







Zaporizhzhia Wastewater and Sludge Treatment Project

<p>Key results:</p> <ul style="list-style-type: none">• Reduced adverse environmental impacts by treating wastewater from Zaporizhzhia to EU standards.• Reduced adverse health and nuisance impacts through stabilized and reduced quantities of surplus sludge.• Enhanced long-term sustainability of the intervention through improving capacity to operate and maintain the facilities through technical skills development by twinning with a Danish utility company.• Reduced Greenhouse Gas (GHG) emissions due to re-use of methane for sludge treatment. <p>Justification for support:</p> <ul style="list-style-type: none">• The project will have a significant development impact by ensuring safely managed wastewater services for the majority of the population in Zaporizhzhia city and reduce CO2 emissions.• Ukraine is an important partner in the EU neighbourhood and Denmark has an interest in Ukraine's positive development. The project is aligned to the Government of Ukraine's policies and plans and addresses concerns raised by Zaporizhzhia Vodokanal (ZVK) and the Zaporizhzhia City Council.• The project promotes Danish development priorities of supporting inclusive and sustainable growth, cf. World 2030, by ensuring safe wastewater treatment.• The project could be have a demonstration effect by being replicated in other localities of Ukraine.• The partnership between Danida Sustainable Infrastructure Finance and NEFCO is a learning opportunity for adjustments to the DSIF-model. <p>Major risks and challenges:</p> <ul style="list-style-type: none">• Volatile political and economic situation of Ukraine.• ZVK financial situation, which requires a combination of continued subsidies from the City Government and tariff increases.• Capacity of ZVK in managing the implementation and the operation and maintenance. Main mitigation is to provide sufficient technical assistance.	File No.	2020-34589				
	Country	Ukraine				
	Responsible Unit	Department for Sustainable Investment, Jobs and Equal opportunities/Danida Sustainable Infrastructure Finance				
	Sector	Wastewater				
	<i>DKK mill.</i>	2020	2021	2022	2023	Total
	Commitment	56,5				56.5
	Projected annual Disbursements	2,6	53,9			56.5
	Duration	2020-2024				
	Finance Act code.	06.38.01.13				
	Head of unit	Adam Sparre Spliid (acting)				
	Desk officer	Lone Bøge Jensen				
	Financial officer	Marie Gro Svenstrup				
	Relevant SDGs					
	Primary impact:	 6 CLEAN WATER AND SANITATION Water and sanitation	 7 AFFORDABLE AND CLEAN ENERGY Clean Energy			
	Secondary Impact:	 3 GOOD HEALTH AND WELL-BEING Good health and well-being	 17 PARTNERSHIPS FOR THE GOALS Partnerships for the goals			
		 11 SUSTAINABLE CITIES AND COMMUNITIES Sustainable cities and communities	 14 LIFE BELOW WATER Life below water			
	Total construction project budget: DKK 131.3 million Of which DSIF financing: DKK 45.9 million DSIF total grant commitment (cash grant + TA): DKK 56,5 million					
	Grant element according to OECD definitions and regulations (concessionality level): 35% of total project investment					

Strategic objective:
To improve the environmental situation in Zaporizhzhia and in downstream rivers and localities, with reduced odour problems, reduced quantities of sludge deposits, and a stable effluent quality in accordance with Ukrainian and EU standards.
Justification for choice of partner:
Zaporizhzhia Vodokanal (ZVK) is a natural monopoly entity in the water sector, owned by the Zaporizhzhia City Government. Its key responsibility is to provide reliable and sustainable water supply and wastewater treatment to the population, industries and public institutions within the City of Zaporizhzhia.
Summary
<p>The Zaporizhzhia Wastewater Treatment Plant 1 (WWTP-1) built in 1974, is not treating the wastewater sufficiently causing adverse environmental and health effects to the local population. The WWTP-1 is treating wastewater from 69% of Zaporizhzhia city population of approximately 740.000 people. An upgrade of the WWTP is highly prioritized by the local government.</p> <p>The project will upgrade the treatment facilities and build capacity of the company to ensure that the treatment of the wastewater from Zaporizhzhia city meets EU standards, resulting in a better environment and health and well-being for the local population as well as downstream Dnipro River. The project will introduce modern climate friendly technology, reducing CO₂ emissions equivalent of at least 3,770 t/year. New monitoring equipment will facilitate the control of the plant.</p>

Budget for construction project (not including Technical Assistance)

Million DKK	Total	Share
Output 1. Renovation and technical upgrade of a wastewater treatment plant (WWTP-1) with a capacity of 280,000 m ³ /day	100.3	
Output 2. New monitoring (SCADA) system	3.0	
Contingencies (12.5%)	12.9	
VAT	15.1	
Total budget (incl. VAT)	131.3	
Of which:		
City of Zaporizhzhia	33.2	25%
NEFCO loan	52.2	40%
DSIF grant	45.9	35%

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ACRONYMS

AER	Annual Emission Reduction
Danida	Danish International Development Aid
DKK	Danish kroner (1 Euro = 7.45 DKK)
DSIF	Danida Sustainable Infrastructure Finance (earlier DBF)
EBRD	European Bank for Reconstruction and Development
EIA	Environmental Impact Assessment.
ESIA	Environmental and Social Impact Assessment
GHG	Green House Gasses
MinRegion	Ministry of Regional Development, Construction and Housing and Communal Services of Ukraine
NEFCO	Nordic Environment Finance Corporation
NEURC	National Energy and Utilities Regulatory Commission
PIU	Project Implementation Unit
O&M	Operation and Maintenance
SCADA	Centralized Supervisory Control and Data Acquisition
SDG	Sustainable Development Goals
ToR	Terms of Reference
UAH	Hryvna (1 Euro = 33.3 UAH) (September 2020)
WWTP	Wastewater Treatment Plant
SPZ	Sanitary Protection Zone
ZVK	Zaporizhzhia Vodokanal
EUR	Euro

1 Introduction

Ukraine is area-wise the second largest country on the European continent and geographically a close and important neighbour to the EU regarding security and economic development. As a lower middle-income country, it faces a range of development challenges, including pollution. The present Danish Country Programme with Ukraine is an integrated part of the Danish Neighbourhood Programme, through which Danish-Ukraine development cooperation has developed since 2004. This DSIF engagement is another concrete demonstration of Denmark's support and commitment to Ukraine's positive development.

Danida Sustainable Infrastructure Finance (DSIF) is a suitable instrument to support the sustainable and inclusive growth objective of the Danish-Ukraine cooperation through strengthening of the local governments' ability to deliver public water services, as well as ensuring energy efficiency. This project will in particular support UN Sustainable Development Goals 6 on Water and Sanitation and 7 on clean energy.

There is a vast need in Ukraine for upgrading of critical infrastructure, which has deteriorated since the dissolution of the Soviet Union. Import of modern green technology has been challenged by the country's low international credit rating.

Earlier this year, the Danish Ministry of Foreign Affairs and the Government of Ukraine entered into a Memorandum of Understanding, paving the way for an increasing number of larger DSIF engagements in Ukraine. In parallel to the drafting of the agreement, DSIF and the Nordic Environment Finance Corporation (NEFCO) have been collaborating on a financing model to offer loans to Ukrainian municipalities. NEFCO is an international financial institution founded by the Nordic countries with the purpose of providing loans for investments in green growth and climate mitigation and adaptation. The Zaporizhzhia Wastewater and Sludge Treatment Project (WWTP) is the first of three pioneer projects selected by DSIF and NEFCO. The model allows for the realization of projects that have important benefits to communities and the country, but which are not otherwise financially viable. At the same time, DSIF obtains experience in Ukraine through working with a trusted and experienced partner.

DSIF provides a grant element of DKK 45.9 million supplement the NEFCO loan of DKK 52.2 million and NEFCO takes the credit risk with a municipal guarantee. The City Council of Zaporizhzhia provides the remaining project funding of DKK 32.2 million. DSIF was in charge of the project preparation (feasibility studies) and NEFCO will be responsible for project implementation, which implies an open international tender for the contract of works. In addition to the grant, DSIF will fund the technical assistance needed during project implementation, including a twinning arrangement with a Danish utility company in the water and sanitation sector.

The feasibility study for the project was undertaken by COWI and finalised in May 2020. An independent consultant carried out an appraisal of the project in August 2020, and the recommendations from this report have been included in the finalisation of the present Project Document.¹

¹ Due to the travel restrictions related to COVID-19 the appraisal was carried out as a desk-study.

