Ramboll Barents AS

UNEP-GEF Project
Russian Federation – Support to the National Programme of Action for Protection of the Arctic Marine Environment

PRE-INVESTMENT STUDIES

Modernization of the Waste Water System in Vorkuta, Komi Republic

FINAL REPORT

Project is financed by:
UNEP GEF

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ABBREVIATIONS

AMAP - Arctic Monitoring and Assessment Programme
BS - Balance Sheet
EBRD - European Bank of Reconstruction and Development
EPS - Environmental Protection System
GEF - Global Environment Facility
IFC - International Finance Corporation
IP - Investment project
IS - Income Statement
MPD - Maximum Permitted Discharge
NDEP - Northern Dimension Environmental Programme
NEFCO - Nordic Environment Finance Corporation
NIB - Nordic Investment Bank
PINS - Pre-investment studies
SAP - Strategic Action Programme
UNEP - United Nations Environmental Programme
WWTF - Waste Water Treatment Facilities

CONTENT

SUMMARY

From December 2009 OOO Vodokanal renders water supply and drainage services for population, enterprises and organizations of the city, which concluded the appropriate rental agreement for water supply and sewage net systems based on the results of the tender for the municipal property tenant right.

Project title	Modernization of waste water system in Vorkuta, Komi Republic
Project owner	MUE Vodokanal, town of Vorkuta (now OOO Vodokanal)
Branch	Municipal services, water supply and sewage
Brief description of IP and its benefits	The IP provides for construction of new sewage treatment facilities in Vorkuta with through output of 40 thousand m3/twenty-four hours and reconstruction of domestic sewage wells of the Zheleznodorozhniy district of Vorkuta. Implementation of these two aspects of the project would provide the quality of waste water treatment in compliance with normative parameters and improving the environment in the Zheleznodorozhniy District and in Vorkuta in general. Elimination of polluters similar to this facility will allow reducing the negative environmental impact in future not in an individual city but along the Arctic coast, thus preserving the unique natural and offshore environment.
Project implementation period	**3 years**
Total investments	**40 050 000 EUR**

Project costs, EUR

	Component	Cost
1.	**Construction of new WWTF, including**	**40 000 000**
	Field survey works	2 000 000
	Design works and expertise	2 000 000
	Construction works	24 000 000
	Procurement of equipment	12 000 000
2.	**Reconstruction of domestic sewage wells of the Zheleznodorozhniy district**	**50 000**
	TOTAL:	**40 050 000**

Financing plan, EUR

Financing sources of IP	2 011	2 012	TOTAL	Share, %
International Funds, loan	10 000 000	10 000 000	20 000 000	50%
Grant	5 050 000	5 000 000	10 050 000	25%
Equity	5 000 000	5 000 000	10 000 000	25%
Total Planned Investment	**20 050 000**	**20 000 000**	**40 050 000**	**100%**

* Change in particular years of project implementation will require adjustment of financial indicators of the project.

Financial conditions

Parameter	Showing	Unit
Total investments	**40 050 000**	**EUR**
Equity	10 000 000	EUR
Grant	10 050 000	EUR
International funds, loan	20 000 000	EUR
Conditions of loan granting		
Loan interest rate	5	%
Loan repayment period	15	years
Grace period	2	years

Terms: Economic life time = 20 years
Inflation rate = 18,0%
1 EUR = 43 RUB

Financial analysis

Internal rate of return, IRR	The internal rate of return (IRR) with the tariff increase schedule is 1.8%.
Sensitivity of IP	The IRR is most sensitive to the changes in water and waste water service revenues, than to operating costs and investment costs
Commercial risk	• Lack of own funds at the enterprise for co-financing and covering of liabilities under international loan. • The co-financing from local budget sources is not confirmed.

1. INTRODUCTION

1.1 Description and assignment

The present report summarises the work related to preparation of regional pre-investment study for modernisation of the municipal waste water system in Vorkuta town in the Komi Republic. The work has been undertaken within the frames of the project "Russian Federation – Support to the National Programme of Action for Protection of the Arctic Marine Environment (NPA-Arctic Project)". The overall aim of the Project is to protect the global marine environment in which the Arctic plays a fundamental role. More specific the program shall contribute to developing and establishing a sustainable framework to reduce environmental degradation of the Russian Arctic from land-based activities on a systemic basis. NPA-Arctic has been established through cooperation between the Ministry of Economic Development of the Russian Federation and United Nations Environmental Program (UNEP) and is financed by the Global Environment Facility (GEF).

The NPA-Arctic Project is coordinated by the Executive Directorate of National Pollution Abatement Facility, NPA Arctic Project office and consists of four main components:

1. The preparation and adoption of a Strategic Action Program (SAP)
2. Completion of a set of Pre-Investment Studies (PINS)
3. Development and implementation of an Environmental Protection System (EPS) consistent with the SAP
4. Undertake three demonstration projects;
   i. preservation of indigenous people's traditional lifestyle in association with development
   ii. oil contamination remediation using marine alga; and
   iii. environmental remediation of decommissioned military bases

Ramboll Barents was given the assignment to develop pre-investment studies for 5-8 selected Investment Projects (IP) in the Central Arctic Region of Russia which includes the Arkhangelsk Region and Nenets Autonomous Okrug, Republic of Komi, and Yamalo-Nenets Autonomous Okrug. Initially in the project selection phase, reference was given to the Hot Spot List of the Barents Region. However, the main criteria for selection of IP have been to comply with the overall and specific objective of the Project objectives. Furthermore the IP has been proposed and supported by the regional authorities.

The following 5 IP in the Central Arctic Region of Russia have been selected and described in separate reports:

Komi Republic

1. Modernization of the Landfill for Municipal Solid Waste Disposal in Vorkuta.
2. Modernization of sewage water treatment system in Vorkuta.

Arkhangelsk region:

3. Land remediation from oil products in water protection zone of Northern Dvina River of White Sea basin near settlement Krasnoe of Primorsky district of Arkhangelsk Region.
4. Construction of new sewage treatment facilities in Lesnaya Rechka residential district of Arkhangelsk.

Nenets Autonomous Okrug:

5. Modernization of Waste Water Treatment Facilities in Settlements Kachgort and Bondarka.

The project of Modernization of Sewage Water Treatment System in Vorkuta is one of the priority projects for the Komi Republic (Annex 1). The project was recommended by the Ministry of Nature and Environmental Protection of the Komi Republic for pre-investment study development. The Ministry provided full support in preparation of the pre-investment studies report and intends to contribute to the further promotion of the project. Republican and local authorities are extremely interested in the implementation of the IP, as the existing WWTP represent an environmental threat to the local and regional environment, including the marine Arctic environment.

The key objective is to define the technical and economical parameters for modernization of waste water system in Vorkuta of Komi Republic.

1.2 Report structure

In compliance with the requirements of the Terms of Reference the PINS should include the following information: information about the owner of the project; description of the investment project; ecological and social assessment of the project; status of the investment project and its implementation activities; project financial viability assessment; legal or any other limitations for Russian and foreign investors; assessment of potential risks and justification of choice and other additional information pertaining to the investment project.

Chapter 1 – introduction. **Chapter 2** describes the municipal entity the City of Vorkuta, including its geographical position, demographical situation, ecological condition and social and economical situation in Vorkuta. **Chapter 3** contains information about the owner of the project – Municipal Unitary Enterprise Vodokanal, its brief description and current financial status. **Chapter 4** contains information about the current status of the investment project, description of possible options for modernization of waste water system and description of proposed technical solutions for implementation of IP. Project costs estimates presented in **Chapter 5**. **Chapter 6** includes an assessment of the environmental and social impacts of the investment project. **Chapter 7** describes project financial viability. **Chapter 8** covers project implementation status and arrangements. **Chapter 9** deals with risk assessments and selection justification. **Chapter 10** – conclusion.

Besides the above mentioned information presented in the relevant Chapters the report contains additional information which gives a fuller picture of current aspects and opportunities for implementation of the investment project.

2. SOCIAL AND ECONOMIC SITUATION IN VORKUTA, KOMI REPUBLIC

2.1 Geographical Location

The Vorkuta municipality in the Komi Republic borders the Yamalo-Nenets Autonomous Okrug of the Tyumen Region in the northeast and the Nenets Autonomous Okrug (Arkhangelsk Region) in the northwest and west.

The city of Vorkuta is located 904 km to the north-east from Syktyvkar (capital of the Komi Republic) and has a status of a republican city (Fig. 1). Vorkuta city is located in the Bolshezemelskaya tundra, in the permafrost area, on the banks of the Vorkuta River, 160 km north of Arctic Circle and 150 km south of the Arctic Ocean, on the western side of the Polar Urals (67º30´N 64º02´E).

The total area of the municipality, covering the border of Vorkuta city and its administrative areas is 24 179.6 km^2.

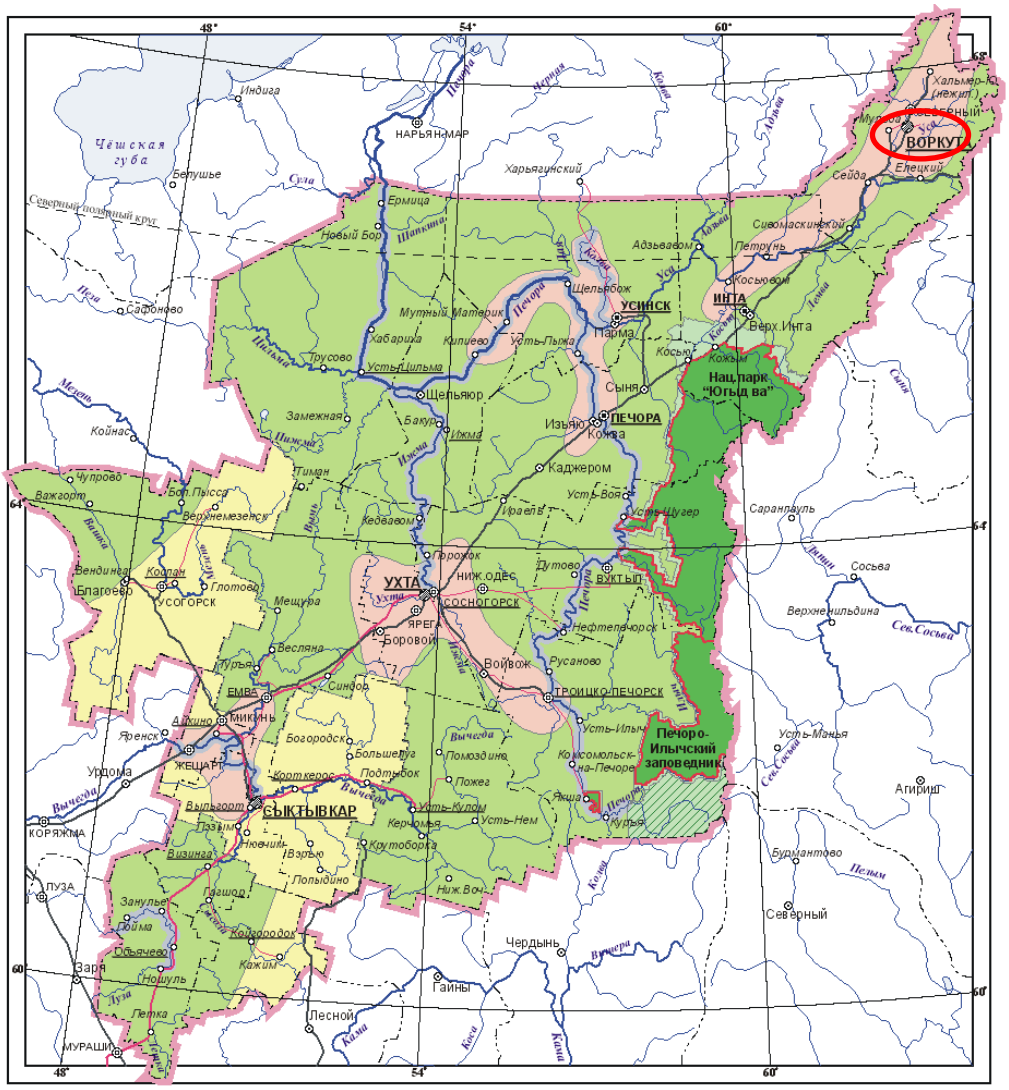


Figure 1: Administrative map of the Komi Republic showing the location of Vorkuta

2.2 Demographics

According to the data of the State Statistics Service of the Komi Republic, the population of Vorkuta as of 1 January 2009 was 113 400 people (table 1). During the recent years there has been a steady decrease in population by approximately 3 500 persons per year. The table below shows changes in Vorkuta population during the past five years (based on the data from the Federal State Statistics Service of the Komi Republic).

Table 1: Development trends in the population of Vorkuta

Year	2003	2004	2005	2006	2007	2008	2009
Population (thousand people)	**133.5**	**130.1**	**127.5**	**123.8**	**120.1**	**116.9**	**113,4**
Born, people	1379	1394	1288	1210	1126	-	-
Deceased, people	1563	1534	1529	1254	1064	-	-
Migration, people	3379	2518	3421	3751	3177	-	-

In 2008 44 622 people were registered as employed in Vorkuta distributed on the following sectors:

- Mining industry: 20%
- Transport: 10%
- Education: 12.5%
- Health sector: 9.5 %

The remaining part of the working population is occupied in other spheres of activities, i.e. trade, social sphere, communications, service enterprises etc, and their share vary from 0.1 to 5% (according to Statistical Report of the State Statistics Committee in Komi Republic in 2008).

Average wage in the town in 2008 amounted to 23 134 roubles. Comparatively the average wage in the Republic of Komi at that time was 20 826 roubles.

Only 38.2 % of the working population is employed in the industrial sector (the main part of the industry in the town is presented by the coal mining (74%) and power production (21%)), the rest of the working population is occupied in the social sphere and services. There are no plans to open new mines. Furthermore, the old mines and industries connected with them are closing as a consequence of the restructuring program for the coal mining sector. Possibilities to establish new production activities in the Far North are very limited.

As a result per 01.01.2008 the total unemployment rate was 3% of the total population of the municipality, the companies reported employment needs of 865 people accounting for 31% of the registered unemployed (2 189 people). The number of pensioners is increasing and currently constitutes 33 000 people (28.2% of the population). Vorkuta is on 7th place in the Republic of Komi for the unemployment rate.

The average age of the population in Vorkuta is increasing fairly quickly due to lack of possibilities for the Vorkuta residents to move after retirement. The average age of population is 35 years.

2.3 Status of Natural Environment

Vorkuta is located in the Bolshezemelskaya tundra in the Pechora Region, which drains directly to the Barents Sea. The average annual temperature is -6.6 ºC ranging from -52.4°C as minimum temperature 33°C as maximum. The number of frost-free days is 67 and winter duration is estimated to 225-235 days/year. The mean annual precipitation is 518 mm and the south westerly wind prevails in the region. The vegetation in the area is characteristic for sub-Arctic shrub tundra bordering forest tundra and taiga in the south (Fig. 2).

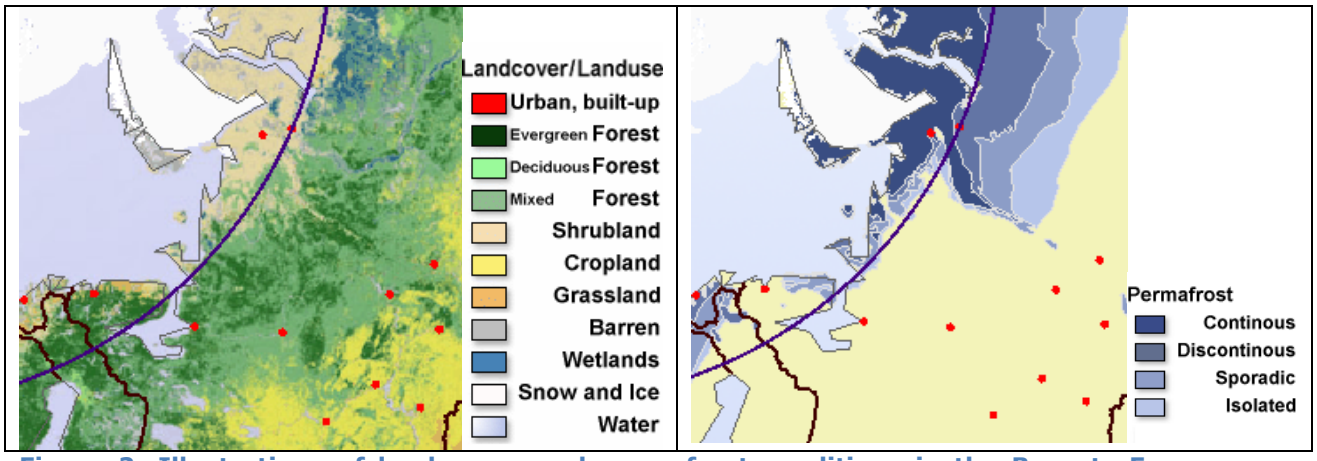


Figure 2: Illustrations of land cover and permafrost conditions in the Barents Euro Arctic Region. Source: www.grida.no

The peculiar feature of the Vorkuta municipality is the concentration of all industrial facilities within one town – Vorkuta. There are not any permanently operating large industrial enterprises and facilities, producing negative impact on the environment outside the city, except the cement plant which is located approximately 40 kilometres northwest of Vorkuta town.

Due to this fact all facilities potentially hazardous for environment (among these power engineering facilities and coal industry facilities) are located in the city and neighbouring settlements. There have been no registered man-made accidents resulting in significant environmental pollution at these facilities during the last ten years. No fuel spills or significant emergency discharges into water basins have been recorded.

In Vorkuta town and the nearest vicinity, the soil environment is characterised by significant alkalisation due to continuous discharges of fly ash from the coal mines, coal heating plant, and the cement plant. In the wider surroundings of Vorkuta the pH is lower and thus characterising a more acidic soil environment. This gives strong indication of the alkaline impact of fly ash and cement dust from the industrial sources in Vorkuta town. Elevated levels of Al, Ba, Ca, K, Mg and Sr in the top soil layers and snow in Vorkuta town have been documented. Reduced production of fly ash and cement dust in the future, due to lower production rates, may result in acidification of the soil environment in Vorkuta and thus increased solubility of the heavy metals (Walker et al. 2009, 2008, and 2003). The general environment in Vorkuta municipality is considered more or less pristine and there is little documentation on potential industrial pollution. Analyses of soil sand snow undertaken by Walker et al. (2009, 2008, and 2003) support this.

In general, during the past ten years there is a tendency in the area of reduction of air emissions and industrial waste water discharge, which is first of all due to economic situation in the area.

However, the area is still facing a number of problems related to man-made environmental pollution. The most significant of these are:

1. Continuous fires of spoil heaps from the Severnaya, Vorkutinskaya and Komsomolskaya mines of OAO Vorkutaugol which result in significant local air pollution around these facilities. Fire-fighting actions have not been efficient. The most unfavourable situation is in the area of spoil heaps from the Severnaya mine, located in close proximity to the settlement Severny. The reason for spoil heap fire is initial violations of their formation process.

2. Municipal waste water treatment problems at the Vorkuta WWTP. Modernization and expansion of WWTP provided by the Republican Programme Environment-2005 was not completed due to termination of funding. Currently the WWTP can only provide partial treatment of the sewage in the town; WWTP overloaded during the active snow melting period. The facility and in addition the sewage pipe network in the town demands serious investments for repair, modernization and reconstruction.

3. The oldest enterprise in the town, the Vorkuta cement factory (now JSC «Vorkutacement», still has problems with treatment of dust and gas emissions. This is due to unfinished works on building and commencing of the electrofilters. The almost ready facility and equipment became useless during recent years. Despite the decrease in production until 2006, the problem with dust collection could appear when factory reaches its projected capacity.

4. Waste utilization problems have appeared in recent years. Due to the geographical location of the town and settlements it is almost unrealistic to get waste transported to other places for utilization. This causes problems utilising waste such as cardboard, paper and plastic, and recycling and utilizing tires, accumulators and wood waste. Due to strict environmental requirements to utilization of waste requiring special decontamination facilities, it is now impossible to recycle fuels and lubricants, wiping material and the already mentioned wooden waste.

As in many other regions of Russia in the late 1990's the Komi Republic government adopted the Republican Environmental program aimed at solving the most vital environmental problems. It included several subprograms focusing on different spheres of environmental pollution.

However at present there is no unified program on the improvement of the situation on waste water discharge in the republic, but this problem was indicated in the list of Hot Spots of the Barents Region in the Komi Republic. In 1999 the Programme "Environment 2005" was adopted in the Komi Republic, which envisaged the activities on construction of treatment facilities for treatment of industrial waste water. No activities were envisaged by this Programme for improvement of the public water supply system. In 2003 the Programme was closed due to financial reasons.

2.4 Economical Status and Future Perspectives

For the present the main part of the industry in the town is presented by the coal mining (74%) and power production (21%). Other branches (engineering and metalworking industry, production of building materials, consumer goods industry, food production etc.) are represented by 5%. 1.7 thousands companies are registered in the town. The largest of them are JSC Vorkutaugol (coal mining and benefication), production units of

Komienergo (heat and power production), and JSC Vorkuta cement factory (production of cement).

Average salary in these sectors is as follows (at the beginning of 2008):

1. Coal mining – 28 606 roubles;
2. Power production – 23 793 roubles;
3. Engineering and metalworking industry – 21 373 roubles;
4. Consumer goods and textile industry – 6 647 roubles;
5. Food production industry – 18 336 roubles.

Agglomerating coal from Vorkuta is delivered to JSC Severstal, JSC Novolipetsk, Moskva mining and coke plant, Nizhnyi Tagil metallurgical plant, JSC Coks, Magnitogorsk and Chelyabinsk metallurgical plants, and abroad, including CIS countries and Baltic states. Power station coals, being enough for energy production in the town, are also delivered to Severodvinsk heat and power plant.

Social sector includes hospitals, educational institutions (including pre-school educational institutions), and cultural institutions. In the beginning of 2008 the town had 13 hospitals, 45 kindergartens, 38 comprehensive schools, 7 technical schools and 3 high schools (branches).

Closing of mines and connected industrial productions in Vorkuta performed within the coal sector restructuring programme, started in the 1990's and still ongoing, made several thousand workers unemployed without any perspectives for new working places. As a result the living standard of the population and birth rate has decreased, and the sickness rate in the period has increased.

In 1998 the Vorkuta city administration developed the Program to reduce the surplus population in the town. The program includes other program on closing down unpromising settlements and moving their inhabitants.

It was, however, the approved measures without any financial support from the city budget, termination of the financing from the state budget that caused the real bankruptcy of the whole municipal sector. The municipal budget incomes accounted to 700 million roubles, whilst the minimum demand to maintain the municipal infrastructure is over 1 400 million roubles per year. At the same time the house building program stopped, causing lots of dilapidated and damaged houses; the operation costs of maintaining these types of houses are higher than standard and this deteriorated the already distressed situation in the town.

2.4.1 Federal and Republican Development Plans for the Komi Republic

The Komi Republic bases its economical and social policy on the general development concept for the Russian Federation. At the same time, the strategy and tactic of the reforms in the Komi Republic are being developed and implemented with account of local factors and specific social and economic status. On 27 March, 2006, the Strategy for Economic and Social Development of the Komi Republic for 2006-2010 and for the Period up to 2015 (further referred to as the Strategy) was approved by the Komi Republic Government.

