groundwaters, bathing waters and drinking water abstraction zones, need to be clarified through transparent criteria, institutional roles and a review cycle aligned with the six-year RBMP updates, so that requirements for tertiary and quaternary treatment are well targeted to achieve the water quality objectives. Further, national rules on stormwater and combined sewer overflows should clearly define overflow structures, admissible frequency and volumes, monitoring and public reporting and the design of reduction plans in sensitive basins.

Further approximation to EU circular economy and health protection rules is necessary for water reuse and sludge. A risk-based programme would focus on plants that intend to reuse or further reuse effluent, send sludge to agriculture or discharge in sensitive or drinking water-related areas. Monitoring of selected emerging contaminants could be phased in for large plants and for sludge intended for agricultural use. Environmentally sound alternatives, such as co-incineration or mono-incineration with phosphorus recovery, should be promoted where land application is not feasible.

The IEP regime must be fully operationalised for water. Secondary legislation is needed to embed BAT for water into sector-specific permit conditions and to standardise monitoring, particularly for nutrients, organic loads and hazardous substances in high-impact sectors and zones. Uniform rules on sampling, frequency, quality assurance and the use of accredited laboratories would provide a robust basis for enforcement. IEP conditions would be periodically reviewed against updated RBMP objectives, water monitoring results and new EU BAT conclusions.

During the transition period, when legacy permits and SWUPs coexist with IEPs, clear guidance is required on precedence, consolidation and prioritisation of installations located in sensitive areas or responsible for high pollutant loads.

Strategic documents should also systematically integrate circular economy, energy and resilience objectives. A National Sludge and Resource Recovery Strategy could set quantitative targets for stabilisation, hygienisation and beneficial use of sludge, identify priority corridors for regional treatment and valorisation facilities and consider emergency solutions for wartime and post-war conditions. An energy-neutral wastewater roadmap would establish baseline energy use and greenhouse gas emissions, identify cost-effective reduction measures and clarify institutional roles and incentives for implementation. Resilience to conflict-related risks, including physical damage, power outages and cyber threats, should be mainstreamed into RBMPs, national programmes and project selection criteria, with critical installations accorded priority support and, where necessary, temporary regulatory flexibilities combined with clear return-to-compliance plans.

8 Process and Energy Optimisation of WWTPs: Key Challenges

8.1 Challenges in Data Collection

The data collection process faced substantial challenges due to the difficulty of locating relevant operational information at WWTP level. Although data at national and regional levels were available on most of the important parameters, the data at WWTP level were not publicly available. The Scientific Research, Design and Technological Institute of Urban Economy was responsible for collecting the information required for national reporting from the WWTPs, including treatment performance and energy consumption. These data were properly consolidated at regional and national level, but the data at WWTP level were not recorded in the publicly available sources. Although the data are not readily available at WWTP level, it is impressive that data are monitored and recorded, especially in terms of energy consumption.

In contrast, quantitative and qualitative data on sludge production and handling are not routinely monitored at WWTPs. Consequently, even the sludge-related data included in national reports are not based on actual measurements but rather on calculated estimates derived from wastewater treatment volumes and total suspended solids (TSS) concentrations in influent wastewater.

Given the absence of readily accessible WWTP-level data, multiple approaches were employed to gather the necessary information.

- **Official correspondence**: Formal letters were submitted to the Ministry of Community Development and Territories and the National Energy and Utilities Regulatory Commission, requesting support in data collection efforts.
- **Stakeholder coordination**: Several coordination meetings were conducted with public and scientific stakeholders engaged in Ukraine's wastewater sector, including representatives from relevant ministries, the Ukrvodokanalekologiya Association and other development projects operating in the sector.
- **Documentation review**: National reports served as valuable sources of information at national and regional aggregation levels. For facility-specific data, RBMPs and project documentation from various development initiatives provided the most comprehensive sources.

From the limited available sources, basic operational data were obtained for 50 WWTPs, which were systematically evaluated to identify facilities with optimal potential for implementing EE and ER interventions.

8.2 Pilot Sites

Based on the data collected on WWTPs in Ukraine, three pilot sites were selected for implementation of the programme activities. The finalisation of these sites was achieved through systematic application of selection criteria to identify the most suitable candidates. Prior to finalisation, the proposed sites were presented to the Ministry of Community and Territorial Development of Ukraine, in its role as the National Focal Point (NFP) for the EU4GRE Programme in Ukraine, and to other relevant stakeholders. Recommendations from the ministries and the Ukrvodokanalekologiya Association were incorporated into the final selection process.

