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THE PRUT RIVER BASIN MANAGEMENT PLAN

Cycle I, 2017 – 2022

Prepared and formulated in accordance with
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Prepared by the Institute of Ecology and Geography of the Academy of Sciences of Moldova (ASM)
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Abbreviations

BOD	Biological oxygen demand CBO_5 - Chemical oxygen demand (five days)
CBA	Cost-Benefit-Analysis
EPIRB	Environmental Protection of International River Basins Project
DPSIR	Driver-Pressure-State-Impact-Response
DWPA	Drinking water Protected Areas
DDE	Dichlorodiphenyltrichloroethane
DDT	Dichlorodiphenyltrichloroethane
PCB	Polychlorinated biphenyl
IEG	Institute of Ecology and Geography of the Academy of Sciences of Moldova
GWB	Groundwater body
GIZ	German Assistance Fund
JFS	Joint Field Survey
HMWB	Heavily modified water bodies
HDW	Household and Drinking water
HPP	Hydropower Plant
ITW	Technical water
IBA	Important Bird Areas
ICPDR	International Commission for the Protection of Danube River
ISRA	Irrigation Sector Reform Activity
LR	Landscape reservation
LRW	Lakes water body
NH4	Ammonium, as Nitrogen
NR	Natural reservation
MAC	Maximum Allowable Concentrations
O_2	Dissolved Oxygen
OM	Operational Monitoring
P	Phosphorus
SO_4	Sulphates
NO_3	Nitrate
NEF	National Ecological Fund
NAER	National Agency for Energy Regulation
PRBMP	Prut River Basin Management Plan of the Prut Basin
PRBAR	River Basin Analysis in Prut River Basin key area of Republic of Moldova Report, 2013
RWB	River water body
SHS	State Hydro meteorological Service of Moldova
SR	Scientific reservation
SWB	Surface water body
SM	Surveillance monitoring
TRRW	Therapeutic, resort and recreational water
TNMN	Transnational Monitoring Network
WB	Water body
WFD	Water Framework Directive

Executive summary

The Objective and Approach of the Draft Plan

The River Basin Management Plan (RBMP) for the Prut River Basin was prepared according to the approaches and methodology proposed in the EU Water Framework Directive (WFD). The aim of the Management Plan is to improve the proper use of water resources. The plan is intended for all authorities responsible for water management – Ministry of Environment and its subdivisions, local public authorities, water users, etc.

The core of this plan is the Programme of measures (PoM), which aims achieving the environmental objectives established for all bodies of water (good status). The Programme of Measures on the analysis of the initial conditions of the basin, the significant human pressures and their impact on water resources are based. A key component of the RBMP represents analysis of main pressures and impact on water bodies, which results from the identification of specific problems and their origin, what can include the water bodies at risk of failing to achieve the established environmental objectives. According to EU WFD three major types of pressure are distinguished: point source pollution; diffuse source pollution and hydro-morphological alterations. The PoM proposes the measures for each water body at risk of not achieving the environmental objectives, resulting from the identified pressures.

When setting up the environmental objectives, identified significant pressures as well as exemption of achieving "good ecological and chemical status/potential" for the next cycle (2016-2021) in accordance with WFD were taken into account. Thus, it was proposed that environmental objectives to be achieved for all water bodies in future planning cycles, with the beginning from the first one which is till 2027 (2021-2027).

In the RBMP considerable attention is given to the economic analysis of water use. The use of water resources directly contribute to their impairment.

In RBMP developing, some gaps in data and information were identified. The main problems face during development of RBMP were: the lack or access to data base regarding volumes and quality of waste water discharges, the lack of monitoring data (quantitative, hydromorphological, ecological and hydrobiological information) for all water bodies, delineation and mapping of protection areas for water abstractions points, poor collaboration and cooperation between national institutions involved in the management and monitoring of water resources, poor experience is development of RBMP and necessity in water management experts, etc. Some of these problems have been partially solved in the EPIRB project, by organizing of three expeditions and the contributions to improving of existing monitoring system. The River Basin Management Plan for the Prut River Basin Project provides some recommendations for the data complement and lack of information.

The Prut River Basin

The Prut River is one of the largest rivers in Western Ukraine, Moldova and Romania, one of the main tributaries of the Danube River. The Prut River basin is transboundary and is shared by three countries. Of the total basin area, 28% of the Prut River Basin is located in the territory of Moldova, 33% in the territory of Ukraine, and 39% in the territory of Romania. The Prut River originates on the south-western slope of the Hoverla mountain, at about 15 km south-south-east of Vorokhta village in the Chornogora massif of the Carpathian forest massifs, and discharges into the Danube River south of Giurgiulesti village, at about 164 km from the Danube mouth. Prut River has length of 967 km and a catchment area – 27 540 km^2.

Within the limits of the Republic of Moldova, the Prut River has a length of 695 km and the basin area of 8226 km^2 (tab.1), basin is a relatively narrow band, with a length of 340 km and a width up to 70 km, with average width of 51 km. The absolute maximum elevation of the basin is 429,5 m, and the minimum - 2,6 m. Main tributaries are: Larga, Lopatnic, Camenca, Ciuhur, Racovăț, Gîrla Mare, Nîrnova , Lapusna, Sarata, Tigheci etc.

Figure 1. Geographic position of the Prut River Basin

Table 1. General information of the Prut River Basin

Characteristics	the Prut River Basin in the limits of Moldova
Basin surface, km^2	8 226
Maximal altitude, m	429,5
Minimal altitude, m	2,6
Number of population, ths. inhab.	798,7
Number of villages	447
Number of towns	15
Number of water bodies	RWBs – 83 LWBs – 7
Average length of river water bodies	26 km
Average basin area of river water bodies, km^2	99
Number of Heavily Modified Water Bodies	63

Identification of water bodies

Within the Prut River Basin 83 river water bodies have been delineated, 7 lake water bodies. One of them (ponds of the Cahul fish farm) has been identified as anartificial water body (fig.3).

Six main aquifers have been analyzed for identification and delineation of groundwater bodies: Holocene alluvial, Pontian, Meotian, Middle Sarmatian (Congerian), Badenian-Sarmatian, Cretaceous-Silurian. Middle Sarmatian represents transboundary water body, shared by the Republic of Moldova and Romania (fig.4).

Economic activity

Agriculture

Agriculture is a traditional economic sector in the Republic of Moldova. The Prut River Basin is a typical agrarian region. Agricultural areas occupy 76.8% (fig. 2). More than a half of the basin's area is arable (52.5%). Share of the arable area is higher in the northern part of the basin with a mean value of 57% decreasing slightly in the middle part of Prut river, within the Codrii heights where the terrain is more drained. Pastures cover over 16% of the total area and are spread actually all over the basin. Generally, they located the river floodplains. The predominance of agricultural lands on the one hand, influences the high demand of water for irrigation, and on the other, causes pollution with nitrates and other nutrients.

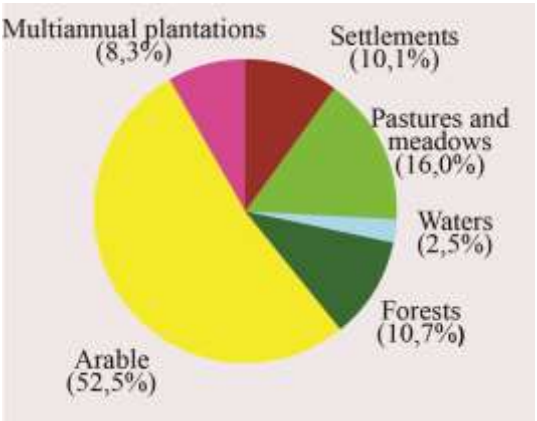


Figure 2. Land use in the Prut River Basin

Industry

The largest water users are the cities with large factories. There are highlighted sugar factories of Glodeni Fălești towns and wineries of Cahul, Nisporeni and Cantemir, baking and dairy products industry, etc. The biggest problem is that most of these companies do not have wastewater treatment plants (except sugar factories) and discharge untreated wastewater directly into water bodies.

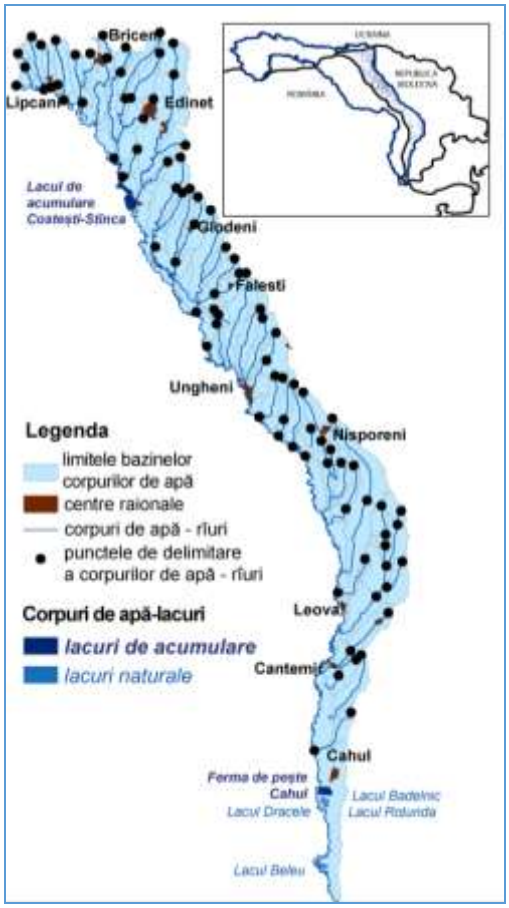


Figure 3. Surface water bodies in the Prut River basin of Moldova

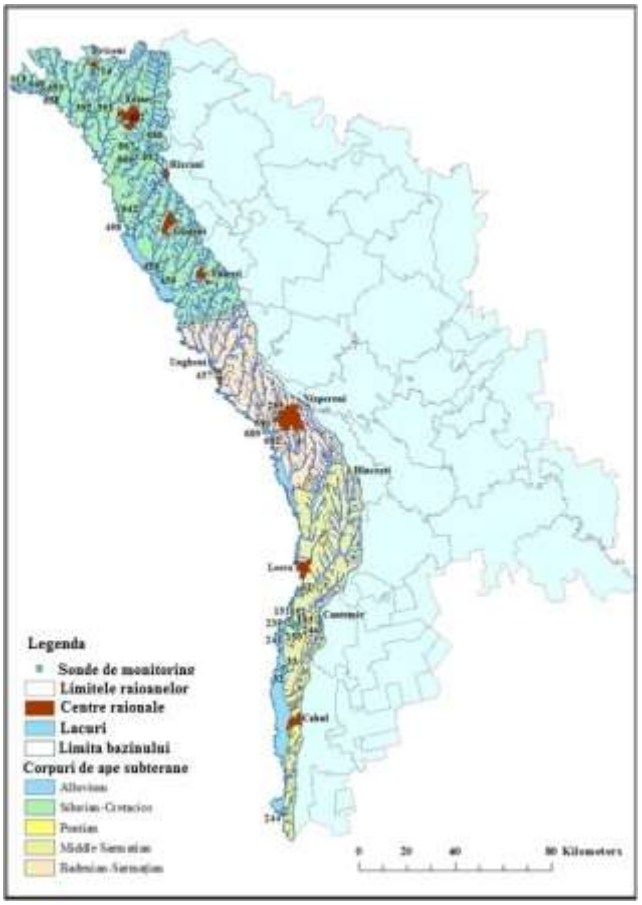


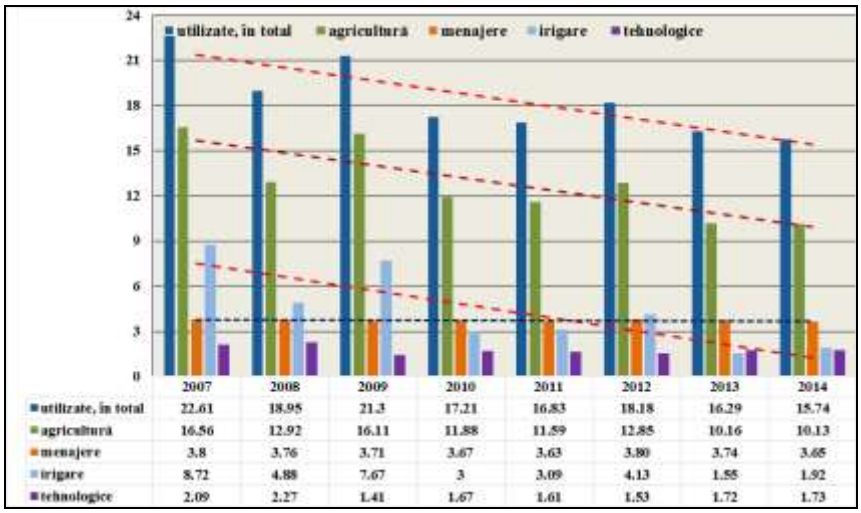
Figure 4. Groundwater bodies and monitoring wells in the limits of the Prut River Basin

Water abstraction

The main source of fresh water is the surface waters of the Prut river. Briceni, Edineț, Cupcini, Glodeni, Ungheni, Leova, Cantemir and Cahul are supplied from the Prut river. The water abstraction decreased by almost 5 times during the last 20 years to 26,8 mil. cub. m. The best public water supply is in the northern districts where the water quality is better. The main source of water is groundwater. Ground water supply becomes more and more important due to decreasing availability of surface water resources and increasing of pollution. The use of water resources is presented in figure 5.

Hydropower plant

Within the Prut basin in Moldova, there is a single 32000 kW Hydropower Plant (HPP) located near the Costeşti town, to 576 km away from the river Prut spring. It was built on the Prut river in cooperation with Romania in 1978 and put into operation in 1979. Costeşti-Stânca HPP was designed to control the flood discharge and electricity production, as well as to provide water supply to irrigated agriculture, processing industry, etc.



	2007	2008	2009	2010	2011	2012	2013	2014
utilizate, în total	22.61	18.95	21.3	17.21	16.83	18.18	16.29	15.74
agricultură	16.56	12.92	16.11	11.88	11.59	12.85	10.16	10.13
menajere	3.8	3.76	3.71	3.67	3.63	3.80	3.74	3.65
irigare	8.72	4.88	7.67	3	3.09	4.13	1.55	1.92
tehnologice	2.09	2.27	1.41	1.67	1.61	1.53	1.72	1.73

Figure 5. The structure of water use, mil. m^3

Significant pressures and impact estimation

The assessment of human pressures and impact on water bodies was performed with the aim to evaluate the status of water bodies and identify those water bodies with risk of failing the EU WFD objectives and included following important stages: identification of water uses and related pressures and risk assessment of possible failure of environmental objectives (tab. 2).

The main sources of pollution are:

- point source pollution (wastewater discharge);
- diffuse source pollution (agricultural activities, unauthorized dumps);
- hydro-morphological alterations (interruption of river continuity by the dam construction, density of irrigation and abstraction canals)

Table 2. The main types of pressures within the Prut river basin

The type of pressure	Basin/Water body	Comments
Wastewater discharge	Ciuhur, Racovăț, Șovăț, Prut (downstream of Ungheni)	Discharges of untreated or insufficiently treated waters
Agricultural activities	All the water bodies	The agricultural lands occupy 76.8%. Over 50% of the basin is occupied by arable lands. Riparian protection strips lacking in most water bodies.
Unauthorized dumps	All the water bodies	The lack of authorized dumps in most settlements. Riparian protection strips lacking in most water bodies.
Interruption of longitudinal continuity of rivers	Racovăț, Camenca, Garla Mare, Șoltoaia	The construction of reservoirs and ponds on water streams.
Dams and irrigation channels	The lower course of Prut River	Construction of flood protection embankments near the Prut minor riverbed and the high density of irrigation canals.
Fishery	Fishery Cahul Lakes, Manta	water resources abstraction from Prut river in artificial water body, Cahul fishery lakes limit water intake in Manta Lake.
Water abstraction	All the water bodies	One of the main problems are unauthorized abstraction of water from small and medium rivers. Another problem associated with the impact on water resources are violations of sanitary protection zones of catchment points of both surface water and groundwater as well.