The objective of the Strategy is to define the sources and reserves for economic growth in the Komi Republic, definition of the mechanisms of increasing the efficiency of the use of natural, industrial, financial and labor resources, development of industrial and innovative activity, development of the industrial and transport infrastructure, intensification of investment and innovation activity, development of the state government system in the Komi Republic, increasing the taxable base and growth of tax

revenue to the republican budget, increase of the working age population employment and decrease of unemployment rate, growth of income for all population groups and reduction of the poverty level, in other words – formation of the Komi Republic economic model which is oriented at increasing the level and quality of life for the Komi Republican population.

The strategic goals in the sphere of economic development are:

- growth of investment appeal and formation of positive image of the Komi Republic;
- assurance of efficient use of natural and resource potential;
- achievement and maintenance in the long-term perspective of the stable economical growth no less than 5% per year;
- diversification of the economy structure in the direction of manufacturing and high-tech branches as well as services;
- increase of competitiveness of the products produced in the Komi Republic in the internal and external goods' markets;
- renewal of the fixed assets of the economic branches;
- implementation of large infrastructural projects, creation of transport system which would fully provide for the needs of commercial entities and public;
- creation of optimal structure of agricultural industry and provision for food supply security for the people;
- increase the contribution of small-scale businesses in the republican economy;
- increase the role of the consolidated budget of the Komi Republic in ensuring the economic growth

The strategic goals in the social development sphere are:

- stabilization of demographic situation: increase of birth and reduction of death rates, increase of the public life span, improvement of health and social and psychological condition of the population;
- increase of the cultural and educational level of the population;
- creation of conditions for working age citizens that would allow them to increase the social consumption level at the expense of their own income, including comfortable accommodation, better quality of services in the sphere of education and public health, adequate level of life for the elderly;
- increase the role of the younger generations in the social and economical development of the republic;
- growth in real earnings of the population;
- increase in the efficiency of social protection programmes which are aimed at overcoming the poverty in the republic, reduction of the percentage of the population with income less than the living minimum wage by no less than 10%;
- ensuring the availability and increase of quality of public social services;
- improvement of the accommodation conditions for the population;
- increase in efficiency, stability and functioning security of the public utilities;
- solving the problem of migration of the superfluous population of the northern towns of the republic;
- reduction of criminality levels and increase in social safety of the population;
- improvement of ecological situation

The goal of the environmental policy introduced in the Komi Republic is improvement of ecological situation and increasing the ecological safety in the republic, creation and maintenance of natural complexes, assurance of rational and stable nature management, and protection of the public health and provision of favorable conditions for living.

The ecological safety section includes a list of priority goals. One of the paragraphs states that the priority direction is provision of ecological safety in the housing and utilities sphere, including the reduction of negative influence of industrial and consumer waste;

reconstruction and construction of treatment facilities; prevention and reduction of ecological consequences in case of depressurization at pipe ducts of the housing and utilities system.

2.4.2 General Development Plan of the town of Vorkuta

The General Development Plan of municipal district Vorkuta was worked out by the Administration of Vorkuta city in 2009 and agreed with the Government of the Komi Republic in 2010. Autumn 2010 the General Development Plan of municipal district Vorkuta will be introduced to the session of the Vorkuta City Council for review and subsequent approval.

3. PROJECT OWNER. ASSESSMENT OF THE FINANCIAL SITUATION

3.1 Brief Description of MUE Vodokanal (OOO Vodokanal)

MUE Vodokanal is responsible for water supply and sewage in the town. The enterprise was established in October 2004. The previous name of the enterprise is "Direction of Teplovodokanal" (established in 1943) being a part of production association "Vorkutaugol". The enterprise has 1 070 employees.

MUE Vodokanal has the following structure:

1. Administration and management;
2. Main production units:
   - 2.1. Municipal department for water treatment pump stations and systems:
     - Water treatment pump station;
     - Water supply systems and arrangements.
   - 2.2. Municipal department for sewage treatment stations and systems:
     - Waste water treatment plant in town Vorkuta;
     - Waste water treatment systems and plants.
   - 2.3. Shakhtersk waste water treatment systems and plants:
     - Water supply systems and plants;
     - Waste water systems and plants.
   - 2.4. Usinsk sewage water treatment systems and plants:
     - Laboratory to test quality of drinking water and water from water supply sources;
     - Water supply system and arrangements;
     - Sewage systems and arrangements.
   - 2.5. Severnyi department for sewage and water treatment pump stations and systems:
     - Sewage treatment plant in Severnyi settlement;
     - Water supply systems and plants.
     - Sewage treatment systems and plants.
   - 2.6. Vorgashor department for sewage and water treatment pump stations and systems:
     - Sewage treatment plant in Vorgashor settlement;
     - Water supply systems and plants;
     - Sewage treatment systems and plants.
   - 2.7. Zapolyarnyi department for sewage and water treatment pump stations and systems:
     - Sewage treatment plant in Zapolyarniy settlement and sewage treatment systems;
     - Water supply systems and plants.
   - 2.8. Railway section:
     - Sivomassky part;
     - Eletsk part.
3. Service facilities:
   - 3.1. Department for repair and maintenance of power supply equipment, measuring equipment, communication equipment (RES);
   - 3.2. Department for maintenance of buildings and constructions (MTS);
   - 3.3. Repair and mechanical shop (RMC);
   - 3.4. Transport department (ATC);
   - 3.5. Car repair shop (ATC);

3.6. Department for repair and maintenance of building and constructions (overhaul).

The main activities include water supply for residents, waste water discharge, water area use (dam).

The project owner is MUE Vodokanal. The city sewage system is owned by the Vorkuta Administration which has transferred it to MUE Vodokanal for operation and management. Contacts in the Vorkuta Administration and MUE Vodokanal Administration are presented in Table 2.

Table 2: Contacts

Project owner	**OOO Vodokanal**	
Contact person	Irina Zibert, Director	
Address:	60, Lenina str, Vorkuta, 169900	
Telephone/fax:	+7 (82151) 5 36 16	+7(82151) 5 38 03
E-mail	vodokanal-vorkuta@yandex.ru	
Declarant	**Administration of the municipal unit Urban District Vorkuta**	
Address:	7, Tsentralnaya str., the Komi Republic, 169900	
Contact person	Alexander Fedorov The deputy of the Head of Administration MU "Vorkuta" The Head of Department of communal services and development	
Telephone/fax:	+7 (82151) 3 13 95	+7(82151) 3 31 58
E-mail	ughib@mayor.vorkuta.ru	

3.2 Key Financial Characteristics

MUE Vodokanal supplies cold water to the residents and businesses in Vorkuta.

The main financial data (amount of services, prices, income of the enterprise) for the last 3 years are given in Table 3.

Table 3: Income structure of the MUE Vodokanal in 2006-2008

Service	Income structure	Sales amount, thous. RUB	Price, RUB	Incomes, thous. RUB
2006				
Cold water supply	**Sale to other parties, included:**	**19811,5**		**276779,0**
	Residents	4667,8	13,99	63301,5
	Public organizations:	884,2		12217,5
	Included:			
	Local budget	516,1	13,99	7006,0
	Other budgets	368,1	14,87	5211,5
	Other organizations	14259,5	14,87	201260,0
Sewage	**Sale to other parties, included:**	**12600,3**		**114352,6**
	Residents	8117,0	9,24	72520,8

	Public organisations:	1394,0		12692,5
	Included:			
	Local budget	895,6	9,24	8033,0
	Other budgets	498,4	9,82	4659,5
	Other organizations	3089,3	9,82	29139,3
2007				
Cold water supply	**Sale to other parties, included:**	**18388,3**		**269155,4**
	Residents	4311,9	13,99	60323,0
	Public organisations:	845,2		12103,3
	Included:			
	Local budget	526,5	13,99	7365,2
	Other budgets	318,7	14,87	4738,1
	Other organizations	13231,2	14,87	196729,1
Sewage	**Sale to other parties, included:**	**12600,3**		**114352,6**
	Residents	8117,0	9,24	72520,8
	Public organisations:	1394,0		12692,5
	Included:			
	Local budget	895,6	9,24	8033,0
	Other budgets	498,4	9,82	4659,5
	Other organizations	3089,3	9,82	29139,3
2008				
Cold water supply	**Sale to other parties, included:**	**17700,0**		**312769,7**
	Residents	3821,0	17,21	64686,0
	Public organisations:	762,4		13190,9
	Included:			
	Local budget	466,4	17,21	7885,2
	Other budgets	296,1	18,29	5305,7
	Other organizations	13116,6	18,29	234892,8
Sewage	**Sale to other parties, included:**	**10992,9**		**125238,8**
	Residents	6667,3	11,37	74473,0
	Public organisations:	1199,8		13677,1
	Included:			
	Local budget	781,4	11,37	8719,5
	Other budgets	418,3	12,08	4957,6
	Other organizations	3125,7	12,08	37088,7

The enterprise renders services against the rates that were approved two years ago. The rates are considerably understated; it is expected that they will be reviewed and increased in autumn 2009.

4. DESCRIPTION OF THE INVESTMENT PROJECT

4.1 Project Information

The matter of pre-investment study is to investigate the existing situation in water supply and wastewater treatment in Vorkuta and to give advice based on investigation results about the best suitable technologies on modernizing the waste water treatment facilities in Vorkuta.

Two major problems that Vorkuta Administration and Vodokanal are currently facing should be studied within the project:

- Renovation of Vorkuta Waste Water Treatment Plant
- Reconstruction of the sewage network of the Zheleznodorozhniy district in Vorkuta.

Implementation of these two aspects of the project would provide the quality of waste water treatment in compliance with normative parameters and improving the environment in the Zheleznodorozhniy District and in Vorkuta in general.

4.1.1 Regulatory Documents in the Sphere of Water Supply and Water Management

In compliance with Article 16 of Federal Law No.131-FZ of 06.10.2003 "On general principles of local government in the Russian Federation" the decisions related to water supply and management (sewage) are made by the Vorkuta City Council, the latter is guided by the following regulatory documents:

- Federal Law No. 89-FZ dated 24.06.1998 "On industrial and consumer waste";
- Federal Law No. 52-FZ dated 30.03.1999 "On sanitary and epidemiological wellbeing of the population";
- Federal Law No. 210-FZ dated 30.12.2004 "On the bases of regulation of the rates of companies providing utilities services"
- RF Government Decree No. 310 dated 31.12.1995 "On the charges for discharge of waste water and polluting substances into the sewage systems of residential areas"
- Law of the Republic of Komi No.22-RZ dated 03.04.2006 "On regulation of water relations in the Komi Reublic".
- Order of the Ministry of Architecture, Construction, Public Utilities and Energy of the Komi Republic No.57-OD dated 19.02.2001 "On approval of the method of calculation expenditures on cold water supply and water management services"
- SanPiN 42-128-4690-88 "Sanitary rules for maintenance of residential territories"

The Vorkuta Council adopted the following normative documents:

- Decree No. 876 dated 07.08.2006 "On charges for discharge of waste water and polluting substances into the sewage systems on the territory of Vorkuta municipal district"
- Resolution No. 99 dated 13.12.2007 "On rates for cold water supply and management (sewage)"
- Resolution No. 96 dated 14 December, 2007 "On Approval of Rules for improvement, maintenance, clean-up and sanitary cleaning of streets, roads, housing areas and excavation works in the territory of the Vorkuta City District".

4.1.2 Brief description of the situation with waste water in Vorkuta

Water intake for water supply purposes in Vorkuta is performed from the river Usa by 2 raisings (water consumption is 28 400 thousand m^3/year) and from the ground water wells (water consumption is 2 400 thousand m^3/year). Total water consumption amounts to 30 800 thousand m^3/year.

The water supply network consists of steel pipes with diameters of 50 - 1000 mm. Pipes are laid on and under the ground surface. The total length of water supply pipes is approximately 355 km.

The sewage system consists of pipes made of cast iron (Ø 150…200 mm) and of reinforced concrete (Ø 250…1250 mm). All of the sewage pipes are laid under the ground surface. Total length of sewage pipes is 200.5 km.

The waste water treatment plant of Vorkuta (Vorkuta WWTP) has been operating since December 1974 and has a capacity of 40 thous. m^3/day. The treatment facilities provide full biological treatment of domestic waste water and of industrial waste water of similar composition.

Waste water is discharged into the Parallelnyi Stream, the western feeder of the Vorkuta River, in two types of discharges:

- After biological treatment (the established limit of discharge - 14600 thous. m^3/ year).
- Direct discharge (no treatment - collector-drainage discharges, the established limit of discharge 1200 thous. m^3/year.)

The waste water treatment system in Vorkuta includes not only treatment plant of the city, but waste water treatment plants in the settlements of Vorgashor, Severnyi, Zapolyarnyi and Sovyetsky. Sewage amount for these plants are as follows:

- Vorgashor settlement - 4 489.4 thous. m^3/year
- Severnyi settlement - 3 991.4 thous. m^3/year
- Zapolyarnyi settlement - 1 449.4 thous. m^3/year
- Sovyetskyi settlement - 200.0 thous. m^3/year

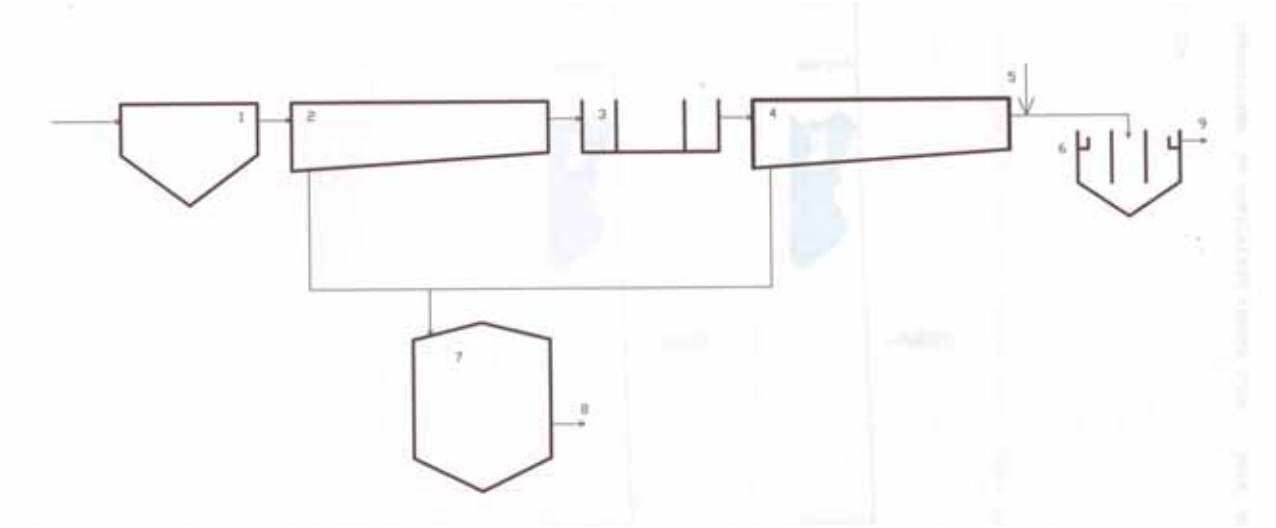
General arrangement of water supply and sewage systems in Vorkuta district are presented in Annex 2 and Annex 3.

Waste Water Treatment Plant, Vorkuta

WWTP with a rated capacity of 40 thousand m^3/day provides a full biological treatment of domestic waste water according to the traditional method, without removal of biogenic elements. The WWTP includes the following facilities (Figure 3):

1. Sand traps with circular motion of water for retention of heavy mineral particles.
2. Primary horizontal flow sedimentation tanks, equipped with scrappers for scrapping the residue.
3. Corridor-type activated sludge tanks for biological treatment of waste water.
4. Secondary horizontal flow sedimentation tanks equipped with scrappers for scrapping the separated active sludge.

5. Contact tanks for providing the required duration of water's contact with chlorine before the treated water is discharged into the water body.
6. Chlorination disinfection unit joined with the chlorine storehouse.
7. Methane digesters for thermophilic fermentation of excessive active sludge and the raw sludge from the primary sedimentation tanks.
8. Pumping stations for technological needs and necessary pipelines.



1. Sand traps with circular motion of water. 2. Primary sedimentation tanks. 3. Activated sludge tanks. 4. Secondary sedimentation tanks. 5. Chlorine addition. 6. Contact chambers 7.Anaerobic digesters (methane tanks) 8. Sludge to the landfill 9.Treated water discharge

Figure 3: Existing WWTP process flow chart

Existing wastewater treatment plant has been in operation since 1974 and is designed to receive 40 000 m^3 sewage per day. WWTP has been operated for 35 years now. During this period there have been at least two attempts to upgrade the plant including the construction of facilities for treatment of the sludge. Reconstruction was also planned, including increasing the throughput capacity of the treatment facilities to 80 000 m^3/day. This was taken into account in the republican program "Environment 2005" but the works were suspended due to economical reasons. Even the preliminary design documentation was not developed. Thus, none of the planned projects of WWTP reconstruction were implemented.

Household Sewage Network in the Zheleznodorozhniy District, Vorkuta

In 2006 the water supply and sewage networks of the Zheleznodorozhniy residential district of Vorkuta, which formerly belonged to and were operated by Severnaya Zheleznaya Doroga (Northern Railroad), were transferred to the books of the Vorkuta Administration. MUE Vodokanal has up to the present moment not begun operating the networks which negatively influences their condition.

The existing sewage network of the Zheleznodorozhniy district has constructional and technological defects. During the survey of the networks that was carried out in 2006 by the Geokriologicheskaya Sluzhba of the Komi Republic (Geocryologic Service) on behalf of Vorkuta Administration, it was found that ground and surface waters penetrate into the sewage network as a result of the defects. This leads to overload of the collectors and waste water treatment plant of the city, the equipment works non-stop. The environmental condition worsen, especially in the flood periods (May, June) due to the large volume of snow typical for the northern area. For example in the Zheleznodorozhniy district in Vorkuta, the partly sewage flood causes the damage of living houses and social objects, and the destruction of houses.

The WWTP is designed for treatment of domestic waste water and does not have the capacity to treat excessive amounts of water, so part of the sewage is discharged into the nearest river. The republican agencies do not allow the discharge of untreated wastewater, so the treatment plant (that works in the normal mode during the winter period) is not capable of providing adequate treatment of the waste water in spring.

It is possible to reduce the excessive volumes of water, caused by penetration of ground and surface waters into the defective sewage system of the Zheleznodorozhniy residential district, by reconstructing the network, i.e. by replacing the most damaged pipelines and wells.

4.2 Technical Description

The project is being implemented in the far-off territory in Vorkuta which lies in the Arctic Zone. The permafrost conditions make it necessary to accurately select the technologies; their application should not influence the environment or the other life-support facilities for the residents significantly.

This section includes the various technical aspects of the wastewater treatment system modernization in Vorkuta, based on which the technological solutions for implementation of the present investment project will be proposed.

4.2.1 Possible Options of Modernization

For the pre-investment studies on modernization of the waste water treatment system it is proposed to review the following alternative options for improving the current situation in the sphere of water management in Vorkuta:

1. Modernization of Vorkuta WWTP
2. Reconstruction of the existing sewage networks in the Zheleznodorozhniy residential district.

Modernization of Vorkuta WWTP may be done by two ways:

- Reconstruction of the existing WWTP
- Construction of a new WWTP,

Further on the study shall consider these two ways of WWTP modernization.

Reconstruction of the existing sewage networks in Zheleznodorozhniy district of Vorkuta is divided into two constituent parts - reconstruction of sewage wells and reconstruction of sewage pipelines, the damage of which lead to penetration of surface waters and sludge (eroded soil) into the network. The study provides the assessment of the necessity of reconstructing the existing sewage networks and proposes activities aimed at improving the efficiency of their operation based on the analysis of the measures pointed out above.

4.2.2 Technical Assessment of the Options

Modernization of Vorkuta WWTP

As mentioned above, the WWTP has been in operation since 1974 and no modernization measures have been undertaken in this period. The results of the survey which was carried out during the visit of the Consultant project team to Vorkuta in June 2009 (Annex 4) showed that the existing technological scheme of the WWTF and structural features of individual facilities have several flaws that reduce the efficiency of waste water treatment:

1. The volume of inflow of the waste water to the WWTP is not being measured. The WWTP personnel approximately calculate the daily inflow of wastewater by counting the number of hours of pumps' operation at the wastewater pumping station, knowing the hourly capacity of the pumps that is stipulated in the Certificate for the pumps. Based on these calculations the maximum daily intake of the waste water in the flood period is 80 thousand m^3/day which is twice higher than the WWTF rated capacity. During the low-water season the intake of the waste water is approximately 40 thousand m^3/day which is within the limits of the rated capacity.
2. Sand traps with the circular motion of water are not the most optimal type of sand catchers for treatment of the domestic waste water. They do not provide the separation of the units of heavy mineral admixtures (sand) and light organic pollutions, which leads to carry-over of the sand and its retention in the primary sedimentation tanks. The increase of the content of organic inclusions in the sand is also possible, which leads to complication of its further treatment and limitation of its use. To reduce the influence of these negative factors it is reasonable to use the aerated sand catchers or devices for hydrodynamic washing of sand before the sand catchers.
3. The existing technological system "activated sludge tanks – secondary sedimentation tanks" does not allow carrying out the biological removal of biogenic elements (nitrogen and phosphorus). Besides the efficiency of oil products removal is very low, which is quite topical for Vorkuta WWTF with systematic discharge of oil polluted waste water to the sewage system.
4. Scrappers for scrapping of the separated active sludge in the secondary sedimentation tanks lead to the roiling of the sludge from the tanks bottom, which significantly worsens the quality of treated waste water. In order to reduce the negative influence of the systems of sludge removal in the secondary sedimentation tanks it is reasonable to use the vacuum suction systems. The vacuum sludge suction systems are typically used at the city WWTFs in the secondary sedimentation tanks of radial structure.
5. Disinfection of the treated waste water by chlorinating is effective in terms of microbiological safety and improves the waste water quality in terms of content of organic oxidizable pollutions. However, it becomes a source of generation of highly toxic chlorine-organic compounds which are not being monitored at Vorkuta WWTF. Besides, use of liquefied chlorine for disinfection leads to the threat of chlorine leakage into the environment during its storage, transportation and use, and to hazard for the life and health of the WWTF personnel. In the modern and developing water supply and sewage system the use of waste water chlorinating is unacceptable. It is reasonable to replace the existing chlorinating facilities with UV exposure equipment and at the same time to significantly improve the main waste water treatment process in order to compensate the elimination of chlorination.
6. The technological scheme of sludge treatment is not complete due to non-realized reconstructions. The mixture of excessive active sludge and raw sludge from the primary sedimentation tanks undergoes sludge digestion in the methane digesters. Further dehydration is done at the sludge beds because the construction of the

designed mechanic dehydration facilities was not completed. The task further use or burial of the dehydrated sludge is not solved.
7. Extremely low level of automation of the technological processes and automated control of technological parameters at the WWTP.
8. Extremely low level of technical equipment of the WWTP laboratory.
9. The building structures of all the facilities have significant defects and marks of deterioration which makes the large-scale reconstruction of the existing WWTF difficult.