Although three pilot sites have been selected, this does not mean that energy recovery technologies will be implemented at each site. The selection of three pilot plants was made to increase the likelihood that at least one facility has the operational capacity and conditions required for demonstrating an energy recovery option. For the remaining plants, the assessment will primarily focus on identifying performance optimisation and energy-efficiency improvement measures. Given the current operational conditions of WWTPs, the immediate implementation of energy recovery technologies, such as biogas recovery, may not be technically or economically feasible in many cases. However, if these facilities are modernised and restored to operate in accordance with their design capacity and intended treatment processes, the implementation of such energy recovery solutions could become viable in the future.

Conducting feasibility studies on these options during EU4GRE can therefore provide important strategic value. In particular, these studies can support the mobilisation of financing for modernisation investments by demonstrating that improvements in WWTP performance would not only enhance wastewater treatment outcomes and thus reduce pollution in receiving waters but also enable energy recovery for plant operations. In certain cases, recovered energy, such as electricity or heat generated, could potentially contribute to meeting the energy needs of nearby communities, further strengthening the economic and environmental benefits of infrastructure upgrades.

1. **Drohobych WWTP**

Drohobych WWTP was selected based on its substantial design hydraulic capacity of 100,000 m³/day and documented plans for modernisation activities focused on replacing energy-intensive equipment with energy-efficient alternatives. The high volume of wastewater treated indicates significant sludge production and energy consumption, suggesting potential for both process and energy optimisation and energy recovery from sludge. The facility satisfies all other selection criteria, including geographic considerations and treatment performance requirements. Details of this plant were provided by the Ukrvodokanalekologiya Association, which is an indication of management's willingness to participate in programme activities.

The WWTP receives wastewater from four municipalities: Drohobych, Stebnyk, Truskavets and Boryslav. Further research showed that the average volume of treated wastewater over the past year was 29,000 m³/day, representing approximately 29% utilisation of the design capacity. The treatment process configuration includes mechanical screening and grit removal, aeration tanks for activated sludge treatment, primary and secondary clarifiers, blower units for aeration and sludge thickening facilities. A significant sludge management challenge exists at this facility, with the total accumulated sludge quantity stored locally amounting to 80,490 tonnes on 7.8 hectares of land.

2. **Kremenchuk WWTP**

Kremenchuk WWTP was selected based on documented plans for adopting energy-efficiency measures and sludge treatment improvements. It was the only WWTP that proactively responded through the EoI, demonstrating strong management engagement, a factor given significant weight in the selection process. The facility satisfies all other selection criteria, including geographic considerations and adequate treatment performance.

The treatment process configuration includes mechanical screening and grit removal, bioreactors for biological treatment and primary and secondary sedimentation tanks. The plant has a nominal design capacity of 48,000 m³/day, while actual average flow is 41,970 m³/day, representing approximately 87% capacity utilisation. Daily sludge production amounts to 13.5 tonnes of raw sludge, which currently undergoes no treatment. The existing sludge management approach involves land-drying. Sludge with 97% moisture content is spread on drying beds to reduce moisture to an average of 75%, after which it is stored in fields surrounded by earthen embankments. This sludge-handling system presents clear opportunities for valorisation interventions that could significantly reduce land storage requirements and associated environmental risks.

3. **Pustomyty WWTP**

Pustomyty WWTP satisfies all selection criteria, including documented plans for energy-efficiency improvements in the treatment process. In contrast to the other two pilot sites, this facility is considerably smaller, with a design capacity of only 2,200 m³/day. This size differential is strategically valuable, as it provides representation of a different facility scale and enables demonstration of measures applicable to smaller WWTPs, a significant segment of Ukraine's wastewater treatment infrastructure that is often underserved by development programmes.

Information on this facility was limited, with available data sourced primarily from RBMPs. However, the facility was specifically recommended by the Ministry of Community Development and Territories, indicating governmental support for its inclusion as a pilot site. Further detailed data collection will be required during the feasibility study phase to fully characterise operational parameters and identify optimal energy-efficiency and recovery interventions appropriate to this scale of facility.

8.3 Technology Selection for Feasibility Studies

The specific technologies and interventions appropriate for each site cannot be definitively determined at this preliminary assessment stage. Given the limited availability of detailed operational parameters, technology selection for EE and ER requires comprehensive on-site evaluation by technical experts. Site visits will be essential to verify actual operational conditions and capacity, conduct detailed measurements of energy consumption, assess sludge production quantities and characteristics, evaluate existing infrastructure and potential integration points for new technologies and identify site-specific constraints and opportunities.