2 Project Context

2.1 Socio-economic context in Ukraine

Since the ‘Maidan’ uprising in February 2014, Ukraine has experienced acute political, economic and security challenges, including the outbreak of conflict in Eastern Ukraine and the Russian annexation of Crimea. President Volodymyr Zelenskyy won the election in April 2019 with 73 per cent of the votes and his government is committed to ambitious and wide-ranging reforms in order to improve trust in public institutions and combat widespread corruption. One of President Zelenskyy’s main electoral promises was to end the conflict in Eastern Ukraine, where Russian-supported separatists are in power in parts of two provinces, but despite some progress, a solution still seems far away.

After an abrupt decline in GDP in 2014–2015, the Ukrainian economy showed some improvement, with the growth rate reaching 3.2 per cent in 2019. However, manufacturing and investment growth remains weak and GDP per capita is still low at 3,300 USD in 2019². Before the COVID-19 pandemic the expectations for 2020 was continued consolidation and an annual growth rate around 3 per cent. The restrictions due to the pandemic, lower remittances from workers, due to the decline in economic activity in Poland and other EU countries, and lower commodity prices contribute to the prediction that the Ukrainian economy will contract with 8.2% in 2020 (IMF, June 2020).

2.2 The socio-economic situation in the area of Zaporizhzhia

As is the case for other Ukrainian cities, the population in Zaporizhzhia is declining. It is anticipated that the population will decline from its current 740,000 inhabitants to 640,000 inhabitants in 2039. The city experiences a gradual decline in the share of the working-age population, which will result in a deficit of labour in a medium-term outlook (10 years).

Real income has been growing in recent years, both in Zaporizhzhia Oblast (the region) and Zaporizhzhia City. However, due to continued devaluations, the euro equivalent wage is lower than the wage in 2013. The economic consequences of COVID-19 will most likely have a negative effect on the economy.

The average weighted tariff for *wastewater* in Zaporizhzhia (approximately EUR 0.14/m³ in 2019) is 31 percent lower than the average tariff in 25 Ukrainian cities. Compared to other European countries in the region, tariffs in Ukraine are among the lowest.

With a 40 % increase in water tariff in 2020, the Zaporizhzhia City Government brought the tariffs closer to the level in other Ukraine cities and demonstrated a political will to implement planned increases of tariffs. However, the appraisal concluded that the economy of Zaporizhzhia Vodokanal most likely will continue to be dependent on subsidies from the government in years to come, not least the subsidy provided for the poorest households.

2.3 The Water sector: stakeholders, policy and sector plans

Since the dissolution of the Soviet Union, access to water supply services in Ukraine has stagnated. In cities and towns, 90 percent of the population is connected to water supply and 85 percent have access to sewerage. Only 70 percent have access to wastewater treatment.³ Decades of underinvestment and

² <https://datacatalog.worldbank.org/dataset/gni-capita-ranking-atlas-method-and-ppp-based>

³ World Bank: ‘Project Appraisal Document for a Second Urban Infrastructure Project’. Data for 2014.

poor maintenance have resulted in the deterioration of wastewater systems, with worn-out infrastructure and equipment that has passed its lifetime. As a result, poorly treated wastewater is discharged, with much of it ending up in the Black Sea.

During the years of post-Soviet independence, the national government has delegated water and sanitation services to local authorities. The fragmentation of the water and sanitation sector in Ukraine derives from a high number of medium and small residential settlements, giving rise to a high number of water supply operators.

The most typical and commonly used form of organization for water supply and wastewater utilities is the communal unitary enterprise fully owned by the local government, which is the case for the company Zaporizhzhia Vodokanal (ZVK). The company is subject to state regulation by the National Energy and Utilities Regulatory Commission (NEURC). State policy for the sector, drinking water standards and environmental protection standards are national responsibilities of the Ministry for Regional Development, Ministry of Health Protection and Ministry of Environment and Natural Resources.

Sector Policies: Centralised water supply and wastewater is regulated by a large number of laws. The two most important laws are: (1) the Law on Housing and Communal Services and (2) the Law on Drinking Water, Drinking Water Supply and Wastewater. These focus on effective and efficient use of resources and equal access to services.

A national strategy on “Development of Water Supply and Wastewater Systems”⁴ is under preparation. The strategy will prioritise reduction of negative impacts on the environment, improving financial and economic condition for water utilities, as well as introducing a transparent and effective system of fees and conditions in order to attract investments to the sector.

2.4 The present wastewater and sludge treatment in Zaporizhzhia

Zaporizhzhia is a large industrial city in southern Ukraine, located on both banks of the Dnipro River. The current population is estimated at approximately 740,000 people (2019), with 69% living on the Left Bank and 31% on the Right Bank of the Dnipro River, respectively.

Two wastewater treatment plans, WWTP-1 and WWTP-2, currently operate in Zaporizhzhia (a sketch of the overall wastewater treatment situation in Zaporizhzhia is included in Annex 1). Wastewater generated on the Dnipro River left bank (east side) is treated in WWTP-1 established in the early seventies with a major refurbishment in 2007-2008. WWTP-1 is a mechanical and biological wastewater treatment plant with biological phosphorus removal and partial nitrogen removal by biological nitrification/denitrification. Treated wastewater from WWTP-1 is discharged into the Dnipro River. Surplus sludge is pumped to sludge lagoons located some 3 km south of the plant for final stabilisation, dewatering and disposal.

WWTP-1 faces three main challenges: (i) the effluent is not up to EU standards regarding Nitrogen and Phosphorous, (ii) odour problems in and around the plant and the sludge lagoons due to un-stabilised sludge, and (iii) lack of capacity at the sludge lagoons.

The feasibility study included an over-all analysis and costing of prioritised tasks for sequenced rehabilitation and expansion of WWTP-1 in order to bring the capacity of WWTP-1 in compliance with

⁴ National Report “Sustainable Development Goals: Ukraine”, 2017 http://un.org.ua/images/SDGs_NationalReportUA_Web_1.pdf

the longer term plans (2038) for the waste water treatment in the city, including a possible inclusion of waste water from the right bank of Dnipro River.

The feasibility study highlights the following technical challenges in its overall assessment of WWTP-1:

- **Fluctuations in effluent quality.** The wastewater treatment processes are not always stable/constant, thereby affecting the effluent quality, in particular the nitrogen content. Therefore the WWTP is not able to live up to the EU effluent standards;
- **Challenges with quality and quantity of sludge.** The surplus sludge is not stabilised before being pumped to the sludge lagoons, causing odour problems at the lagoons. The disposal of large volumes of liquid sludge increases the risk of overflows at the sludge lagoons during heavy rains, causing problems for people living in the vicinity of the lagoons;
- **Data reliability issues.** Current quality and quantity measurements at WWTP-1 are not sufficiently reliable for efficient operation.

The project includes prioritised interventions needed to address the immediate challenges faced by Zaporizhzhia Vodokanal in managing the WWTP-1 system.

2.5 Development partners in the Water and Sanitation Sector

The World Bank estimated in 2014 that an investment of EUR 4-6 billion was needed to bring the water and sanitation systems to operational safety, and a total of EUR 22-26 billion to achieve international service standards. The needed investments cover rehabilitation of existing water and wastewater facilities and for construction of new facilities in Ukraine⁵.

Many wastewater projects in Ukraine are presently under planning or construction, mostly with external funding. The biggest ongoing project is the rehabilitation and extension of the Greater Kyiv WWTP (Bortnytska) with Japanese funding (around USD 900 million). Most larger cities in Ukraine are planning to - or in the process of - upgrading their wastewater facilities. The other main foreign agencies active in the sector are the European Bank for Reconstruction and Development, the European Investment Bank, the World Bank and KfW (Germany). NEFCO has several projects within the wastewater sector.

3 Danish priorities, interests, and strengths

3.1 Key Danish policies and priorities

The project supports the Danish Strategy for Development Cooperation and Humanitarian Action ‘*World 2030*’, by facilitating investments in one of the strategy’s four strategic aims, namely “*inclusive and sustainable growth with a special focus on energy, water, agriculture, food and other areas, where Denmark has particular knowledge, resources and interests*”.