Table 4: Overview of problems at the existing WWTF and suggested measures

1. Inflow volumes	
Status	The volume of the waste water inflow to the WWTP is not being measured. The WWTP personnel approximately calculate the daily inflow by counting the number of hours of pumps' operation at the wastewater pumping station, knowing the hourly capacity of the pumps that is stipulated in the Certificate for the pumps. Based on these calculations the maximum daily inflow of the waste water in the flood period is 80 thousand m^3/day which is double the WWTF rated capacity. During the low-water season the intake of the waste water is approximately 40 thousand m^3/day which is within the limits of the rated capacity.
Problem	The volume of waste water at WWTP seasonally exceeds the capacity.
Measures	Installation of waste water flow metering equipment at the entrance of WWTP. Prevention of surface water inflow into the network.
2. Sand catchers	
Status	Sand traps with circular motion of water are used.
Problem	This type of sand traps is not optimal for treatment of domestic waste water. They do not provide separation of heavy mineral admixtures (sand) and light organic pollutions, which lead to carry-over of the sand and its retention in the primary sedimentation tanks. Increase of content of organic inclusions in the sand leading to complication of its further treatment and limitation of its use is also possible.
Measures	Aerated sand traps or devices for hydrodynamic washing of sand before the sand traps.
3. Activated sludge tanks – secondary sedimentation tanks	
Status	The existing technological system "activated sludge tanks – secondary sedimentation tanks" does not provide biological removal of biogenic elements (nitrogen and phosphorous). The efficiency of oil product removal is also quite low, which is typical for Vorkuta WWTP with systematic discharge of oil polluted waste water into the sewage system.
Problem	The removal of biogenic elements and oil products is limited.
Measures	Introduction of one of the processes that allows for nitrogen and phosphorous removal during activated sludge process. Introduction of tertiary treatment (e.g. sand filtration with coagulation) for additional phosphorous and oil removal.
4. Scrapers for scrapping of separated sludge in the secondary sedimentation tanks	
Status	Scrappers for scrapping of the separated active sludge in the secondary sedimentation tanks lead to the roiling of the sludge from the tanks bottom, which significantly worsens the quality of treated waste water.
Problem	Low sedimentation efficiency.
Measures	In order to reduce the negative influence of the systems of sludge removal in the secondary sedimentation tanks it is reasonable to use the vacuum sludge suction systems. The vacuum sludge suction systems are typically used at municipal WWTPs in the secondary sedimentation tanks of radial flow type.
5. Disinfection	
Status	Disinfection of the treated waste water by chlorination is effective in terms of microbiological safety and improves the waste water quality in terms of content of organic oxidizable pollutions. However, it becomes a source of generation of highly toxic byproducts (chlorinated hydrocarbons) which are not being monitored at Vorkuta WWTP. Besides, use of liquefied chlorine for disinfection leads to the threat of chlorine leakage into the environment during its storage, transportation and use, and to hazard for the life and health of the WWTF personnel.
Problem	Formation of toxic chlorination byproducts.
Measures	Wastewater chlorination is unacceptable for the modern WWTP. It is reasonable to

	replace the existing chlorinating facilities with UV-disinfection equipment and at the same time to significantly improve the baseline wastewater treatment process in order to compensate the elimination of chlorination.
6. Sludge treatment	
Status	The process of sludge treatment is not complete due to uncompleted reconstructions.
Problem	The mixture of excessive activated sludge and raw sludge from the primary sedimentation tanks undergoes anaerobic digestion in the methane digesters. Further sludge dewatering is not performed because the construction of the designed mechanic facilities was not completed.
Measures	The task is to complete the process of sludge treatment by introduction of sludge dewatering and by solving the task of sludge disposal (storage).
7. Automation	
Status	Extremely low level of automation of the technological processes and automated control of technological parameters at the WWTF.
Problem	No automation
Measures	Introduction of automatic control system.
8. Laboratory	
Status	Extremely low level of technical equipment of the WWTP laboratory
Problem	No equipment in the lab.
Measures	Introduction of new laboratory equipment
9.Building structures	
Status	The building structures of all the facilities have significant defects and marks of deterioration which makes the large-scale reconstruction of the existing WWTP challenging.
Problem	Old constructions in poor condition.
Measures	Construction of new facilities.

On basis of a site inspection and on-site evaluation of the constructions and equipments, reconstruction of the existing WWTP entails extensive measures for meeting the environmental, health and safety requirements.

The construction of a new WWTP will demand significant financial resources. The reconstruction of the existing WWTP will demand comparable costs but will not be able to reach similar quality of treated wastewater and reliability. For the purpose of reducing the negative impact on the environment it is proposed to construct a new city WWTP with a capacity of 40 thousand m^3/day.

Construction of the new WWTP will effectively help solve many of the above problems and avoid obstacles of renovating the old existing plant.

Reconstruction of the existing sewage networks in Zheleznodorozhniy district of Vorkuta

The sewage network of the Zheleznodorozhniy district are in an unsatisfactory condition which is getting worse year after year due to the fact that the facilities have not been accepted by MUE Vodokanal for operation.

In the course of the survey (Annex 6) the following was registered/observed during the external examination of the individual parts of the sewage network:

1. The top slabs on part of the sewage wells are damaged or fully destroyed and/or the necks of the manholes are lacking, leading to penetration of foreign objects and construction debris from the adjacent territories into the wells. In addition, as part of the wells are located in areas without asphalt cover and the well necks are located at the level (or lower than the level) of the platform on which they are placed, surface water and sludge (eroded soil) have unlimited access into the network.
2. The wall rings of the examined wells are in good condition. No signs of ground water penetration into the wells through the bottoms rings of the wells were found.
3. The examined wells are to various extents polluted with sludge or foreign objects.

4. Part of the wells work with a backflow of the waste water.
5. 2 wells (of approximately 10 examined) are filled with water and ice and the waste water spilled out of the well onto the ground surface. Such wells do not have top slabs and necks.
6. Soil and construction debris are being dumped on the pressure sewage pipelines from the Sewage Pumping Station No.2 and gravity-flowing networks.

MUE Vodokanal administration initially presented information on the condition of the sewage system in Vorkuta and insisted on re-laying the network in Zheleznodorozhniy district due to their unsatisfactory condition which was the result of construction defects and default operation in the period prior to the network hand-over from the district to the municipality. However the initial information about the significant non-recoverable defects of the sewage pipe ducts was not registered during the survey. It is obvious that the problems in operation of the sewage system are caused by unsatisfactory maintenance of the network, lack of timely repairs and elimination of emergency situations on the network.

This fact is proved by the results of a survey carried out in 2006 by Geokriological Service. It states that the network has both constructive and operational defects. The former are the result of unreasonable and wrong design solutions, the latter show the quality of maintenance. Of 147 wells that were surveyed 139, i.e. 95% require particular repair and renewal work. Some of the surveyed wells do not have top slabs, the others – manholes, the other require capital repairs or replacement, recovery of leakproofness etc., and almost 43% need cleanout.

Besides the survey materials underline that there was no special survey of the pipelines. The survey conducted involved investigating the influence of melting permafrost on the buildings and foundations of Zheleznodorozhnyi. The pipeline network was considered to be a structure connected to the buildings and assumed to be influenced by the same conditions and in addition heating the permafrost with the waste water.

Recovery of the sewage network operation is of significant importance for improvement of the situation with treatment of the waste water at the Vorkuta wastewater treatment plant. Unlimited inflow of surface and melt water into the domestic sewage network through the open manholes leads to the increase in inflow of waste water to the WWTP (by two times, from 40 to 80 thousand m^3/day, according to the information from MUE Vodokanal) as well as to significant dilution. The increase in inflow and dilution negatively influences the treatment process, causing overload of the sewage networks and pumping stations, in flood periods leading to emergency discharge of non-treated waste water into the water bodies.

Within the framework of the pre-investment study for the purpose of improving the sewage network operation in the Zheleznodorozhniy district of Vorkuta as well as improving the waste water treatment in Vorkuta in general it is proposed to do the reconstruction of the sewage wells.

Reconstruction of the sewage pipelines:

The sewage pipe network has not been inspected and the current condition of the sewage pipe ducts is unknown. In order to determine the effect the condition of the pipes has on the WWTF, a survey of the pipe network should be conducted.

At this stage in the project, it has been assessed that the major cause of overflowing the system is due to poor operation of the network and possible construction of a new domestic sewage network in the Zheleznodorozhniy district of Vorkuta has not been considered.

It could, however, be considered in later stages of the project provided that the activities on recovery of the sewage network operation will be completed and the defects that require re-laying of individual sections of the network are identified.

Storm sewage:

The issue of management of storm water sewage during the flood period may become topical when recovering the sewage network and providing the pressurization of the sewage wells. At present a significant part of the surface water is drained in the domestic sewage system and hence in the future it will be necessary to organize the management of surface water in the system of storm water trays and to maintain the operation of this system throughout the year.

4.2.3 Recommendations on Improvement of the Vorkuta Waste Water Treatment System Efficiency

In compliance with the analysis in paragraph 4.2.2 in order to improve the situation in the sphere of wastewater management in Vorkuta and to reduce the negative influence on the water basins and environment it is necessary to consider a set of activities.

- Construction of new city WWTP with a capacity of 40 thousand m^3/day.
- Identify organization(s) liable for the appropriate operation of the sewage network of the Zheleznodorozhniy district.
- Reconstruction of wells of the domestic sewage network of the Zheleznodorozhniy district of Vorkuta.
- Replacement of defective sections of the sewage network of the Zheleznodorozhniy district of Vorkuta provided that the sewage network undergoes TV diagnostics and the activities on recovery of the sewage network operation are completed.
- Organization and proper monitoring of the condition of the sewage network condition in the Zheleznodorozhniy district of Vorkuta stipulated by the regulatory documents (Rules of Technical Operation of Systems and Facilities of the Public Water Supply and Management System MDK 3-02.2001).
- Construction of storm water sewage network at the Zheleznodorozhniy district of Vorkuta.

4.3 Proposed Technical Solutions

Modernization of the waste water system in Vorkuta is reviewed in the report. The main activities within the modernization of the waste water system are as follows:

- Construction of new sewage treatment facilities in Vorkuta with through output of 40 thousand m3/twenty-four hours.
- Reconstruction of domestic sewage wells of the Zheleznodorozhniy district of Vorkuta.
- Arrangement and maintenance of reasonable supervision over the condition of sewage networks of the Zheleznodorozhniy district of Vorkuta.

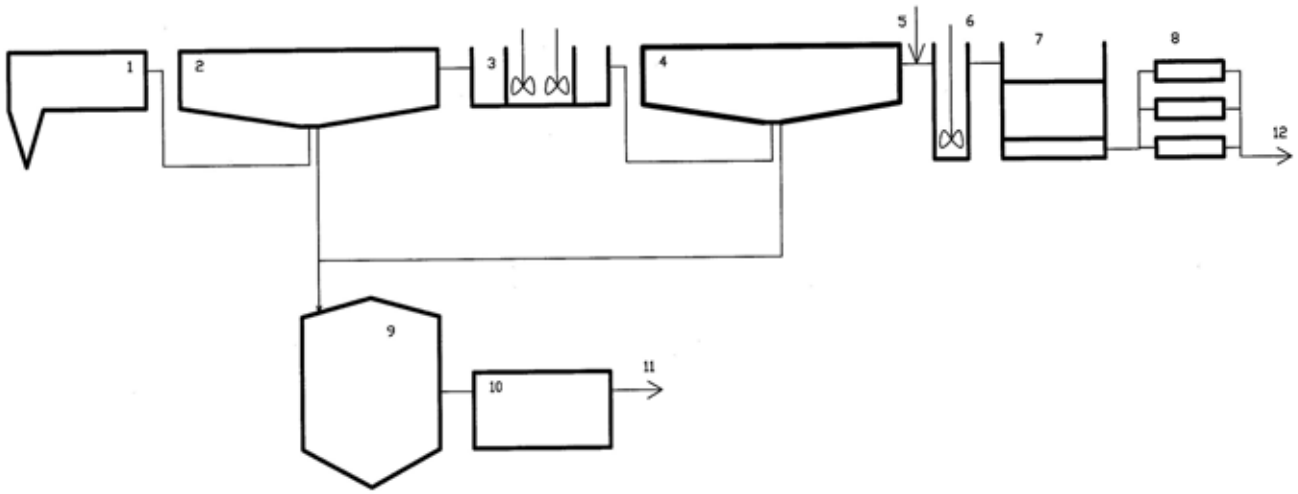
4.3.1 Construction of New Waste Water Treatment Facilities in Vorkuta

Based on the current data and information of the domestic waste water in Vorkuta, a new WWTF process scheme has been suggested. Reservations of the proposed process solutions are made in regards to deficient data/information provided at this stage in the process. Prior to deciding upon the final technical solution, it is suggested to conduct a

process selection survey, in which the suggested process scheme is evaluated and updated in accordance with new information.

Taking into account the above mentioned reservations, the following WWTP process scheme is suggested:

1. Aerated horizontal sand traps to catch sand.
2. Radial flow primary sedimentation tanks.
3. Activated sludge tanks with one of the existing process of deep nitrogen removal.
4. Radial flow secondary sedimentation tanks with the system of vacuum removal of activated sludge.
5. Tertiary treatment unit consisting of sand filters with coagulation.
6. Ultraviolet disinfection unit of treated wastewater prior to discharge into water bodies.
7. Anaerobic digesters for anaerobic stabilization of surplus activated sludge and raw sludge from primary sedimentation tanks.
8. Mechanical sludge dewatering unit.
9. Landfill for dewatered sludge disposal.



1. Aerated sand traps 2 .Primary sedimentation tanks. 3. Activated sludge tanks 4. Secondary sedimentation tanks 5. Chemical agent addition. 6. Mixing unit 7.Sand filtering unit. 8. UV disinfection unit. 9. Digestion tanks (methane tanks). 10. Sludge dewatering unit. 11. Dewatered sludge disposal 12. Treated water discharge

Figure 4: WWTP process flow chart

The suggested treatment process meets the requirements on discharge of suspensions, organic pollution, oil products and phosphorus which existing facilities are not able to fulfill. Removal of organic pollution and most of the oil products will be performed during biological treatment in the activated sludge tanks with simultaneous nitrogen removal. Final removal of suspensions, oil products and phosphorous compounds will be performed at the tertiary treatment unit by coagulation and sand filtration. Ultraviolet disinfection, if compared to chlorine disinfection efficiency, allows avoiding generation of toxic chlorination byproducts and their discharge into the environment. Another important benefit of the ultraviolet disinfection is the possibility to eliminate hazard for WWTP personnel and population connected to transportation, storage and usage of chlorine.

The design of the new WWTP should include complex automation of treatment process and on-line treatment process parameters control. Separate process elements of WWTP should be automated (active sludge tanks, sand filters, ultraviolet disinfection unit, chemical agent units, chemical agent dosing systems etc.) and further integrated into a joint automatic process control system.

The location for the future WWTP can be found 400 meters east of the existing WWTP (Figure 5). It is also possible to consider other similar land plots in the western part of Vorkuta free from construction, suitable for permanent structures building and approved by municipal administration.

Figure 5: Possible location of new WWTF

4.3.2 Reconstruction of Domestic Sewage System Wells in the Zheleznodorozhniy District of Vorkuta

To reconstruct the work of domestic sewage system the following works are required:

1. To implement external and internal technical survey of the network and facilities within the network (sewage wells, chambers, gantries, emergency discharges) along with preparation of fault reports at the network sections.
2. To perform cleaning of the wells from foreign matters, pollution and sedimentation.
3. To repair (if required – to replace) floor slabs of sewage wells, chambers, and manholes sections to secure leakproofness of wells and chambers.
4. To lift manhole sections of sewage wells and chambers located outside roadways and house passages with asphalt pavement to the height of 300-500mm over adjacent area by the installation of additional wall rings or adjusting rings.
5. To perform hydraulic jet washing of the sewage network using channel flushing machine (hydrodynamic backwash machine) of KO-514 type or similar.
6. To intensify supervision over the sewage network and not allow discharge of melt water, snow, split ice, debris and foreign matters into the sewage wells.
7. To dispose debris of ground and construction waste out of sewage network routes to secure free access in order to perform repair works of the network routes.

Repair and reconstruction works at sewage wells and manholes:

According to the survey by State Institution of the Geokriologicheskaya Sluzhba of the Komi Republic (Geocryologic Service), 139 of 147 surveyed wells require repair and reconstruction works. Types of these works are classified in the Table 5 below.

Table 5: Repair and Reconstruction Works at Sewage Wells

No.	Recommended Actions	Number of wells	% from total number of wells
1	Overhaul repairs or replacement of well	15	10,2
2	Build-up and repair of the upper part of well	10	6,8
3	Installation of missing slab	15	10,2
4	Reconstruction of well tightness	12	8,2
5	Slab repair	12	8,2
6	Repair or installation of inspection manhole	5	3,4
7	Installation of stairs	13	8,8
8	Reconstruction of well paving	16	10,9
9	Cleaning and examination	63	42,9

Some of the wells require implementation of several of the recommended actions in Table 5.

4.3.3 Arrangement and Provision of Appropriate Monitoring of the Sewage Networks' Condition at Zheleznodorozhniy District of Vorkuta

Problems in operation of the sewage network are to a great extent caused by unsatisfactory monitoring of the networks condition, lack of timely repairs and liquidation of emergency situations at the network.

In order to solve the existing problems and improve the working efficiency of Zheleznodorozhniy district's network it is required to organize and introduce the system of supervision and monitoring of the sewage network condition in compliance with regulatory documents.

1. Training of the personnel.

2. Organization of the observation and monitoring system, including measures, prescribed by the obligatory Rules of Technical Operation of Systems and Facilities of the Public Water Supply and Management System:

   a) *External survey* is performed according to the route defined by a daily network maintenance plan. Each maintenance crew must be provided with a daily work order. All relevant observations, including registering installed water meters in the wells, along the route must be registered in Survey Registration Book (Annex 7**Ошибка! Источник ссылки не найден.**). A strong tool for data collection and treatment of the external surveys is a pipeline database, and it is strongly recommended to purchase one. External survey must be performed at least 6 times a year by checking the external appearance of the network and manholes without climbing inside the manholes.

   b) *Technical survey* of internal conditions of the network must be performed every year. It is suggested that that the internal inspection is made by TV cameras.

   c) According to the reports of external and technical survey the network crew leader must prepare *repair request forms* and *repair and maintenance plans* (Annex 8) which must be approved by the Chief Technical Officer at the wastewater utility company.

d) Repair and maintenance plans lead to *preventive repair* (wells and pipes cleaning) performed at least every year or more frequently if necessary.

4.3.4 Land plot allocation approval for new construction

It is supposed to build a new WWTP as result of the project implementation. It is not feasible to build a new WWTP at the site of existing WWTP or the site of suspended reconstruction started in 1990s. The existing WWTP technological scheme will not be compatible with future WWTP and the constructions of suspended WWTP reconstruction are damaged and not repairable for new construction purposes.

A new land plot for new WWTP construction is suggested to be beside the existing WWTP, as this will provide for the use of the existing pipelines and infrastructure. If project owner or local authorities should choose another location, this will include design of pipeline network to the WWTP and possible upgrading of infrastructure.

According to the Russian legislation when selecting a land plot for new construction it is necessary to perform selection with drawing up of a selection act signed by the main land owner (Vorkuta municipal administration), Rosnedvizhimost representative in Vorkuta, and Rospotrebnadzor, the Environmental Protection authorities. Since the construction of a new WWTP at the land plot selection stage may infringe interests of other businesses (communication and power lines, water pipelines, and other communications) it is necessary to receive the approval of the land plot selection by corresponding services.

At the later stages, after PINS finalization, project design documentation will be required. Project design documentation will be developed according to the environmental protection requirements and will include an EIA (environmental impact assessment) as an obligatory part of the design documentation. Prior to receiving the approval of the State environmental expertise, the design documentation must be approved by the concerned services and control agencies.

After project implementation and at the termination of operation at the existing WWTP, a decommissioning plan for the existing WWTP should be made in accordance with environmental, safety and health regulations.

5. PROJECT COST ESTIMATE

5.1 Capital costs

Calculation of the capital cost is approximate. It is assumed the detailed cost calculation will be performed during detailed design stage of the project.

Calculation of the capital cost has been based on the cost of similar projects, available project documentation, offers of the equipment providers.

5.1.1 Construction of new WWTF

According to recent examples of modern treatment facilities a WWTP of similar treatment process can demand approximate capital investment in the range of 700-1000 EUR for 1000 thousand cubic meters of treated waste water per day. Since Vorkuta is situated in the area with severe climate and ground conditions it is reasonable to take the highest cost for primary evaluation. The total investment for Vorkuta WWTP will be approximately 40 mln. EUR. Total price and its components presented in Table 6.

Table 6: Capital cost estimates for new WWTF construction

Component	Component's share	Cost of the component, mln. EUR
Field survey works	5%	2
Design works and expertise	5%	2
Construction works	60%	24
Procurement of equipment	30%	12
TOTAL	**100%**	**40**

Field survey works will include land measuring and geological works. It should be undertaken by local or invited company specialising in field survey works.

Design and expertise will have to be carried out by Russian or international design company with significant experience in water and wastewater systems design and preferably with experience in the areas with severe climate and permafrost ground conditions.

Construction will have to be implemented by a company or association of companies with sufficient technical and personal resources and experience of construction in severe climate conditions.

Procurement will include purchase, transportation and installation of pumps, pipes, compressors, aerators, mixing equipment, UV-disinfection equipment, automation equipment, communication and alarm systems.

5.1.2 Reconstruction of Domestic Sewage System Wells in the Zheleznodorozhniy District

In total 139 wells require repair and reconstruction, some of them includes several works. These will include components described in Table 7 below.

Table 7: Capital cost estimates for wells reconstruction

Component	Number of wells	Cost per 1 well, EUR	Cost of the component, EUR
Installation of new well	15	1 500	22 500
Slab repair, manhole installation, paving repair	83	300	21 000
Cleaning and examination	63	100	6 300
TOTAL			**49 800***

* For convenience of financial calculations the cost was rounded and the further sections of the report refer to EUR **50 000**.

Since data for sewerage network defects were provided during 2005-2006 inspections it is necessary to obtain the latest data that can demand additional inspection.

Repairing of damaged wells and installation of new wells will demand purchase and transportation of new reinforced concrete elements, site preparation and installation of new elements on site.

5.2 Operational costs

Operational costs have been calculated as tentative assumption. The following assumptions were made to evaluate operational costs:

- Installed power capacity of equipment - 3 000 kWt,
- Electric power tariff rate - 3 RUR/kWt-hour.
- The number of personnel (electricians, maintenance workers, laboratory technicians for WWTP operation was reduced twice to traditional Russian practice.

5.2.1 Operational Costs of New WWTF

The operational costs related to WWTF are estimated as 2 291 thousand EUR a year (Table 8).

Table 8: Operational costs of WWTF

Position	Annual costs, thous. RUB	Annual rate, thous. EUR*
Wages of personnel	5 400	123
Power	78 000	1 773
Water supply	18	0,4
Chemicals and materials	15 000	341
Maintenance and repairs of WWTP equipment	2 400	55
TOTAL	**100 818**	**2 291,4**

* 1 Euro = 44 rubles

About 78% of the operational cost is electric power expenses as the WWTF will include a lot of power consuming equipment like pumps, compressors, mixers, UV disinfection equipment etc.

Only 5% of total operational expenses fall on the WWTF personnel including administration because it is planned to achieve high level of treatment process automation to reduce personnel expenses (Table 9).