Energy-efficiency improvements can be achieved through energy audits aimed at assessing current energy consumption patterns, identifying optimisation opportunities and recommending operational modifications. Such audits provide a systematic basis for improving the overall energy performance of WWTPs. Potential energy optimisation measures may include the following:

- **Upgrade or optimisation of pumps and blowers:** Ageing equipment in small WWTPs often operates with low energy efficiency. Installing variable-frequency drives (VFDs) on blowers and main pumps can improve operational flexibility and reduce energy consumption. In addition, replacing oversized pumps with properly sized high-efficiency models and optimising pump scheduling to avoid operating multiple pumps at low loads can further enhance efficiency. Regular maintenance, including cleaning pumps and removing blockages, is also essential to maintain optimal performance.
- **Optimisation of aeration systems:** In most biological wastewater treatment processes, aeration accounts for approximately 50–70% of total electricity consumption. Even relatively simple improvements can therefore result in significant energy savings. These measures may include the installation of dissolved oxygen (DO) control systems, replacing coarse-bubble diffusers with fine-bubble diffusers where technically feasible,

implementing timers or simple programmable logic controller (PLC) systems to regulate blower operation and repairing air leaks in piping and diffuser systems.

- **Improved sludge management practices:** Where aerobic sludge stabilisation is applied, energy demand can be reduced through process optimisation. For example, sludge age (solids retention time, SRT) can be adjusted to optimised levels to avoid excessive aeration requirements.

In addition to energy-efficiency measures, energy recovery options can also be implemented. Potential options include, but are not limited to:

- **Biogas recovery:** Organic sludge is treated through anaerobic digestion to produce methane, which can be used in combined heat and power systems to generate electricity and heat, improving plant energy self-sufficiency. This reduces operational costs and turns waste into a valuable renewable energy source.
- **Heat recovery:** Heat pumps can capture residual thermal energy from treated wastewater (effluent) and reuse it for heating buildings or processes within or outside the plant. This increases overall energy efficiency by utilising otherwise wasted low-grade heat.
- **Hydropower recovery:** Micro-turbines or hydrodynamic screws can be installed within the treatment process to harness energy from water flow and elevation differences (hydraulic head). This enables continuous, low-impact electricity generation directly from existing plant operations.

Alternative sludge management strategies, such as agricultural application, composting or co-processing, can also be evaluated where energy recovery may not be technically or economically optimal. The feasibility studies will systematically evaluate each technology option against site-specific technical, operational and institutional criteria, ultimately recommending tailored intervention packages that maximise EE improvements and ER potential.

9 Conclusion

This baseline assessment of Ukraine's wastewater management sector reveals a system at a critical juncture, facing substantial infrastructure challenges while simultaneously pursuing alignment with European Union environmental standards. The findings underscore both the urgency of modernisation efforts and the significant opportunities for transformation towards a more sustainable, energy-efficient and climate-resilient wastewater sector.

9.1 Current State of the Wastewater Sector

Ukraine's wastewater infrastructure comprises 545 WWTPs serving a population of approximately 41 million, with the majority of facilities constructed decades ago and now operating well below their design capacity. While 99.2% of collected wastewater undergoes treatment, the sector is characterised by significant regional disparities in coverage and performance. Urban areas achieve relatively high connection rates of 77%, yet rural populations remain critically underserved, with only 3.6% accessing centralised wastewater treatment services. This urban-rural divide represents not only an infrastructure gap but also a significant environmental and public health challenge.

The physical condition of the infrastructure is concerning, with 55.4% of treatment plants requiring reconstruction or modernisation and 41.5% of the sewer network classified as dilapidated or damaged. Energy consumption across the sector totals approximately 763 million kWh annually, with specific consumption rates varying widely across regions. Sludge management remains underdeveloped, with an estimated 50 to 80 million cubic metres of accumulated sludge stored at facilities nationwide, representing both an environmental liability and an untapped resource for energy recovery.

A fundamental challenge encountered during this assessment was the absence of operational data at the individual WWTP level, which significantly constrains evidence-based planning and investment prioritisation. While Ukraine maintains robust data collection and reporting systems at national and regional levels, the underlying facility-specific information is not retained in accessible government databases after aggregation for reporting purposes.

Through the efforts made in data collection, basic operational data were compiled for 50 WWTPs out of the national inventory of 545 facilities. Even within this limited sample, data completeness varied substantially. Treatment capacity information was available for all 50 facilities, while treatment performance status was documented for only 28 plants and modernisation plans were available for 29 facilities. Critically, no information could be obtained on energy consumption profiles, influent or effluent water quality parameters, or sludge generation characteristics for individual facilities.

9.2 Progress in Regulatory Alignment

Ukraine has made commendable progress in establishing the legal and institutional framework necessary for EU approximation. The adoption of RBMPs for all nine basin districts in late 2024 represents a major milestone, providing a geographic and financial roadmap for sector development over the next six years. The entry into force of the Law on Integrated Prevention and Control of Industrial Pollution in August 2025 introduces a modern, BAT-based permitting regime that will progressively replace fragmented single-media authorisations.

