

Investigation of illegal discharges of wastewater in Carpathian National Nature Park as a major pressure on the ecological status of the Upper Prut pilot river basin in the territory of Ukraine

Inception report



DRAFT

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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' (EPIRB).

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 of 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. In order to maintain the Prut's good ecological status more attention to control and policing of these discharges is required by the regulatory authority.

The object of the assignment is to investigate the impact of waste water as a major pressure on the ecological status (especially illegal discharges of the non-treated waste water in protected areas) in the Upper Prut River basin in the territory of Ukraine and to identify a detailed programme of measures to address the problem and to include it in the RBMP. This assignment will contribute to the implementation of EPIRB project Activity 2.6 – 'Implementation of selected measures'.

Carpathian National Nature Park (CNNP) 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 Chorny 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.

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.



Picture 1. Map of CNNP



1. Design and reporting of a detailed investigation of the extent and impact of untreated waste water (particularly from the tourism industry) in the Carpathian National Nature Park, that lies in the Upper Prut pilot basin

The EU Water Framework Directive (WFD) requires the development of Programme of measures for improving water quality for each basin, as well as the development of the register of special protected areas as a result. The WFD term 'protected areas' is much more inclusive than the traditional notion of national parks, reserves, etc. This register must contain:

- areas designated for the abstraction of drinking water for human consumption;
- areas designated for the protection of economically significant aquatic species;
 - bodies of water designated as recreational areas and bathing areas;
 - nutrient-sensitive areas, including nitrate vulnerable zones with high demand for protection of water and soil from agricultural pollution (under Nitrates Directive 91/676/EEC), and areas with special requirements for municipal waste water treatment (under the Directive 91/271/EEC concerning urban waste water treatment (UWWTD));
- areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection.

The main objective of investigation is maintenance of the 'good ecological status' of the protected area of Upper Prut River Basin via investigation of the extent and impact of untreated domestic and commercial waste water to support the development and operation of Upper Prut ecological monitoring programme.

The potential threat to the environment can be caused by excessive escalation (overload) of recreational objects in some areas that can lead to the worsening of the ecological status of Prut water bodies as a result of exceeding the standards of ultimate load. Despite the considerable reserve between the existing load and the standard rates of recreational capacity of landscapes.

The figures in Table 1 are maximal and give an overview of the EU ecological norms of recreational load on various natural systems.



Table 1. The norms of recreational load on natural systems of the Carpathian region

Natural systems	The norms of recreational load, PPL/km	
	Summer	Winter
Low-lying	80-120	30-50
Undulating land	100-150	40 - 35
Mountainous (incl. Carpathian National Park)	110-200	60-160

The territory of Carpathian National Park is a place of operation for about 50 hotels (40-50 persons each), 48 recreational facilities (3000 beds), about 550 estates for green tourism (9000 tourists), as well as for a series of environmental, scientific, informative and ecological tourism routes of total length of 400 km, including 47 hiking routes, 6 ski routes, 3 water routes; 9 recreational zones and 9 recreational places. The total capacity of some recreational centers (including Bukovel and Yaremche) is close to optimal. Therefore the strict compliance with the optimal recreational load on natural ecosystems is a necessary condition for further development of recreational areas.

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 (untreated) 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.

In framework of the first stage of investigation will need to plan and organize a wide field survey in Carpathian National Nature Park (see map above) and contributing basin, which potentially is under pressure from human activities (recreation areas, camp sites, holiday homes,



restaurants) and for which no information about pressures, first of all about unlicensed waste water discharges.

The survey will be undertaken by accredited laboratory and will include physical-chemical parameters at the selected points. For this tasks will be contracted the Laboratory of Ivano-Frankivsk regional authority for water management of State Agency of Water Resources (Ivano-Frankivsk city, 50 km from Yaremche).



Picture 2. Hydrochemistry laboratory of Ivano-Frankivsk regional authority for water management

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. It 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 physical-chemical parameters of soils.

The address of the accredited laboratory of Ivano-Frankivsk regional department of SAWR: Ivano-Frankivsk, Akademika Saharova Str., 23A.