Table 9: Annual wages of WWTF personnel

Position	Number	Monthly rate, thous. RUB	Annual rate, thous. RUB	Annual rate, thous. EUR*
Chief	1	50	600	14
Mechanical Engineer	1	40	480	11
Process Engineer	1	40	480	11
Engineer on duty	5	30	1 800	41
Electrician	2	20	480	11
Maintenance man	3	20	720	16
Laboratory technician	2	20	480	11
Auxiliary personnel	2	15	360	8
TOTAL	**17**	**450**	**5 400**	**122**

* 1 Euro = 44 rubles

According to traditional Russian practice the maintenance crew for similar WWTPs consists of 40-50 people. Since the new WWTF will include modern automation and control systems it is practical to reduce operational personnel at least twice.

5.2.2 Operational Costs of Domestic Sewage System Maintenance

Operational cost of sewerage system maintenance will basically remain at the same level. Reconstruction of manholes and wells will require neither the additional personnel employment nor additional expenses for sewerage system maintenance and operation. Only the expenses for liquidation of emergency situations will be reduced because of the reduction of incidents and emergency situations (pipe clogging, surface water discharge etc) after reconstruction of manholes and wells.

6. PROJECT PRE-INVESTMENT ASSESSMENT

This chapter includes description of environmental and social assessments of the project. The project is located in Arctic zone of Russia. Climate conditions of this area require thorough study. That is why during project development it is necessary to take into account natural and environmental peculiarities, living conditions of the population, and also existing and possible bottlenecks which could appear during IP implementation.

6.1 Environmental assessment

Implementation of this investment project will certainly allow reducing overall pollution load on local environment as well as global environmental impact. This project is the most perspective one for further implementation in terms of environmental impact and arrangement of ecologically clean territory for comfortable living environment of population.

The environmental assessment is based on the environmental status of the WWTP and assessed dispersion routes of potential pollution from the WWTP.

6.1.1 Existing Environmental Status in the IP Area

According to the State Statistic Report 2-TP 13 958.9 thousand m^3 of waste water were supplied for treatment in 2008. 12 856.4 thousand m^3 were treated, 1 102.5 thousand m^3 of so-called collector-drainage waste water were discharged without treatment through the 'emergency discharge'.

The reason for recurrent discharge of waste water without biological treatment is the increase of load on the WWTP in the flood period due to the poor technical condition of the sewage networks in individual city districts.

Reconstruction (extension) of WWTP to the capacity of 80 thousand m^3/day stipulated by the Republican Programme 'Environment -2005' was suspended for economic reasons. As a result some elements of WWTP were not commissioned. According to the information of the operating company there is technical discrepancy in the capacity of the gravity-flow collector and the actual capacity of the WWTF which recurrently, especially in the storm and flood period, creates a risk of overload and flooding of the sewage pumping stations at the treatment facilities and therefore to their emergency shutdown. A similar situation occurred in May 2007, resulting in 31.2 thousand m^3 of non-treated waste water being discharged directly into the water body.

In the waste water treatment the standards of Maximum Permitted Discharge (MPD), approved by the Dvinsko-Pechorskiy Basin Administration, are not met in regards to suspensions, biochemical consumption of oxygen, oil products, and phosphorus. At the discharge of non-treated waste water the standards are not met regarding all basic factors/components.

Data on the waste water treatment factors in the year 2008 is presented below (Table 10).

Table 10: Factors of the Treated Waste Water 2008.

Name of the Factor	Discharge of Treated Waste Water, tons/year		Discharge of Non-treated Waste Water , tons/year	
	Approved MPD	Actual MPD	Approved MPD	Actual MPD
Suspensions	103,8	**109,9**	8,53	**204,6**
Biochemical oxygen demand (total)	43,8	**47,6**	3,6	**89,1**
Oil products	2,93	**6,4**	0,36	**0,6**
Sulphates	832,2	362,9	64,94	**427,0**
Chloride	506,6	270,8	31,41	**301,0**
Iron	1,46	1,28	0,12	**2,8**
Magnesium	153,3	68,14	15,336	**78,1**
Synthetic Surface-active Substance	1,46	1,2	0,12	**2,6**
Phosphor	2,92	**17,1**	0,24	**18,95**
Ammonia nitrogen	7,3	6,9	0,6	**18,45**
Nitrite nitrogen	1,168	0,0	0,096	0,024
Nitrate nitrogen	584,0	21,1	48,0	21,2
Copper	0,0146	0,0	0,012	0,011
Zink	0,146	0,0	-	-
Chrome	0,292	0,0	0,292	0,0
Phenol	0,0146	0,0	0,012	**0,022**

Values exceeding the MPD standards are accentuated in bold in Table 10. The information presented above shows that Vorkuta WWTP does not provide treatment for the full volume of waste water in the city. The result of which has a negative impact on the general hydrochemical condition of the Vorkuta river.

Field observations
General condition of the WWTP regarding the environment. Condition of the different parts and our evaluation of potential risks to the environment.

The main negative environmental impact at the WWTP is caused by the chlorination unit. It leads to both discharge of toxic chlorination by-products into the river Vorkuta and by unavoidable chlorine emission even during regular treatment process. Accidental chlorine discharge into the atmosphere can potentially lead to significant environmental damages and human casualties.

Uncompleted sludge treatment process also has a negative impact on environment because incompletely treated sludge is transported to the municipal landfill and disposed without environmental protection measures.

6.1.2 Dispersion routes

Geology and hydrogeology
Vorkuta is located in the Bolshezemelskaya tundra in the Pechora Region in boundary of continuous and discontinuous permafrost. According to Vorkutageology the topsoil layer in the Vorkuta region consists of loamy and peat sediments.

Underlying the topsoil layer is quaternary and Permian deposits. The quaternary deposits mainly consist of boulder loam with rare sand layers and have thickness of 20 – 60 m. The Permian deposits consist of alternating of siltstone, mudstone and the prevailing sandstone.

The permafrost underlies the insulating topsoil layer with a thickness of 60 – 70 m. In the area of discontinuous permafrost some of the quaternary deposits could be thawed and in hydraulic contact with water in local taliks flowing towards the River. In areas of continuous permafrost the quaternary deposits are frozen.

Superpermafrost water is located 10 – 20 m below ground level. The superpermafrost water is created by rain and melt water due to the low percolation capabilities of permafrost. The suprapermafrost water has flow direction towards the Vorkuta River.

The permafrost layer limits the vertical percolation of water to deeper ground water aquifers. Due to the low percolation capabilities of the permafrost local subsurface ground water (not an aquifer) or ponds may be formed in the topsoil active layer.

Surface water recipients

The nearest surface water recipient is the Vorkuta River, located approximately 2 000 m west of the WWTP. The Vorkuta River has outlet in the Pechora Sea.

Contaminated waste water from the WWTP is directly discharged into the western feeder of the Vorkuta River - Parallelnyi Stream. Dispersion routes for leakage at the WWTP include ground water, run-off water and transport through thawed deposits.

Air

Dispersion routes of air include gas emissions of pollutants and transport of dust.

Gas emissions from the WWTP include carbon dioxide and methane from the degradation process.

Influence of climate change on the dispersion routes

Climate changes are anticipated to cause a rise in the mean annual air temperatures of up to several degrees over much of the Arctic. Climate changes above ground are often dampened below ground due to the insulating effects of vegetation, organic material and snow cover. In discontinuous permafrost regions, such as Vorkuta, where temperatures are within a few degrees of thawing, permafrost is likely to disappear as a result of ground thermal changes. The time for degradation is uncertain and may take a several decades.

The degradation of permafrost in areas where the ice content in the ground is high is associated with physical impacts such as soil instability, formation of thawing ponds and increasing drainage to surface water recipients.

The physical impacts of climate change may cause the following impact on the dispersion routes of the WWTF:

- Increase in the vertical dispersion to deeper ground water aquifers
- Increase in formation of thawing ponds
- Increase in direct drainage to Vorkuta River
- Soil instability (creep/slope failure) causing

An assessment of the impact of climate change on permafrost at the WWTP is necessary in order to determine whether adaption methods will be required.

6.1.3 Preliminary environmental risk assessment

The preliminary environmental risk assessment is based on existing environmental data, registered observations at the WWTP and the potential dispersion routes.

The existing data covers the controlled discharges of waste water into surface water recipients. It does however not include data for leakage of waste water from the waste water plant or the emissions of greenhouse gases from the waste water and the operation.

Current assessed environmental impact

Human health

Risk 1: Direct contact with the waste
Authorised personnel of the WWTP are directly exposed to the waste water. Through the direct contact with the waste water the personnel is exposed to bacteria, emission products and hazardous contaminants, such as oil products and phenol.

It has not been possible to assess the quantitative impact this exposure has on the human health of the affected people.

Risk 2: Contact with discharged/dispersed waste
Contact with the discharged/dispersed waste water occurs when the waste water is discharged/dispersed to the River. Affected people include the public and local settlements in the discharge/dispersion area along the Vorkuta River bank.

Through the contact with the dispersed waste and degradation products the local people are exposed to bacteria, emission products and hazardous contaminants.

It has not been possible to assess the quantitative impact the exposure has on the human health of the affected people.

Dispersion to the environment

Dispersion via airborne particles and emissions
Dispersion of airborne contaminated particles and hazardous pollutants occurs through emissions and transport of dust/particles.

In the waste water treatment process, the material is wet and the transport of dust/particles outside the WWTP is assessed limited.

The dispersion of greenhouse gasses occurs due to degradation processes and operational works at the WWTP. The emission of greenhouse gases affects the local and global environment. Internationally there is an increasing focus on emission of greenhouse gases and their effect on climate change and global warming.

Environmental investigations or calculations for assessing the environmental impacts of greenhouse gas emissions from the WWTP have not been undertaken. It is hence not possible to quantify the local and global environmental impacts of the greenhouse gas emissions from the WWTP.

Dispersion of pollutants via water resources
The dispersion of pollutants via water routes from the WWTF occurs through the direct discharge of waste water or transport of leakage via ground water or surface runoff water.

According to data from 2008, over 1 000 000 m^3 of waste water was discharged directly into the surface water body without any treatment. Approximately 12 000 000 m^3 treated waste water was discharged into the surface water body. On a yearly basis the discharged treated waste water did not meet the MPD for suspended material, COD, oil products and phosphor.

Environmental surveys to determine the impact that the discharge of waste water has on the biodiversity, ecology and environment of the surface water body has not been undertaken. However due to the amount and composition, the discharge of waste water directly into the surface water body is expected to have significant impact on the biodiversity, ecology and environment of the surface water body. High concentrations of organic components can for instance lead to depleting oxygen levels affecting the ecosystem of the river.

The dispersion of waste water in the river has not been assessed and the extent of the environmental impact on the regional ecosystem has not been qualified or quantified.

The dispersion of waste water via leakage from the WWTP is assessed as being minimal compared to the direct discharge. It is not possible to assess whether isolated leakages have significant environmental impacts on the ecosystem in the River.

Implementation period – assessed environmental impact

In the implementation period a new WWTP is constructed. During construction waste water will be treated at the existing WWTP. The assessed environmental impacts of the WWTP will thus be the same as described in the previous section.

In the following the environmental impacts of the construction is assessed.

In Table 11 below the environmental impacts in the construction period are briefly summarised.

Table 11: Overview of the consequences, risks and preventive measures for environmental impact in the construction of a new WWTF

Description	Consequence/ impact	Affected people/environment	Probability/ risk	Preventive measures
Human health				
Transport vehicles and construction machinery	Exposure to air pollution and particles	Employees and workers	**High**	HSE plan
Construction waste	Exposure to hazardous building materials	Employees and workers	**Low**	HSE plan Waste management plan
Dispersion to the environment				
Transport vehicles and construction machinery	Increase in air pollution and particle emissions	Local, regional and global environment	**High**	Assess the environmental impact Particle filters on vehicles/machines Environmentally friendly use of vehicles/machinery

Construction waste	Generate construction waste	Local and regional environment	**High**	Waste management plan
Accidents	Accidental spills causing unintentional pollution	Local environment	**Low**	HSE plan including emergency action plan

During the construction stage the project will negatively impact the atmosphere due to the utilization of transport vehicles and hardware needed for cargo delivery and construction. The main pollutants are combustion products from fuel use of cargo deliveries, and machinery and hardware operation during the construction. However this will be a short-term pollution limited by the construction period. The long-term environmental gains of constructing a new WWTP are assessed as outweighing the short-term environmental impacts. In order to limit air pollution and particle emissions during the construction period, it is recommended to include a plan for minimizing emissions in the health, safety and environment plan (HSE).

Construction waste will be generated during WWTP construction and renovation of sewage wells, partially used in road construction. The generation of construction waste is limited to the construction area and period. In order to meet environmental standards, it is recommended that a waste management plan for the construction is conducted and that possible management of hazardous waste is included in the HSE.

In the construction period, harmful impacts on the ground and surface waters are not expected. Water from the Vorkuta water supply system used during construction, will be transferred for treatment at WWTP, in periods where the treatment capacity is not exceeded. Significant pollution of ground water and surface water during construction could be caused by accidents. It is hence important to include an emergency action plan in the HSE in order to limit unintentional pollution.

The construction of WWTP will not have an environmental impact on land resources. The WWTP and renovation of the sewage wells will be performed at reclaimed areas not related to forestation, agricultural or natural reserve territories.

Prior to implementing the project, design documentation development will be required. Such design documentation will be developed subject to environmental requirements and shall include an EIA (Environmental Impact Assessment) and shall be subject to a State Environmental Review.

Operational period – assessed environmental impacts

In the following assessment of the environmental impacts in the operational period, the impacts of climate change are not included. These will be presented in the following chapter.

In the operational period, personnel will be exposed to waste water and contaminants. In order to minimize the exposure to hazardous material (biological and chemical), it is recommended that the personnel undergo training in managing the waste water exposure. This training should include the information on the types of contaminants, including the degradation products, and how these affect human health.

In the operational period emissions of greenhouse gasses are expected due to the use of up-to-date automated systems that require additional electric power consumption. The volume of emissions will depend on the quantity of coal used at Vorkuta heat and power plant for generating electric power. It is recommended that the personnel undergo training for cost-effective use of electricity.

The discharge of waste water directly to Vorkuta River and further on to the Pechora Sea will decrease significantly in the operational period as the new WWTP will secure treatment of sewage water in accordance with regulatory requirements. Monitoring of the outlet discharge of treated waste water will be undertaken and in addition annual monitoring of the adjacent surface water bodies will be performed.

During the operational period sediments from the sewage water treatment will be transported to a licensed landfill and the negative impacts of waste generation are assessed to be minimal.

Prior to the operational period, a HSE plan will be conducted. The HSE plan should be updated every 5 years.

Closure of the WWTF – assessed environmental impact

The construction of a new WWTF entails the closure and decommissioning of the existing WWTP. Assuming the ecological and climatic conditions remain unchanged, and the implemented measures have been supervised and updated in the operational period, the closure of the existing WWTP will entail the same environmental considerations at the time of decommissioning.

In Table 12 below the environmental impacts in the decommissioning period are briefly summarised.

Table 12: Overview of the consequences, risks and preventive measures for environmental impact in the WWTP decommissioning period

Description	Consequence/ impact	Affected people/environment	Probability/ risk	Preventive measures
Human health				
Waste water	Exposure to hazardous (biological and chemical) components	Employees and workers	**Medium**	HSE plan
Transport vehicles and decommisioning machinery	Exposure to air pollution and particles	Employees and workers	**High**	HSE plan
Decommisioning waste	Exposure to hazardous building materials	Employees and workers	**High**	HSE plan Waste management plan
Dispersion to the environment				
Waste water	Dispersion of remedial waste water into the environment	Local environment	**Medium**	Supervision of waste water dispersion routes Preventive dispersion action plan Sewage management plan
Transport vehicles and construction machinery	Increase in air pollution and particle emissions	Local, regional and global environment	**High**	Assess the environmental impact Particle filters on vehicles/machines Environmentally friendly use of vehicles/machinery
Decommissioning	Generate	Local and	**High**	Waste management plan

waste	construction waste	regional environment		
Accidents	Accidental spills causing unintentional pollution	Local environment	**Low**	HSE plan including emergency action plan

The employees and decommissioning workers at the WWTP will be exposed to remedial waste water, emissions from decommissioning machinery/vehicles and decommissioning waste in the period. As the WWTP was constructed in the earlier 70-ies, hazardous building materials were probably used (for example asbestos, PCB, etc.). To ensure the workers from health hazards, a HSE plan and waste management plan will be undertaken prior to initiating the decommissioning works.

Dispersion to the environment includes remedial waste water and sewage, air pollution from the decommissioning machinery and generation of decommissioning waste. It is recommended that the HSE plan for the decommissioning work includes a plan for minimizing emissions. Plans for waste management of decommissioning waste and remedial sewage should also be made. In addition emergency action plans should be made for the event of unintended spills and pollutions.

Environmental impacts of climate change
Climate change may have significant physical and environmental impacts on the WWTP site.

A climate change leading to prolonged increases in annual temperatures will result in the degradation of permafrost in Vorkuta. At the WWTP the degradation of permafrost may lead to the following physical impacts:

- Formation of thawing/leachate ponds
- Formation of shallow ground water aquifers
- Increased vertical percolation of water
- Geotechnical instability of the site

The physical changes may have negative environmental impacts. The geotechnical instability could lead to significant construction defaults on the WWTF. Along with the alteration of dispersion routes this could lead to a drastic increase in the leakage of untreated waste water to the adjacent water bodies.

In order to meet the challenges appropriated by climate change, the maintenance plan for the WWTP and waste water network should include assessment of impacts of climate changes in the Vorkuta Region.

6.1.4 Environmental Benefits

During the construction period a short-term increase in environmental impacts is expected. The long-term environmental benefits of constructing a new WWTP are however assessed as outweighing the short-term environmental impacts. In general implementation of this IP will result in decrease of negative environmental impact in Vorkuta including all adjacent water bodies.

The IP implementation will bring the following environmental benefits.

The most important environmental effect of the project will be the dismantling of the hazardous production facility - chlorination plant and WWTP chlorine store house. Replacement of sewage water chlorination unit by ultraviolet sewage water disinfection plant will allow excluding the risk of unavoidable chlorine leakage during transportation, storage and application of this hazardous agent.

Also, as a result, sewage water chlorination products that are highly toxic substances will not be emitted to the environment and the efficiency of disinfection will remain at a high level.

Increase of sewage water treatment effectiveness with respect to "oil products", "phosphorus", "suspended particles", "BOD" and other factors will result in significant reduction of pollutants water discharge (Fig. 6)

For calculation of pollutants discharge after the project implementation most probable concentrations of pollutants in treated wastewater were multiplied by the annual waste water discharge. Also elimination of untreated waste water discharge will have significant effect on environmental impact reduction.

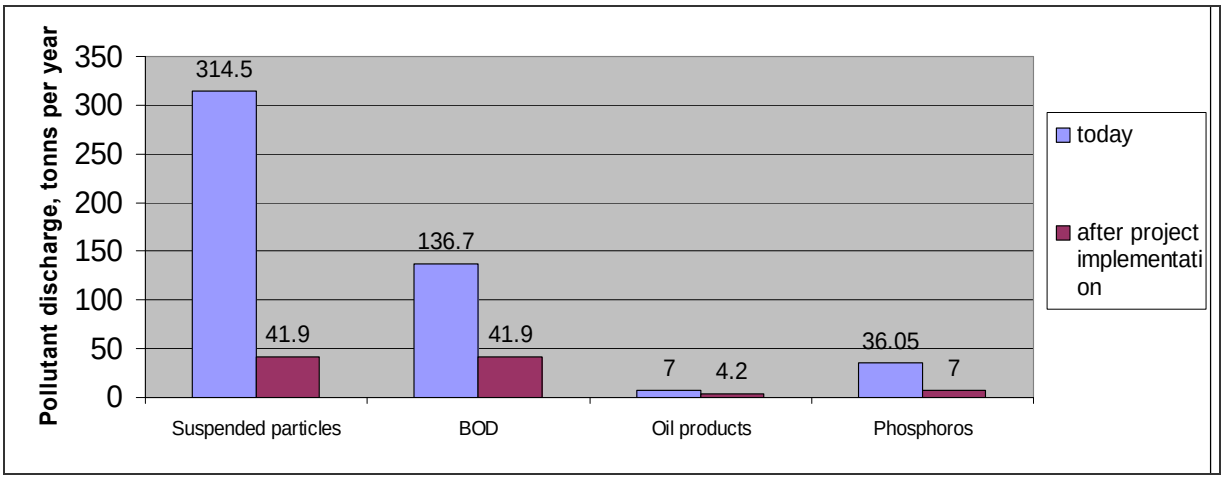


Figure 6: Reduction of pollutant discharge into water bodies

Elimination of polluters similar to this facility will allow reducing the negative environmental impact in future not in an individual city but along the Arctic coast, thus preserving the unique natural and marine environment.

6.2 Social assessment

Sewage system of Vorkuta is in improper condition due to the lack of upgrade work from the date of construction thereof. In spring (snow melting period) untreated sewage water is discharged to the Vorkuta River that results in water area pollution around Vorkuta. In addition there are partial landfloods of residential and social facilities of Zheleznodorozhniy district by sewage water that in turn results in building structure damage. All that result in deterioration of both environmental and social situation in the city, particularly in health impairment of population, and reduction of recreation and tourism areas previously used by population.

6.2.1 Stakeholder identification

The following stakeholders have been identified in the project:

- Employees at the WWTP
- Contractors/workers at the WWTP
- Local settlements
- The general public in Vorkuta
- The Municipal Administration in Vorkuta
- The Komi Republic administration

6.2.2 Social analysis

Thorough social interviews of all stakeholders have not been made. The following social analysis is based on opinions/assessments of the project owner and the local and regional administrations, and further on the general socio-economical situation in Vorkuta.

The administration of Vorkuta municipality is very concerned about the existing situation, which worsens every year due to the poor technical state of the equipment and network, and permanently declining reliability. The meetings held with the some of the stakeholders in Vorkuta indicated that the owners of the project, MUE Vodokanal and relevant regulatory authorities, Rosprirodnadzor (Federal Service for Supervision of Natural Resource Usage), are interested in a rapid problem solving. Administration of Vorkuta city considers this project implementation as one of its top targets.

Current situation

The concerns of the stakeholders regarding the current situation of waste water treatment system is summarised in the table below.

Table 13: Social concerns regarding the current situation at the WWTP

Concerns	Stakeholder
Health of employees/workers at the WWTF	Employees, workers, MUE Vodokanal, Municipal Administration of Vorkuta
Health of local settlements	Local settlements, Municipal Administration of Vorkuta
Environmental concerns	Municipal Administration of Vorkuta, The Komi Republic Administration
Regulatory concerns	Municipal Administration of Vorkuta

Implementation period

The implementation period entails construction of a new WWTP and upgrading of the waste water supply network.

In general, the same concerns as listed in Table 14 apply for the implementation period. In the table below, more specific concerns related to the implementation work are listed.

Table 14: Social concerns regarding the implantation period at the WWTP

Concerns	Stakeholder
Exposure to construction waste	Employees, workers
Increase in air pollution due to increase in use of vehicles and machinery	Municipal Administration of Vorkuta, The Komi Republic Administration
Increase in level of noise due to increase in use of vehicles and machinery	Employees, workers, local settlements (neighbours)

Operational period

In the operational period the concerns listed in the current situation and implementation period are significantly reduced. A general positive attitude of the stakeholders is expected.