However, significant gaps remain between current national regulations and the requirements of the recast UWWTD. Ukraine's framework lacks harmonised agglomeration mapping from 1,000 p.e., formal procedures for designating sensitive areas requiring tertiary treatment, quaternary treatment standards for micropollutants and mandatory energy-efficiency pathways towards carbon-neutral operations by 2045. Addressing these gaps will require sustained legislative effort, technical capacity building and substantial financial investment.

9.3 Strategic Recommendations for Transformation

The most fundamental prerequisite for sector transformation is the development of comprehensive, facility-level data collection and management systems. Ukraine must establish a national WWTP register that maintains complete operational records for each facility, including design and actual treatment capacity, influent and effluent volumes and quality parameters, energy consumption and specific energy use indicators, sludge production quantities and characteristics, treatment process configurations and technologies and compliance with discharge standards.

Infrastructure rehabilitation and modernisation must be accelerated, prioritising facilities in sensitive catchments, those with the poorest treatment performance and systems serving the largest populations. Based on the available data at WWTP level, three pilot sites were selected to demonstrate practical approaches for identifying and implementing targeted improvements through this programme that can serve as replicable models across the country. The selected WWTPs, Drohobych WWTP, Kremenchuk WWTP and Pustomyty WWTP, were chosen to represent the diversity of Ukraine's wastewater treatment infrastructure across multiple dimensions. These facilities are not currently receiving support from other projects, yet they demonstrate clear potential for improvements. Furthermore, the three pilot sites provide sufficient diversity in size and operational characteristics to ensure that feasibility study findings will be relevant across Ukraine's varied wastewater treatment landscape. The studies will generate not only site-specific technical recommendations but also replicable methodologies for data collection, performance assessment and technology evaluation that can guide future interventions at facilities facing similar challenges.

The findings also indicate that, under current operational conditions, the immediate deployment of advanced energy recovery technologies may be limited at some of the plants. However, opportunities exist to improve the energy performance of WWTPs through targeted operational and technological measures. In particular, energy audits, process optimisation, equipment upgrades, improvements in sludge management practices and various competence-upgrading measures for utility staff can contribute to more efficient plant operation. In parallel, site-specific assessments may identify opportunities for energy recovery or alternative sludge valorisation options, where technically feasible. The feasibility studies to be conducted at the selected pilot plants will therefore play an important role in verifying operational conditions, identifying realistic intervention options and developing tailored recommendations based on local technical and institutional circumstances.

Regulatory approximation must proceed systematically, with implementation sequences that reflect both EU timelines and Ukraine's specific circumstances. Priority actions include completing transposition of the recast UWWTD provisions, including requirements for facility-level monitoring and reporting, operationalising the integrated environmental permitting regime with sector-specific guidance for water-intensive industries, updating reclaimed water and sludge management rules to incorporate risk-based approaches and emerging contaminant monitoring and establishing comprehensive digital reporting systems that link facility-level data to basin management objectives and enable transparent public disclosure.

Capacity building and institutional strengthening must be sustained across all levels of the sector. This includes training for utility operators, process optimisation, systematic data collection and quality assurance practices, strengthening of environmental inspectorates and permitting authorities in BAT-based assessment and building capacity within government agencies to maintain, analyse and utilise facility-level operational data for sector planning and investment prioritisation.

9.4 The Path Forward

This baseline assessment establishes a clear evidence base for targeted interventions in Ukraine's wastewater sector while also revealing fundamental gaps in the information systems necessary to support comprehensive sector transformation. By systematically addressing infrastructure deficiencies, establishing comprehensive facility-level data systems, optimising energy performance, recovering value from by-products, strengthening regulatory frameworks and building institutional capacity, Ukraine can develop a wastewater sector that meets EU environmental standards while supporting economic recovery and enhancing public health protection.

The EU4Green Recovery East Programme's support for process optimisation, energy efficiency and by-product valorisation at the pilot facilities, combined with broader efforts to strengthen legal approximation and institutional capacity, represents an important contribution to this transformation. Success will require sustained commitment from Ukrainian authorities. The foundation has been laid through basin planning, regulatory reform and initial pilot interventions. The critical next step is to complement these advances with the information systems and data management practices necessary to guide and evaluate sector transformation. With these elements in place, Ukraine can proceed towards a wastewater sector that serves both environmental protection and development objectives.