Identification of water bodies at risk of failing the environmental objectives was made using the principle **One-Out-All-Out**. This approach is based on the principle that each pressure that exceeds one of the risk criteria has a decisive effect on the overall risk status of the entire water body. The entire impacted water body needs to be put at risk to fail the environmental objectives in case a risk criterion is exceeded at a distinct location in a water body.

From 2152 km water bodies length, 85 km or 26 water bodies are at risk to fail the environmental objective due to hydromorphological alterations, when others 1317 km (57 water bodies) were assessed as possibly at risk. The pollution impact on water bodies is even greater, especially pollution from diffuse sources (agriculture). Thus, the 2102 km of rivers or 98% of total length of RWBs are at risk, the other being possibly at risk. Respecting the principle of "One-Out-All-Out" all these 98% are at risk of not achieving good ecological status.

Environmental objectives

Among the environmental objectives, which will be practically impossible to achieve in the next 6 years there are mentioned enhancing and restoring of all surface water bodies, including Heavily Modified Water Bodies, and groundwater bodies in order to maintain a "good status".
Essentially, achieving the environmental objectives for the Prut River Basin until 2021, suppose:

1) For surface water bodies: achieving a good ecological and chemical status, respectively, a good chemical and ecological potential for water bodies;
2) For groundwater bodies: maintaining a good chemical and quantitative status;
3) For protected areas: achieving the environmental objectives provided by specific legislation;
4) No deterioration of surface and groundwater bodies status.

Programme of measures

For identification of the measures there were taken into account the results of the pressure/impact analysis and established environmental objectives, Activity Program of the Ministry of Environment and existing financial possibilities. The Programme of Measures also refers to the national legislation (the Water Law). In case of the Prut River Basin, the plan will be coordinated with Ukrainian part and partially with be adjusted with Romanian P (fig. 6 și 7).

The Programme of Measures includes “basic” and “supplementary” measures. "The basic measures" are minimum requirements that must be fulfilled (Water Framework Directive, /2000 /60/EC and other daughter directives which are harmonized in Republic of Moldova). "Supplementary" measures are those measures designed and implemented in addition to the basic measures in order to achieve objectives. Prioritization of measures has emerged from the economic importance of the measure and existing opportunities (tab. 3).

Economic analysis of water use

Section "Economic Analysis of Water Use" is developed in accordance with the WATECO Guidelines on the methodology of economic assessment of water use[1] for the implementation of the Water Framework Directive 2000/60 /EC, with River Basin Management Plans implemented in neighboring states, and the economic mechanism of use and protection of water resources applied in the Republic of Moldova. This section includes: 1) legal regulation of water use and protection; 2) water consumption trends and dynamics; 3) economic analysis of water supply, sewerage and wastewater treatment services; 4) economic mechanism for recovery of water use and protection costs.

[1]Guidance document no. 1. Economics and the Environment.– The Implementation Challenge of the Water Framework Directive. Luxembourg: Office for Official Publications of the European Communities, 2003.

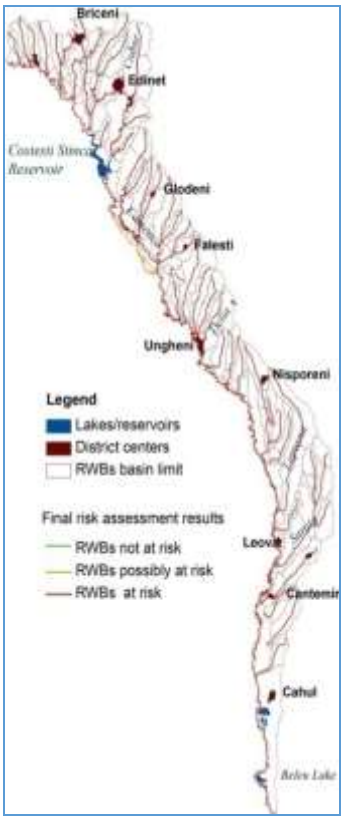
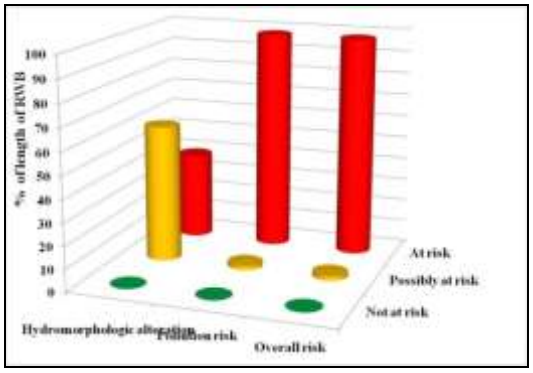


Table 3. Risk assessment results - Hydromophological alterations and pollution (Principle: One-Out-All-Out)

Type	Not at risk		Possible at risk		At risk	
	Number of RWBs	Total lengths, km	Number of RWBs	Total lengths, km	Number of RWBs	Total lengths, km
Hydromorphological alterations	-	-	57	1317	26	835
Percentage	-	-	69	61	31	39
Pollution impact	-	-	1	50	82	2102
Percentage	-	-	1	2	99	98
Overall impact	-	-	1	50	82	2102
Percentage	-	-	1	2	99	98



Figures 6 și 7. Risk assessment results

Table 4. Programme of Measures on the implementation of the Prut River Basin Management Plan (2017-2022)

No.	Measure	Priority class	Estimated cost, thousands MDL
Basic measures			
1	Improving the monitoring program for the surface water bodies	2	9000
2	Improving the monitoring program for the groundwater bodies	2	2300
3	Progressive reduction of pollution from point sources	1	685759
4	Extending and restoration of natural habitats	2	26 474
5	Sustainable use of water resources	1	-
6	Progressive reduction of pollution from diffuse sources	2	-
7	Improvement the population access to water and sanitation	1	738 567
Supplementary measures			
8	Flood risk management measures	1	317 300
9	Climate changes	1	1 050
	Total expenses		**1 780 450**

Introduction

The Republic of Moldova, as Associated country to EU, should harmonize the legislation in the field of water law according to the Water Framework Directive of the European Union (EU WFD). The main aim of the EU WFD consists of achieving and protecting the good status of all waters through prevention of deterioration and ensuring long-term sustainability. It provides an innovative approach for managing water resources based on the river basin approach taking into account the hydrological borders of catchment areas.

At the national level, adaptation and harmonization of the EU WFD is reflected in the Water Law of the Republic of Moldova that has been adopted on 26.10.2013. One of the objectives of the EU WFD and the Water Law of the Republic of Moldova is the development of River Basin Management Plans (RBMP).

This RBMP is developed for the Prut River Basin within the limits of the Republic of Moldova, for the implementation cycle 2016-2021. The RBMP includes general characteristics of the river basin, assessment of surface and ground waters status; delineation of surface water bodies (rivers and lakes) as well as groundwater bodies. As a key component of the RBMP, the analysis of the main pressures and impact on water bodies are presented. According to EU WFD three major types of pressures are distinguished: point source pollution; diffuse source pollution and hydro morphological alterations. The process of assessment of human pressures and their impact on the water bodies consisted of the following important stages:

- Identification of the main human activities and pressures;
- Identification of the significant pressures;
- Assessment of possible impacts;
- Identification of water bodies at risk due to the failure of environmental objectives.

Within the RBMP attention is paid to economic aspects and the related water users that may impact water resources in the Prut River Basin: industry (including hydropower and mining), water abstractions and waste water discharges, agriculture, transport, etc.

When setting up the environmental objectives are identified significant pressures as well as exemptions of achieving "good ecological and chemical status/potential" for the next cycle (2016-2021) in accordance with the WFD were taken into account. It was proposed that the environmental objectives to be achieved for all water bodies in future planning cycles starting from the first one which is till 2027 (2021-2027).

The Program of measures summarize to the progressive reduction of pollution from point and diffuse sources, recovery of costs for water consumption, sustainable use of water resources. Detailed economic analysis was performed for the identification of the current use of water resources and the Water and Sanitation Strategy 2014-2027 and other programs that refer to water resources.
For the development of an effective RBMP it is imperative to improve and to increase the awareness and common understanding of the politicians, competent authorities for water management, water users and population in general regarding EU WFD RBMPs though public consultations.

This RBMP for the Prut River Basin was prepared by the Institute of Ecology and Geography of the Academy of Sciences of Moldova under the consultancy assignment for the Development of the Prut River Basin Management Plan within the limits of the Republic of Moldova, which constitutes an activity within the EU-funded project: ***Environmental Protection of International River Basins Project*** (EPIRB). The assignment was commissioned by the Hulla&Co Human Dynamics KG, an implementing agent for the EPIRB project.

The main challenges that have been faced during the development of this RBMP were the lack or access to databases regarding volumes and quality of wastewater discharges, the lack of monitoring

data (quantitative, hydro morphological, ecological and hydro biological information) for all water bodies, delineation and mapping of protection areas for water abstractions points, poor collaboration and cooperation between national institutions involved in the management and monitoring of water resources, poor experience in the development of RBMPs and capacity regarding relevant water management experts.

This RBMP for the Prut River Basin is based on the requirement of the WFD and the regulated CIS guidelines for WFD implementation, guidelines and comments provided by EPIRB Project expert group: Guidance Document addressing hydro-morphological and physico-chemical parameters for a Pressure-Impact Analysis/Risk Assessment according to the EU WFD; Guidance Document addressing to Chemical Status of Surface Water Bodies for a Pressure-Impact Analysis/Risk Assessment according to the EU WFD; Review of the classification of physico-chemical quality elements in the Moldovan Prut River Basin for the year 2013; Definition of hydrological characteristics for conditions of the Republic of Moldova. CP D.01.05-2012. Code of practice in constructions. Hydraulic and land reclamation structures; Regulation on Environmental Quality requirements for surface waters (the Republic of Moldova Governmental Decision 890 of 12.11.2013); Methodology for assessing damage caused to environment as a result of violation of water laws (Ministry of Ecology, Constructions and Land Development of the Republic of Moldova, nr. 163 of 07.07.2003); Hygienic Regulation "Protection water basins against pollution" (Ministry of Health of the Republic of Moldova, nr. 06.6.3.23 of 03.07.1997); ICPDR Approach to implement the WFD throught the entire Danube river basin; Water Framework Directive[2];; New water law 272 from 2011; by laws; Moldavian Laws; Normative Acts and Strategies.

Primary sources of information for the development of this RBMP are: the initial report on analysis of Prut river basin (An analysis of the Prut river basin in the territories of Ukraine and the Republic of Moldova), report on the delineation, mapping and classification of water bodies (surface and groundwater), cartographic materials (ortophotoplans, maps of 1 : 50 000), statistical data collected from the National Bureau of Statistics (Statistical Yearbook of the Republic of Moldova (1990-2013)), the State Environmental Inspectorate (the State Ecological Inspectorate Yearbooks (2007-2013)), the State Hydro meteorological Service (monitoring data from yearbooks on water quality and quantities) and Agency "Moldova Waters" (Water Reports (Raportul 1 de Gospodărire a Apelor, Apele Moldovei)).

For the implementation of RBMPs in general, the Ministry of Environmental is responsable to develop action plans for each of its subdivisions. Thus, the Apele Moldovei Agency and SE ”Basin Water Management Authority” are assigned the responsibility for the management of surface water resources, and the management of groundwater resources is under the jurisdiction of the Agency for Geology and Mineral Resources. The implementation of the surface water monitoring is done by the State Hydrometeorological Service, and control over the sources of pollution - by the State Environmental Inspectorate of the Ministry of Environmental Protection, monitoring of water quality at drinking water abstraction, leisure and recreation areas are performed by the National Center for Public Health and local Public Health Centers for the Ministry of Health.

[2] WFD establish a legal framework to protect and enhance the status of aquatic ecosystems, prevent their deterioaration and ensure the long-term, sustainable use of water resources throught the EU.

1. General description of the Prut River Basin

1.1. Natural conditions

The Prut River is one of the largest rivers in Western Ukraine, Moldova and Romania and one of the main tributaries of the Danube River (fig. 1.1). The Prut River basin is transboundary and shared by three countries: Of the total basin area, 28% of the Prut River Basin is located in the territory of Moldova, 33% in the territory of Ukraine, and 39% in the territory of Romania. The Prut River originates on the south-western slope of the Hoverla mountain, at about 15 km south-south-east of Vorokhta village in the Chornogora massif of the Carpathian forest massifs, and discharges into the Danube River south of Giurgiulesti village, at about 164 km from the Danube mouth. The Prut River has a length of 967 km and a catchment area of 27.540 km^2.

The Prut River Basin has a broad spectrum of abiotic characteristics, due to its geological structure, geomorphological features and climate conditions. These features significantly determine the hydrological and hydro chemical characteristics of surface and groundwater in the Prut River basin. An important feature of the river is its mountainous hydrological origin which accounts for sufficiently large water contents and frequent floods, which present a real threat to all three countries sharing the Prut River Basin, not only regarding economic issues, but also regarding the lives of people.

Within the Prut River Basin in Moldova, there is a single Hydropower Plant (HPP) located near Costesti Town, 576 km downstream the Prut spring. It was built in collaboration with Romania in 1978 and commissioned in 1979. Costeşti-Stânca HPP was designed to control flood discharge and for electricity generation, as well as for water supply regarding agricultural irrigation and processing industry.

Within the limits of the Republic of Moldova, the Prut River has a length of 695 km and the catchment area size of 8.226 km^2. The basin's shape is a relatively narrow band, with a length of 340 km, a width up to 70 km and an average width of 51 km. The absolute maximum elevation of the basin is 429,5 m, and the minimum is 2,6 m.

Figure 1.1. The Prut River Basin

1.1.1. Climate and vegetation

The Prut River Basin is characterized by a moderately continental climate, with short, warm and snowless winters, long, hot summers, and low precipitation, which falls mostly as short heavy rainfalls during warmer months. In some years, heavy rainfalls cause significant flooding, and sometimes considerable damage to economy and populations. The variability of weather from year to year is significant. Therefore, arid conditions significantly impact the hydrological regime of rivers in the Prut basin.

The average annual precipitation in the Prut basin in Moldova is 524-636 mm. A minimum amount of precipitation is observed during the colder and a maximum during the warmer months of the year. Table 1.1. shows the average monthly and annual precipitations based on long-term observation at meteorological stations of the State Hydro meteorological Service.

Table 1.1. Monthly and annual average rainfall in the Prut River Basin

Meteorological stations	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Year
Briceni	34	35	30	49	68	83	92	63	52	33	42	38	618
Cornești	39	37	36	51	61	92	80	59	59	35	47	40	636
Leova	31	29	28	41	53	70	59	57	46	31	41	37	524
Cahul	32	33	31	39	54	76	58	56	47	31	40	38	535

The absolute daily maximum precipitation is quite high: e.g. 138 mm at the Cornesti meteorological station in 1969.

The Prut River basin belongs to the zone of insufficient humidity. Precipitations decrease from North to South and the spatial distribution of precipitations is significantly affected by the terrain. The wind direction is north-west and west, the highlands receive higher precipitations compared to downwind slopes. The regime of precipitation is highly irregular in time. In some years, the annual amount can be over 900 mm (in the northern and central parts of the basin), or less than 270–300 mm (in the southern part).