Due to the amount of waste water, a general concern regarding health and environment is expected during the operational phase. As long as the WWTF is operated in accordance

to the project plan and regulatory requirements, these concerns are not expected to have significant social impacts.

Decommissioning of WWTP
Implementation of the project will entail the decommissioning of the existing WWTF. The decommissioning of both WWTF is expected to entail similar social concerns.

In the table below, concerns regarding decommissioning of WWTP are listed.

Table 15: Social concerns regarding the decommissioning of the WWTP

Concerns	Stakeholder
Exposure to hazardous decommissioning waste	Employees, workers
Increase in air pollution due to increase in use of vehicles and machinery	Municipal Administration of Vorkuta, The Komi Republic Administration
Increase in level of noise due to increase in use of vehicles and machinery	Employees, workers, local settlements (neighbours)

6.2.3 Social benefits of project implementation

The social impact assessment shows that the project implementation will entail the following social benefits, which are difficult to convert to monetary terms:

- Enhancement of sewage system reliability, which is one of the most important life support systems.
- Prevention of sewage system contingencies and prevention of sewage waters outflows to the surface in Zheleznodorozhny district. This will positively influence the technical condition of building structures and prevent premature wear thereof, particularly during interseasonal periods.
- Prevention of untreated sewage waters to the surface water bodies of Vorkuta city and sewage waters outflows to the surface. This will positively influence the environment and will result in significant improvement of the local population living conditions.
- Improvement of habitation conditions will decrease the disease level that in turn will result in the reduction of personal and budget expenses for medical treatment. This could also decrease the migration of population to other regions of the Russian Federation.

6.3 Stakeholders participation/involvement

Stakeholder participation
Stakeholder participation in the project is essential for communicating the social benefits of the project to stakeholders.

Measures aimed at public and local population awareness of this IP implementation are taken in the course of pre-investment studies. The municipal web-portal Vorkuta Info published information describing the project. In June 2009 public state-owned TV and radio broadcaster Komi Gor presented interview with I. Senchenya, NPA-Arctic project manager, informing about the activities carried out within this project and NPA-Arctic project in general.

The stakeholders and community were informed about the IP implementation prior to the project implementation and were able to learn about the project and this Report to introduce remarks and comments. In October 2009 the Administration of Vorkuta municipality posted a press release about the IP on the web-site (http://www.mayor.vorkuta.ru), and it was also published in a local Vorkuta newspaper Zapolyarie (dated 22.10.09). Moreover, in the middle of November this year information about the project was presented on the Ministry of Natural Resources and Environment web-site (www.mpr.rkomi.ru). Some delay in the press-release publication at the Ministry web-site was caused by the replacement of minister thereof.

More detailed information about the project is available in the offices of: the Customer – NPA-Arctic, the Project owner – Administration of Vorkuta, MUE Vodokanal and the Consultant – Ramboll Barents. This was organized for the IP owner to be able to define possible concern of the acknowledged community and stakeholders at the early stage of the project implementation.

Comments from the Ministry of Natural Resources and Environment of the Komi Republic and MUE Vodokanal were received. All comments are positive and do not require any update of the PIN. No public comments were received.

Recommendations on investment programme

The Consultant recommends the project owner MUE Vodokanal and Vorkuta municipal administration together with the government of the Komi Republic prepare a feasibility study of Vorkuta water and wastewater systems modernization including the development of a long-term investment programme and detailed short-term priority investment programme. The Consultant recommends that the stakeholders apply for assistance and possible financing to the international financing organizations with significant experience in big construction and modernization projects including municipal water and wastewater systems: EBRD. NEFCO, NIB etc.

7. PROJECT FINANCIAL VIABILITY

This chapter covers the financial justification for the implementation of the proposed WWTP modernization measures.

7.1 Approaches of economic evaluation

The main goal of evaluation is to determine financial viability and economic efficiency of the investment project. After economic evaluation the financial viability and cover of expenditure lead to the decision about the investment project implementation reasonability.

The reasonability evaluation is based on comparison of the current situation and expected situation after project implementation.

When evaluating the project it becomes clear that there is no direct economic effect after project implementation because there is no fuel, energy or material saving results. Other factors and effects are also considered such as environmental and social influence. So, many of the benefits cannot be evaluated in money equivalent.

7.2 Financial position of MUE Vodokanal

The Balance Sheets (BS) and Income Statements (IS) of Vorkuta Vodokanal were analysed to verify the financial status of the organisation and possibility to assume loan financing and capacity to pay the loan back.

The BS and IS were collected from the last 5 years and the first quarter of the year 2009. The BS and IS are presented in RUB and EUR.

Table 16: Income Statement of Vorkuta Vodokanal, in EUR

Income Statement, in Vorkuta Vodokanal format

Income Statement	Unit	2004	2005	2006	2007	2008	2009, 1st Q
Receipts and expenditures in general activities							
Products, works and services sales proceeds (netto) (minus VAT, excises and similar copulsory payments)	EUR	1 019 884	6 366 349	9 220 581	8 844 093	10 186 233	2 786 837
Net value of goods and services sold	EUR	-1 073 558	-6 397 605	-8 681 372	-7 973 302	-10 374 744	-2 752 721
Gross Profit	**EUR**	**-53 674**	**-31 256**	**539 209**	**870 791**	**-188 512**	**34 116**
Operating Profit	**EUR**	**-53 674**	**-31 256**	**539 209**	**870 791**	**-188 512**	**34 116**
Other receipts and expenditures							
Interest due	EUR	0	-2 884	-6 047	0	0	0
Other operating incomes	EUR	78 512	507 791	105 744	73 302	364 791	13 047
Other operating expences	EUR	-19 907	-221 023	-156 860	-215 884	-240 884	-60 326
Income not related to sales	EUR	0	181 465	0	0	0	0
Expences not related to sales	EUR	-70	-193 140	0	0	0	0
Profit (loss) before taxes	**EUR**	**4 860**	**240 953**	**482 047**	**728 209**	**-64 605**	**-13 163**
Deferred tax assets	EUR	0	0	8 907	-8 907	-3 791	0
Current income tax	EUR	-1 163	0	0	-100 907	-209	-93
Fines	EUR	0	0	0	0	0	0
Income taxes and other similar compulsory payments	EUR	0	0	0	0	0	-140
Income taxes of previous period	EUR	0	0	0	0	0	0
Settings with founders	EUR	0	0	0	0	0	0
Tax penalties	EUR	0	0	-93	0	-23	0
Net Profit (loss)	**EUR**	**3 698**	**240 953**	**490 860**	**618 395**	**-68 628**	**-13 395**
Permanen taxable payments (taxable)	EUR	0	-124 605	-124 605	-64 953	19 488	2 744

During the last years the revenues have been increasing. The increase was from RUB 270 million in 2005 to RUB 440 million in 2008. Vorkuta Vodokanal was established in October 2004, consequently the year 2004 figures are not comparable to the other years. When considering an average 18% inflation the real value of revenues of the Vodokanal services have been in clear decline since 2006. This can be seen also in the declining water demand between the years 2006 and 2008 (Figure 7). Also the real tariff levels for waste water have been declining in the same period (Table 17).

During the period 2005 – 2008 the revenues have been higher than the cost (profit 4 to 7 % of the revenues). However, during the year 2008 and the first quarter of 2009 there were slight losses. The losses in the both periods were less than 1% of the revenues.

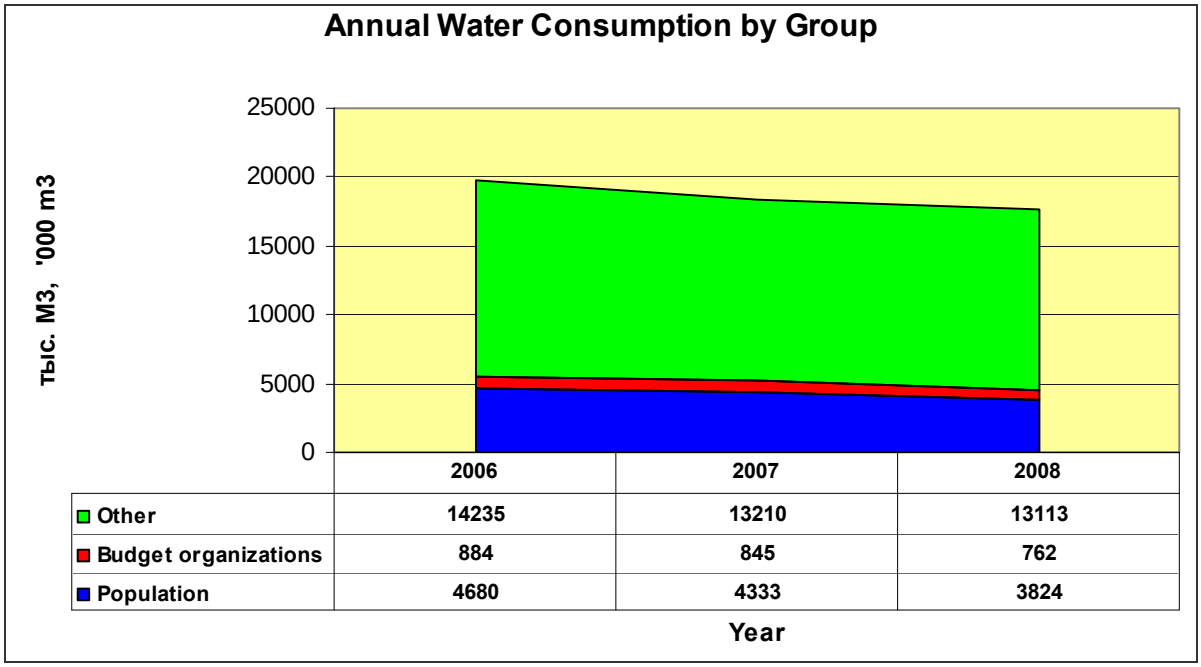


Figure 7: Water demand/sales between the years 2006 and 2008

Table 17: Tariff levels in the period 2005 – 2008, VAT assumed to be 18 %.

Waste Water Tariffs in 2005, 2006, 2007 and 2008, EUR/m3

	2005		2006		2007		2008		2009	
Drinking water	w.o. VAT	with VAT	w.o. VAT	with VAT	w.o. VAT	with VAT	w.o. VAT	with VAT	w.o. VAT	with VAT
Population	0,18	0,21	0,21	0,25	0,21	0,25	0,26	0,31	n/a	n/a
Local budget	0,18	0,21	0,21	0,25	0,21	0,25	0,26	0,31	n/a	n/a
Other clients	0,18	0,21	0,23	0,27	0,23	0,27	0,28	0,33	n/a	n/a
Weighted avg. (water demand as a weight)	**0,18**	**0,21**	**0,22**	**0,26**	**0,22**	**0,26**	**0,27**	**0,32**	**n/a**	**n/a**
Weighted average with 18% inflation correction to 2009 money value	**0,35**	**0,41**	**0,36**	**0,43**	**0,31**	**0,36**	**0,32**	**0,38**	**n/a**	**n/a**

Table 18: Balance Sheet of Vorkuta Vodokanal in EUR

Balance Sheet

ASSETS	Unit	2004	2005	2006	2007	2008	2009, 1st Q
Fixed Assets							
Fixed Assets	EUR	6 458 977	6 346 930	371 814	232 721	235 930	229 535
Uncompleted constructions	EUR	0	0	1 860	2 116	0	0
Deferred tax assets	EUR	0	0	8 907	0	0	0
Total Fixed Assets	**EUR**	**6 458 977**	**6 346 930**	**382 581**	**234 837**	**235 930**	**229 535**
Current Assets							
Inventories	EUR	0	884	66 047	50 488	69 512	60 093
VAT on purchased valuables	EUR	71 395	89 233	23 140	23 070	0	0
Receivables	EUR	691 209	1 914 349	3 357 674	4 184 605	6 036 860	7 897 442
Cash assets	EUR	24 465	698	3 698	65 116	35 465	29 442
Other Current Assets	EUR	22 302	0	0	0	0	0
Total Current Assets	**EUR**	**809 372**	**2 005 163**	**3 450 558**	**4 323 279**	**6 141 837**	**7 986 977**
TOTAL ASSETS	**EUR**	**7 268 349**	**8 352 093**	**3 833 140**	**4 558 116**	**6 377 767**	**8 216 512**

LIABILITIES	Unit	2004	2005	2006	2007	2008	2009, 1st Q
Equity and reserves							
Equity capital	EUR	2 349	2 349	2 349	2 349	2 349	2 349
Undivided profit (ucovered loss)	EUR	6 486 023	6 727 047	1 339 163	1 615 442	1 534 860	1 521 442
Total Equity Capital	**EUR**	**6 488 372**	**6 729 395**	**1 341 512**	**1 617 791**	**1 537 209**	**1 523 791**
Long term liabilities							
Long term liabilities	EUR	0	0	0	0	0	0
Total long-term liabilities	**EUR**	**0**	**0**	**0**	**0**	**0**	**0**
Current Liabilities							
Bills payable	EUR	663 698	1 525 558	2 294 488	2 770 023	4 685 070	6 540 558
Income of future periods	EUR	116 279	97 140	197 140	170 302	155 488	151 698
Total Current Liabilities	**EUR**	**779 977**	**1 622 698**	**2 491 628**	**2 940 326**	**4 840 558**	**6 692 256**
Total Liabilities	**EUR**	**779 977**	**1 622 698**	**2 491 628**	**2 940 326**	**4 840 558**	**6 692 256**
TOTAL EQUITY CAPITAL AND LIABILITIES	**EUR**	**7 268 349**	**8 352 093**	**3 833 140**	**4 558 116**	**6 377 767**	**8 216 047**

Vorkuta Vodokanal does not have long term loans.

Based on the information received from Vorkuta Vodokanal:

- they do not have any unpaid taxes nor unpaid salaries;
- they do not get any support from the Republic;
- between 2006 – 2008 Vorkuta Vodokanal did not pay any pollution fines;
- in 2009 Vodokanal paid RUB 15000 for exceeding normative discharges of waste water;
- only about 50% of tariffs are collected.

Table 19: Analysis of working capital

WORKING CAPITAL

Working capital	Unit	2004	2005	2006	2007	2008	2009, 1st Q
Working capital in the end of the year							
Receivables	'000 RUB	29 722	82 317	144 380	179 938	259 585	339 590
Bills payable	'000 RUB	28 539	65 599	98 663	119 111	201 458	281 244
Inventories	'000 RUB	0	38	2 840	2 171	2 989	2 584
Working capital compared to							
Products, works and services sales proceeds (netto) (minus VAT, excises and similar copulsory payments)	'000 RUB	43 855	273 753	396 485	380 296	438 008	119 834
Net value of goods and services sold	'000 RUB	46 163	275 097	373 299	342 852	446 114	118 367
Materials	'000 RUB	n/a	n/a	n/a	n/a	n/a	n/a
Rotation times of working capital categories							
Receivable, average payment time	Days	247	110	133	173	216	259
Bills Payable, average payment time	Days	226	87	96	127	165	217
Inventories, consumables turnover	Days	n/a	n/a	n/a	n/a	n/a	n/a

Working capital of Vorkuta Vodokanal was, as regards to receivables and bills payable, analysed. The inventory was not analysed because there were not enough information available.

The collection time of receivables in early 2009 has been 259 days, which is over 8 months. The payment time of bills payable during the same period was about 7 months. Obviously receivables include large amounts of bad debts (receivables which will be never received). Bad debts may lead Vodokanal to serious financial problems.

7.3 Project financing

7.3.1 Financial analysis of IP

The ability of Vorkuta Vodokanal to cover the investment costs and the financing costs of the proposed investment program was analyzed and the tariff levels needed to generate adequate revenues were estimated. The proposed investment program is presented earlier in this document.

The financing schedule by financier and the year is presented in the table below. The financing schedule is preliminary and represents a typical structure of IFI financed waste water treatment project in Russia.

Table 20: Financing Schedule by Financier and Year, EUR

Financing sources of IP	2 011	2 012	TOTAL	Share, %
International Funds, loan	10 000 000	10 000 000	20 000 000	50%
Grant	5 050 000	5 000 000	10 050 000	25%
Equity	5 000 000	5 000 000	10 000 000	25%
Total Planned Investment	**20 050 000**	**20 000 000**	**40 050 000**	**100%**

* Change in particular years of project implementation will require adjustment of financial indicators of the project.

The financial data and information for the financial analysis was received from the accounts of Vorkuta Vodokanal by interviewing management of Vodokanal and by making estimates by using previous experience of the consultant.

The financial analysis was made by using the following assumptions:

- The investment program is of the value RUB 1 722 million (EUR 40 million).
- The investments are assumed to be made by using following financing sources:
  - local financing of RUB 430 million
  - international grant financing of RUB 432 million and
  - International Financing Institution (IFI) loan of RUB 860 million.
- The construction starts in 2011 and ends 2012. The treatment plant is in full use in the beginning of 2013.
- The conditions for the IFI loan are assumed to be:
  - 15 year maturity including 2 year grace period;
  - disbursement period is 2 years;
  - the loan is nominated in EUR;
  - interest rate is 5%
  - there are no other costs related to the loan.
- The past inflation rate has been 18% per annum during the period 2006 to 2008.
- The monetary figures in 2009 and forward presented in the tables are in the constant 2009 money value.
- The figures presented in the tables and figures before the year 2009 are presented in current money value, exempt when it is indicated that an inflation correction was made.
- Exchange rate used is 43 RUB/EUR.
- Depreciation of assets was made by using straight line method and by assuming 30 years depreciation time.
- Income tax rate was assumed to be 20% and the property tax rate 1%. Estimates for the other taxes were not received from the management of Vorkuta Vodokanal. VAT rate is 18% - however, VAT is not a cost for Vorkuta Vodokanal, hence the tariff rates are presented without VAT.
- Tariff scenarios for the future were made in two different ways:
  - by assuming that the year 2009 percentage differences between DW and WW tariffs and between tariffs of different client groups will sustain in the future,
  - by calculating weighted average for the tariffs which is effectively the same as the unified tariff for the different client groups.
- It is assumed that 100% of tariffs are collected.
- It is assumed that the year 2010 tariffs are the same as 2009 tariffs.
- Unit costs for variable costs, to base the analysis, were calculated based on the estimated operating cost figures for the new WWTP given in this report. However, energy price is assumed to increase by 10% annually for next 5 years and to keep unchanged after that until the end of the analysis period. The variable costs are linearly dependent on the waste water volume treated.
- Fixed costs of the new WWTP are assumed to stay on the same real value level throughout the project as estimated in the technical part of this report.
- The financial analysis for the investment was made only for the new investment for the period 2011 - 2029. It was assumed that the old Vorkuta waste water treatment plant is obsolete and its operations end when the new plant starts operation.

The results of the cash flow analysis are presented in the Table 21 and the Figure 8. The tariff increase scenarios are presented in Figure 9.

Annexed to the report are the following tables:
- Operations – Water Consumption Projections and Sales Revenues, 2010 – 2029 (Annex 9);
- Cash Flow Table for Financial Planning, 2011 – 2029 (Annex 10)

Table 21: Cash flow table for the proposed investment plan, EUR

Cash Flow Table for Financial Planning										
Cash inflow	**Unit**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
Financial resources	EUR	20 050 000	20 000 000	0	0	0	0	0	0	0
Sales revenue	EUR	11 748 843	11 738 269	11 670 774	11 433 857	11 090 841	10 758 116	10 435 373	10 122 311	9 818 642
TOTAL inflow	**EUR**	**31 798 843**	**31 738 269**	**11 670 774**	**11 433 857**	**11 090 841**	**10 758 116**	**10 435 373**	**10 122 311**	**9 818 642**
Cash outflow		0	0	0	0	0	0	0	0	0
Investments	EUR	20 050 000	20 000 000	0	0	0	0	0	0	0
Operating costs (excl. Depreciation)	EUR	10 894 909	10 568 062	8 636 681	8 396 769	8 163 774	7 937 497	7 717 739	7 491 649	7 272 341
Debt. Services, Interest+fees	EUR	500 000	1 000 000	923 077	846 154	769 231	692 308	615 385	538 462	461 538
Debt. Services, Repayments	EUR	0	0	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462
Taxes	EUR	348 229	164 700	541 738	544 272	524 203	504 848	486 186	470 727	455 790
TOTAL outflow	**EUR**	**31 793 138**	**31 732 762**	**11 639 958**	**11 325 656**	**10 995 670**	**10 673 114**	**10 357 772**	**10 039 299**	**9 728 131**
Cash Balance	**EUR**	**5 705**	**5 507**	**30 816**	**108 201**	**95 172**	**85 002**	**77 601**	**83 012**	**90 511**
Cumulative cash Balance	EUR	5 705	11 212	42 027	150 228	245 400	330 401	408 002	491 015	581 526

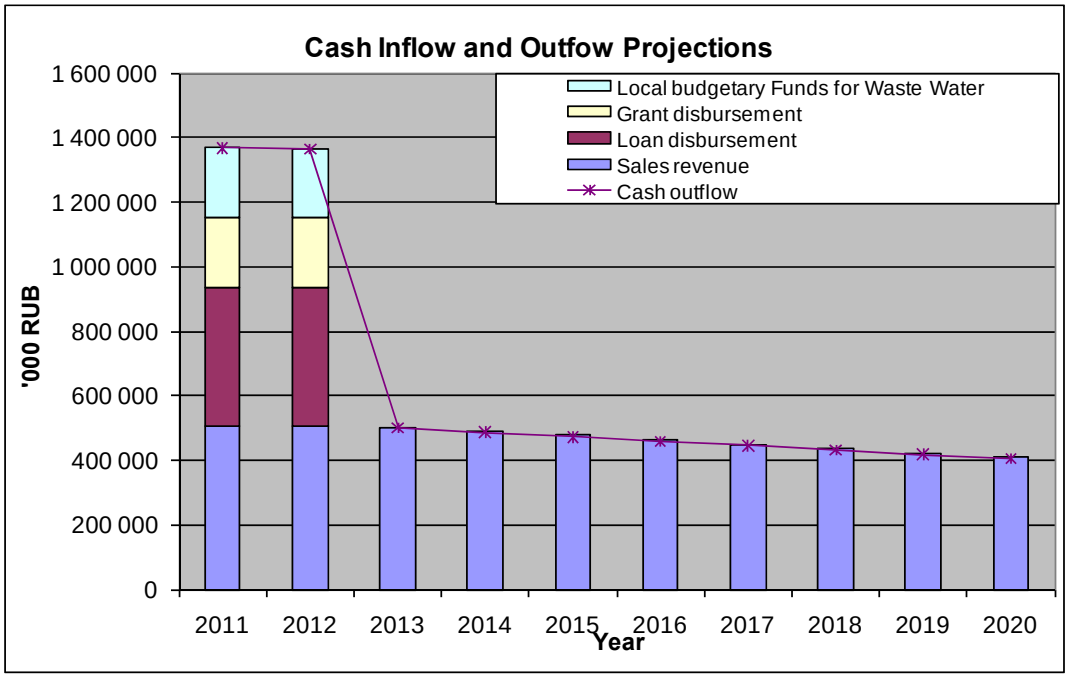
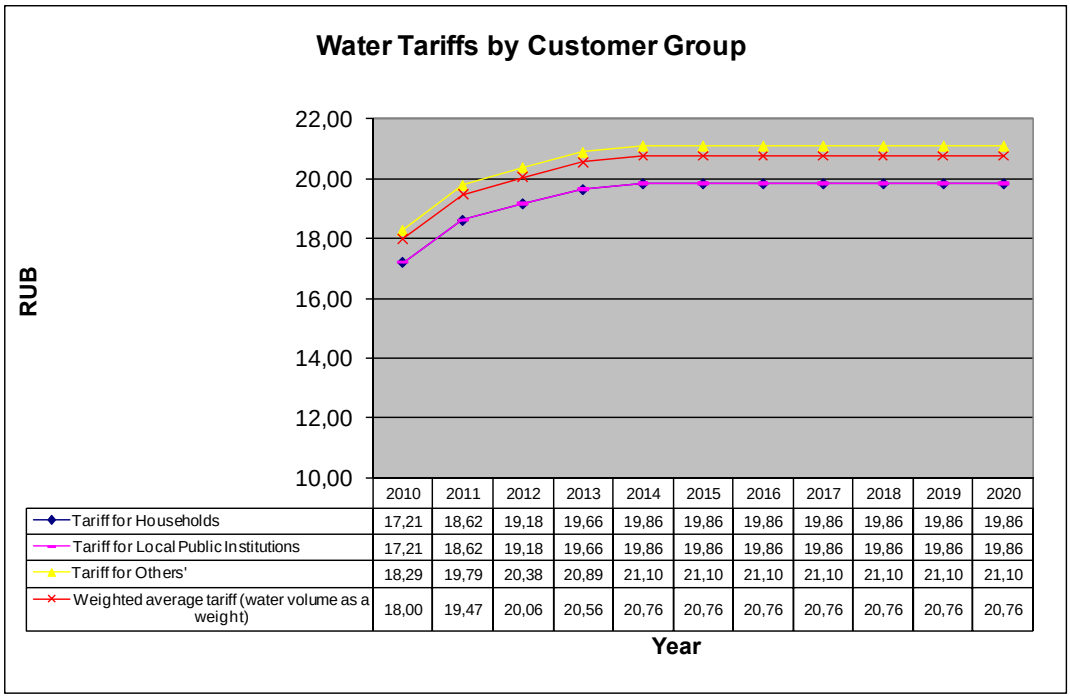


Figure 8: Cash inflow and outflow projections



	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Tariff for Households	17,21	18,62	19,18	19,66	19,86	19,86	19,86	19,86	19,86	19,86	19,86
Tariff for Local Public Institutions	17,21	18,62	19,18	19,66	19,86	19,86	19,86	19,86	19,86	19,86	19,86
Tariff for Others'	18,29	19,79	20,38	20,89	21,10	21,10	21,10	21,10	21,10	21,10	21,10
Weighted average tariff (water volume as a weight)	18,00	19,47	20,06	20,56	20,76	20,76	20,76	20,76	20,76	20,76	20,76

Figure 9: Water tariff projections to cover the costs of the investment plan (year 2010 tariff is assumed to be the same as 2009)

The investment schedule and the tariff increase scenario were harmonized to balance the cash flow during the investment period. With the proposed tariff increase schedule the cash inflow and outflow is in balance (0 to 8 million surplus) until the loan repayment ends in the year 2026. After that there is constant about RUB 70 million cash surplus.

