



Field survey of municipal waste water treatment discharges in Carpathian National Nature Park in the Upper Prut basin and design of monitoring programmes for the national park in accordance with the Water Framework Directive

Inception report



DRAFT

Prepared by TMC CEUME LTD

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Abbreviations and Acronyms

BOD	biochemical oxygen demand
BUWR	River basin management authority
Ca	calcium
Cd	Cadmium
CIS	Common Implementation Strategy (for WFD)
Cl	Chloride
CNNP	Carpathian National Nature Park
DO	dissolved oxygen
DWPA	drinking water protected areas
EC	Electric conductivity
EPIRB	Environmental Protection of International River Basins
EU	European Union
HCO₃	hydro-carbonate
Hg	Mercury
ISO	International Standardisation Organisation
IWRM	Integrated Water Resources Management
M	total mineralisation
MAC	maximum allowable concentration
MENR	Ministry of Ecology and Natural Resources
m³, m²	cubic meter, square meter
mg-eq/l	milligram-equivalent per litre = [(mg/l) / eq weight]
mg/l	milligrams per litre
Na	Sodium
NGO	Nongovernment organisation
NH₄	Ammonium
NO₂	Nitrite
NO₃	Nitrate
PoM	programme of measures
PRB	Prut River Basin
SAWR	State Agency for Water Resource of Ukraine
SO₄	Sulphate
WB	Water Body
WFD	Water Framework Directive
WWTP	Waste water treatment plant



Introduction

The present inception report has been prepared by Consulting and methodological center 'CEUME LTD' within the signed contract for Implementation of selected measures from the programme for pilot projects in the scope of EU funded project 'Environmental Protection of International River Basins'.

The EPIRB project targets the improvement of water quality in the trans-boundary river basins of the wider Black Sea region and Belarus. It supports the move towards modern management tools and compliance with the EU Water Framework Directive (WFD) by building capacities learning-by-doing, and through the development and implementation of River Basin Management Plans for selected pilot river basins according to the requirements of WFD.

EPIRB project has undertaken both groundwater and surface water Field Surveys in Upper Prut River Basin in 2013 and 2014. The results has enable the project establish 'reference conditions' for the various water body types and determine 'good ecological status' (WFD 2000/60/EC) of the water bodies within the Natural Parks.

A major pressure that has been identified is tourism, where resorts near/in the Natural Parks are discharging waste water and solid wastes into the River Prut, clogging of river channels and worsening of the waters ecological status. More attention to control and policing of these discharges is required by the regulatory authority in order to maintain the Prut's good ecological status.

The objectives of the assignment are to:

- 1) Undertake a survey of critical municipal waste water discharges and ambient water quality at key locations in the Upper Prut basin in the territory of Ukraine, principally within the Carpathian National Nature Park; and
- 2) Evaluate existing monitoring plans with the Carpathian National Nature Park and design new monitoring plans in compliance with the WFD and the Habitats Directive.

This assignment will contribute to the implementation of EPIRB project Activity 2.6 – 'Implementation of selected measures'.

Carpathian National Nature Park was created according to the decree #376 of Council of Ministers of USSR on 03.06.1980 on the area of 50 495 hectares. The park is situated in the north-eastern slopes of Ukrainian Carpathians and covers territory within absolute altitudes of 400 (Dora village) – 2061 (Hoverla mountain) to the north of drainage divide of Chornohora's ridge and to Yaremche town, then along the Prut River and western tributaries of Chornyi Cheremosh River. The length of the national park is 55 km from northwest to southeast and 20 km from west to east.

The park was created for the purpose of preservation, restoration and efficient use of natural complexes and objects of Chornohora and Gorgany that have special environmental, recreational, historical, cultural, scientific, educational and aesthetic value.



Rivers and streams are the habitat of brown trout that is one of representatives of salmon fishes. It ascends through the mountain streams up to thousands of meters above sea level. Mountain rivers are the habitat of fishes like common minnow, stone loach, common bullhead, common nase, European chub, spined loach, Carpathian barbel and Danube barbel.