10 References

1. UNEP-DHI. (2025). *Sustainable wastewater management as a pillar for the sustainable reconstruction of Ukraine – Technical Report.*
2. Ukraine State Agency for Water Resources (SAWR). (2024). *River Basin Management Plans Ukraine 2025–2030.* Available from https://www.eu4waterdata.eu/images/pdf/Summary%20factsheets/english/Full%20Pack_eng_compressed_reduced.pdf
3. Arnika. (2018). *Czech study reveals industrial pollution in Ukraine*. Retrieved from https://arnika.org/en/news/czech-study-reveals-industrial-pollution-in-ukraine
4. State Statistics Service of Ukraine. (2022). *Population statistics overview*. Ukrainian Census Database. Retrieved from http://db.ukrcensus.gov.ua/PXWEB2007/ukr/news/op_popul.asp
5. Ministry of Environmental Protection and Natural Resources of Ukraine. (2025). *Summary Report on the progress of the implementation of the Protocol on Water and Health in Ukraine in 2022–2024.*
6. Vasylkivskyi, I., Ishchenko, V., Sakalova, H., Ullianodt, G. C. H., and Polyvanyi, S. (2023). Municipal wastewater management in Ukraine. *Desalination and water treatment*, *288*, 159–164. https://doi.org/10.5004/dwt.2023.29379
7. Ministry for Communities and Territories Development of Ukraine. (2024). *National Report on the Quality of Drinking Water and the State of Drinking Water Supply and Wastewater Treatment in Ukraine in 2023.*
8. EU4Environment. (2024). *Ukraine adopts eight River Basin Management Plans: a major milestone towards sustainable water management.* https://eu4waterdata.eu/en/blog-news/34-ukraine/400-ukraine-adopts-eight-river-basin-management-plans-a-major-milestone-towards-sustainable-water-management.html
9. UNEP-DHI Centre. (2025). *Sustainable wastewater management as a pillar for the sustainable reconstruction of Ukraine – Technical report – Final working draft*.
10. Vasilkivskij, I., Ishchenko, V., Sakalova, H., Ullianodt G. and Polyvanyi, S. (2023). Municipal wastewater management in Ukraine. *Desalination and Water Treatment*.
11. Cabinet of Ministers of Ukraine. (2024). *Resolution No. 548/2024 on the procedure for assessing the state of water drainage and wastewater treatment*. 14 May 2024.
12. Ecopolitic. (2025, 17 January). *Law No. 3855-IX/IEP on industrial pollution: What by-laws should be expected in the near future*.
13. State of Ukraine. (2025). *Law No. 3855 IX/IEP on the Prevention of Industrial Pollution*.
14. Ecopolitic. (2025, 28 January). *The Government has taken another step to implement industrial pollution reform: what document was approved*.
15. State of Ukraine. (1995). *The Water Code*.
16. State of Ukraine. (2023). Law No. 2887-IX *On Water Supply and Wastewater Treatment*. 12 January 2023.
17. Cabinet of Ministers of Ukraine. (2019). *CMU Resolution No. 690/2019 On Approval of the Rules for the Provision of Centralised Water Supply and Centralised Water Disposal Services and Standard Contracts for the Provision of Centralised Water Supply and centralised Water Disposal Services*.

18. Ministry Of Regional Development, Construction, Housing and Communal Services of Ukraine. (2017). Order No. 316/2017 *On Approval of the Rules for Accepting Wastewater into Centralised Wastewater Disposal Systems and the Procedure for Determining the Amount of Fees Charged for Excessive Wastewater Discharges into Centralised Wastewater Disposal Systems*.
19. Cabinet of Ministers of Ukraine. (1996). CMU Resolution No. 1100/1996 *On Approval of the Procedure for Developing Standards for the Maximum Permissible Discharge of Pollutants into Water Bodies and a List of Pollutants Whose Discharge into Water Bodies is Regulated*.
20. Cabinet of Ministers of Ukraine. (1999). CMU Resolution No. 465/1999 *On Approval of the Rules for the Protection of Surface Waters*.
21. Ecopolitic. (2025, 3 March). *Industrial pollution reform: What is known about the current level of readiness for implementation*.
22. Cabinet of Ministers of Ukraine. (1996). Resolution No. 1100/1996 *On Approval of the Procedure for Developing Standards for Maximum Permissible Discharges of Pollutants into Water Bodies and the List of Pollutants Whose Discharge into Water Bodies is Regulated*. 11 September 1996, last amended 9 September 2020.
23. Cabinet of Ministers of Ukraine. (2024). *CMU Resolution No. 2024/1998 Sanitary Protection Rules Prohibiting Injection of Return Waters into Underground Horizons in Protected Zones*.
24. Cabinet of Ministers of Ukraine. (1999). *Resolution No. 465/1999 Rules for Protecting Surface Waters from Return Waters*. 18 December 1998, last amended 9 September 2020.
25. Ecopolitic. (2025, 16 January). *How and where water will be monitored in Ukrainian rivers in 2025*.
26. Ecopolitic. (2025, 8 August). *The Law No. 3855-IX on the Prevention of Industrial Pollution has entered into force: What you need to know*.
27. State of Ukraine. (2023). *Law of Ukraine on Waste Management*. 17 November 2023.
28. Ministry for Communities and Territories Development. (2018). *Order No. 341 of 12 December 2018 On approval of the Procedure for the reuse of treated wastewater and sewage sludge subject to compliance with maximum permissible pollutant concentrations*. Registered in the Ministry of Justice on 22 January 2019, No. 75.
29. Ministry for Communities, Territories and Infrastructure Development of Ukraine. (2024). *Order No. 643 of 17 July 2024 On Approval of the Procedure for Primary Accounting of the Volumes of Formation, Treatment, Storage and Reuse of Sewage Sludge*. Registered by the Ministry of Justice on 27 August 2024, No. 1306/42651.
30. Ministry of Regional Development, Construction, Housing and Communal Services of Ukraine. (2013). *DBN V.2.5-75:2013 Sewerage. External Networks and Structures. Basic Design Provisions*.
31. KSV. (2013). *DSTU 7369:2013. Wastewater: Requirements for Wastewater and its Sediments for Irrigation and Fertilisation*.
32. Ecopolitic. (2025, 30 November). *The Ministry of Environment has developed European rules for the operation of landfills*.
33. EU4Environment – Water and Environmental Data. (2025). Ukraine RBMPs (2025–2030) – Summary fact sheets. https://www.eu4waterdata.eu/images/pdf/Summary%20factsheets/english/Full%20Pack_eng_compressed_reduced.pdf . Accessed December 2025.
34. Delegation of the European Union to Ukraine. (2022, 24 August). *Update and finalisation of the River Basin Management Plan (RBMP) for the Dnipro River Basin in Ukraine*.