The tariffs should be increased in 2011 with 8.2%, in 2012 with 3.0%, in 2013 with 2.5% and in 2014 with 1%. After that there is no need to increase tariffs further. Altogether the tariff increase need from the year 2009 level is 15% by 2014. However, this requires that 100% of the tariffs are collected.

The operating costs are estimated to be clearly lower than the operation costs of the presently operated plant.

The internal rate of return (IRR) with the tariff increase schedule is 1.8%.

Profitability of IP

In the case the proposed tariff increase is made and 100% of the tariffs are collected the project is slightly profitable. However, making these changes may be challenging. The economic benefits like improved health of people and better environment provide justification for the project. The economic benefits have not been estimated. A cash flow analysis was made for the project in order to analyze the ability of the project to generate revenues to finance the project with IFI loan.

Sensitivity analysis

The sensitivity of the IRR was tested by varying:

- water and waste water service revenues,
- operating costs,
- investment costs.

The analysis yielded the following results:

Item	Increase, %	IRR %
Water and waste water service sales revenues	- 10	-0,7
Operating costs	+10	1,4
Investment costs	+10	1,0

If the sales revenues decrease by 10%, the IRR decreases to -0.7 %. The rate of return of the project is most sensitive to the changes in sales revenues. If investment costs increase by 10 % the IRR decreases to 1.0 %. If the operating costs increase by 10 the IRR decreases to 1.4%.

Assessment of the financial analyses

At present Vodokanal does not have any long term loans. The collection time for receivables is long and includes receivables which will not be received. According to Vodokanal only 50% of tariffs are collected.

The financing structure of the investment is assumed to be half loan and one quarter grant and one quarter local financing. Total investment value is RUB 1.722 million.

Vodokanal will be able to cover the assumed loan and the financing costs with the revenues received with its operations provided that the real value of the tariffs is increased in 2011 with 8.2%, in 2012 with 3.0%, in 2013 with 2.5% and in 2014 with 1%. The internal rate of return is about 2%. It is also assumed that 100% of the tariffs will be collected. However, this condition is considered to be very difficult to reach.

The IRR is most sensitive to the changes in water and waste water service sales revenues.

Before the financing can be allocated to the project the methods to ensure adequate tariff collection rate should be established.

7.3.2 Planned project co-financing

It is impossible to describe project co-financing today. High project cost will probably restrict the possibilities of financing this project by one investor and will demand the creation of consortium of investors, each of them to finance separate elements of the project.

7.3.3 Possible sources of payments

There are some possibilities for the local investment attraction for the project implementation. Possible local financing sources:

- MUE Vodokanal. Co-financing can be carried out by MUE Vodokanal own funds notably by increasing tariffs and introduction of investment tariff component of 10-20%.
- Financing from republican and municipal budgets. 2010 republican and municipal budgets do not provide financing of the project. So co-financing of the project form the local budgets in 2010 will be awkward.

- Federal program "Clean water". During meetings in the Komi Republic Ministry of natural resources and environment experts confirmed the project relevance for the federal program "Clean water". It was also confirmed that Komi Republic expects to receive the project co-financing from the federal budget.

- State-private partnership. During meetings in the Komi Republic Ministry of natural resources and environment experts confirmed that the task of attraction a private investor to the project will be considered after the adoption of the federal program "Clean water" that provides for the easier access to the market of holdings and lower loan cost for the private operators. Today it is impossible to define volumes of private investment due to financial crisis and difficulties in communal sphere in Komi Republic.

In order to clarify the existing financial support for the IP from the relevant authorities and the project owner, as well as to identify potential IFIs additional consultations have been held.

The Ministry of Nature of the Komi Republic did not confirm the possibility to assign funds from the regional budget for the IP implementation. However the Ministry has confirmed its extreme interest in the IP implementation. The Ministry provides dynamic support to promote this project and searches for potential financing sources (Annex 11). In May 2010 The Ministry of Nature of the Komi Republic submitted a letter to Deputy Minister of Economic development of the Russian Federation, S.S. Voskresenskiy, expressing the interest in implementation of the second stage of NPA-Arctic project where it proposed to include this project for implementation. On the 28th of May 2010 a work meeting between Deputy Head of the Komi Republic, I.A. Pozdeev, and manager of the Northern Dimension Environmental Programme (NDEP), Mr. Jaakko Henttonen, was held with the purpose to discuss perspective projects and I.A. Pozdeev proposed to include this project for financing within the NDEP framework as one of the priority projects for the Komi Republic. The Ministry of Nature carries out regular consultations with Vorkuta Administration to identify possibilities of co-financing of the project from the municipal budget. Such consultations were held in April 2010 and the next one is planned for the end of June this year.

Administration of Vorkuta has confirmed that it makes all possible efforts to promote the project and search for financing sources for the IP implementation (Annex 12). For the time being the approximate amount of funds required for the IP implementation is not defined. In connection with that Vorkuta Administration together with OOO Vodokanal undertake measures to identify potentials for financing of the planned IP. In case of affirmative decision of the potential investor regarding participation and financing of this IP Administration of Vorkuta is ready to consider the possibility to participate in the project implementation.

Vorkuta Vodokanal noted that the enterprise does not have financial means for the project implementation (Annex 13). As mentioned above, despite of financial difficulties, Vorkuta Administration together with OOO Vodokanal take measures to identify potentials for financing of the planned IP.

Possibilities to attract international financing sources were considered besides Russian investments. Consultations with IFI - International Finance Corporation (IFC), European Bank for Reconstruction and Development (EBRD), the Global Environment Facility (GEF Earth Fund), Northern Dimension Environmental Programme (NDEP), NEFCO, UNEP, and the Nordic Investment Bank (NIB) showed that large credit organizations such as EBRD, NDEP and NIB believe that financing of this IP is possible subject to the appropriate conditions.

EBRD expressed its interest in the project implementation in Vorkuta having noted that the bank does not finance projects of private companies. Change of form of ownership of Vorkuta Vodokanal may cause some complications. The bank experts are ready to meet personally with the representatives of the enterprise and authorities to discuss the project details (Annex 14).

NDEP provides financing for the projects developed by international financing institutions using financial schemes combining loans and grants (Annex 15). NDEP is open to consider possibility to project financing in the form of grants based on the proposals from IFIs. NDEP has forwarded the message to partner institutions: NIB and NEFCO. NDEP also noted that it is ready to continue negotiations under this IP in case of assurance from the Komi Republic about unconditional support of the IP and relevant guarantees.

NIB has expressed its interest in this IP as the scope of investments is significant and comply with the financial investments the bank operating with (Annex 16). NIB has obtained information about the project status from NEFCO and the bank is interested in the final report.

To attract international financing the Consultant conducted negotiations with NEFCO (Henrik Fosstrom, Senior Advider). During meetings the current project was discussed several times. NEFCO representatives expressed interest in the project implementation because the project is in the Hot Spots list in the Russian sector of the Barents region. In the Komi Republic the relevant Hot Spot is Ko4 "Discharge of household wastewater in the minor localities". To finance this type of project NEFCO offers "Environmental efficiency fund". There is no specific agreement on this project yet as NEFCO experts are interested to receive the final pre-investment studies report before they are ready to consider financing of this project.

7.4 State support

"Ecology 2005" programme was initiated in Komi Republic in the past, which included plans for reconstruction of the city treatment facilities, and some work even started ion this regard. But in 2003 the programme was closed due to the economic reason, and reconstruction of treatment plant was not completed.

For the time being the problem with waste water treatment remains urgent. The importance of this issue solution was repeatedly emphasized during the meetings with the representatives of the Ministry of Natural Resources and Environment Protection and municipal authorities. In addition, this project was selected as a priority for the development of the regional pre-investment studies (Annex 1).

Therefore, the project will be supported on both municipal and republican levels.

7.5 Legal or other types of restrictions for Russian and foreign investors

The project will be implemented on the territory without any restrictions. Russian and foreign investors can participate in co-financing of the project.

8. PROJECT IMPLEMENTATION STATUS AND ARRANGEMENTS

8.1 Present situation

Vorkuta municipal administration and the project owner MUE "Vodokanal" are interested in the project implementation and emphasised their interest during pre-investment studies meetings in Vorkuta.

8.2 Project implementation plan

The project implementation will include several stages:

- receiving a loan or grant;
- tender documents preparation and tender procedures;
- design documentation preparation and approval;
- contract negotiation;
- production and procurement;
- construction works;
- personnel education and comissioning;
- equipment maintenance and monitoring the project's economic efficiency.

The project implementation schedule is presented in Table 22 with beginning of 2010 as the start point. If the financing plan will be changed the project implementation plan will also demand corrections with fixed implementation intervals. The duration of implementation will be 3 years from the start of contract negotiation till the project completion.

It is necessary to consider severe climate conditions of Vorkuta when developing the project implementation plan. It is possible to perform construction and installation works from June to September only.

This project implementation plan is very approximate and depends on possible investor because MUE "Vodokanal" and Vorkuta municipal administration cannot afford financing this project on their own account.

Table 22: Project implementation schedule

	Component of the project implementation	2010	2011	2012	2013
1	Field survey and design works.				
2	Construction works.				
3	Equipment procurement and installation.				
4	Start-up.				

8.3 Organizational measures/key-points of decision-making

Prior to the initiation of the project it is necessary to perform the following organizational measures:

- Vorkuta municipal administration should appoint a company to be responsible for sewerage networks maintenance in the Zheleznodorozhniy district of Vorkuta.
- To complete the reconstruction works at the sewerage networks in the Zheleznodorozhniy district of Vorkuta as indicated in 4.3.2.
- To prepare a financing plan meeting the requirements of a foreign investor and the possibilities of municipality and the project owner.
- Vorkuta municipal administration should plan co-financing of the project from the municipal budget in 2011-2013.
- The government of the Komi Republic should plan to co-finance the project from the republican budget.

8.4 Own resources of MUE Vodokanal for project implementation

MUE "Vodokanal" does not have resources for this project implementation. Field survey, construction works and equipment procurement in similar projects is performed by sub-contracted service companies.

8.5 Project organization structure

MUE "Vodokanal" is the owner of the project and possible future loan receiving party.

To enhance project implementation efficiency and to use the experience of project development in the north-west of Russia the following project organization structure is proposed (see Figure 10).

The obligatory requirement for IFO-financed international projects is also an independent project manager.

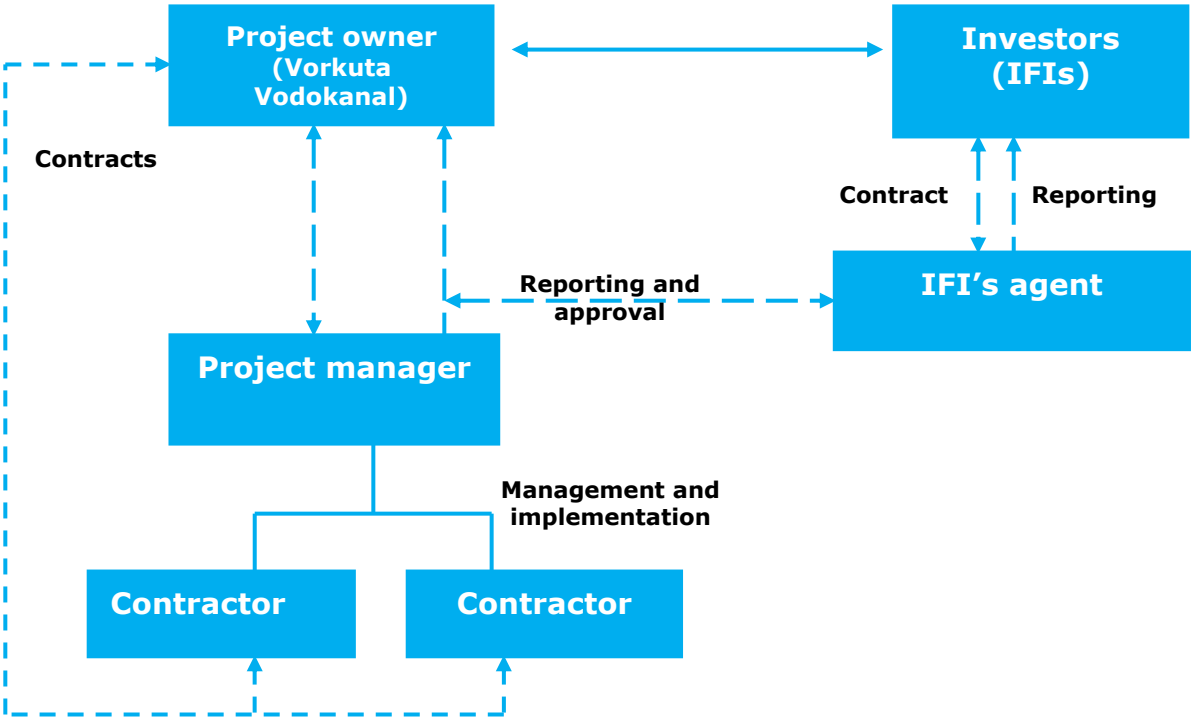


Figure 10: The example of possible project organisation chart with participation of international financing organizations

The project organization chart can be slightly changed in case of changes in project participating parties and in other cases.

The managing function will belong to the Project Manager whose responsibilities will include daily project progress monitoring at every project stage. Main responsibilities include:

- to coordinate and approve project activities;
- to coordinate work on the project;
- to insure the project reports comply with the requirements;
- to organize conference meetings covering the project progress;
- to prepare the documents for the project financing management;
- to coordinate procurement and contractors' activities;
- to approve and control project expenses;
- to control contractors' activities;
- to coordinate changes in the project plan.

The owner of the project MUE "Vodokanal" is responsible for the project realization in accordance to the contracts with the investor and contractors; performs co-financing of the project, bears the financial and legal liabilities for the project.

Vorkuta municipal administration acts as a project sponsor, controls the progress of the project, co-finances the project, bears the legal and financial liabilities in case the project owner fails to fulfil its responsibilities.

Selection of contractors is base on tender procedures. The candidates should confirm their technical, organizational and financial abilities by documents (necessary license is obligatory, company registration etc). The winner of the tender is awarded a contract with the Employer.

Tender committee is formed according to the Employer's decision and using its personnel with the approval of the municipality administration. Representative of the Project Manager has advisory vote only aiming to make an impartial assessment of the tender procedure.

During project realization the participants should follow the requirements of the Russian legislation, federal standards, industry requirements and standards, other requirements regulating investment and construction activity.

9. ASSESSMENT OF RISKS AND JUSTIFICATION OF SELECTION

This chapter contains preliminary risks assessment and selection justification. As the project is at the starting stage specific information is limited for the project. Preliminary assumptions are based on collected information, basic knowledge of the field and professional experience in similar projects.

9.1 Risks evaluation

Project evaluation includes the following investment risks assessment:

- Technological risk
- Environmental risk
- Social risk
- Implementation and operational risk
- Financial risk
- Legislative risk
- Responsibility risk

Technological risk
Technical solutions proposed for the project are quite common in Russian and foreign practice of wastewater treatment. There are no considerable risks in implementing these solutions in Vorkuta provided design works and construction works are performed by experienced companies and with high quality.

Environmental risk
Environmental risks will be reduced significantly as the proposed solutions will help reduce negative influence of untreated wastewater discharge and also eliminate the negative influence of wastewater chlorination.

Undertaking an environmental impact assessment prior to project initiation is a preventive tool that will enable mapping potential problems and taking these into account when implementing the project.

Social risk
Project implementation will help also improve the social tension among the population of Vorkuta. Elimination of accidents on sewerage networks in the Zheleznodorozhniy district of Vorkuta will significantly improve the sanitary situation and living standards for the population.

Prior to the project initiation the project owner will hold public hearings in Vorkuta involving citizens of the city and other stakeholders of the project. The aim of the hearings is to map potential problems and to be taken into account when implementing the project.

Implementation and operational risk
Implementation risk is heightened because there is still no company appointed to be responsible for sewerage networks maintenance in the Zheleznodorozhniy district of Vorkuta. The parts of the project connected with new WWTP construction does not have implementation risk.

Time frame for the project has not been determined yet because the first task is to find an investor. During calendar plan preparation it will be necessary to consider sever

climate conditions that will allow implementing construction and recultivation works during 4 month of the year only (July-September).

It is necessary to consider companies with similar project experience as a Main Contractor for the project.

Considering possible effect of the financing crisis and on the basis of economic efficiency it is possible to sign turnkey contracts with subcontractors and suppliers.

Financial risk
Developing financial crisis can lead to insufficient project financing and higher project implementation cost.
To reduce financial risk it is reasonable to search for external financing sources in the form of grants or loans providing for more preferential terms than in usual practice.

Besides, to minimize financial risk it is necessary to initiate the introduction of the project in the Komi Republic target program with respective financing before the next year republican and municipal budgets are adopted.

Also Vorkuta municipal administration and the project owner discussed possible increase of the water services tariff by adding an investment component into tariff. This measure will not be popular but will allow to significantly reduce the financial risk.

Legislative risk
Clearance and approval of the site for the new WWTP should be obtained before initiating the project. Other than that, there are no obstacles for the project implementation in the Russian legislation.

Responsibility risk
The owner of the project has been determined and will bear the legal and financial risk.

To reduce the responsibility risk Vorkuta municipal administration must act as a sponsor of the project implementation and provide guarantees by adding special articles into the next year municipal budget to cover possible loan.

9.2 Selection justification

The project of Vorkuta sewerage system renovation has been supported by the Komi Republic Ministry of natural resources and environment and also by Vorkuta municipal administration. More over, the IP is included in the NEFCO/AMAP list of Environmental Hot Spots in the Russian part of the Barents region. According to the Strategic action plan for the environmental protection of the Arctic zone of the Russian Federation (SAP-Arctic) Vorkuta is included in the ranged list of priority hot spots on the territory of Arctic zone of Russian Federation.

Elimination of the pollution source will contribute to reduction of contamination of the Arctic marine environment as the WWTP is not far from the sea coast. Project implementation will also improve social situation in the city of Vorkuta.

10. CONCLUSIONS AND RECOMMENDATIONS

The scope of this pre-investment study has been to describe the technical, environmental, and financial aspects of the modernisation of the waste water treatment system in Vorkuta. The study has been limited to the reconstruction of the sewage network of the Zheleznodorozhniy district and to the modernization of the waste water treatment plant in Vorkuta. Two approaches to for modernization of the treatment plant was considered initially; reconstruction of the existing plant or design and construction of a new plant. Based on an initial assessment discussed in this report and priorities from the project owner and local administration, the analysis of the modernization of the WWTP is focused on construction of a new treatment plant.

Environmental and social aspects
The most important environmental effect of the project will be the dismantling of the hazardous chlorination plant and the associated WWTP chlorine store house. Replacement of sewage water chlorination unit by ultraviolet sewage water disinfection plant will exclude the risk of chlorine leakage during transportation, storage and application. Furthermore, the sewage water chlorination products that are highly toxic substances will not be emitted to the environment and the efficiency of disinfection will remain at a high level.

As illustrated in figure 6 in chapter 6.1, the implementation of the IP will lead to improved effectiveness of waste water treatment with respect to oil products, phosphorus, suspended particles, and organic compounds which again will result in significant reduction of pollutants.

Prevention of untreated sewage waters to the surface water bodies of Vorkuta city and sewage waters outflows to the surface shall be another positive result of the IP. This will positively influence the environment and will result in significant improvement of the local population living conditions.

Administrative and technical aspects
The ownership of the domestic sewage system in the Zheleznodorozhniy district appears as unclear and should be settled prior to implementation of the project. This is necessary if Vodokanal shall be interested in investing the domestic sewage system.

The selected technology for the modernization of the system is standard technology however it has to be secured that Vodokanal and the local administration are supported and strengthened with national or international professional experience.

Financial aspects
At present Vodokanal does not have any long term loans. The collection time for revenue is long and is likely to include revenues which shall not be received. According to Vodokanal only 50% of the tariffs are collected. The financing structure of the investment is assumed to be half loan and one quarter grant and one quarter local financing. Total investment value is RUB 1.72 billion. Vodokanal will be able to cover the assumed loan and the financing costs with the revenues received with its operations provided that the real value of the tariffs is increased in 2011 with 8.2%, in 2012 with 3.0%, in 2013 with 2.5% and in 2014 with 1%. The internal rate of return is about 2%. It is also assumed that 100% of the tariffs will be collected. However, this condition is considered to be very difficult to reach.