The project is highly relevant in this context:

- The main aim of the project is to reduce adverse environmental, health and climate impact by improving the wastewater effluent quality and introducing sludge stabilisation, including energy recovery; and

⁵ World Bank: “Water and Waste Water Services in the Danube Region, Ukraine Country Note, 2015”

- The project draws on Danish know-how to provide up-to-date solutions within wastewater treatment and sludge management and opens opportunities for Danish contractors and suppliers, as well as for the Danish Water and Wastewater Utilities for provision of technical assistance through a twinning arrangement with ZVK.

Ukraine is an important partner for Denmark and supported through the Danish Neighbourhood Programme (DANEP) with the aim of promoting human rights and democracy, and strengthening sustainable and inclusive growth.

The project aligns with DSIF's guiding principles:

- Contributing to **poverty reduction indirectly** by supporting sustainable public infrastructure in line with the SDGs.
- Being based on local demand and responding to a local development challenge.
- The project is economically beneficial, but **not viable under commercial conditions**.
- IFC performance standards and **UN guiding principles** for business and human rights are reflected in the guidelines of NEFCO, who will be DSIF's main partner.
- The project will be tendered based on **total life cycle cost**, including operating cost (e.g. cost-effectiveness of energy and water efficiency).
- The project will be tendered in accordance with NEFCO rules, which require an open international tender. This is compatible with existing DSIF regulations, which allow for untying from Danish bidders only under certain circumstances such as the purpose of developing the DSIF instrument on a pilot basis, or if the interest from Danish companies is expected not to be sufficient in order to complete a competitive tender.

3.2 Main Danish strengths and lessons learned

The project supports the broader Danish strategic framework for cooperation with Ukraine and the Danish Neighborhood Programme (DANEP). Within DANEP the Danish embassy has a long-term cooperation with Ukrainian government institutions and development partners, in particular the EU. The EU is by far the largest development partner in Ukraine, supporting democracy and human rights, rule of law, good governance and sustainable development. DANEP is supporting the EU programmes on decentralization and anti-corruption and aims at complementing the EU assistance through targeted and flexible interventions. The DSIF framework agreement with Ukraine focuses on concrete investments within the energy, water and sanitation sectors. Through DANEP, the embassy holds regular meetings with national authorities responsible for service provisions at local level, such as the Ministry for Communities and Territories Development (water) and the Ministry of Energy and the State Agency for Energy Efficiency (energy).

There is great potential for co-financing small and medium-sized projects with NEFCO in Ukraine, where NEFCO's local presence and resources can provide added value to a DSIF project. In parallel to the Zaporizhzhia project, DSIF is currently collaborating with NEFCO in developing a wastewater treatment project in Lviv city and a district heating project in Kremenchuk. With these three projects DSIF and NEFCO are testing a finance model, where NEFCO will be responsible for project implementation. As NEFCO rules prescribe an open international tender, the NEFCO-DSIF finance model will furthermore provide lessons learned of including Danish green solutions and know-how in project design without tying the contract to Danish suppliers.

Danish companies and service providers within the water and sanitation sector represent a solid resource base with regard to green technology in wastewater and sludge process optimisation, and wastewater and sludge treatment, including gas production and utilisation. 3Vand – a cooperation of Danish water service companies - has participated in the project preparation and advised on the technical solutions and technologies adopted in the project. As a result, the Zaporizhzhia Vodokanal has requested that part of the support for advice and capacity building during project implementation be integrated in a twinning arrangement between Zaporizhzhia Vodokanal and a Danish utility company.

4 Strategic considerations and justification

This project in its core is fully aligned with Denmark's increasing focus on environment and climate, as well as upskilling and technical skills development based on the transfer of Danish expertise. Based on the above, the main strategic considerations behind the proposed project are:

- The project will have a significant development impact by ensuring safely managed wastewater services for the majority of the population in Zaporizhzhia city (SDG6 water and sanitation) and reducing the emissions of CO₂ By re-use methane for sludge treatment. The project will furthermore improve the health and well-being of the people living in the vicinity of the plant (SDG 3), and ensure that the effluent quality from the WWTP complies with EU standards, thereby reducing pollution of the rivers leading to the Black sea.
- Ukraine is an important partner in the EU neighbourhood and Denmark has an interest in Ukraine's positive development. The project is aligned with the Government of Ukraine's policy and plans and addresses concerns raised by Zaporizhzhia Vodokanal and the Zaporizhzhia City Council with regard to rehabilitation and management of WWTP-1 and the sludge lagoons.
- The project promotes Danish development priorities of supporting inclusive and sustainable growth by ensuring safe wastewater treatment.
- The project could have a demonstration effect by being replicated in other localities of Ukraine. The project will implement sustainable wastewater and sludge treatment technologies and management and will result in an increased focus on energy efficiency and life cycle costing, thereby promoting efficient wastewater management.
- The partnership between Danida Sustainable Infrastructure Finance and NEFCO is a learning opportunity for adjustments to the DSIF-model. Collaborating with NEFCO, who has experience in Ukraine, through a finance model on results-based green finance will reduce the risk and increase the probability of successful implementation.
- This project will directly support UN Sustainable Development Goals 6 on Water and Sanitation and SDG 7 on clean energy, and to some extent support SDG 3 on good health and well-being, SDG 11 on sustainable cities and communities, and SDG 14 on life below water.

5 Project Objectives and theory of Change

5.1 Objectives and results

The project's overall objective is 'To improve the environmental situation in Zaporizhzhia and in downstream rivers and localities, with reduced odour problems, reduced quantities of sludge deposits, and a stable effluent quality in accordance with Ukrainian and EU standards.

Thematic Programme title		Zaporizhzhia Wastewater and Sludge Treatment Plant Project	
Thematic Programme Objective		To improve the environmental situation in Zaporizhzhia and in downstream rivers and localities, with reduced odour problems, reduced quantities of sludge deposits, and a stable effluent quality in accordance with Ukrainian and EU standards	
Impact indicator 1		Effluent quality in compliance with EU standards	
Baseline	Year	2020	Fluctuations in effluent quality documented by ZVK effluent quality measurements (baseline to be established)
Target	Year	2024	Quality of effluent are in compliance with EU standards. Reduced fluctuations (improved constancy) in effluent quality and within EU standards, as documented by ZVK effluent quality measurements (target to be established)
Impact indicator 2		Odour complaints at sludge lagoons	
Baseline	Year	2020	Frequent complaints (baseline to be established)
Target	Year 1	2024	Reduced number of complaints (target to be established)
Outcome 1		Reduced adverse environmental impacts by treating wastewater from Zaporizhzhia to EU standards.	
Outcome indicator		Ammonia NH ₄ -N in effluent from WWTP-1	
Baseline	Year	2020	389 t/year
5 year target	Year 1	2024	34 t/year
End target	Year 5	2029	34 t/year
Outcome 2		Reduced adverse health and nuisance impacts through stabilized and reduced quantities of surplus sludge	
Outcome indicator		Sludge transferred to sludge lagoons	
Baseline	Year	2020	152,000 m ³ /year – non stabilised
5 year target	Year 1	2024	28,000 m ³ /year -stabilised/treated
End target	Year 5	2029	28,000 m ³ /year -stabilised/treated
Outcome 3		Enhanced long-term sustainability of the intervention through improving capacity to operate and maintain the facilities through technical skills development by twinning with a Danish utility company.	
Outcome indicator		ZVK has implemented a plan for capacity development (indicator to be finally determined between Danish utility company providing twinning support and ZVK, depending on the final scope of the capacity development support)	
Baseline	Year	2020	To be determined in contract regarding twinning support
5 year target	Year 1	2024	To be determined in contract regarding twinning support
End target	Year 5	2029	To be determined in contract regarding twinning support
Outcome 4		Reduced Greenhouse Gas (GHG) emissions due to re-use of methane for sludge treatment	
Outcome indicator		Annual CO ₂ reduction (Annual Emission Reduction)	

Baseline	Year	2020	-
5 year target	Year 1	2024	3,770 t/year CO ₂ equivalent reduction
End target	Year 5	2029	3,770 t/year CO ₂ equivalent reduction

The theory of change builds on the following **main pathways**:

- By renovating WWTP-1, the wastewater being led into the Dnipro River will meet Ukrainian and EU effluent standards and thereby ensure access to safely managed wastewater (SDG6) for the majority of the city's population.
- By upgrading the sludge treatment process, the sludge quantity will be treated and reduced, which will decrease the adverse health and nuisance impacts on local residents, thereby improving the health and well-being of the population living in the vicinity of the plant (SDG3).
- By treating the sludge from the plant, the greenhouse gas (GHG) emissions will be reduced with an estimated CO₂ equivalent of at least 3,770 t/year.
- By installing a new monitoring (SCADA) system, including various measuring equipment, the operations of WWTP-1 will be more effective and sustainable.