35. Ecopolitic. (2025, 16 July). *Cabinet of Ministers approves unified form and requirements for integrated environmental permit*.
36. EU4Environment. (2024, 20 November). *Ukraine adopts eight River Basin Management Plans: A major milestone towards sustainable water management*.
37. Bandura, R. and Romanishyn, A. (2025). *Striving for Access, Security and Sustainability: Ukraine's Transition to a Modern and Decentralized Energy System*. Centre for Strategic and International Studies (CSIS).
38. CMW Law Now. (2025, 17 October). *Ukraine adopts EU standards with new regulation of industrial pollution*.
39. Alexander. (2025, 11 September). *The Register of Integrated Environmental Permits has become operational in Ukraine*.
40. Tkachenko, T. (2025). *Express monitoring of environmental safety in Ukrainian municipal wastewater systems during war*.
41. Ecopolitic. (2025, 11 September). *The Register of Integrated Environmental Permits has been launched in Ukraine*.
42. UN. (2023, 23 March). *Ukraine: Rapid Damage and Needs Assessment*.
43. Shcherbakov, I., Bryleva, K., Strawbridge, R., Nikolajeva, M., Matkovska, N., Kravec, V., Ougrin, D. and Young, A. H. (2025). *Poor quality of sewage water in Ukraine: A priority in post-war rebuilding*. *Scientific Reports*. 2 July 2025.
44. Ministry of Regional Development, Construction, Housing and Municipal Services of Ukraine. (2017). *Order No. 316 of 1 December 2017 On Approval of the Rules for Acceptance of Wastewater to Centralised Sewerage Systems and the Procedure for Determining the Amount of Payment Charged for Exceeding the Norms of Wastewater Discharges into Centralised Sewerage Systems*.
45. ISO. (2022). ISO/IEC 27001:2022. *Information security, cybersecurity and privacy protection – Information security management systems – Requirements*. Edition 3.
46. AICPA. (2020). *TSP Section 100 – Trust Service Criteria*.
47. NIST. (2020). *NIST SP 800-53 Rev. 5: Security and Privacy Controls for Information Systems and Organizations*. September 2020, including updates as of 10 December 2020.
48. CIS. (2025). *CIS Critical Security Controls Version 8 for Prioritised Defensive Practices*.
49. NIST. (2024). *Cybersecurity Framework*.
50. European Union. (2020). *Regulation (EU) 2020/741 of the European Parliament and of the Council of 25 May 2020 on Minimum Requirements for Water Reuse (Text with EEA relevance)*.
51. Eurostat. (2012). Glossary: Wastewater. European Commission. https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:Wastewater
52. Council Directive 91/271/EEC of 21 May 1991 concerning urban waste-water treatment. (1991). Official Journal of the European Communities, L 135, 40–52. https://eur-lex.europa.eu/eli/dir/1991/271/oj/eng
53. *EU4Environment – Water and Environmental Data. (2024).* Catalogue of Nature-based Solutions for Water Management in the Eastern Partnership Countries*.*

11 Annex: Principal Ukrainian Legislative and Regulatory Instruments

See below the principal Ukrainian legislative and regulatory instruments governing water and wastewater (sewerage and sanitation). It is grouped by level: primary legislation (codes and laws), core Cabinet of Ministers (CMU) by-laws and rules, sectoral regulators' acts, national standards/building codes and key international commitments that shape Ukraine's acquis alignment.