As part of complete financial and investment plan it should be further studied how Vodokanal has covered the uncollected tariff revenues. There is controversy in the past

revenues and the tariff collection rate. Before the financing can be allocated to the project the methods to ensure adequate tariff collection rate should be established.

Conclusive recommendations

The IP has significant support in the local and regional administration. In order to overcome the financial uncertainties related to project implementation, it is suggested to continue with a full scale investment plan where the Republic authority is brought into negotiations with international financing institutions in particular with those that expressed their interest in funding the project.

ANNEXES

Annex 1: Letter of MINPRIRODA of Komi Republic with request to include this IP for PINS development, dated of 11.02.2009

**МИНИСТЕРСТВО
ПРИРОДНЫХ РЕСУРСОВ
И ОХРАНЫ ОКРУЖАЮЩЕЙ
СРЕДЫ РЕСПУБЛИКИ КОМИ
(МИНПРИРОДЫ РЕСПУБЛИКИ КОМИ)**

**КОМИ РЕСПУБЛИКАСА
ПРИРОДАСА ОЗЫРЛУНЪЯС, ВӦР-ВА
ДА СЫНӦД ВИДЗАН МИНИСТЕРСТВО**

Интернациональная ул., д.157,
г.Сыктывкар, ГСП-2, 167982
тел. 24-07-44, факс 44-13-90
e-mail: mprrk@rkomi.ru
mprrk@mail.ru

11.02.2009г. № 05—13-

На № _____

ООО "Ramboll Storvik"

филиал в г.Сыктывкаре
старшему консультанту
Урюпинскову А.И.

В рамках реализации Проекта ЮНЕП (Программа ООН по окружающей среде)/ГЭФ (Глобальный экологический фонд) «Российская Федерация – поддержка Национального плана действий по защите арктической морской среды», Министерство природных ресурсов и охраны окружающей среды Республики Коми предлагает включить для проведения прединвестиционных исследований следующие проекты:

1. Утилизация твёрдых бытовых отходов в г.Воркута, Республика Коми;
2. Модернизация системы очистки сточных вод в г.Воркута, Республика Коми;
3. Сбор, транспортировка и термическое обезвреживание опасных отходов лечебно-профилактических учреждений Республики Коми.

Реализация вышеперечисленных проектов приведёт к значительному улучшению экологической обстановки в заполярном городе Воркуте, и в Арктическом регионе, в целом.

Министр А.П.Боровинских

Тюпенко Т.И.
28 80 67

Annex 2: Scheme of Water Supply System in Vorkuta

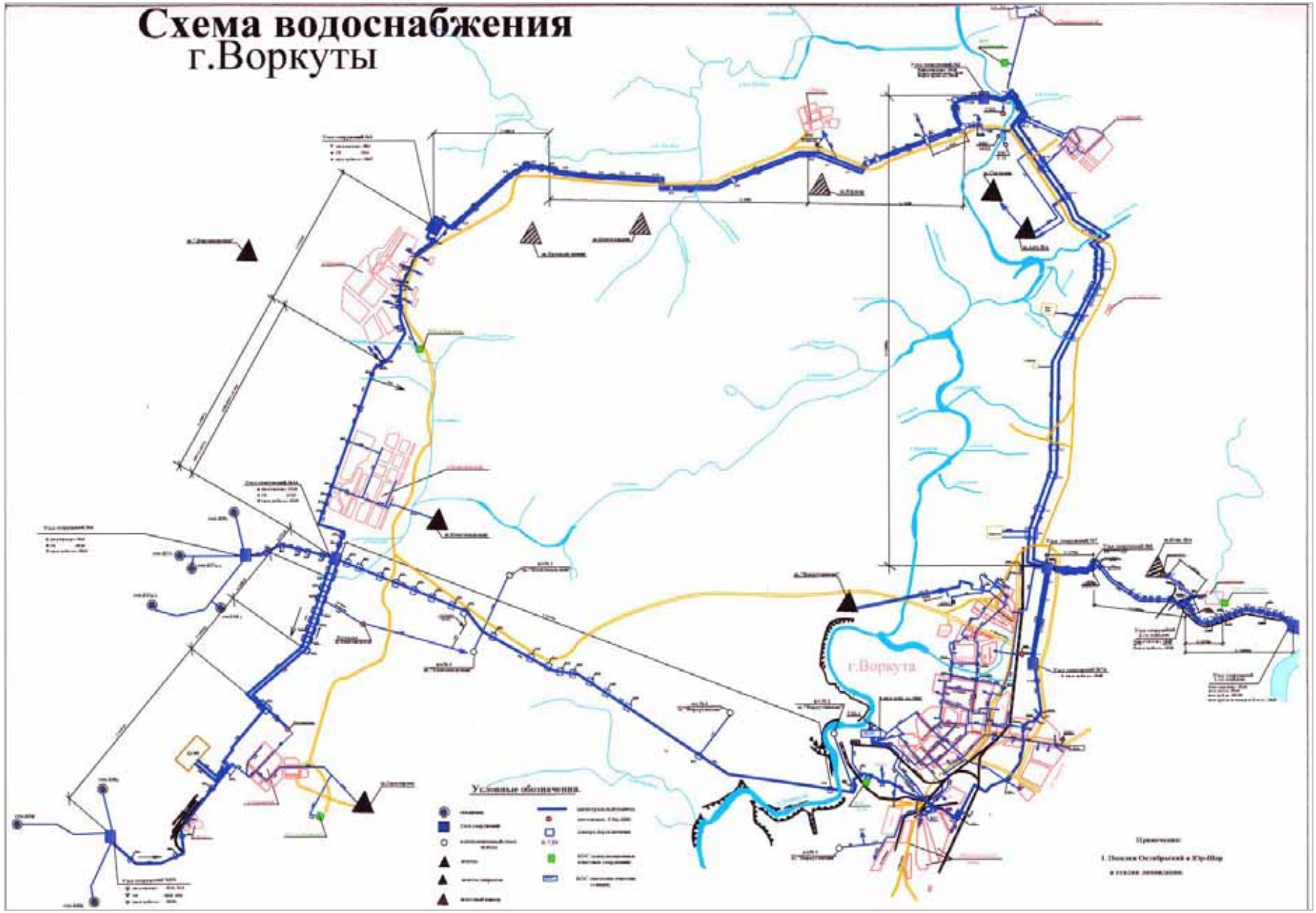


Схема водоснабжения
г.Воркуты
г.Воркута
Условные обозначения

Annex 3: Scheme of Sewage System of the Vorkuta Ugolniy District

Схема канализации Воркутинского угольного района.

№ п/п	Наименование КНС
1	КНС КОС города №1
2	КНС КОС города №2
3	КНС МКР№7
4	КНС ДОЗ
5	КНС АТП
6	КНС кв. Заводской
7	КНС Горняцкого р-на
8	КНС Тиман
9	КНС Рудник №2
10	КНС п.Северн.мкр.№1
11	КНС ЗКПД
12	КНС кв.Г-12
13	КНС КОС п.Северн.
14	КНС п.Северная
15	КНС п.Юршор
16	КНС п. Воргашор №1
17	КНС п.Воргашор №2
18	КНС п.Комсомольского
19	КНС п.Заполярного
20	КНС п.Заполярная
21	КНС п.Советского №1
22	КНС п.Советского №2
23	КНС №1 Ж/д района
24	КНС №2 Ж/д района

район канализ.	Наименование КОС	№№пп. организов. сбросов
I	КОС г.Воркута	2,2а
III	КОС п.Северного	6
IV	КОС п.Воргашор	3
V	КОС п.Заполярного	1
VI	КОС п.Советского	9

– организованный сброс очищенных стоков

– ТЭЦ -1, ТЭЦ -2

Annex 4: Visit of a Project Team to Facilities in Vorkuta, 2-4th June 2009

Waste Water Treatment Plant in Vorkuta

Photo. 1. Secondary horizontal sedimentation tanks

Photo. 2. Faults of reinforced concrete walls of active sludge tanks

Photo. 3. Passage active sludge tanks

Photo. 4. Primary horizontal sedimentation tanks

Photo. 5. Sand traps with rotary movement of water

Photo. 6. Storage house of chlorine in containers

Photo. 7. Primary horizontal sedimentation tanks with a gear to collect floating contamination

Photo. 8. Partially blocked dwelling house

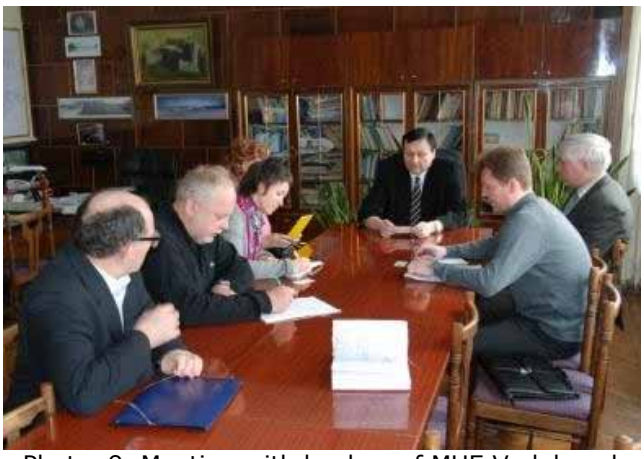


Photo. 9. Meeting with leaders of MUE Vodokanal

Photo. 10. Meeting with A.L. Fedorov, Vice Head of the Administration of Vorkuta

Annex 5: Waste Water Treatment Plant in Vorkuta

Annex 6: Visit of a Project Team to Facilities in Vorkuta, 2-4th June 2009

Domestic Sewage Network of the Zheleznodorozhniy district of Vorkuta

Photo 1. Well without floor slab, cover at the bottom

Photo 2. Well filled with water and without floor slab

Photo 3. Network well with backwater

Photo 4. Well with faulty floor slab and untight manhole

Photo 5. Well with demolished floor slab

Photo 6. Well without floor slab and filled with water

Photo 7. Foreign matters (shoes) and sediment in well

Photo 8. Demolished floor slab

Photo 9. Area of the Zheleznodorozhniy district where sewage system is located

Photo 10. Chutes for surface water withdrawal

Annex 7: Survey Registration Book

Survey Registration Book in _____ [month] 20__.
Organization: MUE «Vodokanal» _____
Dwelling District: _____

Date	Maintenance crew (name, position)	Route	Observations
1	2	3	4

Annex 8: Repair and maintenance plans

Repair and maintenance plans for sewerage networks in _____ [month] 20__
Organization: MUE «Vodokanal»
Dwelling District: _____

Work description	Units	Quan-tity	Address	Actual implementation
1	2	3	4	5

Signature of the person in charge

Signature of the approving person

Annex 9: Water Consumption Projections and Sales Revenues, 2010 -2029

OPERATIONS - WATER CONSUMPTION PROJECTIONS AND ALL SALES REVENUES (excluding VAT)		EUR																			
Water Demand Projection		**Unit**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Population		Persons	113 396	111 128	108 906	106 727	104 593	102 501	100 451	98 442	96 473	94 544	92 653	90 800	88 984	87 204	85 460	83 751	82 076	80 434	78 826	77 249
Population Served, water		%	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Water consumption per person		litres/day	111	110	109	108	106	105	104	103	102	101	100	99	98	97	96	95	94	93	92	91
Water demand of households		m3/a	4 590 000	4 452 300	4 318 731	4 189 169	4 063 494	3 941 589	3 823 342	3 708 641	3 597 382	3 489 461	3 384 777	3 283 233	3 184 736	3 089 194	2 996 519	2 906 623	2 819 424	2 734 842	2 652 796	2 573 212
Water demand of local public institutions		m3/a	529 000	513 130	497 736	482 804	468 320	454 270	440 642	427 423	414 600	402 162	390 097	378 394	367 043	356 031	345 350	334 990	324 940	315 192	305 736	296 564
Water demand of others		m3/a	13 681 000	13 270 570	12 872 453	12 486 279	12 111 691	11 748 340	11 395 890	11 054 013	10 722 393	10 400 721	10 088 699	9 786 038	9 492 457	9 207 684	8 931 453	8 663 510	8 403 604	8 151 496	7 906 951	7 669 743
Total Water Demand		**m3/a**	**18 800 000**	**18 236 000**	**17 688 920**	**17 158 252**	**16 643 505**	**16 144 200**	**15 659 874**	**15 190 077**	**14 734 375**	**14 292 344**	**13 863 574**	**13 447 666**	**13 044 236**	**12 652 909**	**12 273 322**	**11 905 122**	**11 547 969**	**11 201 530**	**10 865 484**	**10 539 519**
Water to Wastewater Transition		**Unit**																				
Population		Persons	113 396	111 128	108 906	106 727	104 593	102 501	100 451	98 442	96 473	94 544	92 653	90 800	88 984	87 204	85 460	83 751	82 076	80 434	78 826	77 249
Population Served, waste water		%	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %	100 %
Household Wastewater (% of water)	175 %	m3/a	8 029 614	7 788 725	7 555 064	7 328 412	7 108 559	6 895 303	6 688 443	6 487 790	6 293 156	6 104 362	5 921 231	5 743 594	5 571 286	5 404 148	5 242 023	5 084 762	4 932 220	4 784 253	4 640 725	4 501 504
Local Public Institutions, Wastewater (% of water)	167 %	m3/a	882 205	855 739	830 067	805 165	781 010	757 579	734 852	712 806	691 422	670 680	650 559	631 042	612 111	593 748	575 935	558 657	541 898	525 641	509 871	494 575
Others, Wastewater (% of water)	25 %	m3/a	3 452 243	3 348 676	3 248 216	3 150 769	3 056 246	2 964 559	2 875 622	2 789 353	2 705 673	2 624 503	2 545 768	2 469 395	2 395 313	2 323 453	2 253 750	2 186 137	2 120 553	2 056 937	1 995 228	1 935 372
Total Wastewater Treated/Invoiced		**m3/a**	**12 364 062**	**11 993 140**	**11 633 346**	**11 284 346**	**10 945 815**	**10 617 441**	**10 298 918**	**9 989 950**	**9 690 252**	**9 399 544**	**9 117 558**	**8 844 031**	**8 578 710**	**8 321 349**	**8 071 708**	**7 829 557**	**7 594 670**	**7 366 830**	**7 145 825**	**6 931 451**
Water Tariff Revenues (excluding VAT)		**Unit**																				
Tariff for Households		EUR/m3	0,40	0,43	0,45	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46
Tariff for Local Public Institutions		EUR/m3	0,40	0,43	0,45	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46	0,46
Tarrif for Others'		EUR/m3	0,43	0,46	0,47	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49	0,49
Weighted average tariff (water volume as a weight)		EUR/m3	0,42	0,45	0,47	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48	0,48
Tariff Revenue from Households		EUR	1 837 067	1 928 076	1 926 340	1 915 264	1 876 384	1 820 093	1 765 490	1 712 525	1 661 149	1 611 315	1 562 975	1 516 086	1 470 604	1 426 486	1 383 691	1 342 180	1 301 915	1 262 857	1 224 972	1 188 223
Tariff Revenue from Local Public Institutions		EUR	211 723	222 212	222 012	220 735	216 254	209 767	203 474	197 369	191 448	185 705	180 134	174 730	169 488	164 403	159 471	154 687	150 046	145 545	141 179	136 943
Tariff Revenue from Others		EUR	5 819 197	6 107 480	6 101 984	6 066 897	5 943 739	5 765 427	5 592 464	5 424 690	5 261 950	5 104 091	4 950 968	4 802 439	4 658 366	4 518 615	4 383 057	4 251 565	4 124 018	4 000 298	3 880 289	3 763 880
Total Water Tarrif Revenue (excluding VAT)		**EUR**	**7 867 988**	**8 257 768**	**8 250 336**	**8 202 897**	**8 036 378**	**7 795 286**	**7 561 428**	**7 334 585**	**7 114 547**	**6 901 111**	**6 694 078**	**6 493 255**	**6 298 458**	**6 109 504**	**5 926 219**	**5 748 432**	**5 575 979**	**5 408 700**	**5 246 439**	**5 089 046**
Waste Water Tariff Revenues (excluding VAT)		**Unit**																				
Tariff for Households		EUR/m3	0,26	0,29	0,29	0,30	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31
Tariff for Local Public Institutions		EUR/m3	0,26	0,29	0,29	0,30	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31
Tarrif for Others'		EUR/m3	0,28	0,30	0,31	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32	0,32
Weighted average tariff (water volume as a weight)		EUR/m3	0,27	0,29	0,30	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31	0,31
Tariff Revenue from Households		EUR	2 123 179	2 228 362	2 226 356	2 213 554	2 168 619	2 103 561	2 040 454	1 979 240	1 919 863	1 862 267	1 806 399	1 752 207	1 699 641	1 648 652	1 599 192	1 551 216	1 504 680	1 459 540	1 415 753	1 373 281
Tariff Revenue from Local Public Institutions		EUR	233 271	244 828	244 607	243 201	238 264	231 116	224 182	217 457	210 933	204 605	198 467	192 513	186 738	181 136	175 702	170 430	165 318	160 358	155 547	150 881
Tariff Revenue from Others		EUR	969 840	1 017 885	1 016 969	1 011 122	990 596	960 878	932 052	904 090	876 967	850 658	825 139	800 385	776 373	753 082	730 489	708 575	687 317	666 698	646 697	627 296
Total Waste Water Tariff Revenue (excluding VAT)		**EUR**	**3 326 290**	**3 491 075**	**3 487 933**	**3 467 877**	**3 397 479**	**3 295 555**	**3 196 688**	**3 100 787**	**3 007 764**	**2 917 531**	**2 830 005**	**2 745 105**	**2 662 752**	**2 582 869**	**2 505 383**	**2 430 222**	**2 357 315**	**2 286 596**	**2 217 998**	**2 151 458**
Other Sales Revenue		**Unit**																				
Other Activities		EUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Other Revenues		EUR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total Revenues		**EUR**	**11 194 278**	**11 748 843**	**11 738 269**	**11 670 774**	**11 433 857**	**11 090 841**	**10 758 116**	**10 435 373**	**10 122 311**	**9 818 642**	**9 524 083**	**9 238 360**	**8 961 209**	**8 692 373**	**8 431 602**	**8 178 654**	**7 933 294**	**7 695 295**	**7 464 437**	**7 240 504**

Annex 10: Cash Flow for Financial Planning, 2011-2029

Cash Flow Table for Financial Planning																				
Cash inflow	**Unit**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**
Financial resources	EUR	20 050 000	20 000 000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sales revenue	EUR	11 748 843	11 738 269	11 670 774	11 433 857	11 090 841	10 758 116	10 435 373	10 122 311	9 818 642	9 524 083	9 238 360	8 961 209	8 692 373	8 431 602	8 178 654	7 933 294	7 695 295	7 464 437	7 240 504
TOTAL inflow	**EUR**	**31 798 843**	**31 738 269**	**11 670 774**	**11 433 857**	**11 090 841**	**10 758 116**	**10 435 373**	**10 122 311**	**9 818 642**	**9 524 083**	**9 238 360**	**8 961 209**	**8 692 373**	**8 431 602**	**8 178 654**	**7 933 294**	**7 695 295**	**7 464 437**	**7 240 504**
Cash outflow		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Investments	EUR	20 050 000	20 000 000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating costs (excl. Depreciation)	EUR	10 894 909	10 568 062	8 636 681	8 396 769	8 163 774	7 937 497	7 717 739	7 491 649	7 272 341	7 059 613	6 853 266	6 653 110	6 458 959	6 270 632	6 087 955	5 910 758	5 738 877	5 572 153	5 410 430
Debt. Services, Interest+fees	EUR	500 000	1 000 000	923 077	846 154	769 231	692 308	615 385	538 462	461 538	384 615	307 692	230 769	153 846	76 923	0	0	0	0	0
Debt. Services, Repayments	EUR	0	0	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	1 538 462	0	0	0	0
Taxes	EUR	348 229	164 700	541 738	544 272	524 203	504 848	486 186	470 727	455 790	441 358	427 418	413 954	400 952	388 399	376 279	349 197	322 524	296 247	270 356
TOTAL outflow	**EUR**	**31 793 138**	**31 732 762**	**11 639 958**	**11 325 656**	**10 995 670**	**10 673 114**	**10 357 772**	**10 039 299**	**9 728 131**	**9 424 048**	**9 126 839**	**8 836 295**	**8 552 219**	**8 274 415**	**8 002 696**	**6 259 955**	**6 061 401**	**5 868 400**	**5 680 786**
Cash Balance	**EUR**	**5 705**	**5 507**	**30 816**	**108 201**	**95 172**	**85 002**	**77 601**	**83 012**	**90 511**	**100 034**	**111 522**	**124 914**	**140 154**	**157 187**	**175 958**	**1 673 339**	**1 633 894**	**1 596 036**	**1 559 718**
Cumulative cash Balance	EUR	5 705	11 212	42 027	150 228	245 400	330 401	408 002	491 015	581 526	681 560	793 082	917 996	1 058 150	1 215 337	1 391 295	3 064 634	4 698 529	6 294 565	7 854 283

Annex 11: Letter of Minprirody RK on project support 22.06.2010

ОТ:МИНПРИРОДЫ РК ТЕЛ: 22 ИЮН. 2010 13:42 СТР1

МИНИСТЕРСТВО
ПРИРОДНЫХ РЕСУРСОВ
И ОХРАНЫ ОКРУЖАЮЩЕЙ
СРЕДЫ РЕСПУБЛИКИ КОМИ
(МИНПРИРОДЫ РЕСПУБЛИКИ КОМИ)

КОМИ РЕСПУБЛИКАСА
ПРИРОДАСА ОЗЫРЛУНЪЯС, ВӦР-ВА
ДА СЫЫӦД ВИДЗАН МИНИСТЕРСТВО

Интернациональная ул., д.157,
г.Сыктывкар, ГСП-2, 167982
тел. 24-07-44, факс 44-13-90
e-mail: mprrk@rkomi.ru
mprrk@mail.ru

22.06.2010г. № 05-13-937

На №

Генеральному директору
ООО «Рамболь Баренц»

С.Е.Маковеевой

Уважаемая Светлана Евгеньевна!

Министерство природных ресурсов и охраны окружающей среды Республики Коми информирует Вас о ситуации по двум инвестиционным проектам в г.Воркуте: «Модернизация полигона твердых бытовых отходов в г.Воркута, Республика Коми» и «Модернизация системы водоотведения в г.Воркута, Республика Коми», по которым были выполнены прединвестиционные исследования.

22.03.2010г. Минприроды РК направило письмо с информацией по проектам Главе городского округа – руководителю администрации МО ГО «Воркута» В.Л.Будовскому, а 20.04.2010г. получило ответ от первого заместителя руководителя администрации МО ГО «Воркута» А.А.Кочергина (копию письма прилагаем).

В мае 2010г. Минприроды РК подготовило ответ заместителю министра экономического развития РФ С.С.Воскресенскому о заинтересованности в осуществлении второго этапа проекта «Реализация стратегической программы действий по охране окружающей среды Арктической зоны РФ» и предложило включить для реализации оба вышеуказанных проекта.