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2. Preparation of waste water treatment and control strategy for the Upper Prut and Carpathian National Nature Park

The conditions of functioning of water bodies in Ukraine are regulated by water legislation and other legal acts that formulate the requirements for the state of water bodies. Protection of water bodies is provided by a system of organizational, technical, economic, legal and reclamation activities that are aimed at preventing the consequences of pollution, their contamination, exhaustion and elimination.

The basic principles of water protection are expounded in "Sanitary rules and norms for the protection of surface waters from pollution". They contain clearly formulated requirements for the discharge of waste water into water bodies and specified quality standards for water that are discharged into water bodies. Special paragraph states that city or town that is the place of discharge of waste water is a first control point of water use. "Rules" also contain the terms of wastewater disposal into the water bodies, procedures for controlling the effectiveness of treatment, disinfection and decontamination of wastewater. Enterprises, organisations and institutions which affect the state of waters are obliged to take measures that would ensure the protection of waters against pollution and improvement of their state. There are many modern methods and devices that can purify wastewater. The use of certain of them depends on the composition of pollutants in water, its further use and discharged substances.

It will be prepared a detailed analysis of the options for municipal waste water treatment, including modern and inexpensive available treatment techniques for camp sites and small hotels. The current regulatory regime will be reviewed for improvement of WWTP efficiency.

The task of wastewater treatment facilities is to reduce the amount of pollutants in the wastewater to a level where they can be discharged into a water body without the risk of environmental pollution. The existing in water organic compounds are transforming into the harmless inert substances during the purification process. Moreover the amount of pathogen organisms is significantly reduced to the acceptable level. Thus the treated wastewaters stop being the source of environmental contamination. However, health authorities (sanitary and epidemiological stations) require disinfection of these waters before the discharge into water bodies.

The proposed strategy of wastewater treatment will be based on the main principles of treatment, depending on the composition of the wastewater and financial ability of local communities. In accordance with the European principles the water purification systems anyhow should include mechanical treatment (clarification), chemical system (more expensive



but it uses different reagents for transformation of water contaminants into the soluble compounds and their subsequent deposition on the bottom of the aeration tanks or septic tanks) and biological system for wastewater treatment from contamination (using microorganisms).

The results of the pilot project will be presented and discussed during a public consultation meeting in the CNNP Directorate (Yaremche, Ukraine) with all interested local communities, local authorities and NGOs.



3. Schedule and implementation modality

Duration of the assignment is 7 months. The expected commencement date for implementation of the assignment is March, 2015, and the completion date – September, 2015. The assignment is divided into 4 phases with the following general schedule:

Investigation of waste water discharges as a major pressure in the Upper Prut pilot river basin (Ukraine)	2015						
	Mar	Apr	May	Jun	Jul	Aug	Sep
Deliverable 1: Inception report - outlining contractor's appreciation and implementation methodology							
Deliverable 2: Design and reporting of a detailed investigation of the extent and impact of untreated municipal waste water, particularly from the tourism industry, in the Carpathian National Nature Park, lying in the Upper Prut pilot basin							
Deliverable 3: Preparation of waste water treatment and control strategy for the Upper Prut and Carpathian National Nature Park Final report							
Deliverable 4: Final Report to include a summary of activities and lessons learnt.							

The approximate schedule and description of the deliverables for each Phase 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.	Language of deliver	Start date	Due date for draft	Finalization



	Appendices	able		report	
Deliverable- 1: Inception report - outlining contractor's appreciation and implementation methodology	10	English	07 Mar 15	26 Mar 15	31 Mar 15
Deliverable 2: Design and reporting of a detailed investigation of the extent and impact of untreated municipal waste water, particularly from the tourism industry, in the Carpathian National Nature Park, lying in the Upper Prut pilot basin.	30	Ukraine / English	01 Apr 15	25 July 15	30 July 15
Deliverable 3: Preparation of waste water treatment and control strategy for the Upper Prut and Carpathian National Nature Park.	40	Ukraine/ English	01 July 15	17 Aug 15	31 Aug 15
Deliverable 4: Final Report to include a summary of activities and lessons learnt.	45	Ukraine/ English	01 Sep 15	21 Sep 15	30 Sep 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.