A) Primary Legislation (Codes and Framework Laws)

- Water Code of Ukraine (No. 213/95-VR, 6 June 1995). Core framework for ownership, use, protection and management of surface and groundwater; introduces basin management principles (now aligned with the EU WFD via secondary acts).
- Law of Ukraine *On Drinking Water and Drinking Water Supply* (No. 2918-III, 10 January 2002). Establishes state policy, service obligations and reporting (including the National Report), quality and access provisions; repeatedly updated (latest revision noted 31 October 2025).
- Law *On Wastewater Disposal and Treatment* (No. 2887-IX, 12 January 2023). Dedicated framework for wastewater collection and treatment, quality and effluent norms interface and planning; linked CMU implementation procedures in 2024.
- Law *On Housing and Utility Services* (No. 2189-VIII, 9 November 2017). Cross-cutting for municipal utilities, including centralised water supply and centralised wastewater (service models, contracts, subscriber fees, quality and compensation).
- Law *On Environmental Impact Assessment* (No. 2059-VIII, 23 May 2017). EIA for projects, including water supply and wastewater facilities; current revision noted 15 November 2024.
- Law *On Strategic Environmental Assessment* (No. 2354-VIII, 20 March 2018; in force 12 October 2018). Applies to plans and programmes in water resources, urban planning, etc.
- Law *On the National Commission for State Regulation in the Spheres of Energy and Utilities* (NEURC/NERC) (No. 1540-VIII, 22 September 2016). Establishes the economic regulator for, inter alia, centralised water supply and wastewater service licensing and tariff regulation.
- Law *On the Public Health System* (No. 2573-IX, 6 September2022)
- Constitution/other cross-sector acts often used in practice (selected):
    - Law *On Environmental Protection* (1991) and related enforcement; Law *On Local Self-Government* (1997); Law *On Natural Monopolies* (2000); urban planning law (No. 3038-VI). These frame competencies, tariff setting at local level, planning and public participation affecting water and sanitation.

B) Cabinet of Ministers of Ukraine (CMU) Resolutions, Rules and Government Procedures (Core for Water and Sanitation Operations)

- CMU Resolution No. 690 of 5 July 2019 *On Approval of the Rules for the Provision of Centralised Water Supply and Centralised Wastewater Disposal Services and Standard Contracts* (as amended, latest noted 10 September 2024). Fundamental service rules, connection and contract models, quality claims, etc.
- CMU Resolution No. 548 of 14 May 2024 *On Approval of the Procedure for Assessment of the State of Wastewater Disposal and Wastewater Treatment* (implements Law No. 2887-IX).
- CMU Resolution No. 808 of 21 August 2019 *On Establishing the Maximum Amount of the Subscription (Customer Service) Fee per Subscriber for Communal Services Provided to Consumers under Individual Contracts for the Provision of Communal Services or under Individual Contracts with Maintenance of In-Building Systems for the Provision of Communal Services*. Cited by utilities for subscription fee caps applied to water and wastewater services.
- CMU Resolution No. 1114 of 4 October 2022 *On Approval of the Procedure for Sampling and Testing Samples for Services of Centralised Water Supply, Hot Water Supply, and Supply and Distribution of Natural Gas*. Used for water quality sampling under service control.
- Procedure for wastewater treatment in vulnerable areas: https://zakon.rada.gov.ua/laws/show/378-2024-%D0%BF#Text
- Procedure for connecting to networks: https://zakon.rada.gov.ua/laws/show/1066-2025-%D0%BF#Text
- Procedure for developing standards for wastewater discharge into centralised wastewater systems: https://zakon.rada.gov.ua/laws/show/61-2025-%D0%BF#Text
- Procedure for state monitoring in the areas of water supply and wastewater disposal: https://zakon.rada.gov.ua/laws/show/61-2025-%D0%BF#Text
- CMU Resolution(s) on river basin management under the EU WFD:
    - CMU Resolution No. 336 of 18 May 2017 *The Procedure for Developing a River Basin Management Plan*. Establishes RBMP structure and process.
    - CMU approvals of nine river basin management plans (November–December 2024). EU4Environment notice.
- Concept of the State Target Social Programme for Improving Drinking Water Supply in Ukraine ('Sotsvoda') with the objective of ensuring equal access for all citizens of Ukraine to safe drinking water in accordance with the requirements of Directive (EU) 2020/2184 and UN SDG No. 6, *Clean Water and Sanitation* (Resolution of the Cabinet of Ministers of Ukraine dated 19 November 2025, No. 1271-r).
- CMU amendments affecting service rules during martial law (e.g., CMU No. 85 of 2 February 2022; No. 1405 of 29 December 2023 amending Resolution 690, among others). Summaries with references.
- State Target Economic Programme for Energy Modernisation of Water Supply and Wastewater Utilities ('Enerhovoda') (Resolution of the Cabinet of Ministers of Ukraine of 15 November 2024, No. 1133-r): to be developed for the period 2024–2030 with an objective of energy modernisation of water supply and wastewater utilities,

reduction of energy consumption, enhancement of system autonomy and strengthening of resilience to emergency situations.