There are ten species of amphibians. Five species belong to the Salamanders' order and Advanced salamanders' suborder: common newt, northern crested newt, Carpathian newt, alpine newt and fire salamander. Anura order is represented by four species: yellow-bellied toad, common toad, European tree frog and European common frog.

The territory of park contains about 1000 protected rivers and streams, 85 natural sources of groundwater and two natural lakes of glacial origin: Maricheika lake (area of 0,7 hectares, the depth does not exceed 2,0 m) and Nesamovyte lake (area of 0,3 hectares, depth does not exceed 0,8 m). Two territories within the CNNP were submitted on their inclusion in the list of Wetlands of International Importance to the Ramsar Convention Secretariat:

1) The riverhead of Prut (administrative location: Ivano-Frankivsk region, Yaremche town council, Vorokhta village, geographic location: north – 48°12'N 24°32'E, east – 48°9'N 24°37'E, south – 48°7'N 24°33'E, west – 48°9'N 24°30'E; minimum altitude above sea level is 900 m, maximum altitude above sea level is 2061 m, the total area of wetland is 4935,44 hectares.

2) The riverhead of Pogorilets (administrative location: Ivano-Frankivsk region, Verkhovyna district, Zelene village; geographic location: north – 48°04'N 24°38'E, east – 48°02'N 24°38'E, south – 47°59'N 24°41'E, west – 48°04'N 24°37'E; minimum altitude above sea level is 900 m, maximum altitude above sea level is 2061 m, the total area of wetland is 1624,55 hectares.



Picture 1. Map of CNNP



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Beneficiary and recipients:

Beneficiary: Ministry of Ecology and Natural Resources of Ukraine (MENR).

Recipients: Administration of the Carpathian National Nature Park (Ministry of Ecology and Natural Resources), Prut River Basin authority (State Water Agency of Ukraine), local authorities, local communities, local business (tourism (green tourism), recreation etc.), NGOs.



1. Municipal waste water discharges survey of the Upper River Prut, focusing on the Carpathian National Nature Park

Waste Water Treatment plants are the significant point sources of multi spectrum pollutants, including organic matter, nutrients (particularly, nitrogen and phosphorus) and different chemical pollutants, taking into account that most of mini hotels and ski-resorts discharge their non-treated or low treated wastewaters to the small Upper Prut river tributaries. There is an International method to assess the pressure of untreated Waste Water related to emissions of BOD₅, COD, N_{tot} and P_{tot} into the environment.

The indicators for discharges of waste water should include: BOD₅ (biochemical oxygen demand over five days); COD (chemical oxygen demand; preferably dichromate method, other permanganate); NH₄⁺ (total ammonium); NO₂⁻ (nitrite); NO₃⁺ (nitrate); PO₄ (orthophosphate). It will be provided in-situ measurements of electric conductivity, pH, dissolved oxygen and water temperature. Low concentration of Oxygen can identify wastewater discharges, as colour and smell can also be indicative.

WWTP of all settlements are point sources of water bodies' pollution in the Prut basin area. In the current economic situation, all these structures are inefficient. They have been constructed 50 - 60 years ago and have not been designed to take out modern pollutants. Besides it the WWTPs' technical equipment is out of date and its lifetime has been exhausted long time ago.

It should be noted that most of all industrial enterprises in the basin district are so-called "secondary" water users, as their wastewaters are transported for treatment to the municipal treatment facilities.

The main point sources of anthropogenic impact on surface water in the basin are the biggest industrial enterprises: OJSC Sugar Factory "Khreschatyk", OJSC "Nadvirnaftogas" (in Vizhnitsky region), OJSC Chernivtsi oil and fat plant, JSC Chernivtsi brickyard # 3, JSC Chernivtsi chemical plant, as well as the Water utilities: SCE Chernivtsivodokanal, SCE Kolomyavodokanal and SCE Yaremchevodokanal. WWTPs of the settlements s.Vorohta, s.Delyatyn, s.Snyatin, s. Zabolotiv, s. Tovmachyk of Ivano-Frankivsk Region are in poor condition and low-treated wastewater is being discharged into the rivers of the Prut basin.