1.1.2. Geological structure and geomorphology

Geologically, the regional structure includes Archeozoic, Proterozoic, Paleozoic, Mesozoic and Cenozoic formations. Thus, the geological structure of the Prut river basin is comprised of a large variety of rocks with different physical and chemical properties. These have played a major role in the formation of the topographic characteristics of the basin in the current structure of the hydrographic network, and characteristics of ground waters.

The Prut River basin is situated in the Moldovan Plateau. The highest elevation is 429 m, the Codri heights, and 2,4 m minimum at the Prut mouth. Based on the absolute elevation, the basin can be divided into three topographic classes:

1. High elevation terrain: 250–300 m (up to 400–420 m. in Codri Hills and up to 300 m in North Moldavian Highland and Tigheci Hills);
2. Medium elevation terrain: 200–250 m (Middle Prut, Sarata Plains and Lower Prut Plains);
3. Low elevation terrain: 60 m or less (floodplains).

The morphology of river valleys in the basin is largely determined by the geological structure. Based on the aspects of the basin's morphology and morphometry, the river valleys are of two main types:

1. **Narrow valleys/gorges:** Typical of the Prut River tributaries in the Northern Moldavian Highland: Larga, Vilia, Racovat, Draghiste, Ciuhur, etc. These are entrenched into Neogene limestone in the zone of Toltry (or Medobory). These valleys have very steep slopes and transition into riverbed directly, forming numerous rapids and small waterfalls.

2. **Broad terraced floodplain valleys:** are predominant, including the Prut valley and the valleys of its tributaries from Codri heights in the middle of the basin to the Prut River mouth. The morphology and structure of these valleys are determined by the geological structure and terrain.

The most common among exogenous geodynamic processes are landslides, karsts, mudflows, gully, riverbed erosion and flooding. Most intensively landslide processes develop on valley slopes of Prut River tributaries within Codri heights, Tigheci heights and the Middle Prut Plains.

1.1.3. Surface waters

1.1.3.1. Rivers

The Prut River water resources

Prut River is the longest river of the Republic of Moldova (695 km length) and represents the main water source that can fully ensure water needs of the basin's population. The surface water resources of the Prut river are evaluated based on the database of monitoring network of State Hydro meteorological Service of Moldova. Only three hydrological stations are located along the Prut River in Moldova that provides continuous hydrological observation data for different periods: Sirauti (situated at the border with Ukraine), Ungheni and Costesti-Stinca Hydropower plant. The Ungheni hydrological station provides the most comprehensive data series covering 55 years. The relatively natural flow of the Prut River is monitored at Sirauti because in the upstream part is not modified by reservoirs. The hydrological station at Ungheni and Leova represent the Prut river flow modified by operation of Costesti-Stinca Hydropower plant.

The average annual flow volume of the Prut River is equal to 2,7 km^3, and varies from 1,2 km^3 in years with insufficient humidity up to 5 km^3, values achieved in the years with the heights insurance of water resources. The average annual flow is equal to 78 - 87 m^3/s, fluctuations are ranging from 40 up to 162 m^3/s (table 1.2. and fig. 1.2).

Table 1.2 The parameters of surface water in the Prut River, Moldova

Quantitative characteristics	Prut River water resources at stations				
	Sireuti	Costesti HPP	Ungheni	Leova	Prut mouth
Basin area, km^2	9230	11800	15200	23400	27540
Annual averages:					
Discharge, in m^3/s	77,7	83,0	86,7	90,8	93,7
Specific discharge, in $l/s*km^2$	8,42	7,03	5,71	3,88	3,40
Flow, in mm	266	222	180	122	107
Flow volume, km^3/y					
Average	2,45	2,62	2,74	2,78	2,96
25% availability	2,92	3,01	3,28	3,44	3,55
50% availability	2,35	2,54	2,63	2,75	2,84
75 % availability	1,86	2,04	2,05	2,15	2,22
95 % availability	1,30	1,47	1,37	1,43	1,48

The water resources of the Prut River have a heterogeneous monthly distribution. The months with the highest values of flow are April, May, June and July (fig. 1.3). The highest average flow is registered in June and is equal to 124-127 m^3/s, and the minimal flow, less than 60 m^3/s, is registered during winter months.

The Construction of the Costeşti-Stânca reservoir has altered the hydrological regime of the river Prut. The flow control, according to the operational rules, results in a redistribution of water resources. According to the intergovernmental arrangement between Romania and the Republic of Moldova, the minimum flow (ecological flow) downstream the reservoir should not be less than 25 m^3/s. Particularly in the lower course of the river Prut, in dry years the volume of the river flow can be

below the ecological flow, thus affecting the hydrological regime of the floodplain lakes and ecological state of the scientific reserve "Lower Prut" as well.

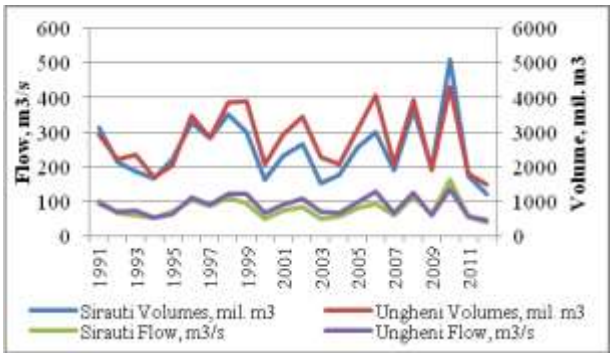


Figure 1.2. Discharge of the Prut River at Sirauti and Ungheni posts

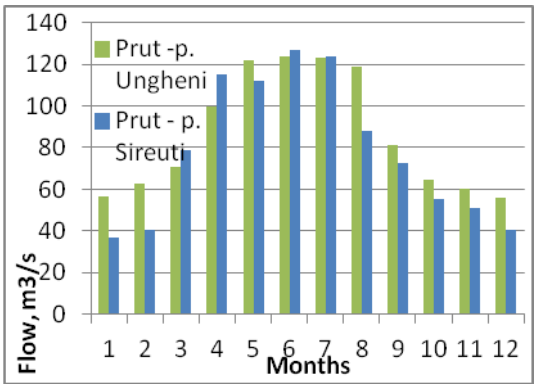


Figure 1.3. The monthly distribution of average discharge (m3/s)

Source: State Hydro meteorological Service

The knowledge of water resources on tributaries of the Prut River within the limits of the Republic of Moldova is insufficient due to the lack of monitoring data. Relatively comprehensive data exists only for six tributaries.

Multiannual average flow of Prut river´s tributaries are ranging from 1.21 m^3/s (Girla Mare) to 2,64 m^3/s (Kamenka). The largest volume of water is characteristic for the river Kamenka, exceeding 83.38 million. m^3, and the lowest - 10 mln. m^3 - for Girla Mare.

Table 1.3 shows the estimated values for the main tributaries of the Prut within the territory of Moldova.

Table 1.3. Water resources of the main tributaries of the Prut River (in the limits of Moldova)

Tributary	Length, km	Catchment area, km^2	Specific discharge, $l/s/km^2$	Annual flow volume, mil. m^3
Vilia	50	298	2,3	21,40
Lopatnic	57	265	2,3	16,00
Racovaț	67	795	2,3	57,40
Draghiste	70,7	279	2,04	17,97
Ciuhur	90	724	1,93	60,86
Camenca	93	1230	2,64	83,38
Caldarusa	40	318	1,87	58,93
Glodianca	30	147	1,3	41,00
Girla Mare	40	285	1,21	10,72
Delia	30	219	1,62	51,08
Nyrnova	49	358	1,66	18,79
Lapusna	70	483	1.64	24,91
Sărata	59	716	1,2	27,12
Tigheci	43	205	1,8	11,67
Larga (2)	33	150	1,8	8,5

Floods

The Prut River Basin is located in the area of the Ukrainian Carpathians and Sub Carpathians, where the atmospheric circulation causes heavy rains with daily amounts of 200–300 mm. As a consequence, these processes create conditions for catastrophic floods which cause inundation of large areas. Maximum flow of the Prut river can reach 4000–5000 m^3/s. Catastrophic floods were registered in

1959, 1965, 1969, 1970, 1971, 1975, 1991, 1996, 1998, 2008, and 2010. Particularly intense flooding occurred in 2010 on the Prut River which caused damage worth 84.2 million Lei.

For the mitigation of this natural disaster the Costeşti-Stânca reservoir was built. Having a total volume of 678 mil. cub. m, it allows to evacuate a 4 times smaller flow in comparison with inflow and to reduce the consequences of the flood wave. Figure 1.4 shows the positive effect of Costeşti-Stânca reservoir by decreasing the peak annual discharge measured at Sireuti post which can range from 4000 m3/s to 500-750 m3/s.

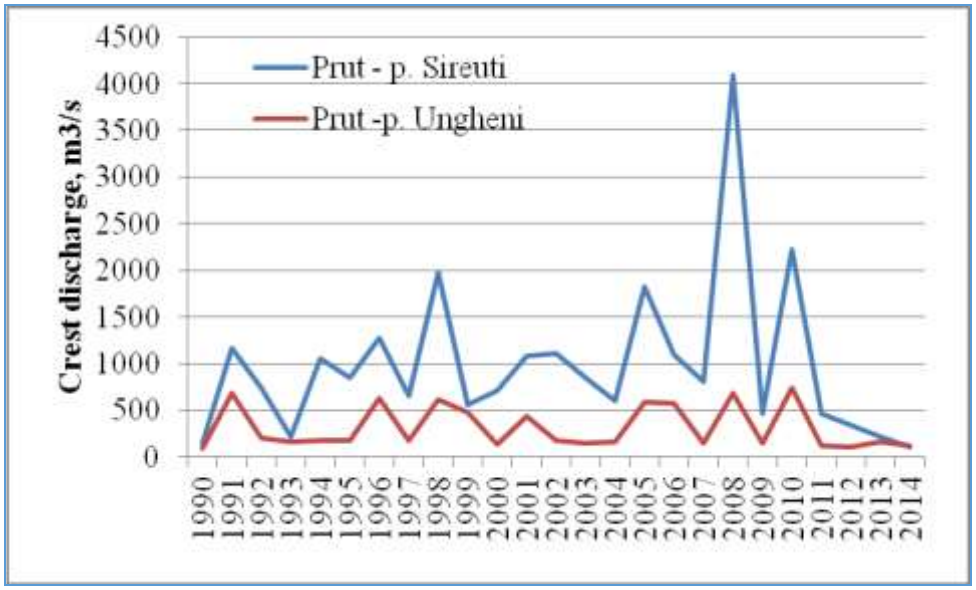


Figure 1.4. Peak annual discharge of the Prut River

Source: State Hydro meteorological Service

Flooding in the lower section of the Prut can also be related to high water levels of the Danube, which locks the Prut flow and causes a backwater effect. For example, on 7 July 2010, during the flooding of large areas downstream of the Prut River, the maximum level of the Danube at Galati was 581 cm, exceeding the record high (26 April 2006). Studies show that in the past 30–40 years the frequency of extreme flood events has doubled compared to the previous 100-year period.

1.1.3.2. Lakes and reservoirs

Lakes are located primarily in the lowland of Prut River valley. Typically they have a small surface area, shallow in depth, and are often covered with marsh and hydrophytic vegetation. Only two of these lakes have surface areas larger than 2 km^2. By origin, they are two types: floodplain lakes and dammed lakes.

Floodplain lakes: Their characteristics (area, depth, hydrologic regime, etc.) are largely determined by the regime of lower Prut River and the Danube River. The largest Prut floodplain lake is Beleu Lake, which is located in the lower part of the Prut River Basin between the villages of Valeni and Slobozia Mare.

Dammed lakes have formed as a result from landslide processes. They do not exceed the size of a few hectares in area and 1,0–1,5 m in depth. These are found in the landscape reserve "Suta de Movile."

Artificial lakes have been created to meet different economic needs (fisheries, irrigation, power generation, recreation, etc.), as well as to regulate the river flow and control floods. About 1.350 artificial lakes are located in the Prut basin, with an overall combined area of 75,3 km^2. They can be grouped into two conventional categories: ponds (volume of less 1 mil. m^3) and reservoirs (volume of over 1 mil. m^3).

Reservoirs include artificial lakes with useful water volume of over 1 mil. m^3. 46 reservoirs are located in the Prut basin, with a total (projected) volume of about 825,52 mil. m^3. Costesti-Stanca Reservoir is the largest reservoir on the Prut River. The estimates show that, in the time of their operation, due to siltation, the combined volume of reservoirs has decreased by an average of 0,50% per year, and the volume of Costesti-Stanca Reservoir – by 0,58% per year, making its effective volume in 2011 approximately equal to 594,4 mil. m^3.

1.1.4. Groundwaters

The Prut River basin occupies 24% of the territory of Moldova, and holds about 12% of the entire country's groundwater resources. The groundwater resources constitutes 137,38 mil. m^3/y, 50,61 mil. m^3/y are used for different purposes: household and drinking water – 39,84 mil. m^3/y (78,32%), technical water – 10,16 mil. m^3/y (20,09%), and therapeutic, resort and recreational water – 0,71 mil. m^3/y (1,58%) (Annex 1.1).

The Badenian-Sarmatian aquifer is the richest aquifer in the Prut basin in Moldova and the most important one for centralized water supply. In the northern part of the pilot basin, the main productive aquifer is Cretaceous-Silurian, which accounts for approximately 39% of all drinking water reserves of the area. The upper Sarmatian and Holocene alluvial aquifers account for about 30% of all water reserves of the area. In the southern part of the basin the most productive are Pontian and Middle Sarmatian aquifers.

There are over 500 abstraction points and wells for groundwater in the Prut basin in Moldova. Of these, 330 are used for drinking water supply. In some cities groundwater is an exclusive source of drinking water supply. In Edinet District 100% of drinking water supply comes from groundwater wells (71 wells), in Briceni District – 96,49% of all used water is pumped from 55 groundwater wells, in Cahul District 93% of all centralized water supply is abstracted from 97 production wells (tab.1.4).

Some aquifers in the basin (i.e. Pliocene) are hydraulically connected with overlying aquifers; others have limited groundwater resources and only local importance.

Table 1.4. Hydrogeological groundwater wells by district, Prut River basin, Moldova

Administrative district	Hydrogeological wells			
	% of all available wells	Number	Operational	Used for drinking water
Briceni	100	93	57	55
Cantemir	100	63	44	18
Cahul	100	156	104	97
Edinet	100	137	71	71
Falesti	95	116	43	17
Glodeni	100	75	22	0
Hincesti	60-65	88	47	28
Leova	95	102	26	5
Nisporeni	100	40	22	1
Ocnita	50	36	9	9
Riscani	50	80	22	18
Ungheni	80-90	105	36	11
TOTAL	-	1091	503	330

Source: SEI, Annual Report, Chisinau, 2010

1.2. Delineation of water bodies

1.2.1. Delineation of surface water bodies

All surface waters (rivers, canals, lakes, reservoirs and ponds) are national propriety of the Republic of Moldova. The Water Law No. 272 of 23.12.2011, Article 5: *The management of water resources* instigates that the river basin district shall be the principal unit for the management of river basins (fig.1.5) and their associated ground waters. The river basin districts of the Republic of Moldova are:

i) the Dniester River Basin District; ii) the Danube-Prut and the Black Sea River Basin District (fig. 1.6).