By providing support to a twinning arrangement between ZVK and a Danish water utility company, which will provide technical assistance and training on best-practice, the operation and maintenance of the implemented project will furthermore be enhanced. This will contribute to the long-term sustainability of the project.

The Theory of change rests on **two main assumptions**:

- 1) that Zaporizhzhia City Council will provide the required part of the funding for the project.
- 2) that Zaporizhzhia Vodokanal will be able to operate and maintain the rehabilitated facility.

The main risks identified are (see also separate risk section):

- 1) that Zaporizhzhia Vodokanal lacks the capacity to manage the implementation of the project. This concern has been addressed in the design of the project by including an implementation consultant position.
- 2) Zaporizhzhia Vodokanal (ZVK) is currently running a small deficit. The operation of the new facility will add costs, so ZVK is dependent on continuous increase in tariff or continued subsidies from the City Government.

5.2 Human Rights and Social and Environmental Impact assessments

Human rights impact

The core activity of ZVK is the provision of water supply and sanitation services, access to both of which are basic human rights. The project's immediate impact is thus securing the right to access to water and sanitation for Zaporizhzhia's inhabitants living on the Left Bank of the Dnipro River.

Since WWTP-1 was built in the 1970s, the city has grown and the plant is now located inside the city boundary. Over the past decades, people have settled inside the Sanitary Protection Zone (SPZ) surrounding WWTP-1 and in the proximity of the sludge lagoons, despite land use restrictions. As part of the stakeholder mapping for the project, ZVK is currently identifying and mapping the landowners

inside the protection zones. Estimates indicate that approximately 2,500 people live in the area, and the present project will not require relocation of these households. The City Government is planning public hearings on the rehabilitation of the WWTP to identify and address concerns expressed by stakeholders regarding the project.

Environmental and social impact

The feasibility study recommended that the Environmental and Social Assessment required by Ukrainian law should be undertaken at a later stage in the project preparation process, as a complete assessment can only be made once the contractor has concluded the final design of the project. For the DSIF subsidy to be released by NEFCO, the following two conditions must be met; (1) the Ukrainian authorities approve the Environment and Social Impact Assessment, and (2) DSIF accepts the subsequent Environmental and Social Action Plan. The project implementation unit in Zaporizhzhia Vodokanal will be responsible for obtaining the approval and elaborating the action plan, with assistance from the implementation consultant financed by the project.

During the feasibility study, a preliminary evaluation of the project's social and environmental impact was conducted and the findings were confirmed during the appraisal. In summary:

- The project is mainly an environmental project, reducing pollution in the surroundings of WWTP-1 and in the Dnipro River. The stabilisation of the wastewater treatment process will make WWTP-1 more resilient to load fluctuations and the improved stabilisation and dewatering of the sludge will reduce disposal volumes at the sludge lagoons as well as lower the risks of surface runoff of sludge in case of heavy rains. Improved removal of particular nutrients (Nitrogen and Phosphorous) will result in improved quality of the effluent and thus reduce the impact on the biological environment of the Dnipro River. In addition to the environmental impact, a considerable reduction in CO₂ emissions is envisaged due to improved operation of the WWTP.
- The rehabilitation and upgrading of the plant will take place within the existing WWTP-1 premises and therefore no additional land will be used. The expectation is that there will be no requests of compensation or resettlement that need to be handled before project implementation.

5.3 Project set-up

In 2017 Zaporizhzhia City established a working group 'On preparing and implementing investment projects of Vodokanal Utility Company' by Decree 23/10/2017. During implementation of the project, a Project Implementation Unit (PIU) will have the main responsibility of the day-to-day implementation of the project. The specific duties of the PIU comprise, among others, the elaboration of plans and reports, carrying out the works contract tendering and ensuring compliance with environmental and social requirements (national and those required by DSIF and NEFCO), as well as monitoring and evaluating progress of the project. The PIU will be responsible for the elaboration of a full ESIA according to Ukrainian and DSIF/NEFCO requirements.

DSIF will finance an implementation consultant, who will work under a contract with NEFCO, and advise the PIU regarding design review, procurement, contract administration, engineering supervision, disbursement, implementation, commissioning, testing and acceptance and monitoring. During implementation, the consultant will supervise the construction, clear invoices from the contractor and make recommendations to NEFCO regarding payments to be made according to the loan agreement.

Danish-Ukraine twinning

DSIF will finance a twinning arrangement with a Danish utility company in the water and sanitation sector. The twinning arrangement will be based on a plan for capacity development reflecting the introduction of new technologies of the project. The arrangement may include on the job training during extended visits by the Danish utility company and introduction of best practise solutions.

The twinning partner will follow the project from project initiation. The scope and duration of the twinning arrangement will be further elaborated during the final design phase. The support is expected to include three main areas of intervention:

- Training in equipment management;
- Training of operation and maintenance staff; and
- Upgrade of the laboratory (equipment and procedures)

Depending on NEFCO's negotiations with ZVK and NEFCO's fiduciary risk assessment of ZVK, NEFCO will decide whether the loan and grant disbursements will be made directly to the contractor or via ZVK.

5.4 Monitoring mechanisms

During the preparation of the tender documents, the implementation consultant will validate the quality of the proposed indicators and ensure obtainment of the baseline data.

ZVK will be required to gather the data for monitoring the indicators in the results framework, and if required, suggest revisions to the indicators. ZVK will receive technical assistance for the monitoring of the indicators from the implementation consultant and through the twinning arrangement.

During the tender and construction phases, the implementation consultant will report to NEFCO on implementation progress, with copy to DSIF. NEFCO will report to DSIF on the results framework after final implementation of the project. Reporting format and requirements are defined in the DSIF-NEFCO framework agreement.

DSIF shall have the right to carry out any technical or financial mission considered necessary to monitor the implementation of the project. After termination of the project support, DSIF reserves the right to carry out an evaluation of the project.

5.5 Operation and maintenance

When the project has been commissioned, Zaporizhzhia Vodokanal (ZVK) will have the full responsibility for the operation and management of the new/rehabilitated WWTP-1 facilities. The institutional sustainability of the project is dependent on ZVK having:

- technical capacity to operate and maintain the new/rehabilitated facilities at WWTP-1 properly;
- sufficient cash flow to finance proper maintenance.

ZVK has a skilled workforce but the feasibility study suggests further capacity development in order for ZVK to fully benefit from the improvements in efficiency introduced by the project. In order to strengthen the capacity of ZVK, DSIF has agreed to facilitate and fund a twinning arrangement with a Danish utility company specialising in water and wastewater.

The annual additional operation and maintenance costs for ZVK will be around EUR 1.2 million. As described in section 2.2 there are two ways of ensuring more income for ZVK; either the tariffs are increased, or the annual subsidy from the City Government is increased. A combination of the two is the most likely scenario, hence the economy of Zaporizhzhia Vodokanal will continue to be dependent on subsidies from the government for operating and maintain the WWTP.

6 Procurement

The Implementation Consultant and the Contract of Works will be tendered using NEFCO's tendering process in accordance with NEFCO Procurement Guidelines (12 December 2013). These extensive guidelines, which comply with DSIF requirements and processes, call for open international tendering with fair and transparent processes. Safeguards against corruption includes that NEFCO reviews and provides no-objection to the procurement and contract administration processes, i.e. the tender documents, as well as to the tender evaluation and contract award procedures. The same safe guards are also used in DSIF implemented projects. The NEFCO Policy on Anti-Corruption and Compliance (December 2019) requires that all stakeholders under NEFCO-financed contracts observe the highest standard of transparency and integrity during the procurement, execution and implementation of such contracts.

The implementation consultant will assist the PIU with the tender process and preparation of tender documents. The tender document preparation and procurement is estimated to take 12 months. The physical construction works are expected to last 24 months, followed by a 12 months Defects Liability Period.

DSIF will be responsible for the implementation of the twinning arrangement, which will be an agreement between DSIF and a Danish utility company.

7 Lending arrangements and financial management

According to the Framework Agreement between DSIF and NEFCO, NEFCO provides a loan, while DSIF provides a grant to soften the conditions of the NEFCO loan. The City Government of Zaporizhzhia will provide the remaining funding for the project. DSIF will disburse the grant directly to NEFCO. NEFCO will be responsible for financial management, procurement and physical implementation and monitoring. NEFCO will report to DSIF according to the Framework Agreement.