28.05.2010г. заместитель Главы РК И.А.Поздеев провел рабочую встречу с представителем программы Природоохранного партнерства Северного измерения ЕБРР г-м Хенттоненом, на которой обсуждались перспективные проекты для финансирования. Оба проекта также были предметом обсуждения на данной встрече. Минприроды РК планирует проведение в ближайшие дни встречи с представителями МО ГО «Воркута» по обсуждению дальнейшего финансирования проектов. Результаты встречи будут сообщены Вам дополнительно.

И.о.министра С.Л.Гераймович

Annex 12: Letter of Vorkuta administration on project support 27.05.2010

27 МАЙ 2010 12:22 ECONOMICA 8 (82151) 3-17-64 с 1

КОМИ РЕСПУБЛИКА
"ВОРКУТА" КАР КЫТШЛӧН МУНИЦИПАЛЬНӧЙ
ЮКӧНСА АДМИНИСТРАЦИЯ

РЕСПУБЛИКА КОМИ
АДМИНИСТРАЦИЯ МУНИЦИПАЛЬНОГО ОБРАЗОВАНИЯ ГОРОДСКОГО ОКРУГА "ВОРКУТА"

169900 Республика Коми, г. Воркута, ул. Центральная, 7
тел. 82151, тел. 3-23-23, факс 3-12-79,
E-mail: adm@mail.vorkuta.ru

27.05.2010 № 08-321/01

На На 68 от 23.03.2010 года

в отношении финансирования инвестиционных проектов

ООО «Рамболь Баренц»

Муртазалиевой Н.У.

Портовый проезд, д. 21, г. Мурманск, 183038,
факс 8 182 462 265

Уважаемая Наиля Убайдулаевна!

В отношении реализации инвестиционного проекта по модернизации очистных сооружений города, администрация МО ГО «Воркута» сообщает следующее.

С декабря 2009 года оказанием услуг по водоснабжению и водоотведению для населения предприятий и организаций города занимается ООО «Водоканал», заключившее по итогам проведенного конкурса на право аренды муниципального имущества, входящего в состав городской казны, соответствующий договор аренды систем водоснабжения и канализационных сетей города.

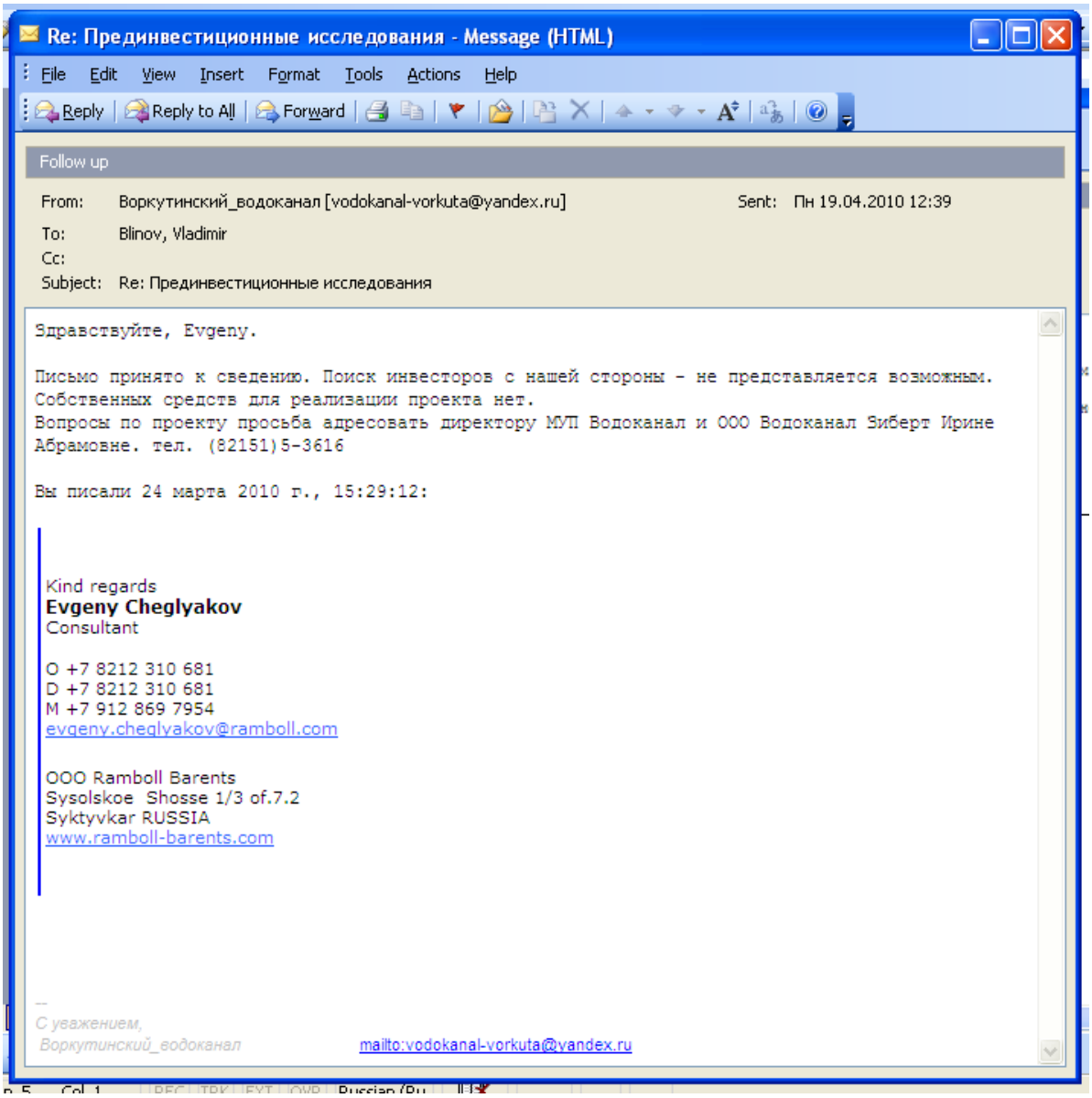
На текущую дату примерный объем средств, необходимых для реализации инвестиционного проекта по модернизации арендуемых очистных сооружений, ООО «Водоканал» не определен. В связи с чем, администрацией МО ГО «Воркута» совместно с ООО «Водоканал» ведется работа по выявлению потенциальных возможностей финансирования планируемого инвестиционного проекта.

В случае положительного решения потенциального инвестора по вопросу участия и финансирования данного инвестиционного проекта администрация МО ГО «Воркута» готова рассмотреть возможность участия в реализации предлагаемого проекта.

С Уважением,
И.о. руководителя администрации
муниципального образования
городского округа «Воркута» А.А. Кочерга

Исп. Баринова Е.Ю. 3-73-37

Annex 13: Letter of OOO Vodokanal on project support 19.04.2010



Re: Прединвестиционные исследования - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

Follow up

From: Воркутинский_водоканал [vodokanal-vorkuta@yandex.ru] Sent: Пн 19.04.2010 12:39

To: Blinov, Vladimir

Cc:

Subject: Re: Прединвестиционные исследования

Здравствуйте, Evgeny.

Письмо принято к сведению. Поиск инвесторов с нашей стороны - не представляется возможным.
Собственных средств для реализации проекта нет.
Вопросы по проекту просьба адресовать директору МУП Водоканал и ООО Водоканал Зиберт Ирине
Абрамовне. тел. (82151)5-3616

Вы писали 24 марта 2010 г., 15:29:12:

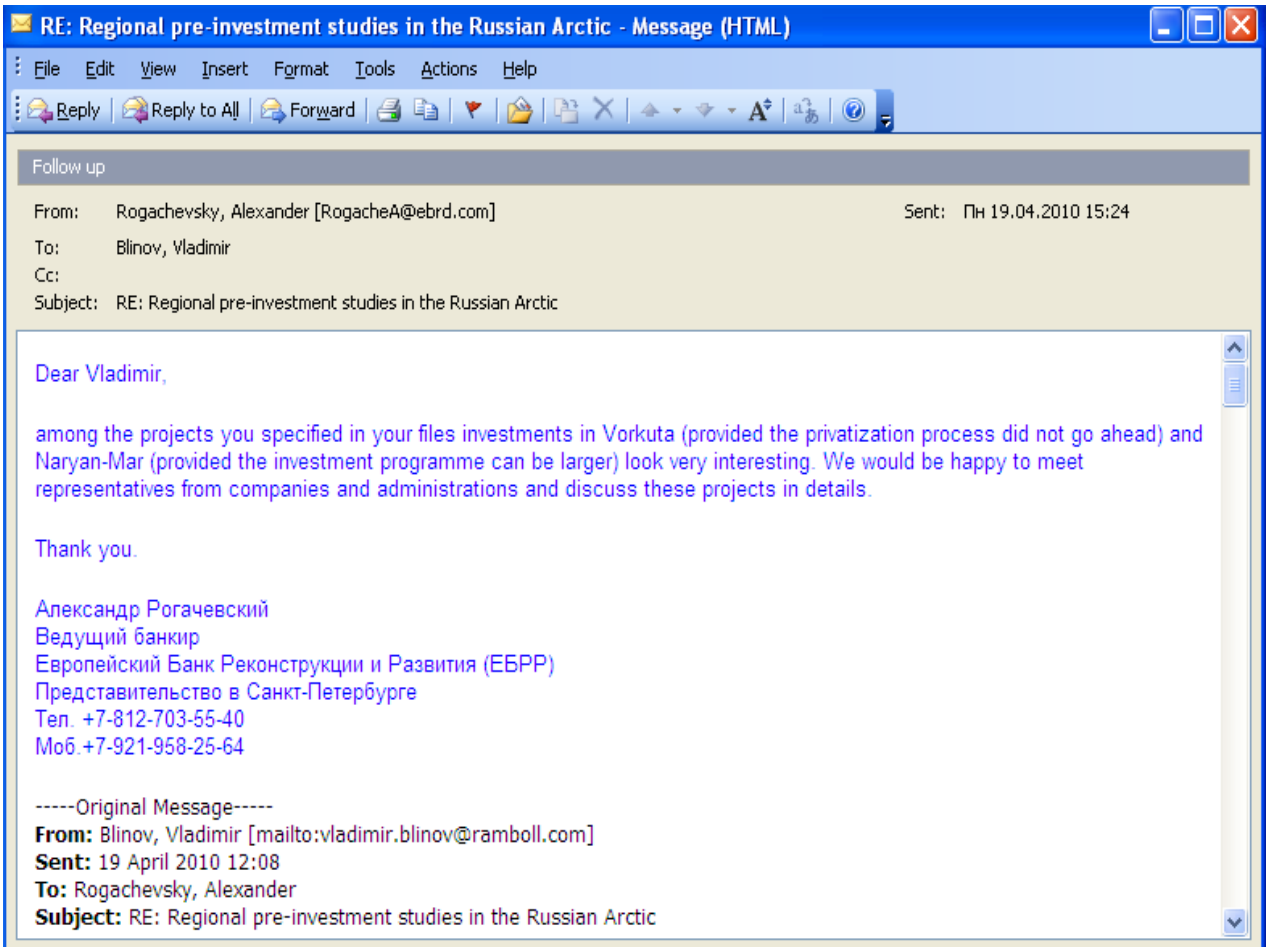
Kind regards
Evgeny Cheglyakov
Consultant

O +7 8212 310 681
D +7 8212 310 681
M +7 912 869 7954
evgeny.cheglyakov@ramboll.com

OOO Ramboll Barents
Sysolskoe Shosse 1/3 of.7.2
Syktyvkar RUSSIA
www.ramboll-barents.com

--
С уважением,
Воркутинский_водоканал mailto:vodokanal-vorkuta@yandex.ru

Annex 14: Letter of EBRD on project support 19.04.2010



RE: Regional pre-investment studies in the Russian Arctic - Message (HTML)

File Edit View Insert Format Tools Actions Help

Reply | Reply to All | Forward

Follow up

From: Rogachevsky, Alexander [RogacheA@ebrd.com] Sent: Пн 19.04.2010 15:24

To: Blinov, Vladimir

Cc:

Subject: RE: Regional pre-investment studies in the Russian Arctic

Dear Vladimir,

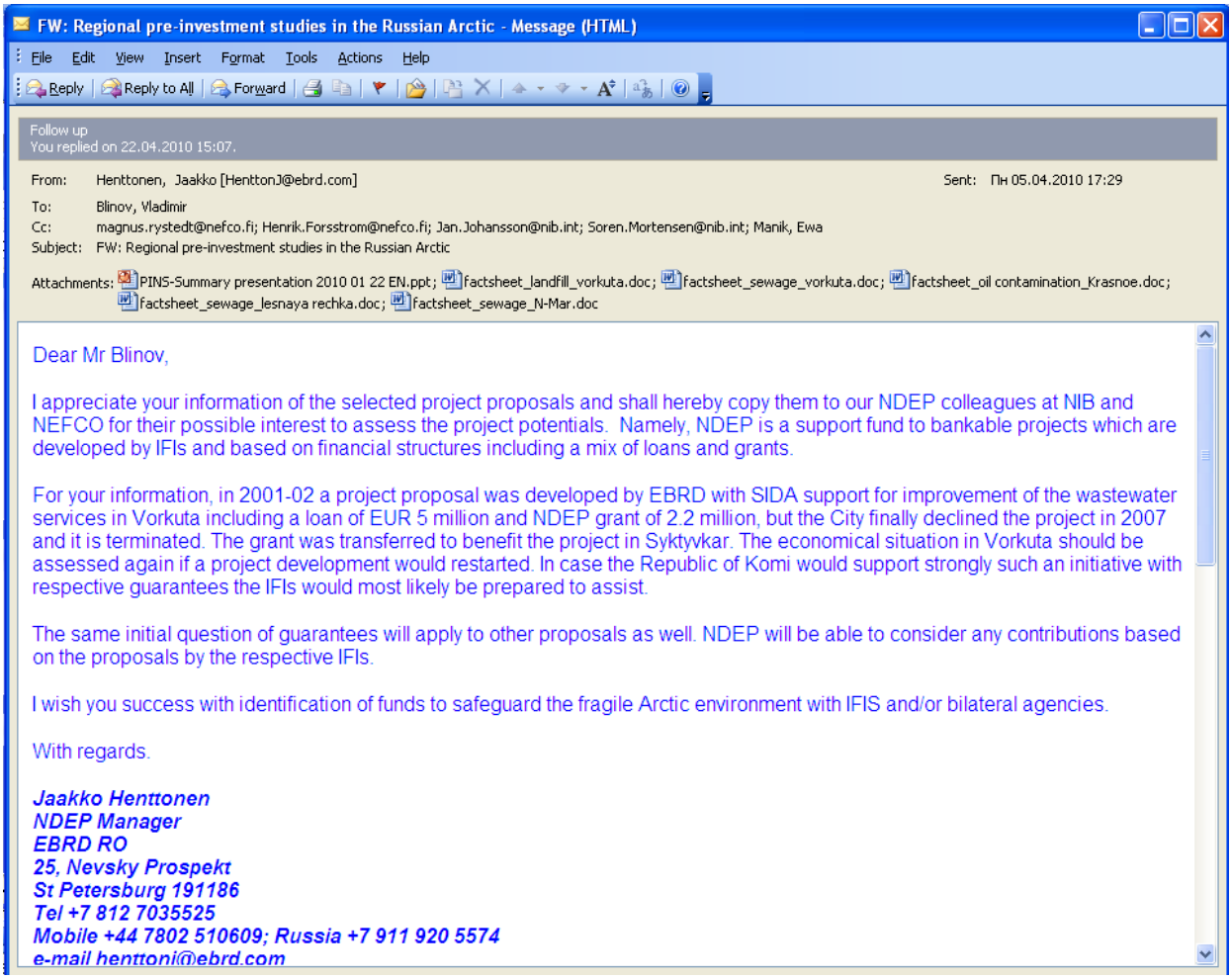
among the projects you specified in your files investments in Vorkuta (provided the privatization process did not go ahead) and Naryan-Mar (provided the investment programme can be larger) look very interesting. We would be happy to meet representatives from companies and administrations and discuss these projects in details.

Thank you.

Александр Рогачевский
Ведущий банкир
Европейский Банк Реконструкции и Развития (ЕБРР)
Представительство в Санкт-Петербурге
Тел. +7-812-703-55-40
Моб.+7-921-958-25-64

-----Original Message-----
From: Blinov, Vladimir [mailto:vladimir.blinov@ramboll.com]
Sent: 19 April 2010 12:08
To: Rogachevsky, Alexander
Subject: RE: Regional pre-investment studies in the Russian Arctic

Annex 15: Letter of NDEP on project support 05.04.2010



FW: Regional pre-investment studies in the Russian Arctic - Message (HTML)

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Reply | Reply to All | Forward

Follow up
You replied on 22.04.2010 15:07.

From: Henttonen, Jaakko [HenttonJ@ebrd.com] Sent: Пн 05.04.2010 17:29

To: Blinov, Vladimir

Cc: magnus.rystedt@nefco.fi; Henrik.Forsstrom@nefco.fi; Jan.Johansson@nib.int; Soren.Mortensen@nib.int; Manik, Ewa

Subject: FW: Regional pre-investment studies in the Russian Arctic

Attachments: PINS-Summary presentation 2010 01 22 EN.ppt; factsheet_landfill_vorkuta.doc; factsheet_sewage_vorkuta.doc; factsheet_oil contamination_Krasnoe.doc; factsheet_sewage_lesnaya rechka.doc; factsheet_sewage_N-Mar.doc

Dear Mr Blinov,

I appreciate your information of the selected project proposals and shall hereby copy them to our NDEP colleagues at NIB and NEFCO for their possible interest to assess the project potentials. Namely, NDEP is a support fund to bankable projects which are developed by IFIs and based on financial structures including a mix of loans and grants.

For your information, in 2001-02 a project proposal was developed by EBRD with SIDA support for improvement of the wastewater services in Vorkuta including a loan of EUR 5 million and NDEP grant of 2.2 million, but the City finally declined the project in 2007 and it is terminated. The grant was transferred to benefit the project in Syktyvkar. The economical situation in Vorkuta should be assessed again if a project development would restarted. In case the Republic of Komi would support strongly such an initiative with respective guarantees the IFIs would most likely be prepared to assist.

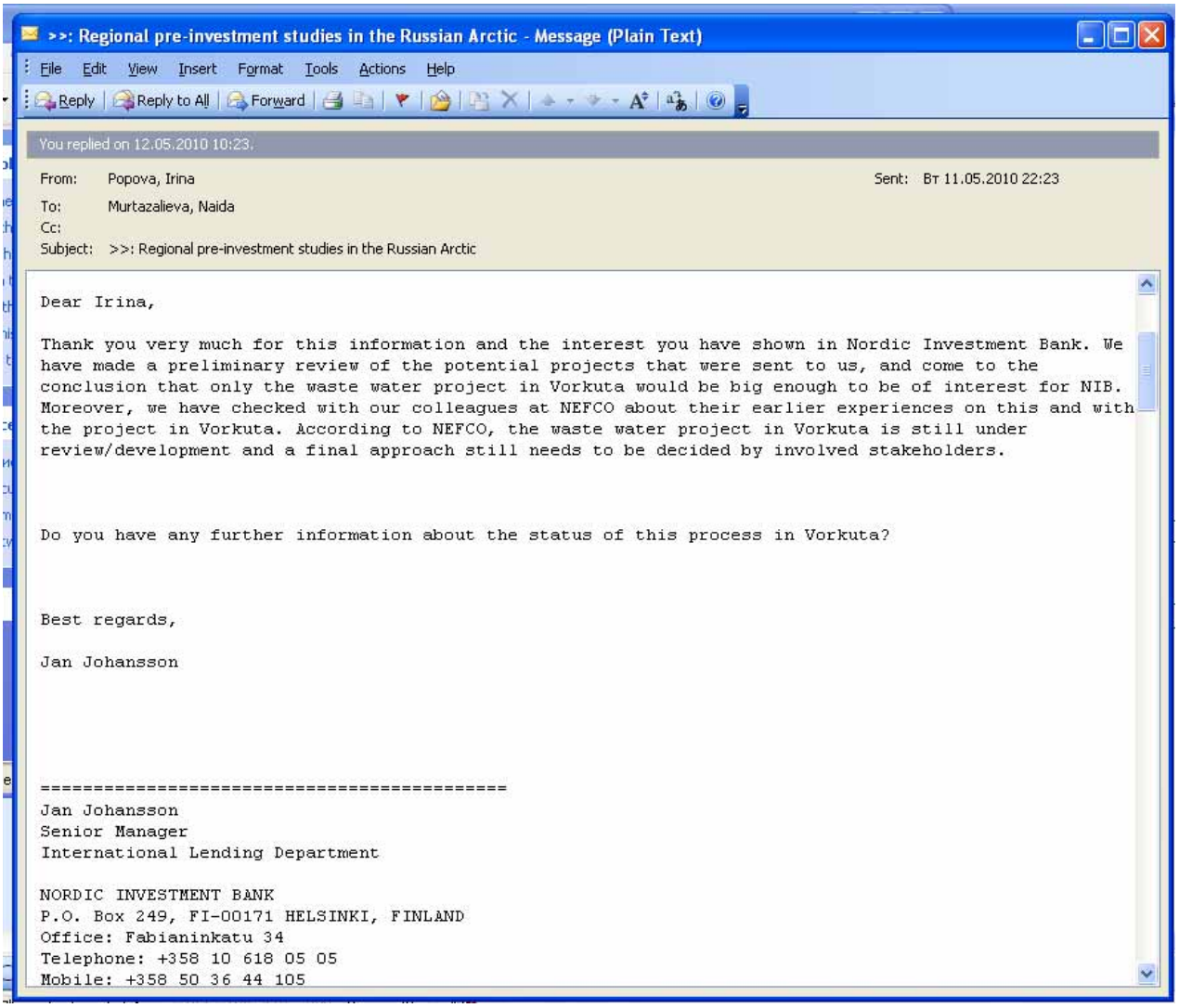
The same initial question of guarantees will apply to other proposals as well. NDEP will be able to consider any contributions based on the proposals by the respective IFIs.

I wish you success with identification of funds to safeguard the fragile Arctic environment with IFIS and/or bilateral agencies.

With regards.

Jaakko Henttonen
NDEP Manager
EBRD RO
25, Nevsky Prospekt
St Petersburg 191186
Tel +7 812 7035525
Mobile +44 7802 510609; Russia +7 911 920 5574
e-mail henttonj@ebrd.com

Annex 16: Letter of NIB on project support 11.05.2010



>>: Regional pre-investment studies in the Russian Arctic - Message (Plain Text)

File Edit View Insert Format Tools Actions Help

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You replied on 12.05.2010 10:23.

From: Popova, Irina
Sent: Вт 11.05.2010 22:23
To: Murtazalieva, Naida
Cc:
Subject: >>: Regional pre-investment studies in the Russian Arctic

Dear Irina,

Thank you very much for this information and the interest you have shown in Nordic Investment Bank. We have made a preliminary review of the potential projects that were sent to us, and come to the conclusion that only the waste water project in Vorkuta would be big enough to be of interest for NIB. Moreover, we have checked with our colleagues at NEFCO about their earlier experiences on this and with the project in Vorkuta. According to NEFCO, the waste water project in Vorkuta is still under review/development and a final approach still needs to be decided by involved stakeholders.

Do you have any further information about the status of this process in Vorkuta?

Best regards,

Jan Johansson

==========

Jan Johansson
Senior Manager
International Lending Department

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