For the purpose of assessing the ecological status of surface water, planning and implementation of program of measures, rivers and lakes have been divided into discrete types of surface water bodies (WBs). According to the WFD 'Body of surface water' means a discrete and significant element of surface water such as a lake, a reservoir, a stream, river or canal, part of a stream, river or canal, a transitional water or a stretch of coastal water (EU WFD, Art.2).

The process of delineation of surface water bodies of the Prut River Basin consists of several steps. The delineation was based on types of water bodies. The method used for the WBs delineation aims identification of the location and boundaries of surface water bodies according to the initial characterization in accordance with the methodology described below:

- The surface WBs within the river basin/sub-basin were identified as falling within either one of the following surface water categories - rivers, lakes, or as heavily modified surface water bodies.
- Each surface WB within the river basin/sub-basin has been allocated to the relevant ecoregions in accordance with the geographical areas. The Prut River Basin belongs to ecoregions 12 and 16 (the Eastern plains and the Pontic province).
- Then, each surface water category, the relevant surface WB within the river basin/sub-basin was assigned to surface water types. These types have been defined using the system A of the WFD (Annex 1.2).

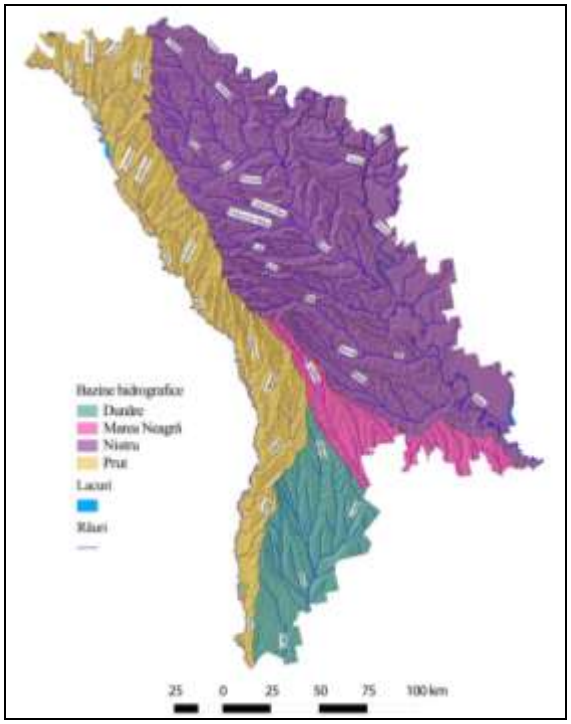


Figure 1.5. River basin of the Republic of Moldova

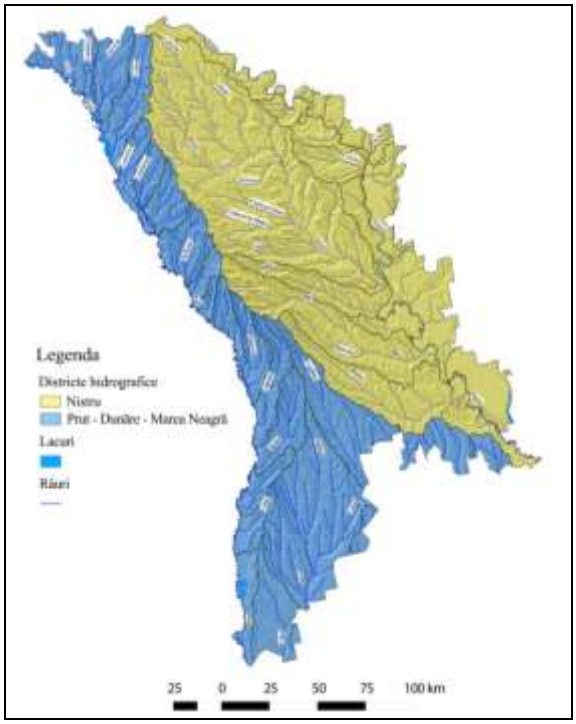


Figure 1.6. River basin districts of the Republic of Moldova

83 river water bodies have been delineated in the Prut River Basin with a total length of 2.152 km (fig. 1.7, 1.8). The average length of RWBs is 26 km and only 1 RWB has a length over 100km. The average RWBs basin area is 99 km^2, 55 RWBs basins have an area less than 100 km^2 (tab. 1.5).
7 lake water bodies were delineated in the MD part of the Prut River Basin (tab.1.6). One of them (ponds of the Cahul fish farm) has been identified as an artificial water body.

Table 1.5. General information on Rivers water bodies

Number of water bodies	RWBs – 83
Average length of river water bodies	26 km
Average basin area of river water bodies	99 km^2
Number of Heavily Modified Water Bodies	63

Table 1.6. The parameters of the lake water bodies

Lake	Position	Genesis	Type	Area Sq.km.	Depth m	Code
Costesti-Stinca	Riverbed	HMWB	Reservoir	42.56	>15	MDHMWB020101
Badelnic	Floodplain	Natural	Lake	1.443	3-15	MDN020104
Dracele	Floodplain	Natural	Lake	2.774	3-15	MDN020103
Rotunda	Floodplain	Natural	Lake	2.329	3-15	MDN020102
Beleu	Floodplain	Natural	Lake	8.538	3-15	MDN020101
Prut nameless	Floodplain	Natural	Lake	0.986	3-15	MDN020106
Cahul fish farm	Floodplain	Artificial	Reservoir	12.597	3-15	MDAWB020104

Surface water bodies are classified into water bodies in natural conditions, Heavily Modified and artificial water bodies. The delineation of surface water bodies and heavily modified water bodies (HMWBs) is based on several guidelines and an agreed methodology, 63 of them have been identified as HMWBs.

For the coding of the delineated water bodies the international hydrological coding system was used (Zavoianu *et al*, 2009), which ranks the streams based on a hierarchy of the tributaries. Each delineated water body in the Prut River Basin has obtained an unique code using the format given in the Annex 1.3.

1.2.2. Delineation of groundwater bodies

According to the EU WFD, *body of groundwater* means "a distinct volume of groundwater within an aquifer or aquifers" (Article 2.12). Thus, the first step in the procedure of identifying groundwater bodies is to analyze groundwater aquifers or some of their parts, which are characterized with significant flow of groundwater and/or significant volume of abstraction.

As follows from EU WFD (Article 2.27), *significant flow of groundwater* is "one that, were it from reaching an associated surface water body or a directly dependent terrestrial ecosystem, would result in a significant diminution in the ecological or chemical quality of that surface water body or significant damage to the directly dependent terrestrial ecosystems".

The EU WFD (Article 7) requires the identification of all groundwater bodies, which are used, or planned to be used in future, for the abstraction of over 10 m^3/d of drinking water on average. For purposes of water body identification, this volume of abstraction qualifies as *significant quantity of groundwater*. Geological layers, which allow the abstraction of such quantity of groundwater (even only locally), qualify as aquifers (EU WFD Article 2.11). Almost all aquifers, which hold fresh groundwater, can generate over 10 m^3/d, and should be analyzed for groundwater body delineation.

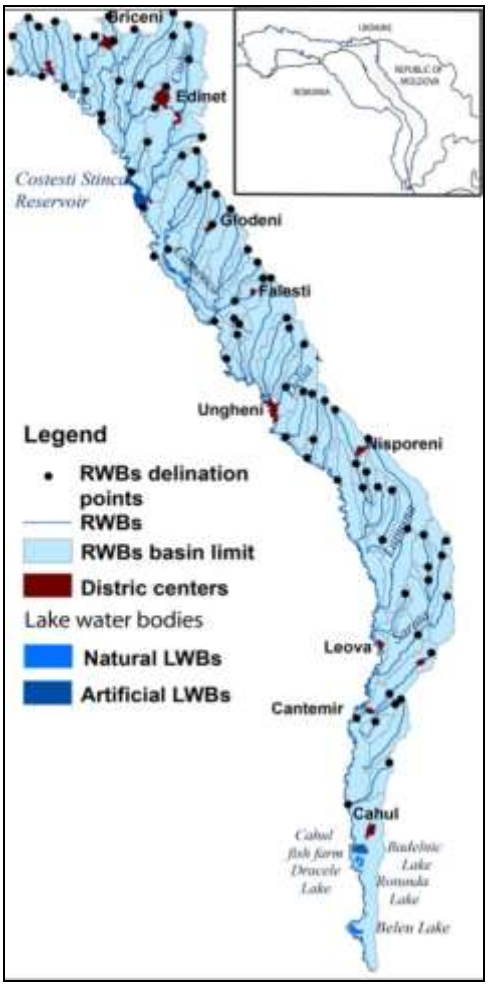


Figure 1.7. Surface water bodies in the Prut River basin of Moldova

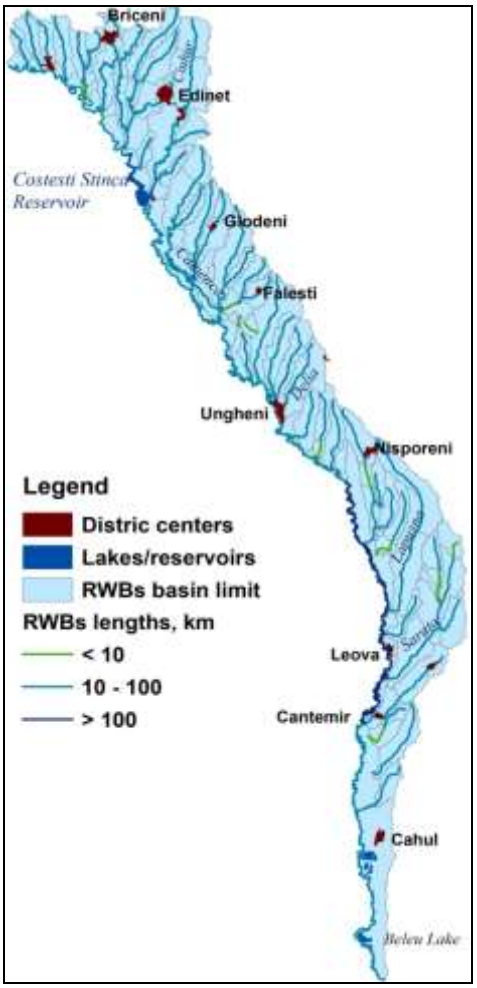


Figure 1.8. Distribution of river water bodies by length (km).

The following WFD recommendations were observed in the process of GWB identification in Prut river basins:

- different aquifer types (porous, fractured) within the hydrogeological map – distinguished;
- geological boundaries of target aquifers – defined;
- hydrodynamic differences of target aquifers – analyzed;
- hydro chemical variety of target aquifers – evaluated;
- groundwater abstraction (>10 m^3/d) – checked and defined;
- groundwater systems, which consists of several layers of shallow aquifers with similar hydrodynamic and hydro chemical status – defined as a single water body classification;
- artesian hydrogeological units with similar chemical and quantitative status – identified as a groundwater body;
- GWB lower boundary – determined based on the depth from which it is realistic (not disproportionately expensive) to abstract water;
- subdivision of aquifers into unmanageable number of water bodies – small groundwater bodies with low practical use were grouped with the main aquifers (Figure 1.9);

- temporary groundwater body codes – assigned: G-Q100, G-300, etc., where *G* designates "groundwater," *Q* – Quaternary, and *100, 200*, etc. is a three-digit number of the groundwater body; should later a subdivision of GWB be necessary into smaller management units, new units will be numbered 101, 102, 103, etc.
- River Basin Districts – all preliminary identified groundwater bodies have been assigned to Dnieper and Prut River Basin Districts.

Six main aquifers have been analyzed for identification and delineation of groundwater bodies:

1. Holocene alluvial
2. Pontian
3. Upper Sarmatian Meotian
4. Middle Sarmatian (Congerian)
5. Badenian-Sarmatian
6. Cretaceous-Silurian.

The main groundwater bodies characteristics are presented in Annex 1.4. The Middle Sarmatian represents transboundary water body, shared by the Republic of Moldova, Romania and Ukraine.

Classification of Moldavian groundwater bodies has not been straightforward and contains some uncertainties. The WFD indicates that the presence of an anthropogenically induced intrusion in a groundwater body will result in it being at poor status. However, measuring the extent of an anthropogenic intrusion is complex, as some groundwater bodies have naturally elevated levels of salinity due to the geochemistry of the aquifer. This is the case with Moldavian groundwater. Natural background concentrations of salinity indices (Cl, SO_4, Na, TDS, etc.) are quite high, because of marine origin of water bearing sediments, which still contain saline waters in their pores. The present number of monitoring wells (33 observation wells) is sufficient for the assessment of groundwater status, but number of chemical analyses carried out is insufficient.

Analysis of groundwater body status in the Prut pilot basin in Moldova has been conducted using data from the River Basin Analysis and groundwater body delineation reports, data on groundwater monitoring of 2005-2010 provided by the Agency for Geology and Mineral Resources, 2013 JFS results. Results of analyses are presented in the JFS report. At the same time, GWB in the Prut River Basin are assigned to good quantitative and chemical status.

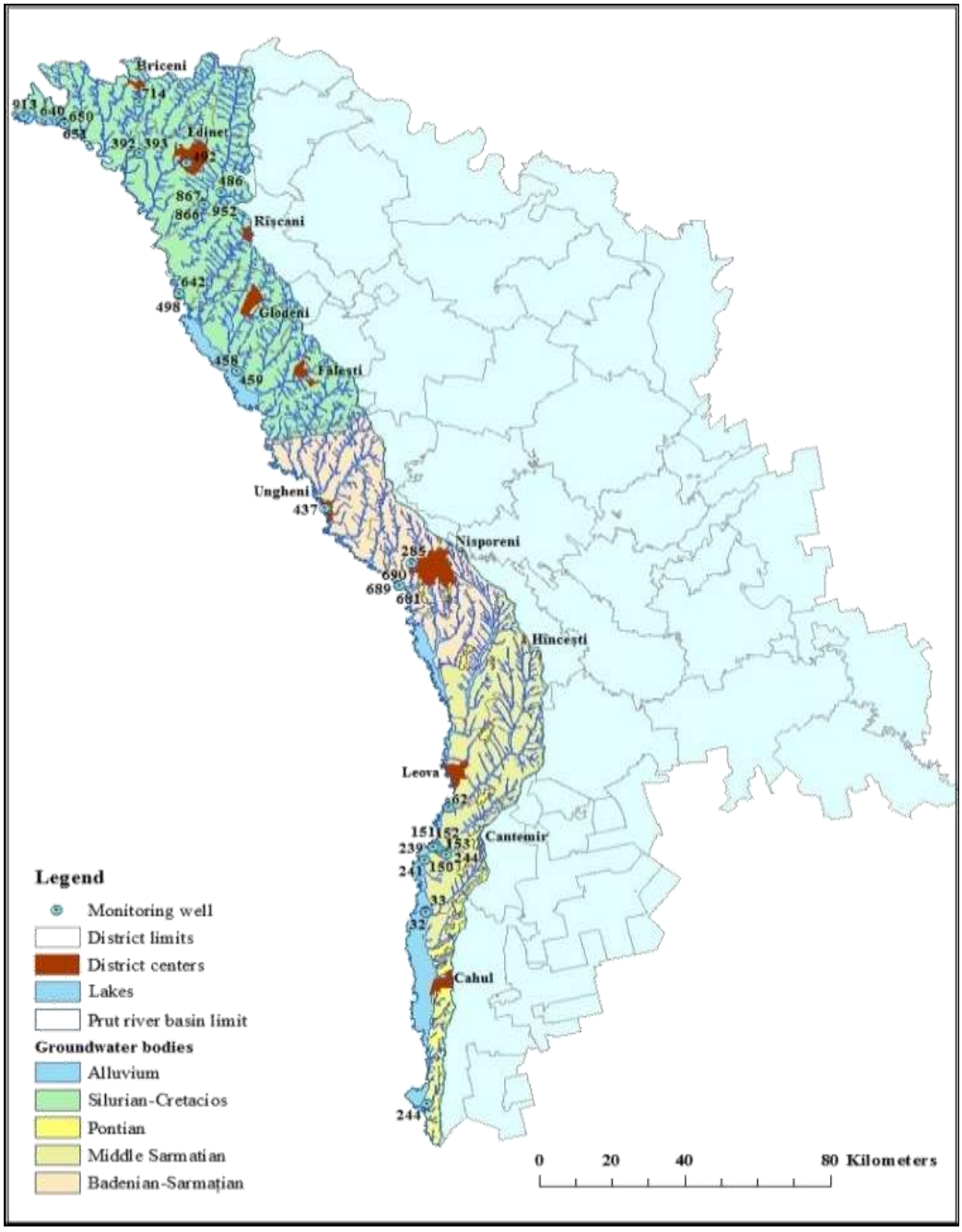


Figure 1.9. Groundwater bodies and monitoring wells with in the Prut River Basin

2. Identification of significant pressures and impacts

The necessity to analyze the anthropic pressures and their impact is provided in Article 5 of the EU Water Framework Directive, article that states: *Each Member State should ensure a review of the impact of human activity on the status of surface and groundwater for every district of the hydrographic basin or for any portion of an international river basin, which is on its territory*.
This assessment process of human pressures and their impact on the water bodies lead to the identification of those water bodies, which risks not to achieve the WFD objectives, regarding the following important stages (fig. 1):

- Identification of activities and pressures;
- Identification of significant pressures;
- Impact assessment;
- Risk assessment of failure to the environmental objectives.