Table 1. Wastewater discharges into surface water bodies of the Prut river basin, Ukraine (mln.m³), 2013

Administrative unit (rayon, city)	WW discharged		WWTP's Capacity, mln m ³
	total	Including normatively treated	
Carpathian National Nature Park Region			
Verkhovinskyi	0,01	0,01	0,23
Kolomyyskiy	2,63	0,02	1,72
Kosivskyi	0,82	0,004	0,74
Snyatynskyi	1,96	0,12	2,44
Kolomyia	6,46	5,97	6,56
Yaremche	0,29	0,15	0,72



Table 2. Main industrial enterprises which caused anthropogenic influence on environment in Prut RB, CNPP (Reference; Ecological passports of Ivano-Frankivska, 2013)

N on map	Name of enterprises	Location	Volume of WW discharges, MLN.m ³ /y		WWTP capacity	River WB receiving WW	Pollution type
			total	inadequately treated			
Yaremche City Council							
1	Vorohtyanska sportive school "Zaroslyak"	Vorohta Zavollya	0,002	0,002	0,027	Prut	Solid Waste (SW), Waste Water (WW)
2	JSC «Skorzonera»	Polyanytsya	0,087	0,069	0,117	Prutets	SW, WW
3	Charity organization «Dytyache Selysche»	Yablunytsya	0,002	0,002	0,027	Prutets	SW, WW
4	Sanatorium «Mountain air»	Vorohta	0,004	0,004	–	Prut	SW, WW
5	JSC «Ruslana»	Vorohta	0,001	0,001	–	Prut	SW, WW
6	CC «Village communal service provider»	Vorohta	0,008	0,008	0,087	Prut	SW, WW
7	JSC «Bili Gorvaty»	Tatariv	0,001	0,001	0,004	Prut	SW, WW
8	JSC "Koruna Karpat»	Tatariv	0,002	0,002	0,009	Prut	SW, WW
9	JSC «Firma Brolis»	Tatariv	0,001	0,001	–	Prut	
10	Medical rehabilitation Center «Kremintsi»	Tatariv (Kremintsi)	0,008		0,015	Prut	SW, WW
11	Yaremche VodoKanal	Yaremche	0,125	–	0,401	Prut	SW, WW
12	Hotel «Pervotsvit»	Yaremche	0,001	0,001	–	Prut	SW, WW
13	Recreation center «Legenda»	Dore	0,002	0,002	–	Kamianka	SW, WW
Verkhovynskyi Rayon							
14	VerkhovynskeVodokanal Water Utility	Verkhovyna	0,022		0,017	Chorny Cheremosh	SW, WW
15	Medical-rehabilitation Center "Verkhovyna"	Verkhovyna	0,005	0,005	–	Chorny Cheremosh	SW, WW
Kosivskyi Rayon							
16	KosivVodoKanal	Kosiv	0,065	0,065	0,730	Rybnytsya	
17	Ltd «Скіфавто»	Kociv	0,001	0,001	–	Rybnytsya	
18	Recreation center «Bayka»	Goriv (Kosiv)	0,001	0,001	–	Rybnytsya	SW, WW
19	JSC «Barliskinwest»	Cherganivka	0,001	0,001	–	No name	
20	Sanatorium«Prykarpattya»	Rozhniv	0,288	0,288	–	Rybnytsya	SW, WW



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21	Sanatorium «Kosiv»	Smodna	0,012	0,012	–	Rybnytsya	SW,WW
22	Technical School ПТУ-96	Kuty	0,001	0,001	–		SW,WW

According to the Plan of activities of this Pilot Project the sampling and laboratory analysis for a survey of licensed municipal waste waters in the Upper Prut River basin will be undertaken, focusing on the impact on Carpathian National Nature Park. The survey will be undertaken in summer 2015 and the results will be made available in August 2015 and reported in accredited laboratory procedures. The survey will be undertaken by accredited laboratory under a separate contract and will include physical-chemical parameters at the selected points. The Beneficiary (Carpathian Nature Park is under the management of Ministry of Ecology) must conserve the Good Ecological status of Prut water bodies. There are no official monitoring sites in Park and there is a lack of control of waste water discharges. The Beneficiary will use the survey information for strengthening the strict observance of ecological standards regarding EU Water Framework Directive obligations. Monitoring sites will be selected in relation to known discharge sites.