NEFCO takes the credit risk without requirement for a guarantee from the export credit agency, EKF, which in turn would be guaranteed by the official development budget, as is the usual DSIF procedure when loans are extended by a private commercial bank.

While NEFCO will procure the implementation consultant and manage the commercial contracts, DSIF will finance the implementation consultant via a grant through NEFCO. The twinning arrangement will be financed and managed directly by DSIF.

8 Budget

Budget	DKK million	Share
Component 1. Renovation and technical upgrade of a wastewater treatment plant (WWTP-1) with a capacity of 280,000 m ³ /day	100.3	
Component 2. New monitoring (SCADA) system	3.0	
Contingencies (12.5%)	12.9	
VAT	15.1	
Total budget (incl. VAT)	131.3	
Funding provided by:		
City of Zaporizhzhia	33.2	25%
NEFCO loan	52.2	40%
DSIF grant	45.9	35%
DSIF-financed Technical Assistance (twinning agreement and project implementation consultant)	10.6	
DSIF total grant (appropriation)	56.6	

In the case that the costs during tender turn out to be higher than the estimated budget, the City Government (Zaporizhzhia City Council) will finance the difference.

The Technical Assistance will comprise a twinning arrangement with a Danish utility company specialised in water and wastewater, at an estimated cost of DKK 5.2 million, and an implementation consultant, estimated at DKK 3.4 million. A buffer of DKK 2 million is included in the budget for technical assistance.

9 Risk Management, preconditions and monitoring

9.1 Assumptions and risks

The main *contextual risks* are:

- A deterioration of the political situation in Ukraine and increased conflict in the Eastern part of the country. The impact is assessed as minor. The EU and its member states are committed to continue supporting Ukraine economically and politically, and Zaporizhzhia City is located some 200 km west of the Eastern conflict areas. ZVK is providing a vital service in Zaporizhzhia, and the service is unlikely to be interrupted due to national politics. However, in the case of an adverse political and economic scenario subsequent to project implementation, the quality of the maintenance of the WWTP may deteriorate.

- The impact of the COVID-19 pandemic. COVID-19 may result in a considerable deterioration of the economy and the financial situation of the national Government. This may affect the capacity of the City Government to continue subsidising operation and maintenance of Zaporizhzhia Vodokanal.

Among the *programmatic risks*, are:

- The ability of the City Government to finance the agreed counterpart funding of the project (25%). This risk is considered minor as the project has high priority for the City Government.
- The capacity of ZVK to ensure a sufficient cash flow to finance the increased operation and maintenance costs caused by the project. The substantial increase in tariffs approved in February 2020 may diminish this risk. However, as inflation is expected to continue, the tariffs will have to be continuously increased to keep up with the costs. This is a politically sensitive issue, so there is a risk that this may not happen. Overall, the risk is considered to be medium, as ZVK provides an essential service, and in case the tariff is not increased sufficiently, the City Government is likely to continue providing a subsidy for operation and maintenance. However, the quality of the maintenance may deteriorate.
- The technical capacity of ZVK to manage the implementation of the project. To mitigate this risk, NEFCO/DSIF will provide an implementation consultant to support ZVK during tender and implementation, and the residual risk is considered to be minor.
- The technical capacity of ZVK to operate and maintain the rehabilitated/new facilities. The risk is significant, and will be mitigated through a twinning arrangement, where a Danish utility company will provide technical assistance and training in sustainable operation and maintenance. The residual risk is considered minor.
- Enforcement of industrial wastewater discharge into the sewer system. This risk has a major impact, as WWTP-1 can be overloaded, in particular with loads of un-desirable components, such as heavy metals, which could inhibit the biological processes of the WWTP. To mitigate this, ZVK will closely monitor the industrial discharges into the sewer system. The residual risk is considered medium.

The main *institutional risks* are:

- Lack of transparency during tender and construction. This risk is considered to be low, as NEFCO will be managing the process and has substantial experience in operating in the complicated environment in Ukraine, where corruption is widespread.
- Violation of the rights of the people living in the vicinity of the plant and the sludge lagoons. This risk is considered very low, as no land acquisitions will be necessary, and the project will actually improve the environmental conditions, particularly for the people living within the Sanitary Protection Zone. ZVK is fully aware of its responsibilities and has already initiated a process of mapping the stakeholders within the Sanitary Protection Zone.

9.2 Preconditions

DSIF's main development partner in the project is NEFCO, who will be responsible for implementing the grant for the subsidy linked to the NEFCO loan to the City Council of Zaporizhzhia and the grant financing the contract with the implementation consultant.

In the DSIF agreement with NEFCO it will be a pre-condition that Zaporizhzhia Vodokanal ensures that a full Environmental and Social Impact Assessment will be completed, once final design of the project has been made by the contractor. In the agreement between NEFCO and the City Government, it will be a pre-condition that the City Government confirms available local funding on an annual basis before disbursements under the loan can be made.

Before the DSIF Grant for the loan is transferred from DSIF to NEFCO, the following conditions shall be met:

- Approval of the project by Denmark's Minister for Development Cooperation
- Final Investment Approval of the project by NEFCO Board
- Environmental and Social Action Plan (ESAP) accepted by DSIF
- Key terms of the NEFCO loan agreement, acceptable to DSIF, signed by NEFCO and the Ukrainian project owner

9.3 Communication on results

The terms of reference for the implementation consultant shall include support for elaboration of a communication strategy. The implementation consultant will thus have an important role in assisting NEFCO, DSIF and the City Government in the communication of the results.

Annex 1. Zaporizhzhia WWTP

- Dnipro Left Bank consumers discharging into WWTP-1;
- Dnipro Right Bank consumers discharging into WWTP-2; and
- Khortytsia Island consumers discharging into ponds located on the island.

A sketch of the overall wastewater treatment situation in Zaporizhzhia is shown in the below figure.



Annex 2. Partners

Zaporizhzhia Vodokanal (ZVK)

Zaporizhzhia Vodokanal (ZVK) was established in 1894 and is one of the oldest running water utilities in Ukraine. It is fully owned by the City Government (Zaporizhzhia City Council) and its primary business is to provide reliable and sustainable water supply and wastewater collection and treatment for domestic, public, commercial consumers and industrial clients within the City of Zaporizhzhia. ZVK is regulated at national level, where the National Energy and Utilities Regulatory Commission (NEURC) is the state body responsible for regulation, monitoring and control over companies operating in the energy and communal services sectors, including the water sector.

There are currently two wastewater treatment plants in operation in Zaporizhzhia, both operated by ZVK; WWTP-1 and WWTP-2. WWTP-1 was constructed in 1974 and partially upgraded in 2007-08. WWTP-2 was constructed in 1958 and is also in need of renovation. Nearly 99% of the city's population is connected to the network and others (1%) use cesspits and septic tanks, where the wastewater is transported to Zaporizhzhia Vodokanal's treatment facilities. Provision of centralized wastewater service has increased by 3.3 percentage points from 2014 to 2018. Total number of employees in ZVK is 2,897 (2018), where 48.2% were men and 51.8% were women – however only 3% women at management level. Gender/non-discrimination is integrated in the implementation process.

Zaporizhzhia's wastewater tariffs are low compared to other big Ukrainian cities. ZVK's gross profit has been positive for the years 2014 to 2017 but turned slightly negative in 2018 and 2019. ZVK does not have any debt or loan repayment obligations at present. In 2018 ZVK realized a net loss before tax of 1.4 million EUR, but a net profit of 0.6 million EUR in 2019. The positive net result is due to budgetary support from local government. In 2020 the tariff for business and industries is expected to increase by 60% whereas the wastewater tariff to households is expected to increase by 40%. This will potentially generate a substantial larger net profit to ZVK.

ZVK has many years of experience operating the WWTP; however, the capacity to ensure efficient and sustainable management and maintenance during a major project implementation is limited. ZVK has some experience implementing large projects from the upgrade of WWTP-1 in 2007-08 funded by EBRD, but the experience of current staff must be considered limited. To capacitate ZVK, NEFCO and DSIF will provide technical assistance to ZVK during project preparation, implementation and subsequent operation. ZVK has been deeply involved in the preparation of the feasibility study in close collaboration with a Danish water utility. To ensure sufficient implementation an implementation consultant will be hired to assist ZVK with procurement, contract award and supervision of construction. A twinning arrangement with a Danish water utility will build capacity within ZVK on efficient and sustainable planning, management and operation of the WWTP.