The assessment of human pressures and impacts on water bodies was performed with the aim to identify those water bodies at risks for failing the EU WFD environmental objectives. The process included the following important stages: identification of water uses and related pressures and risk assessment of possible failure of the environmental objectives.

The DPSIR concept (Driver-Pressure-State-Impact-Response) has been used as an analytical basis to undertake the pressure and impact assessment. In this context, it was necessary to use information about water uses and possible impacts on water status of the water body. On this basis, it has been selected as a quality improvement (basic measures to be taken to improve the condition of the water body).

The following groups of pressures have been considered for the risk assessment:

- Organic polution;
- Nutrients pollution;
- Hazardous substances pollution;
- Hydromorphological alterations.

The impact assessment of human pressures is based on comparing the state of water body and environmental objectives related to the examined water body, when monitoring data are available.

If at the level of water body the monitoring sections are not present, in this case the monitoring data of another monitoring station located on another water body from the upstream or downstream can be considered for the assessment with the condition that it represents the same typology and the same categories of human pressures.

Methodological principles were applied with the aim of achieving ecological and chemical status corresponding to the 2021 year, taking into account the baseline scenario (implementation of basic measures until 2020 for human activities which causes significant pressure). Water bodies which are under the significant pressures and /or impacts and for that do not implement the necessary measures for achieving the objectives until 2021 are identified as being at risk.

The principle for identification of water bodies at risk of failing the environmental objectives is the principle One-Out-All-Out (described in Guidance Document addressing hydromorphology and physico-chemistry for a Pressure-Impact Analysis/Risk Assessment according to the EU WFD).

Estimation of water bodies at risk was made by attributing to each water body the type of risk (not at risk, possibly at risk, at risk) and respective color: green, orange, and red (tab. 2.1). The same approach was used when creating the maps for this RBMP.

Table 2.1. Types of risk

Risk	Color and value
Not at risk	1
Possibly at risk	2
At risk	3

2.1. Types of pressures

2.1.1. Population and demography

798.700 inhabitants live in the Prut River basin, which is 22.4% of the total population of the Republic of Moldova. The basin is characterized as atypical agrarian region where the share of rural population is 74% of the total number. Over the last 20 years, the population in the region has decreased by approximately 50,000 people.

From the point of view of the territorial-administrative structure, the basin area (within the Republic of Moldova) includes 253 communities allocated to 12 districts. The number of settlements within the basin is 447 villages and 15 towns.

Due to the small size of RWBs catchments and high number of population, the pollution pressure on small rivers is high. The share of settlements area is higher in the northern part of the Prut River (over 10% of RWBs catchments) and is lower in the center and in the south (fig. 2.2.). Population density remains to be high in the RWBs catchments where the district centers and towns are present (fig. 2.3, 2.4). Within the water bodies (basins) with a higher population density a more intense pollution of water resources is recorded, especially from individual households, unauthorized dumps, untreated wastewater discharges, etc.

Most towns (except for Lipcani, Cupcini, Costesti, Cornesti and Iargara) are district centers. As for the number of population, the small and medium-size towns (at the national scale) are predominant. The urban population ranges between 2500 (Costesti) to 41100 (Cahul). On the average, the number of population in towns equals to 13700 inhabitants. This may be classified into 4 groups (Table 2.2). Consequently, a greater part of the urban population is concentrated in the towns having no more than 10000 inhabitants, absolutely all of these being district centers. The population of these towns has remained constant over the last 20 years (fig. 2.1).

Table 2.2. Classification of towns by the number of population, as of 01.01.2009

Nr.	Number of population	Number and names of towns	Total population and percentage
1.	< 5 000	3 – Costesti, Cornesti and Iargara	10100 (5.1%)
2.	5000 – 10000	5 – Lipcani, Briceni, Ocnita, Cupcini and Cantemir	383000 (19.3%)
3.	10000 – 20000	5 – Edinet, Glodeni, Falesti, Nisporeni and Leova	72300 (36.5%)
4.	> 20000	2 – Ungheni and Cahul	773000 (39.1%)

Source: Statistical yearbook of the R. Moldova, 2013

Over the last 20 years, the urban population has decreased by about 22500 due to economic crisis and migration (fig. 2.1).

The number of rural population is 593000 inhabitants. It is concentrated in 432 villages. The size of the villages varies from 1 person (nearly abandoned villages) (Chetrisul Nou, Falesti District) to 10500 people (Carpineni, Hincesti District). The average size of a village is 1372 inhabitants that is nearly 10 times less than an average town.

Within the basin, the birth rate is 8.9% and this percentage is stable since 2003.

Based on the primary demographic indicators, it is an easy matter to suppose that the number of population in the basin tends to decrease in the near future. The low level of economic development contributes to the outflow of working-age population. In this context, it is believed that the pressure of human factor on the natural resources will be slightly lowered that is likely to lead to certain environmental improvements.

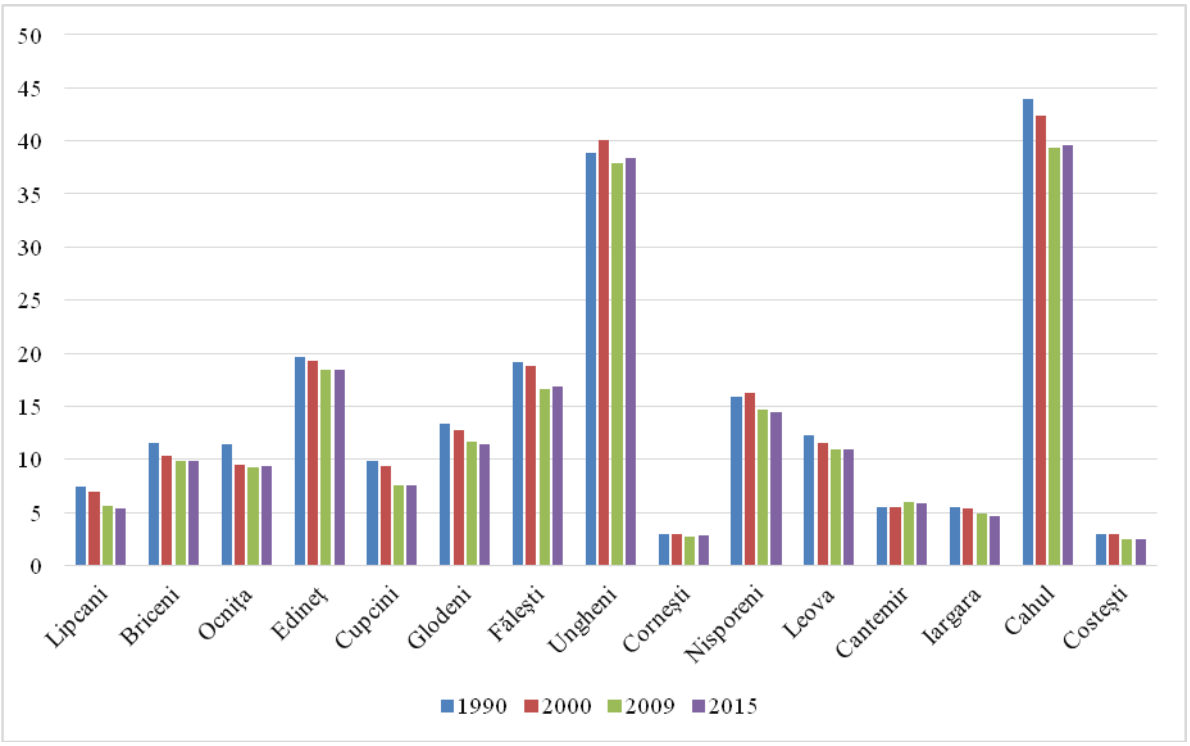


Figure 2.1. Dynamics of urban population in the Prut River Basin (thousand people)

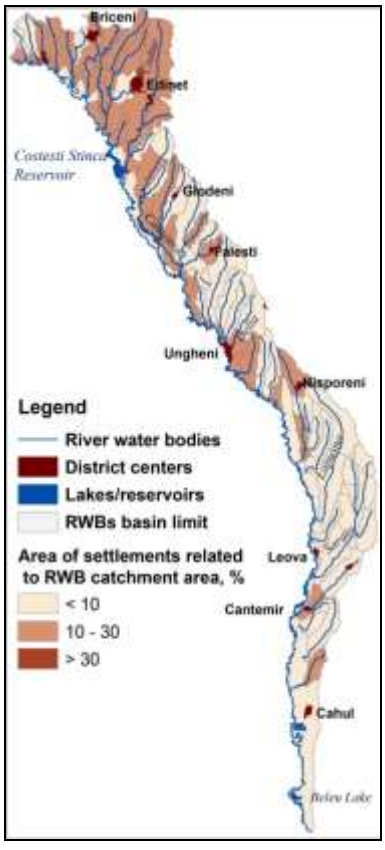


Figure 2.2. Surface of settlments in RWB catchment area

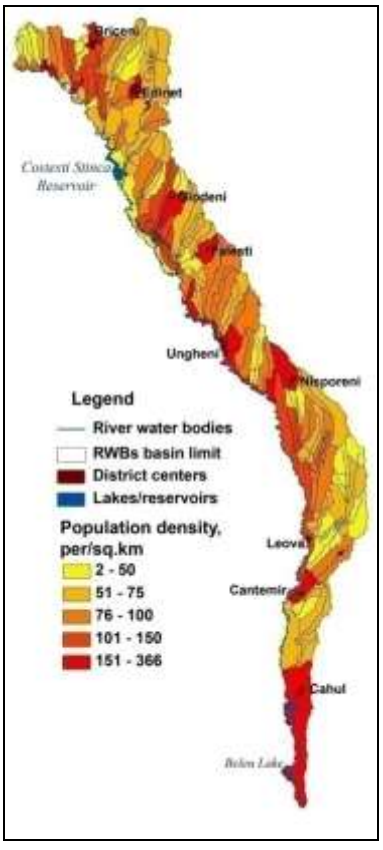


Figure 2.3. Population's density in RWB catchment

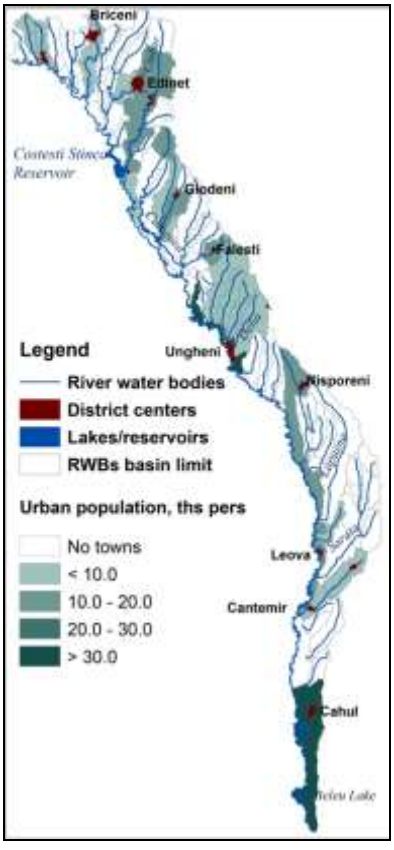


Figure 2.4. Urban population in RWB catchment

2.1.2. Point source pollution

2.1.2.1. Wastewater discharge

Water status is influenced by the discharge of untreated or insufficiently treated wastewater. The main sources of wastewater discharge are the big cities in the basin. The last 20 years marked a steady decline in the volume of wastewater disposal by more than 9 times (fig. 2.5), from 97 mil. Cub. M in 1990 to 10,2 mil. cub. m in 2013. The decrease of wastewater discharge is determined by the reduction of water consumption, as a result of the economic crisis and, respectively, decrease the quantity of water used for irrigation and industry. The volume of wastewaters is influenced by the number of urban population (fig. 2.6). Only the towns have sewage systems which are more or less monitored and can give an idea about the impact of wastewater on water resources.

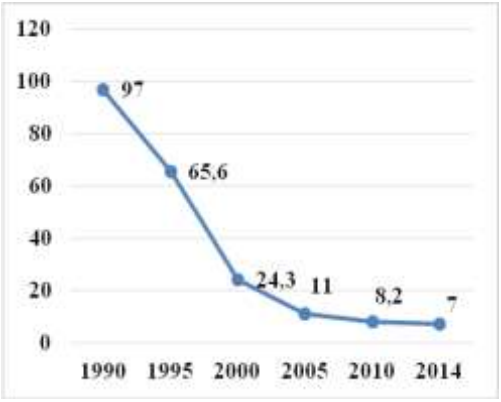


Figure 2.5. The dynamics of total wastewater discharge in the basin of the river Prut (1990-2014)

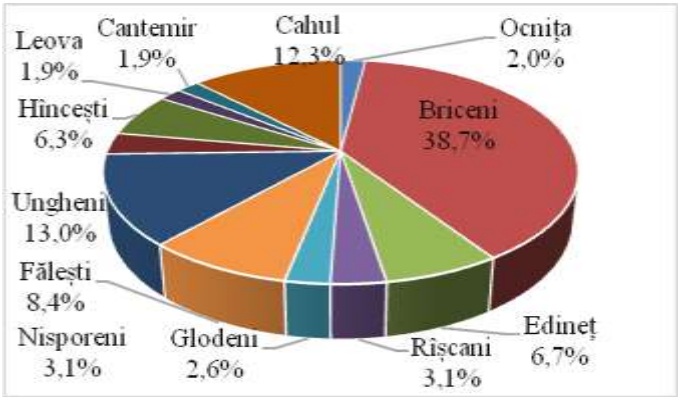


Figure 2.6. Total wastewater discharge in 2014, thousands m^3 by administrative districts

Source: Yearbook of State Ecological Inspectorate

The quality of waste water has decreased significantly as a result of inadequate operation of treatment plants due to their technological outdate and decreasing capacity for water treatment. Despite of the reduction in the volume of insufficiently treated wastewater by 4 times it remains high (tab.2.3), thus average volume over the last 4 years was 1.5 mil. cub. m per year. For the whole period the share of conditionally treated waste water was an average of 60%, and the share of treated waters was about 15%.