The accredited Laboratory of Ivano-Frankivsk regional authority for water management of State Agency of Water Resources of Ukraine (Ivano-Frankivsk, Akademika Saharova Str., 23A. Phone number: (0342) 52-31-42, phone/fax number: (0342) 52-31-51. E-mail: voda@if.ukrtel.net) will be contracted for these tasks.



2. Review of existing monitoring plans with the National Park and the design of new monitoring plan in compliance with the Water Framework Directive

It will be necessary to undertake a thorough review of the existing Surface water monitoring plans of the Carpathian National Park in respect to chemical, hydro-biological and hydro-morphological parameters and identify the short-falls in meeting the requirements of the WFD and the UWWTP, Habitats Directive and the Nitrates Directive. The review shall highlight the capacity of building and training needs both within the local laboratories, identify and estimate the investment needs (incl. equipment).

A number of weaknesses in the monitoring systems in the basin of the Upper Prut have been identified during the RBMP with respect to the WFD, including:

- no items for checking the quality of water in small rivers, especially in small settlements and rural area;
- there is no database on water abstractions and discharges;
- lack of assessment of the quality of surface and ground water (except multiplicity exceeding MPC); not measured concentrations of synthetic surface-active substances, phosphorus and other pollutants in river waters according to Ukrainian and WFD requirements ;
- no data monitoring of pollutants that come from non-point sources, description of the sources and their potential threats to the aquatic environment;
- hydrobiological monitoring data (conducted by the Central Geophysical Observatory of the Hydro-meteorological Centre of Ukraine) does not include the parameters for assessing surface water quality required by the EU Water Framework Directive;
- hydromorphological monitoring to detect the destruction of river banks, changes to the beds and deposition of sediments has not been undertaken.

Monitoring of water quality in water bodies at the territory of CNNP is carried out by the Laboratory of monitoring of waters and soils of Ivano-Frankivsk department of State Agency for Water Resource of Ukraine and by the Laboratory of CNNP. Laboratory of Ivano-Frankivsk department is certified to carry out the measurements in sphere of the state metrological supervision – Accreditation certificate #199 issued February 20, 2012, valid until April 11, 2016 and it determines 31 quality indicators of surface water, 21 quality indicators of ground water and 23 indicators of composition and physico-chemical properties of soils. Laboratory conducts monitoring of the surface water under the programme for the environmental monitoring as regards the implementation of control of surface water quality by the State Agency for Water Resource of Ukraine. According to the Programme of hydrogeological and reclamation works the measurement of samples of ground, drainage and surface waters and soils on inter-farm reference drainage systems is carried out by the Laboratory.

The objects of quality control on hydrochemical and radiological indexes of surface water are Dniester and Prut rivers and their tributaries that flow in the Ivano-Frankivsk region.

The Programme of SAWR approves 21 sections on 14 rivers for the monitoring of water quality. Among them 18 are located in the Dniester river basin and 3 are located in the Prut river basin, besides 2 sections were established in Yaremche and Kolomyia towns (quarterly)



The list of indicators of surface water quality that are measured in accredited laboratory in Ivano-Frankivsk (SAWR)