Corruption is endemic in Ukraine. ZVK has initiated measures to mitigate this risk. One transparency measure is information via their website where ZVK disseminates information regarding investment programs and where they disclose annual reports. Anticorruption control is one of the responsibilities of the ZVK's Safety Department. In 2018, 88 tender procedures were cancelled due to deviations from competitive bidding rules, including 79 contractual procurement procedures and 9 open tenders. The DSIF financed implementation consultant will assist and monitor the tender process and report to NEFCO, who will review and provide no-objection throughout the process.

Nordic Environmental Finance Corporation, NEFCO

NEFCO was established in 1990 by the five Nordic countries with an aim to finance environmental and climate projects of interest to the Nordic countries. NEFCO has a particular focus on Eastern Europe, as well as the Baltic Sea, Arctic and Barents regions. NEFCO is working closely with various partnerships and global organisations) and is a trusted partner to IFU and the Danish Ministry of Foreign Affairs, e.g. via a Trust Fund Agreement implementing Energy Efficiency Demonstration Projects in Georgia. NEFCO has extensive experience working in Ukraine in cooperation with other IFIs and DFIs, such as Sida and the European Bank for Reconstruction and Development (EBRD).

Summary of key partner features

Partner name	Core business	Importance	Influence	Contribution	Capacity	Exit strategy
What is the name of the partner?	What are the main business, interest and goals of the partner?	How important is the programme for the partner's activity-level (Low, medium high)?	How much influence does the partner have over the programme (low, medium, high)?	What will be the partner's main contribution?	What are the main issues emerging from the assessment of the partner's capacity?	What is the strategy for exiting the partnership?
Zaporizhzhia Wastewater and Sludge Treatment Plant Project						
Zaporizhzhia Vodokanal (ZVK)	The Company's primary business is to provide reliable and sustainable water supply and wastewater collection and treatment services for domestic, public, commercial and industrial clients in the Zaporizhzhia City area.	High. The project emerged from concerns expressed by both ZVK and the City Government regarding the handling and treatment of the sludge at WWTP-1 and disposal at the sludge lagoons.	High. Both ZVK and the City Government have participated actively in the formulation of the project components, and have selected the components to be included under the budget NEFCO ceiling.	The City Government will contribute a substantial part of the funding for the project (25%). ZVK will provide a skilled workforce to the PIU for management of project implementation.	The project is envisaged to be implemented under a design-and-build contract.. Although there is some experience with design-and-build contracts in Ukraine the experience of the current staff is considered limited. ZVK has staff for managing and implementing the project, but they need training, upgraded knowledge and skills. This should not only be within implementation of design-and-build contracts, but also – as highly supported by ZVK management – further training in English. As part of the implementation, a project implementation consultant will be engaged by NEFCO to prepare tender documents and provide support to ZVK with procurement, contract reward and supervision of construction and on-the-job training of ZVK staff.	This support is a one-off support to Zaporizhzhia City Government to upgrade WWTP-1. There are no further commitments from DSIF/Danida. The twinning arrangement with a Danish Water and Wastewater Company, will furthermore provide technical assistance and training to ZVK. These services will be funded by DSIF with an additional grant. The twinning is planned to be carried out from early project start and run until the end of the defects liability period. The twinning is expected to contribute substantially to enhancing the sustainability of the investments made.

Annex 3. Results Matrix

Thematic Programme title		Zaporizhzhia Wastewater and Sludge Treatment Plant Project	
Thematic Programme Objective		To improve the environmental situation in Zaporizhzhia and in downstream rivers and localities, with reduced odour problems, reduced quantities of sludge deposits, and a stable effluent quality in accordance with Ukrainian and EU standards	
Impact indicator 1		Effluent quality in compliance with EU standards	
Baseline	Year	2020	Fluctuations in effluent quality documented by ZVK effluent quality measurements (baseline to be established)
Target	Year	2024	Reduced fluctuations (improved constancy) in effluent quality and within EU standards, as documented by ZVK effluent quality measurements (target to be established)
Impact indicator 2		Odour complaints at sludge lagoons	
Baseline	Year	2020	Frequent complaints (baseline to be established)
Target	Year 1	2024	Reduced number of complaints (target to be established)
Outcome 1		Reduced adverse environmental impacts by treating wastewater from Zaporizhzhia to EU standards	
Outcome indicator		Ammonia NH ₄ -N in effluent from WWTP-1	
Baseline	Year	2020	389 t/year
5 year target	Year 1	2024	34 t/year
End target	Year 5	2029	34 t/year
Outcome 2		Reduced adverse health and nuisance impacts through stabilized and reduced quantities of surplus sludge	
Outcome indicator		Sludge transferred to sludge lagoons	
Baseline	Year	2020	152,000 m ³ /year – non stabilised
5 year target	Year 1	2024	28,000 m ³ /year -stabilised/treated
End target	Year 5	2029	28,000 m ³ /year -stabilised/treated

Outcome 3		Enhanced long-term sustainability of the intervention through improving capacity to operate and maintain the facilities through technical skills development by twinning with a Danish utility company	
Outcome indicator		ZVK has implemented a plan for capacity development (indicator to be finally determined between Danish Utility providing twinning support and ZVK, depending on the final scope of the capacity development support)	
Baseline	Year	2020	To be determined in contract regarding twinning support
5 year target	Year 1	2024	To be determined in contract regarding twinning support
End target	Year 5	2029	To be determined in contract regarding twinning support
Outcome 4		Reduced Greenhouse Gas (GHG) emissions due to re-use of methane for sludge treatment	
Outcome indicator		Annual CO ₂ reduction (Annual Emission Reduction)	
Baseline	Year	2020	-
5 year target	Year 1	2024	3,770 t/year CO ₂ equivalent reduction
End target	Year 5	2029	3,770 t/year CO ₂ equivalent reduction
Output 1		Renovation and technical upgrade of a wastewater treatment plant (WWTP-1) with a capacity of 280,000 m ³ /day, restoring full capacity	
Output indicator		Reduce adverse environmental impacts by treating wastewater to meet Ukrainian and European effluent standards.	
Baseline	Year	2019	Reduced capacity
Annual target	Year 1	2024	280,000 m ³ /day capacity
Annual target	Year 5	2029	280,000 m ³ /day capacity
Output 2		Strengthen technological capacity of ZVK personnel and allow for capability transfer from Denmark to Ukraine	
Output indicator		Twinning agreement in place and operational between ZVK and a Danish water utility	
Baseline	Year	2019	-
Annual target	Year 1	2024	To be determined in contract regarding twinning support
Annual target	Year 5	2029	To be determined in contract regarding twinning support

Annex 4. Risk management matrix

Contextual risks

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
Deterioration of the political situation in Ukraine and increased conflict in the Eastern part of the country.	Likely	Minor	EU and individual EU countries (including Denmark) have committed to continue supporting Ukraine economically and politically. This will possibly mitigate the impact.	Minor	Zaporizhzhia is located some 200 km west of current conflict areas, so it is not close to the conflict zone. ZVK is providing a vital service in Zaporizhzhia, and the service is unlikely to be interrupted due to national politics or economic considerations. However, the quality of the maintenance may deteriorate under economic hardship.
The impact of the COVID-19 pandemic may imply a considerable deterioration of the economy and the financial situation of the Government. This may affect the capacity to continue subsidising ZVK.	Likely	Minor	As above	Medium	ZVK is providing a vital service in Zaporizhzhia, and the service is unlikely to be interrupted even under a deteriorating economic scenario. However, the quality of the maintenance may deteriorate under economic hardship.

Programmatic risks

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
The City Government does not contribute with its share of the implementation budget	Unlikely	Major	NEFCO will monitor the counterpart funding	Minor	This project has been given very high priority by the City Government from the initial project formulation stage, and the City Government has been involved in all aspects of the elaboration of the feasibility study.
ZVK does not achieve sufficient cash flow for operation and maintenance	Unlikely	Major	None.	Medium	ZVK will require additional annual revenue of around UAH 41 million/year to break even. This can be covered either by a subsidy from the City Government, an increase in wastewater tariffs, or a combination of both. ZVK is providing a vital service in Zaporizhzhia, and it is unlikely that the City Government will let it be interrupted.
Works contract tenders higher than budget	Unlikely	Major	The City Government will have to provide additional funding.	Minor	The budget is based on best estimates based on tenders and equipment costs, and includes a 12.5% contingency. This project has been given very high priority by the City Government so it is likely to come up with additional funding if this turns out to be necessary.