In most cases, insufficiently treated and untreated wastewater is discharged by the cattle breeding farms; many of them are located in the buffer strips alongside rivers. The discharge of the untreated municipal waste waters remains a key issue. In some cases, water pipelines are built without construction of sewage facilities and sewage treatment plants.

Table 2.3. Wastewater discharge structure

	1990	1995	2000	2005	2010	2014
Total volume of wastewater, mil. cub. m	97	65.6	24.3	11	8.2	7
Untreated, mil. cub. m	0.5	0.3	0.1	0	0	0
Insufficiently treated, mil. cub. m	5.2	1.8	2	1.1	1.4	1.46
Conditionally treated, mil. cub. m	66.9	47.3	15.5	6.1	3.8	2.62
Treated, mil. cub. m	17.3	12.7	3.7	2.1	1.4	1.31
Wastewater discharge into artificial or specially equipped reservoirs, mil. cub. m	7.3	3.5	3	1.6	1.6	1.61

Source: Yearbook of State Ecological Inspectorate

The volume of discharged wastewater mostly reflects the volume of water consumption. In fact, this depends on the demographic characteristics of territorial entities (Ungheni and Cahul) and the presence of large industrial enterprises (e.g. sugar factories from Glodeni, Falesti and others).

Wastewater treatment plants and their adequate functioning operation are very important for the protection and water status of water courses. The effectiveness of wastewater treatment plants is monitored by the environmental laboratories of the State Ecological Inspectorate of Moldova and the Center for Public Health. About 40% of the existing sewage treatment plants have project

documentation. Some of them operate according to the regulatory standards (Glodeni, Edineț districts); others provide an insufficient treatment of the wastewater (Leova, Cahul, Hîncesti districts) or do not operate at all (Ungheni). Discharge of untreated or insufficiently treated wastewater into the water bodies of the Prut river basin provides a substantial impact on the water resources.

It should also be mentioned that the sewage treatment plant of the sugar processing factory in Glodeni town was the only one in 2011 to comply with the requirements provided under the special water permit, which is issued by the State Ecological Inspectorate of Moldova for a period of 3 years.

2.1.2.2. Estimation of point source pollution impact

The pressure of total possible untreated water and of total discharged wastewater was calculated based on the recommendation from the EPIRB Project Guidance Document addressing hydro morphological and physio-chemical composition for a Pressure-Impact Analysis/Risk Assessment according to the EU WFD.

Main point sources of pollution were assessed using the following indicators:

- Total possible untreated water discharge;
- Total discharged wastewater.

Total possible untreated water discharge (Dww) was calculated as a fraction of the total number of inhabitants of the RWB catchments and the minimum flow of RWB. The assessment of mean and minimum annual flow of the RWBs was made based upon 2 approaches:

- Mean and minimum annual flow was attributed to RWBs based on measurements data from measurements of river flow made by SHS, JFS 2013, PRBAR;
- Mean annual and minimum annual flows were calculated for RWBs where is a lack of information based on approaches from *Definition of hydrological characteristics for conditions of the Republic of Moldova. CP D.01.05-2012. Code of practice in constructions. Hydraulic and land reclamation structures.*

Average minimum flow for small RWBs is 0.12 m^3/s and for Prut river is 31.8 m^3/s. Taking in consideration a big number of population in the Prut River Basin and low minimum flow, Dww value is extremely high for small RWBs. As it can be seen in Figure 2.7, the pressure of total wastewater is higher on small RWBs and is characteristic for basins where the district centers are present (Edinet, Falesti, Cantemir.). The assessment of specific wastewater discharges that flow directly from districts directly into the Prut River showed also a high value of Dww except for Cahul district, and are moderate for Ungheni district.

Taking into account that in the Prut River Basin are living a high number of population and low minimum flow, 68 of water bodies are *at risk* to fail the environmental objectives. On the other hand, 14 of the water bodies which correspond to the Prut River do not show any pressures and are *not at risk* (tab. 2.4, fig. 2.7).

Table 2.4. The number of RWBs that have been assessed at risk, possibly at risk and not at risk within the Prut River basin estimation of point source pollution impact.
Pressure: The total possible untreated water discharge (Dww)

Risk type	Not at risk	Possibly at risk	At risk
Number of RWBs	14	1	68
Percentage, %	17	1	82
Total lengths, km	519	78	1556
Percentage, %	24	4	72

The impact of total discharged wastewater was calculated as a fraction of sum of all upstream wastewater discharges into the river and mean annual flow of the river. The highest volumes of untreated wastewater are derived by the towns which have water supply but do not have sewage systems and wastewater treatment plants. Regarding this type of pressure, most of water bodies are *not*

at risk to fail the environmental objectives. Only one water body has been assessed to be *at risk*. The WB is located near Edinet Town (tab. 2.5, fig. 2.8).

Table 2.5. The number of RWBs that have been assessed at risk, possibly at risk and not at risk within the Prut River basin estimation of point source pollution impact. Pressure: The total quantity of discharged wastewater (Sww)

Risk type	Not at risk	Possibly at risk/No data	At risk
Number of RWBs	42	4/36	1
Percentage, %	51	5/43	1
Total lengths, km	1343	71/727	10
Percentage, %	62	3/34	0.5

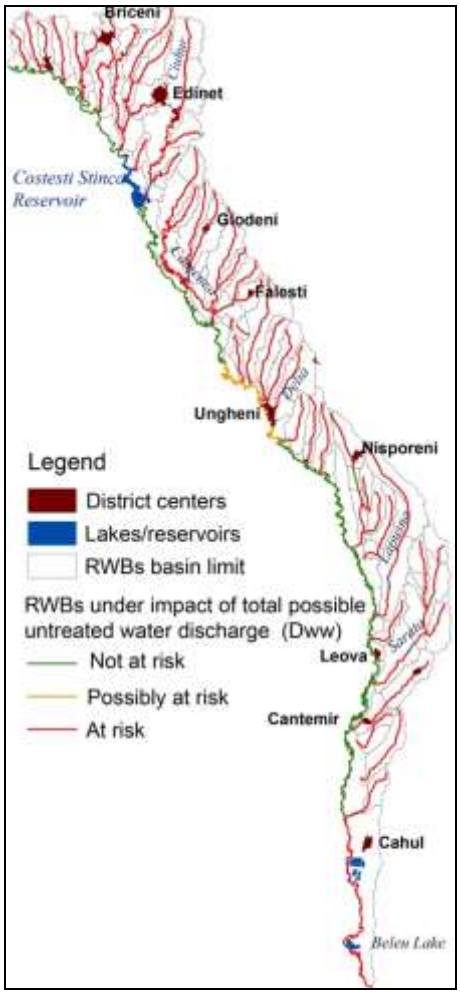


Figure 2.7. RWBs under impact of total possible untreated water discharge

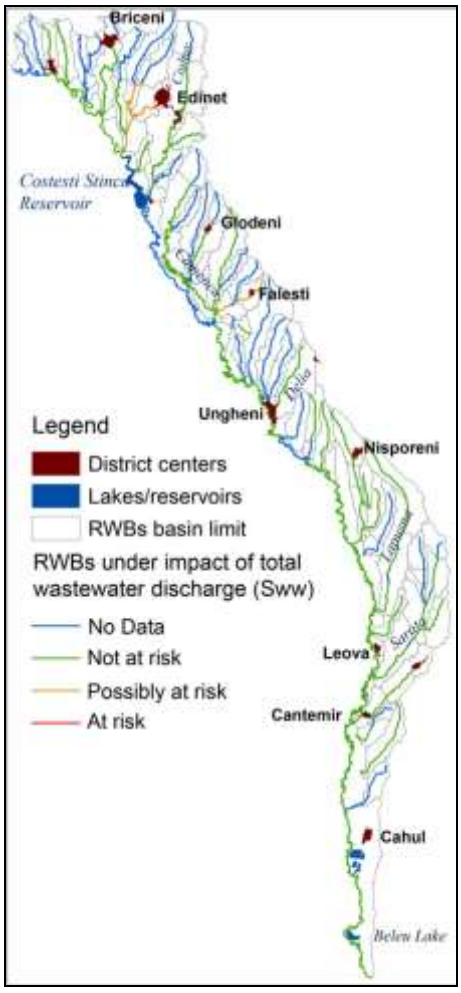


Figure 2.8. RWBs under impact of total discharged wastewater

2.1.3. Diffuse source pollution

2.1.3.1. Agriculture and animal farming

Agriculture is a traditional economic sector in the Republic of Moldova. The agro-industrial sector accounts for over 1/3 of the total GDP and this is the sector where about 40% of the active population is actively involved. Currently, the agricultural products represent over 13% of the total exports. The

main agricultural exports include cereals (primarily wheat), fruit (apples, grapes, etc.) and sunflower seeds.

The Prut River Basin is a typical agrarian region. Agricultural areas occupy 76.8% (fig. 2.9 and 2.10) of the region. More than a half of the basin's area is arable (52.5%). The share of the arable area is higher in the northern part of the basin with a mean value of 57% decreasing slightly in the middle part of Prut river, within the Codrii heights where the terrain is hilly. Pastures cover over 16% of the total area and are spread actually all over the basin. Generally, they are located in the river floodplains. The predominance of agricultural lands on one hand, influences the high demand of water for irrigation, and on the other, causes pollution with nitrates and other nutrients.

Crop production. The favorable natural conditions allow growing a variety of agricultural crops with a focus on certain crops depending on a geographic zone (north, center and south) and local conditions. Cereals are widespread in all the parts but the most abundant areas are in the south part. The northern part contains mainly fields for potato-growing and actually all the areas fit for sugar-beet. Vinery is concentrated in the central and southern parts.

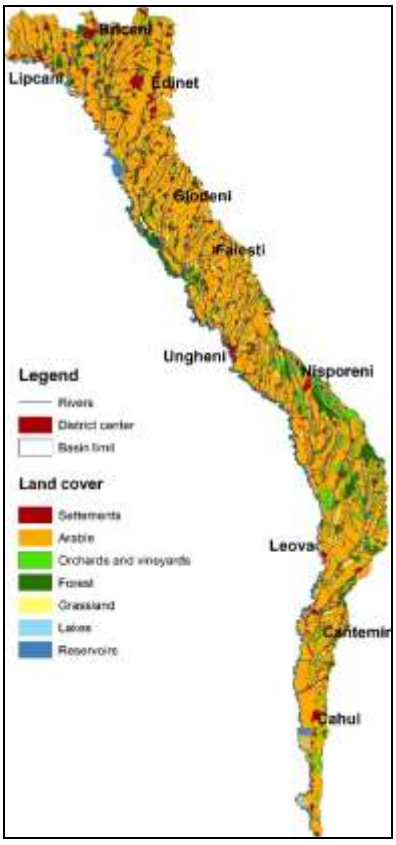


Figure 2.9. Land Use within the Prut Basin

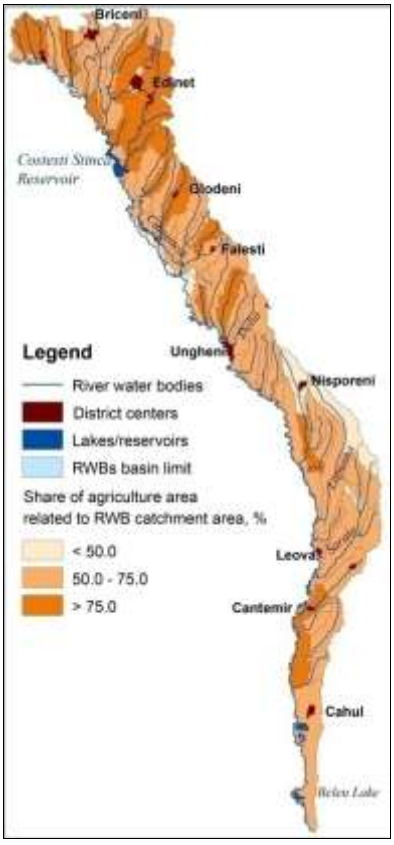


Figure 2.10. Share of agriculture area related to RWB catchment area

Animal farming recorded a drastic slump in recent years. This was because of the economic factor (no subsidies) and natural factor (droughts over the last years). These factors had an impact on the number of animals. Hence, if pigs and poultry do not differ much in number by regions as this farming is intense, then, sheep and goats grow in number toward south whereas the cattle grows in number toward north. This depends by the area and quality of natural pastures.

2.1.3.2. Estimation of diffuse source pollution impact

The pressure of diffuse source pollution was calculated based on recommendation from the EPIRB Project Guidance Document addressing hydro morphological and physio-chemical composition for a Pressure-Impact Analysis/Risk Assessment according to the EU WFD.

Main diffuse sources of pollution were assessed using the following indicators:

- Agriculture area;
- Animal livestock.

Diffuse pollution generated by agriculture was calculated as a fraction of area of agricultural lands and the total area of the RWB basin. The agricultural area within RBWs catchments occupies a high share, only in 9 RBWs catchments the arable area is less than 50% (fig. 2.9). As a consequence the value of this parameter is high, generating conditions of risk to fail the environmental objectives for 80 water bodies (fig. 2.11). The remaining 3 water bodies are in the category of *possible risk*. (tab. 2.6).

Table 2.6. The number of RWBs that have been assessed as at risk, possibly at risk and not at risk within the Prut River basin estimation of diffuse source pollution impact.

Driver: Agriculture

Driver: Agriculture	Not at risk	Possibly at risk	At risk
Number of RWBs	-	3	80
Percentage, %	-	4	96
Total lengths, km	-	60	2092
Percentage, %	-	3	97

The impact of animal farming was calculated as a fraction of the conventional livestock and surface of the respective WB basins. Regarding this type of pressure, 58 of water bodies are *not at risk* to fail the environmental objectives (especially those from the Middle and Lower Prut Plains), and 25 of water bodies are "possibly at risk" (Edineț, Nisporeni and Cantemir districts) (fig. 2.12).

Table 2.7. The number of RWBs that have been assessed at risk, possibly at risk and not at risk within the Prut River basin estimation of diffuse source pollution impact.

Driver: Animal livestock

Driver: Animal livestock	Not at risk	Possibly at risk	At risk
Number of RWBs	58	25	-
Percentage, %	70	30	-
Total lengths, km	1313	839	-
Percentage, %	61	39	-

Thus, summing up all the pressures identified in the agricultural sector, 81 of 83 WBs have been categorised *at risk*, 2 are at *possibly at risk* status and none is *not at risk*. The agricultural activities represent one of the basic sources that negatively affect the RWBs state.