- State Target Environmental Programme for Technical Modernisation of Wastewater and Wastewater Treatment Utilities ('Ekostoky') (Resolution of the Cabinet of Ministers of Ukraine dated 24 December 2024, No. 1502-r) to be developed for the period 2026–2034 with an objective of technical modernisation of wastewater collection and treatment systems, reduction of anthropogenic pressure on the environment, alignment of wastewater treatment standards with EU legislation and creation of conditions for sustainable development of communities.

C) NEURC (Regulator) Sectoral Regulation for Water and Wastewater

- Licensing conditions for centralized water supply and wastewater disposal (approved by NEURC on 22 March 2017; entities require a license; sets organisational, technical and staffing criteria). Sector legal summaries.
- Tariff setting for centralized water supply and centralized wastewater services (individual NEURC resolutions by licensee; general competence derives from Law No. 1540-VIII). Example tariff decisions and explanatory notes.
- Methodology for distribution of utilities consumed in a building among consumers (Order No. 315 of 22 November 2018, as amended on 28 December 2021) implementing Law No. 2119 and Law No. 2189 (applies to water and heat). Civil society brief with citations.

D) Health Protection and Water Quality Standards (Sanitary Rules and Guidance)

- State Sanitary Norms and Rules DSanPiN 2.2.4-171-10 *Hygienic Requirements for Drinking Water Intended for Human Consumption*. The principal national drinking water quality standard (microbiological, chemical and radiological indicators), still referenced; wartime temporary norms have been proposed or used for risk-based control.
- Wartime and/or emergency sanitary requirements for drinking water (draft and guidance; *DSanPiN for Wartime*, introduced for temporary regulation under martial law to address new risks, including WMD contamination scenarios). Official institute communications and peer-reviewed summary.
- Ongoing Ministry of Health standardisation initiatives (e.g., draft CMU resolution on classification of drinking water as natural mineral water to align with EU law).

E) National Building Codes and Technical Norms (Design and Operation of Systems)

- DBN V.2.5 64:2012 *Internal Water Supply and Sewerage* (Design and Construction). Frequently cited in academic and design practice.
- DBN V.2.5 75:2013 *Sewerage. External Networks and Structures. Basic Design Provisions* (external sewerage systems and treatment works).
- Selected DSTU standard frequently referenced:
  - DSTU N B V.2.5-40:2009 (design and installation of plastic pipe water and sewerage networks).

F) River Basin Management Instruments (EU WFD Alignment)

- Procedure for developing RBMPs (CMU No. 336/2017) and the RBMPs approved for nine basins in late 2024 (Dnipro, Dniester, Danube, Southern Bug, Don, Vistula, Azov, Black Sea and Crimea rivers), with public consultation processes organised under EU support in 2024.
- State Water Resources Agency RBMP implementation tools and portal (public access to measures, ecological status and planning).

G) Selected Programmatic and Reporting Instruments Required by Law

- National Report on the Quality of Drinking Water and the State of Drinking Water Supply and Wastewater Disposal (annual; mandated by the Drinking Water Law; example: 2023 report released in 2024, led by the Ministry for Communities, with MOH/MEPR/NEURC contributions).
- National Report on the State of the Environment of the Ministry of Environment and Ministry of Economy (link).

H) Other Frequently Used Cross-Cutting Instruments (Selected)

- Urban planning cadastre and procedures (affecting siting and permits for water and wastewater facilities), plus local self-government tariff setting competences for non-NEURC-licenced operators.
- Consumer rights and obligations under CMU 690 and related acts (standard contracts, service quality and connection rights). Utility references to CMU 690 illustrate practical application.
- Procedure for developing regulations: https://zakon.rada.gov.ua/laws/show/z0618-24#Text
- Rules for technical operation: https://zakon.rada.gov.ua/laws/show/z0231-95#Text
- Rules for use: https://zakon.rada.gov.ua/laws/show/z0936-08#Text
- Rules for the reuse of wastewater and sludge: https://zakon.rada.gov.ua/laws/show/z0075-19#Text
- Rules for the primary accounting of wastewater sludge: https://zakon.rada.gov.ua/laws/show/z1306-24#Text

I) Notes on Sanitary Regulation during Martial Law

- Ukrainian health authorities and research institutes have issued guidance and proposed temporary sanitary norms adjusting some DSanPiN thresholds and monitoring frequency to address conflict-related risks; these complement but do not replace the legal DSanPiN unless formally registered.

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