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
The Contractor may not have the capacity to maintain a steady progress during implementation causing delays.	Unlikely	Significant	NEFCO will monitor implementation of progress through the implementation consultant.	Medium	The Tender Documents will include requirements regarding the technical and financial capacity of the contractors. A previous pre-qualification round will be considered, but would require extra time to carry out pushing the timetable back wit 3-4 months.
Insufficient capacity of ZVK to manage implementation (contract management), including required reporting to NEFCO and DSIF.	Unlikely	Significant	NEFCO will engage an implementation consultant, which will follow the whole process from tendering to end of liability of the works, including in particular tendering, contract management and reporting issues.	Minor	ZVK has implemented a large EBRD funded WWTP project some 10 years ago, and therefore possesses some experience with implementation of internationally financed projects.
Insufficient capacity of ZVK to manage, operate and maintain the rehabilitated facilities.	Unlikely	Significant	DSIF will under a separate grant funding fund a twinning arrangement with a Danish Water and Wastewater Company, which will provide technical assistance and training to ZVK.	Minor	The technical capacity of ZVK is quite good, but training is required with respect to asset management and operation and maintenance of the new/rehabilitated facilities.
Reliability of current monitoring data on flows and pollutants.	Likely	Significant	The project includes an upgrade of the measuring equipment (Output No.6). The DSIF funded twinning arrangement with a Danish Water and Wastewater Company will include a laboratory upgrade component covering both training, new equipment and improved procedures.	Minor	The feasibility study has revealed a limited reliability of current monitoring data from WWTP-1. In September 2019, ZVK initiated a new monitoring programme, which apparently provides more reliable data.
Changes in loads (flow and pollutants) on WWTP-1	Unlikely	Significant	The investments are only the first step in a defined Road Map to reach a 2039 Strategic Vision for WWTP-1. Should the loads change significantly in the future compared to the values used in the feasibility study, the main impact will be that next step in the Road Map will have to be implemented earlier than currently expected.	Minor	The feasibility study has worked out “robust” designs, based on detailed demographic studies.

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
Poor enforcement of industrial wastewater discharge into sewer system	Likely	Major	ZVK intensify monitoring of industrial discharges into the sewer system	Medium	The risk is that the WWTP-1 will be overloaded in particular with loads of non-desirable components, such as e.g. heavy metals, which could inhibit the biological processes in the WWTP. However, an inhibition test carried out during the feasibility study on incoming wastewater at WWTP-1 did (surprisingly) not indicate any inhibition.

Institutional risks

Risk Factor	Likelihood	Impact	Risk response	Residual risk	Background to assessment
Possible corruption during tendering could affect DSIF and NEFCO reputation.	Unlikely	Significant	NEFCO will be responsible for the project implementation and will carry out the tendering following its own proceedings.	Minor	NEFCO has much experience in implementing projects in Ukraine.
Delays in carrying out the ESIA study.	Unlikely	Medium	The Environmental and Social Impact Assessment will be included in DSIF's contract with NEFCO, and NEFCO will make sure it is included in the contract with ZVK – as a precondition for the loan.	Medium	NEFCO has much experience in implementing projects in Ukraine. ZVK is well aware of their responsibility in ensuring a proper ESIA is carried out, in compliance with Ukrainian regulations and NEFCO/DSIF requirements.
Violation of rights of the people living in the vicinity of the plant and the sludge lagoons	Unlikely	Medium	Possible negative impact on people living in the area will be identified in the Environmental and Social Impact Assessment and compensations prescribed in the Environment and Social Impact Plan.	Minor	The risk is considered very small, as no land acquisitions will be necessary, and the project will improve the environmental conditions, particularly for the people living within the Sanitary Protection Zone. ZVK is fully aware of its responsibilities, and has already initiated a process of mapping the stakeholders within the ZVK.

Annex 5. List of main material consulted

The main documents used, apart from the partner documentation, are the following:

Danida documents

1. 'Guiding Principles for Danida Business Finance', April 2016
2. 'Aid Management Guidelines', Danida;
3. 'Danida Business Finance', Danida, January 2012;
4. 'Danida Business Finance, Rules for Procurement', March 2017;
5. 'General Conditions for Loan Agreements and for the Provision and Administration of Interest Subsidy under the Mixed Credit Programme', Danida, October 2010;
6. Strategic Framework for the Danish Neighbourhood Programme 2017-2021, Danida, October 2017;
7. DANEP 2017-2021. Ukraine Country Programme Document, Danida, October 2017;
8. Guiding Principles for Danida Sustainable Infrastructure Financing 2020, Investment Fund for Developing Countries, 2020
9. The World 2030 Denmark's strategy for development cooperation and humanitarian action, Danida 2017;

Project documents:

10. Background data for Feasibility Study (FS) for the Zaporizhzhia Wastewater and Sludge Treatment Project, Ukraine, 3-VAND, December 2018;
11. Feasibility Study for Zaporizhzhia Wastewater and Sludge Treatment Plant, Final Feasibility Study Report, COWI, April 2020;
12. Feasibility Study for Zaporizhzhia Wastewater and Sludge Treatment Plant, Project Presentation Document, COWI, April 2020;

Other documents

13. 'Water Protection in Ukraine', Ministry of Environmental Protection and Natural Resources, Presentation made Bratislava, 2012
14. 'IMF Executive Board Approves 18-month US\$5 Billion Stand-By Arrangement for Ukraine', June 2020, <https://www.imf.org/en/News/Articles/2020/06/09/pr20239-ukraine-imf-executive-board-approves-18-month-us-5-billion-stand-by-arrangeme>
15. "National Report - Sustainable Development Goals: Ukraine", 2017 http://un.org.ua/images/SDGs_NationalReportUA_Web_1.pdf
16. 'Ukraine Country Strategy 2018-2023', EBRD, 2018;
17. 'The Covid-19 Crisis in Ukraine', OECD, 10 August 2020;
18. 'Project Appraisal Document on a Proposed Loan in the Amount of US\$300 Million and a Proposed Clean Technology Fund Loan in the Amount Of US\$50 Million to Ukraine for a Second Urban Infrastructure Project', World Bank, January 2014;
19. 'Water and Wastewater Services in the Danube Region, Ukraine Country Note', World Bank 2015
20. 'Ukraine. Recent Developments.' World Bank, March 2020;
21. 'Benefits and Costs of DCFTA: Evaluation of the Impact on Georgia, Moldova and Ukraine', Amat Adarov and Peter Havlik, The Vienna Institute for International Economic Studies, December 2016;

22. 'Water supply, sewerage tariffs in Ukraine will grow by an average of 20%', <https://en.interfax.com.ua/news/economic/639873.html>
23. '*Water and Wastewater Projects in Ukraine*' <https://www.globalmarketsinternational.com/latestmarketpost/ukraine-wastewater-sewage-treatment-plant-projects/>;
24. '*Ukraine. Economic Update*'. World Bank, November 19, 2019;
25. '*Rethinking of Water Security for Ukraine*', T. I. Adamenko, A. O. Demydenko, M. I. Romashchenko, A. M. Tsvietkova, A. M. Shevchenko, M. V. Yatsyuk, Global Water Partnership, 2016

Annex 6. Plan for Communication of results

<p>The NEFCO implementation consultant will be tasked with supporting the elaboration of a communication strategy, as well as contributing to the implementation of the strategy by providing information on the project. The implementation consultant will thus have an important role in assisting NEFCO and DSIF in the communication of the results.</p> <p>What? (the message)</p>	<p>When? (the timing)</p>	<p>How? (the platforms)</p>	<p>Who? (Target groups)</p>	<p>Responsible and resources</p>
<p>Denmark is bringing affordable and sustainable wastewater and sludge treatment to people in Ukraine</p>	<ul style="list-style-type: none"> • When the Works contract is signed • When rehabilitated and expanded WWTP-1 is taken into operation 	<ul style="list-style-type: none"> • The DSIF/IFU and NEFCO web pages • Ukrainian media (TV, newspapers) • Selected Danish media 	<ul style="list-style-type: none"> • The Ukrainian and Danish public to ensure transparency and accountability of the use of Danish development funds 	<p>DSIF in cooperation with NEFCO, with support from the implementation consultant</p>
<p>Danish Water and Wastewater Company are providing technical assistance and training to a Ukrainian water and wastewater company through a twinning arrangement</p>	<ul style="list-style-type: none"> • When the separate grant funded contract with Danish Water and Wastewater Utility is entered 	<ul style="list-style-type: none"> • The IFU and NEFCO web pages • Ukrainian media (TV, newspapers) • Selected Danish media 	<ul style="list-style-type: none"> • Private sector in Denmark and the Danish Public in general 	<p>DSIF in cooperation with NEFCO, with support from the implementation consultant</p>