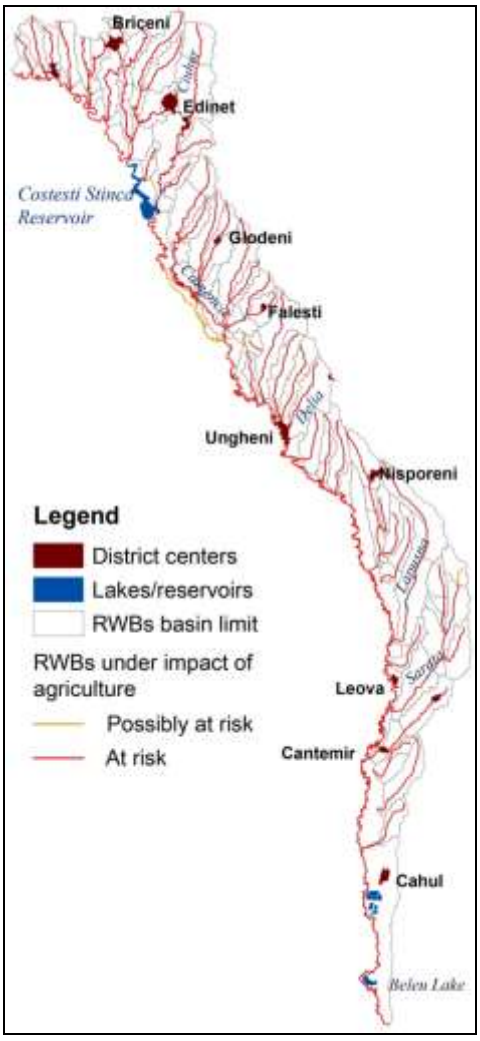


Figure 2.11. RWBs under impact of agriculture

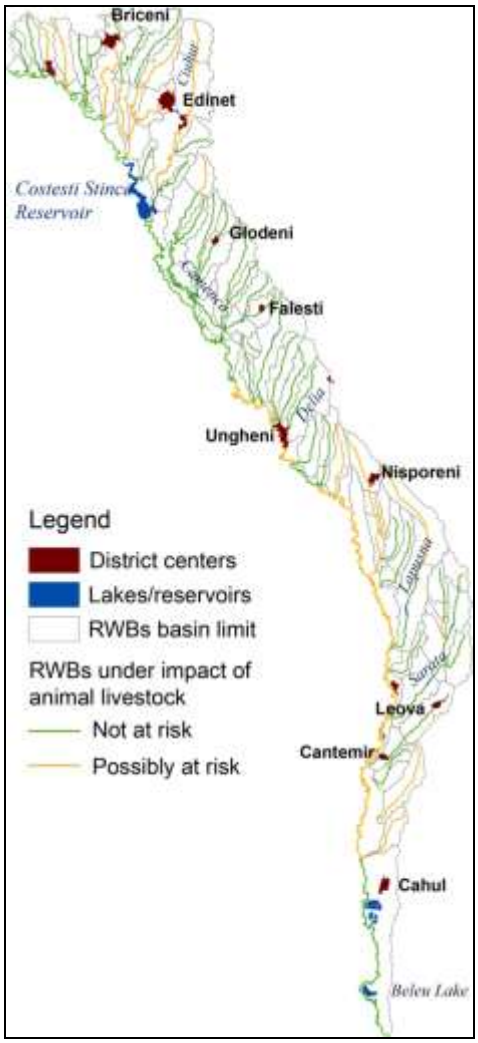


Figure 2.12. RWBs under impact of animal livestock

2.1.4. Hydro morphological alterations

The key hydro morphological alterations which have been addressed include water abstraction, impoundments/reservoir effect (interruption of the river continuity by dam construction), density of irrigation canals and flood protection levees. The most significant pressure is caused by dam construction on the rivers which affects the hydrological regime of small rivers. Because of lack of data some hydro morphological alterations could not be good enough evaluated and were only conceptually analyzed.

2.1.4.1. Water abstraction

The main source of fresh water are the surface waters of the Prut river. Briceni, Edineț, Cupcini, Glodeni, Ungheni, Leova, Cantemir and Cahul are supplied from the Prut river (fig. 2.13). The problem with water abstraction is the high losses of water in the process of transportation, approximately 70% of total water abstracted. The water abstraction decreased by almost 5 times during the last 24 years and reached from 320.36 mil.m^3/year in 1990 and until 20.17 mil.m^3/year in 2014 (tab. 2.8). At the same time, the structure of water consumption over the major sectors remained unchanged.

Table 2.8. Total water abstraction from the basin of the river Prut within the territory of the Republic of Moldova for the period from 1990 to 2014, mil. cub. m

Year	1990	1995	2000	2007	2008	2009	2010	2011	2012	2013	2014
Total volume of water abstraction, million m^3	320.36	137.8	43.66	29.71	25.17	28.02	24.0	24.12	24.24	21.44	20.17

Source: Annual Reports generalized concerning the Water Management indices. Basin Water Management Authority, "Apele Moldovei" Agency

The best public water supply is in the northern districts where the water quality is better. Here the main water source is groundwater (fig. 2.13). Ground water supply becomes more and more important due to decreasing availability of surface water resources and increasing pollution. Population from the central part of the basin has a considerably low access to qualitative water resources (Nisporeni and Hîncesti districts).

An average of 21% of the consumed water is used for ***municipal purposes***. The water consumption has stabilized over the past 4 years at a level of 3.7 mil. cub. m. The most important areas in the structure of water use are Ungheni and Cahul towns (fig. 2.14). There are almost 100 water consumers over the basin. The largest consumers (2013) are the companies providing water supply and sewage: ÎM "Apă Canal" Ungheni (1173.5 thousand cub. m), ÎM "Apa Canal Cahul" (964 thousand cub. m), SRL «Nufărul Alb» (137.9 thousand cub. m), Înt. Mun „Apă-Canal" Edineț (250,7 thousand cub. m), ÎM "Servicii Comunale" Glodeni (185,45 thousand cub. m), Glodeni Sugar Plant (143.3 thousand cub. m), Î.M "Apă Canal Service" Leova (r. Prut) (139.2 thousand cub. m), ÎM "Apă-Canal" Cantemir (135.3 thousand cub. m). Apă Canal, which is a part of Apă Canal Moldova, is the main (78.4%) consumer of water for municipal purposes.

Annually approximately 4.7 mil. $m^3$of water are used for ***irrigation purposes*** (mean for the 2007-2014 years), which represents 25.2% of total water use and about 1/3 of the water used in agriculture. Although, water abstraction for this purpose has decreased by 75 times in comparison with 1990 and 27 times in comparison with 1995. The total volume of water use fluctuated greatly for the last 13 years – from 1.05 mil. cub. m in 2001 to 8.72 mil. cub. m in 2007 (fig.2.14, 2.15). During some years the availability of water resources decreased heavily due to dry weather (droughts in 2007 and 2012).

Decreasing of water use for irrigation purpose is caused by limited access to irrigation systems, its condition, and lack of annual funding to support public irrigation systems, low number of farms and water users associations, as well as the high cost of water for irrigation.

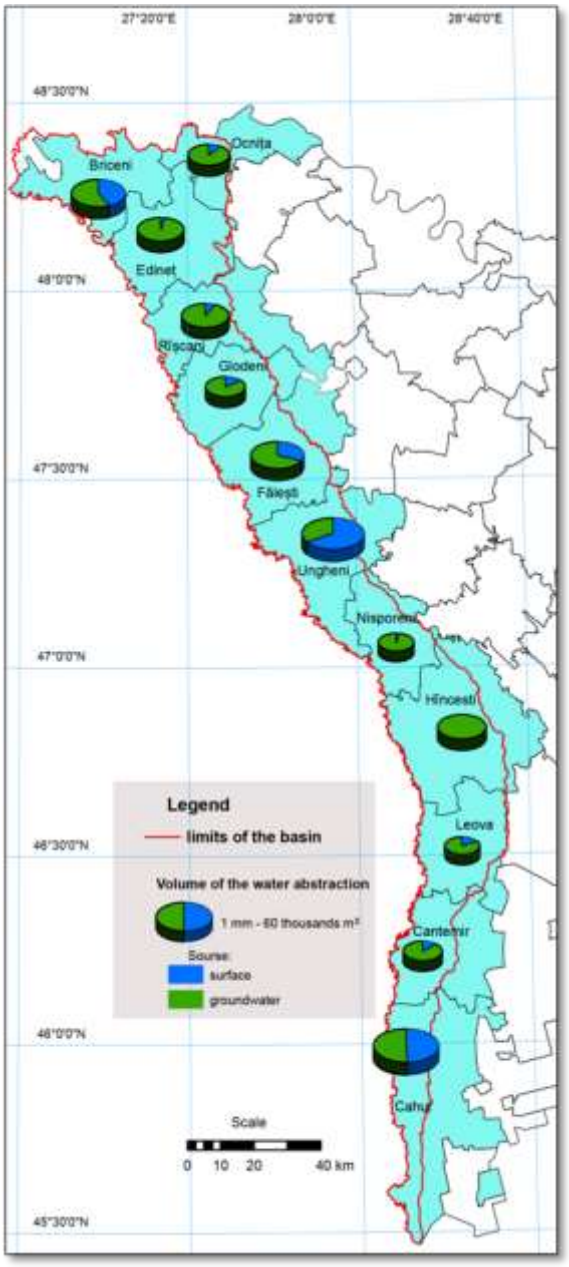


Figure 2.13. Abstraction of water in the Prut River Basin, 2014

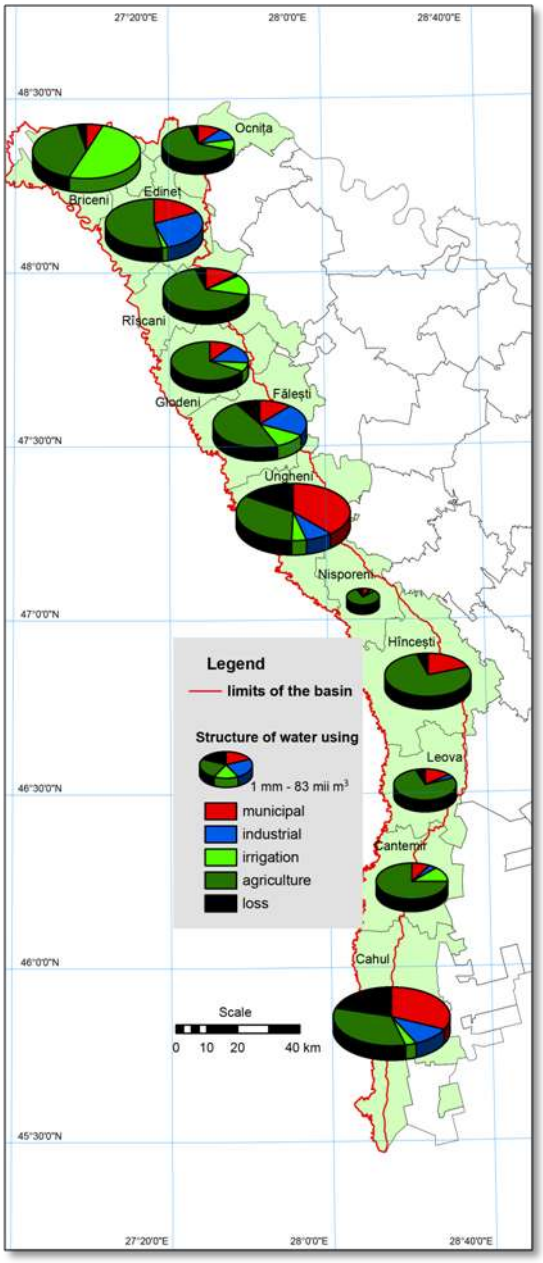


Figure 2.14. Water use, 2014

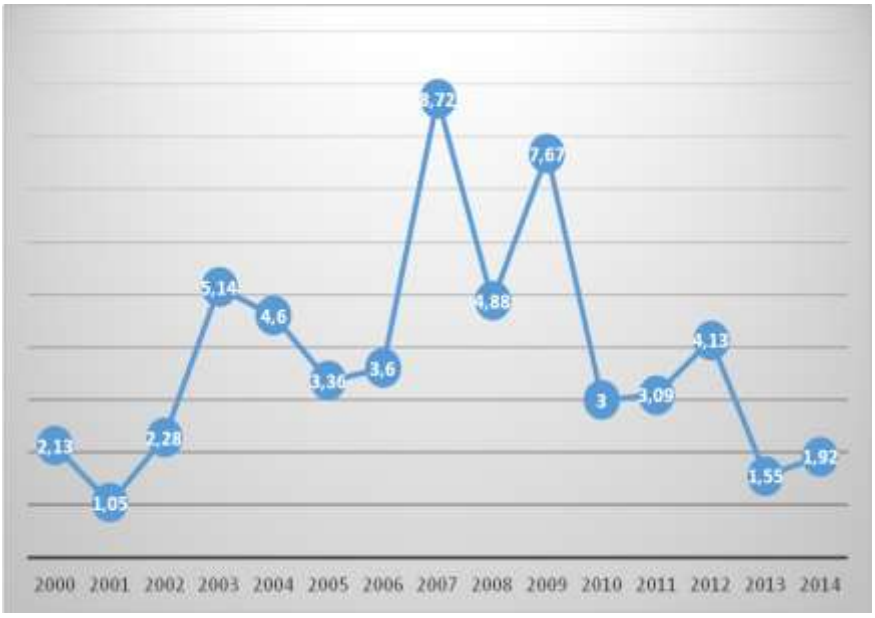


Figure 2.15. Dynamics of water consumption for irrigation purposes for the period from 1990 to 2014, mil. cub. m

Source: Yearbook s of State Ecological Inspectorate

Northern districts of Moldova (Râșcani, Fălești, Glodeni and Edineț) are the largest water users for irrigation purposes among all the districts (fig. 2.16), with a share of 53.3%. This area is characterized with the highest density of reservoirs, including the largest reservoir - Costeşti-Stânca.

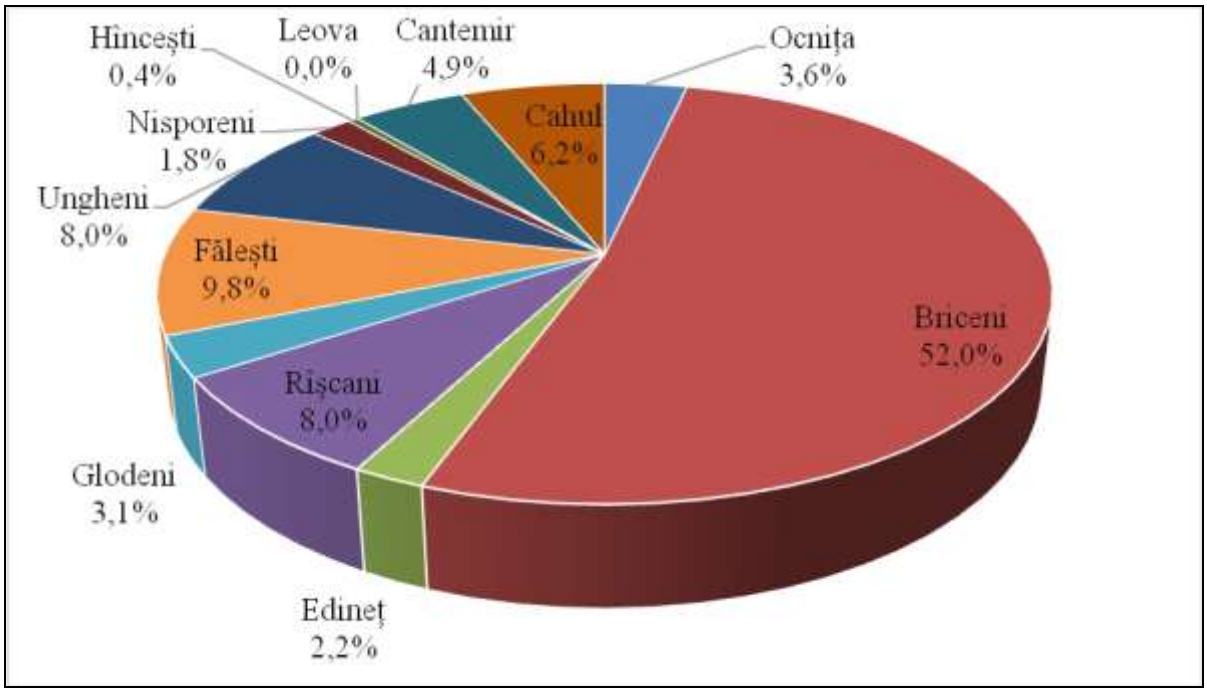


Figure 2.16. The structure of water use for irrigation purposes, by districts, in 2014

Source: Yearbook of State Ecological Inspectorate

The central (Hîncesti and Nisporeni districts) and, especially, southern part of the basin (Leova and Cahul districts) use insignificant volume of water for irrigation purposes. These areas have a greater demand in irrigation compared to the northern regions, but the existing sources of surface water and irrigation system are insufficient.