Temperature (in degrees)	Chlorides, mg/l
Odour (in points)	Sulphates, mg/l
Colour (in degrees)	Dissolved oxygen, mg/l
Transparency (according to Snellen)	Biochemical oxygen demand , mg/l
Solid residual, mg/l	Chemical oxygen demand , mg/l
Suspended solids, mg/l	Total iron, mg/l
Hydrogen ion exponent (pH)	Copper, mg/l
Alkalinity, mEq/l	Total chromium, mg/l
Hardness, mEq/l	Chromium (III), mg/l
Calcium, mg/l	Chromium (VI), mg/l
Magnesium, mg/l	Manganese, mg/l
Potassium + sodium, mg/l	Petroleum products, mg/l
Ammonium salt, mg/l	Phenols, mg/l
Nitrites, mg/l	Surfactants, mg/l
Nitrates, mg/l	Phosphates, mg/l
Caesium – 137, pCi/l	
Strontium – 90, pCi/l	

The monitoring of water quality at the Prut river within CNNP is carried out in 8 control sections annually, since 2001. However the systematic monitoring of hydro-morphological, hydro-chemical and hydro-biological state of rivers is not performed. Most of them have the reference conditions in accordance with the requirements of the EU Water Framework Directive. Laboratory works in the park and has no necessary equipment even for the full range of research according to the Ukrainian water legislation. Moreover laboratory has not been accredited to conduct hydro-chemical studies since 2010 due to lack of funds.

At this stage of investigation will include the design of a comprehensive monitoring plan for the Carpathian National Nature Park including surveillance and operational components and investigatory components (where they have been identified) in compliance with the WFD that



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will be implemented in phased stages. The monitoring plan will incorporate a financial implementation plan and will be presented to the stakeholders, beneficiaries and potential donors at final workshop to be held at the Carpathian National Nature Park head office. Furthermore, once implemented, the monitoring will provide regulatory authority with a cost effective mean of tracking trends in ambient water quality and being able to pin-point problem discharges. It will enable to establish water quality standards and track trends. Finally, it will be able to put pressure on the discharges to improve water quality through enhanced treatment.



3. Schedule and implementation modality

Duration of the assignment is 8 months. It was time calculated bearing in mind inception period, preparation and realization of field survey, reports of sampling analyses, than review and design preparation of monitoring plan, discussing with beneficiary and providing the final workshop with local authorities. The expected commencement date for implementation of the assignment is March, 2015, and the completion date – October, 2015. The assignment is divided into 4 deliverables with the following general schedule:

<i>Field survey of municipal waste water treatment discharges in Carpathian National Nature Park in the Upper Prut basin and design of monitoring programmes for the national park in accordance with the Water Framework Directive and the Habitats Directive</i>	2015							
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct
Deliverable 1: Inception report - outlining contractor's appreciation and implementation methodology								
Deliverable 2: Municipal Waste water survey of the Upper River Prut, focusing on the Carpathian National Nature Park								
Deliverable 3: Review of existing monitoring plans with the National Park and the design new monitoring plans in compliance with the WFD and the Habitats Directive.								
Deliverable 4: Final Report to include a summary of activities and lessons learnt.								

The approximate schedule and description of the deliverables is given in the table below:

Summary of the work schedule and deliverables for the Prut River Basin in Ukraine

Deliverable	Max. No. of pages excl. Appendices	Language of deliverable	Start date	Due date for draft report	Finalization
Deliverable 1: Inception report - outlining contractor's appreciation and implementation methodology	5 -10	English	02 Mar 15	26 Mar 15	31 Mar 15
Deliverable 2: Municipal Waste water survey of the Upper River Prut, focusing on the Carpathian National Nature Park	30 - 40	Ukraine / English	01 Apr 15	15 July15	31 July 15
Deliverable 3: Review of			01 July	21 Oct 15	31 Oct 15



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existing monitoring plans with the National Park and the design new monitoring plans in compliance with the WFD and the Habitats Directive.	30	Ukraine/ English	15		
Deliverable 4: Final Report to include a summary of activities and lessons learnt.	45	Ukraine/ English	01 Oct 15	19 Oct 15	31 Oct 15

The draft deliverables reviewed by the beneficiary and the project team members and final approval of deliverables will be given by the EPIRB Team Leader.