Annex 7. Process Action Plan for implementation

	Activity/Output	Date	Responsible
1	Prepare Final Draft Programme Document for appraisal.	August 2020	Consultant
2	Appraisal	September 2020	Appraisal consultant
3	Prepare final Programme Document based on input from appraisal	September 2020	Consultant/DSIF
4	Presentation of the project to Council for Development Policy.	October 2020	UM/GJL
5	Final Project Approval by Danida	November 2020	Minister
6	Signing of NEFCO/DSIF agreement Form of Contribution letter + Handover to NEFCO	December 2020	DSIF/NEFCO
7	Procurement of PIU Consultant including pre-qualification.	December 2020	NEFCO/ZVK
8	Detailed design and preparation of tender documents	Feb-June 2021	ZVK/NEFCO/PIU Consultant
9	Tender of construction contracts and signing of contracts.	Sep-March 2022	ZVK/NEFCO/PIU Consultant
10	Contract effective – after signing and approval of Loan Agreement.	June 2022	NEFCO/ZVK Contractor
11	Construction of project	June 2022-June 2024	Contractor
12	Commissioning	July 2024	Contractor/ZVK

Annex 8. Appraisal recommendations and follow-up

Rec. #	Recommendation	Responsible	Action
2	It is recommended to slightly reformulate the objective to refer to the expected post-project situation rather than the strategy to reach the objective: <i>‘Improved environmental situation in and around Zaporizhzhia WWTP-1, with reduced odour problems at the plant, reduced amount of sludge deposited in the sludge lagoons, and a stable effluent quality in compliance with Ukrainian and EU standards.’</i>	DSIF	Included in the present project document.
3	The exact role and mandate of the proposed NEFCO <i>‘implementation consultant’</i> , which it is understood will cover both the tender process and the supervision of the construction, should be clarified with NEFCO, and it should be ensured that NEFCO will finance it (as it is not part of the project budget).	DSIF/NEFCO	NEFCO has clarified that the same consultant will support both under the tender and the supervision role during the construction phase. The consultant will be paid for by a separate DSIF grant. Included in the present project document.
3	It should be described more in detail how NEFCO will ensure transparency during tender (safeguards as e.g. possible no-objections to the selection and the contract).	DSIF/NEFCO	It has been clarified that NEFCO will base its accept of the tender process based on the recommendations made by the implementation consultant. Included in the present project document.
4	DSIF should confirm that the twinning arrangement to strengthen the capacity of ZVK will be provided outside the project budget.	DSIF	DSIF has confirmed that it will finance the twinning arrangement.
5	As no Environmental and Social Assessment (ESIA) has been carried out as part of the Feasibility Study, as an ESIA is required by Ukrainian regulations and by NEFCO/DSIF, and as furthermore according to the feasibility consultant the ESIA cannot be carried out before the contractor has made the detailed design, it should be made clear in the Project Document that the ESIA will be part of the responsibilities of either the	DSIF/NEFCO	This has been included in the present project document.

Rec. #	Recommendation	Responsible	Action
	contractor or the Project Implementation Unit. It should furthermore be explained how this can be done without delaying the project (or the delay should be included in the project planning).		

Annex 9. Quality Assurance checklist for Appraisal⁶

File number/F2 reference: 2020-34589

Programme/Project name: Zaporizhzhia Wastewater and Sludge Treatment Project, Ukraine

Programme/Project period: 2020-2024

Budget: DKK 565 million

Presentation of quality assurance process:

The project has undergone an independent appraisal in August 2020. The project was appraised according to Danida guidelines. Due to COVID-19 travel restrictions, the appraisal was desk-based, relying on video-meetings with the team behind the feasibility study (Cowi), NEFCO and partners in Ukraine. It is the overall impression that the appraisal has been thorough and that recommendations are appropriately reflected in the final project document.

☒ **The design of the programme/project has been appraised by someone independent who has not been involved in the development of the programme/project.**

Comments: The appraisal was undertaken by PEM-consult, who was not part of the preparation of the project.

☒ **The recommendations of the appraisal has been reflected upon in the final design of the programme/project.**

Comments: All recommendations have been included in the finalization of the project document.

☒ **The programme/project complies with Danida policies and Aid Management Guidelines.**

Comments: The project supports the overall Danish engagement in Ukraine and contributes directly to Danish development priorities of promoting inclusive and sustainable growth with a special focus on energy, water, agriculture, food and other areas, where Denmark has particular knowledge, resources and interests.

☒ **The programme/project addresses relevant challenges and provides adequate responses.**

⁶ This Quality Assurance Checklist should be used by the responsible MFA unit to document the quality assurance process of appropriations where TQS is not involved. The checklist does not replace an appraisal, but aims to help the responsible MFA unit ensure that key questions regarding the quality of the programme/project are asked and that the answers to these questions are properly documented and communicated to the approving authority.

Comments: The appraisal concludes that the project is relevant as a response to the challenges faced by Zaporizhzhia Vodokanal in living up to the EU standards for effluent as well as ensuring the well-being of people living in Zaporizhzhia city and close to the WWTP and the sludge pools. The interventions are prioritised as needed first steps in the long-term plan of improving the WWTP-1. Danish experts were consulted during project preparation and Danish know-how and expertise will be part of the proposed twinning arrangement.

☐X Issues related to HRBA/Gender, Green Growth and Environment have been addressed sufficiently.

Comments: An Environmental and Social Impact Analysis will be undertaken once the final technical design of the project has been decided. It is expected that the project will have considerable impact in improving the environment, reducing CO2 and introducing greener energy in the operation of the plant. No negative impacts are expected for local communities and residents.

☐X Comments from the Danida Programme Committee have been addressed (if applicable).

Comments: Comments from the programme Committee have been reflected in the project document and in its preparation.

☐X The programme/project outcome(s) are found to be sustainable and is in line with the partner's development policies and strategies. Implementation modalities are well described and justified.

Comments: A parallel DSIF project establishing a twinning arrangement with a Danish utility company, specialising in water and wastewater, to improve the operation and management capacity of Zaporizhzhia Vodokanal will enhance the sustainability of the project. The project complies with national water and sanitation policies. The appraisal finds that the proposed interventions constitute relevant first steps in the long-term plan for developing the capacity of the plant.

☐X The results framework, indicators and monitoring framework of the programme/project provide an adequate basis for monitoring results and outcome.

Comments: A few baselines will have to be established/verified during the final design/elaboration of tender documents.

☐X The programme/project is found sound budget-wise.

Comments: The project addresses prioritised operational bottlenecks at the plant, rather than rehabilitating the whole plant, and is thus quite cost-efficient. It is consistent with a longer-term improvement plan.

☒ **X The programme/project is found realistic in its time-schedule.**

Comments: The appraisal confirms the realism of the time schedule with a caveat related to Covid-19 travel restrictions, etc.

☐ **Other donors involved in the same programme/project have been consulted, and possible harmonised common procedures for funding and monitoring have been explored.**

Comments: NEFCO and DSIF are collaborating to make this project happen. No other donors are involved.

☒ **X Key programme/project stakeholders have been identified, the choice of partner has been justified and criteria for selection have been documented.**

Comments: Not relevant.

☒ **X The executing partner(s) is/are found to have the capacity to properly manage, implement and report on the funds for the programme/project and lines of management responsibility are clear.**

Comments: NEFCO is considered a professional development organisation with extensive experience from Ukraine. Zaporizhzhia Vodokanal will be assisted by an implementation consultant throughout the tender process and during construction. The implementation consultant will be recruited by NEFCO and financed by DSIF.

☒ **X Risks involved have been considered and risk management integrated in the programme/project document.**

Comments: The appraisal report confirms the evaluation of the risks and supports the proposed mitigation measures described in the project document and in the risk management matrix in annex 5.

☒ **X In conclusion, the programme/project can be recommended for approval: yes**

Date and signature of desk officer: 07.10.2020 Lone Bøge Jensen

Date and signature for management: 09.10.2020 Adam Sparre
Deputy Head of Department, GJL



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