Water abstraction for ***industrial purposes***, just as for the other sectors of economy, significantly has decreased in the period from 1990 to 2013 (over 10 times). Over the last 13 years this level dropped by more than 1 mil. cub. m (fig. 2.17) and reached 1.73 mil. cub. m in 2014.

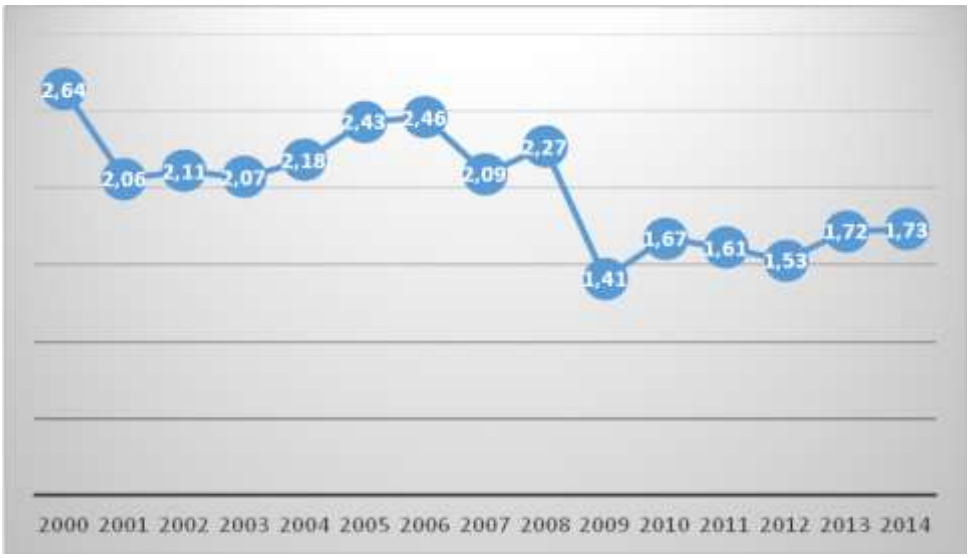


Figure 2.17. Dynamics of water consumption for industrial purposes over the period from 2000 to 2014, mil. cub. m

Source: Yearbook of State Ecological Inspectorate

The largest water users are the regions with large manufacturing outfit. Two sugar factories (in Glodeni and Făleşti Towns) consume 728 thousand cub. m of water per year, which is 45.2% of the total amount of water from the basin used for industrial purposes. Wine industry in the administrative districts of Nisporeni, Cantemir and Cahul, baking industry (Cahul and Ungheni districts), dairy industry (Făleşti and Rîşcani districts), breweries (Cahul), light industry (Ungheni, Cahul and Făleşti districts), etc. are among the other major water consumers.

One of the main problems are the unauthorized abstractions of water from small and medium sized rivers (there is no official information about it) and specifically in dry periods it can create unsatisfactory conditions for river water status. Hence, all RWBs were attributed to be *possibly at risk*. Another problem associated with the impact on the water resources is violations of sanitary protection zones of abstraction points of surface waters as well as groundwaters.

2.1.4.2. Reservoirs and flow regulation

Within the Prut River Basin in Moldova, there is a single Hydraulic Power Plant (HPP) - Costeşti-Stânca. The construction of Costeşti-Stânca dam and reservoir changed the hydrological regime of the Prut River. Key factors that cause hydro morphological alterations includes the regulation of the Prut River flow so that 34 settlements with over a hundred thousand inhabitants that are located downstream the course of the river could be protected against periodic floods.

Hydro peaking effect, except flood events, is not characteristic for Costesti-Stinca HPP. From this point of view the hydro technical complex presents low pressure on hydrological regime. Because of lack of information, the hydro peaking effect situated on small and medium sized RWBs cannot be evaluated.

In comparison with the Prut River controlled only by one reservoir, the flow of its tributaries is regulated by cascade of reservoirs. Over 300 reservoirs situated on small rivers have a direct impact on flow distribution which cannot be evaluated because of lack of monitoring data. Reservoirs and ponds have unequal spatial distribution. The share of reservoirs area of RWBs basins counts from 1.5–4% in the north to 0.5–1.5% in the south. The most impounded RWBs are situated in the Middle Prut Plain, in the Camenca River Basin.

2.1.4.3. Irrigation and drainage channels

The irrigation and drainage system was constructed in the downstream part of the Prut River Basin in 1970-1980. It includes a number of drainage and collecting canals and over 20 drainage pumping stations. In recent years, R. Moldova has been widely practicing rehabilitation and expansion of irrigation systems that is to be followed by expansion of irrigated farmlands.

In the Republic of Moldova, 26 water users associations were registered to date with only 6 of them are located within the Prut basin. A spatial analysis of the registered water users shows their non-uniform areal distribution. 33 irrigation systems exist within the Prut basin with a total area fitted for irrigation of 51481 hectares. The biggest irrigation systems are located in the lowlands, in two regions – The Lower Prut Plain and the Middle Prut Plain.

The density of irrigation canals depends on the specifics of landscape, having the same spatial distribution as protection dams. These areas are increasing, due to expansion of irrigated areas projects, so the influence of this factor will increase.

2.1.4.4. Flood protection (embankment)

National flood protection embankments along the river Prut were designed, constructed and reconstructed, starting from the second half of the 20th century, particularly after the historical flood of 1969. Existing flood protection levees were designed and built to mitigate 100-year floods with the flow of 3350 m^3/s before the construction of the Costesti-Stinca reservoir and 1260 m^3/s after its entry into operation. This is the current protection system in the floodplain of the river Prut, which is protecting farmlands and agricultural facilities from being flooded by high water of Prut River (Annex 2.1).

The levees have both a positive influence, through flood protection of settlements and agriculture lands, and negative influence by increasing the velocity of the river flow, and changes of the structure of banks. The levees have been built in lowland regions - in the middle and lower part of the Prut River Basin, very close the Prut river bed.

2.1.4.5. Assessment of hydro morphological alterations impact

Analysis of hydro morphological alterations is based on the approaches and methodology proposed in the WFD and the guidelines for WFD implementation, Guidelines provided by project EPIBR expert group: Guidance Document addressing hydro morphology and physio-chemistry for a Pressure-Impact Analysis/Risk Assessment according to the EU WFD, New water law 272 from 2011, by laws, Moldavian Laws, Normative Acts and Strategies.

Main diffuse sources pollution were assessed addressing the following pressures:

- Water abstraction,
- Impoundments/reservoir effect (interruption of the river continuity by dam construction),
- Density of irrigation canals
- Lengths of flood protection levees

The method of identification of water bodies at risk of failing the environmental objectives in accordance with impoundments/reservoir effect consists of estimation of share of impounded length of the RWB from its total length. If the share is less 10% then the RWBs are considered not at risk, in case of 10-30% the RWBs are possibly at risk and if the share is over 30% then the RWBs are at risk of failing the environmental objectives of WFD. Impoundments/reservoir effect is a widespread pressure. 20 water bodies are not impacted by reservoirs at all. Only 11 are low influenced by reservoirs and are included in group of water bodies *not at risk*. They are represented by the Prut river (there is only one reservoir -Costesti-Stinca) and some of its tributaries, which are located in the plateau areas, where the construction of reservoirs is more problematic due to specific landscape. 30 water bodies are *possibly at risk* (ex. Ciuhur, Sarata, etc.), and 22 water bodies are *at risk* (tab. 2.9). Water bodies at risk are predominantly located in the Northern part of the pilot basin, most of them are

within the limits of the Middle Prut Plain (Caldarusa, Glodeanca, Ustia, Garla Mare, Şoltoaia, etc.) (fig. 2.18).

Regarding canals density impact, RWBs were divided in: RWBs not at risk when the canal density is less 0.1 km/km^2, RWBs possibly at risk in case if canal density is equal to 0.1-0.3km/km^2, and RWBs at risk when canal density is over 0.3 km/km^2. At present, the total number of water bodies *at risk* is 4 but the total length of these water bodies is 391 km (fig. 2.19, tab. 2.10).

According to the length of dams, related to the length of the RWBs, Cahul, Cantemir, Leova, Hînceşti districts are highlighted (all in the lower course of the Prut River) and Făleşti and Glodeni districts (in the middle course of the Prut River). Only 1 RWB is embanked on a length over 70 % and represents RWB *at risk*. Water bodies *possibly at risk* are in number of 4 because the length of RWB is embanked on 30-70% (fig. 2.20, tab. 2.11).

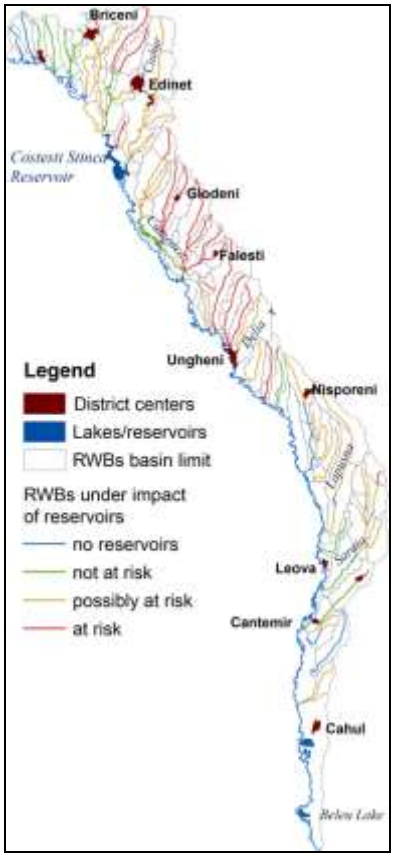


Figure 2.18. RWBs under the influence of impoundment/ /reservoir effect

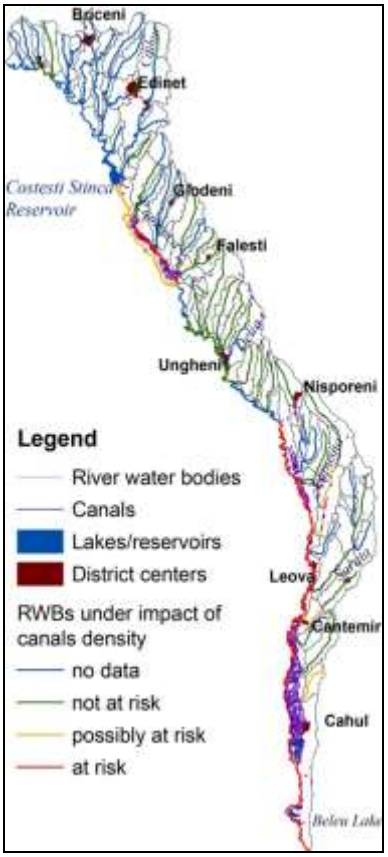


Figure 2.19. RWBs under the influence of canals density

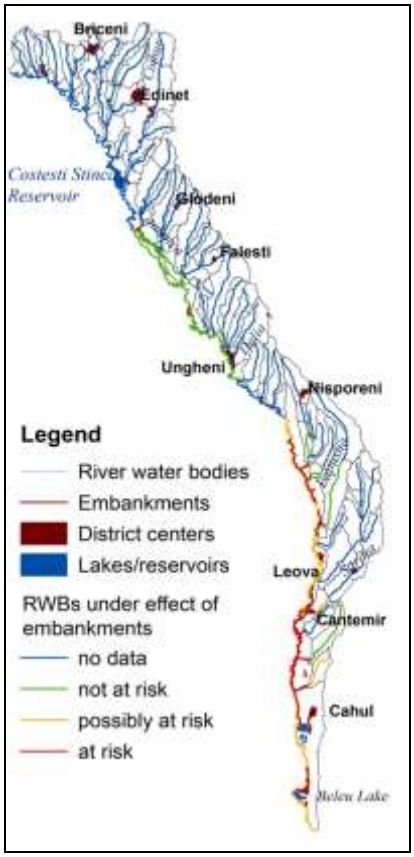


Figure 2.20. RWBs under the influence of embankments

Table 2.9. RWBs under the influence regarding impoundment/reservoir effect

Risk type	Not at risk / No reservoirs	Possibly at risk	At risk
Number of RWBs	11 / 20	30	22
Percentage, %	13/24	36	27
Total lengths, km	296 / 755	657	444
Percentage, %	14/35	31	21

Table 2.10. RWBs under the influence impact regarding canals density

Risk type	Not at risk / No reservoirs	Possibly at risk	At risk
Number of RWBs	31/42	6	4
Percentage, %	37/51	7	5
Total lengths, km	715/873	173	391
Percentage, %	33/41	8	18

Table 2.11. RWBs under the influence impact regarding embankments

Risk type	Not at risk / No reservoirs	Possibly at risk	At risk
Number of RWBs	8/70	4	1
Percentage, %	10/84	5	1
Total lengths, km	307/1472	318	55
Percentage, %	14/68	15	3

2.2. Overall assessment of RWBs at risk of failing the environmental objectives

Identification of water bodies at risk of failing the environmental objectives was applied using the One-Out-All-Out principle. This approach is based on the principle that each pressure that exceeds one of the risk criteria has a decisive effect on the overall risk status of the entire water body. The entire impacted water body needs to be put at risk to fail the environmental objectives in case a risk criterion is exceeded at a distinct location in a water body.

According to the described principle assessment of hydro morphological alteration, *at risk* of failing the environmental objectives are 26 water bodies with a length of 835 km, and 57 water bodies are *possibly at risk*. There are no water bodies *not at risk.*

From 2.152 km of water bodies' length, 85 km or 26 water bodies are at risk to fail the environmental objective due to hydro morphological alterations when others 1317 km (57 water bodies) were assessed as possibly at risk. The pollution impact on water bodies is even greater, especially pollution from diffuse sources (agriculture). Thus, the 2102 km of rivers or 98% of total length of RWBs are at risk, the other being possibly at risk (tab. 2.12). Respecting the principle of „One-Out-All-Out" all these 98% is at risk of not achieving good ecological status.

Table 2.12. Risk assessment results - Hydromophological alterations and pollution (Principle: One-Out-All-Out)

	Not at risk		Possible at risk		At risk	
	Number of RWBs	Total length, km	Number of RWBs	Total length, km	Total length, km	Number of RWBs
Hydromorphological alterations	-	-	57	1317	26	835
Percentage	-	-	69	61	31	39
Pollution impact	-	-	1	50	82	2102
Percentage	-	-	1	2	99	98
Overall impact	-	-	1	50	82	2102
Percentage	-	-	1	2	99	98

In summary, almost all water bodies (98%) in the Prut River Basin are considered to be *at risk* of failing the environmental objectives (tab. 2.12, fig. 2.21-2.26). This can be explained by the fact that almost all water bodies are subject to specific types of pressure: pollution, particularly diffuse pollution from agriculture, point pollution caused by wastewater discharge, hydrological alteration specially due to possibly (illegal) water abstraction, hydro morphological alteration due to impoundment effect and flow regulation.

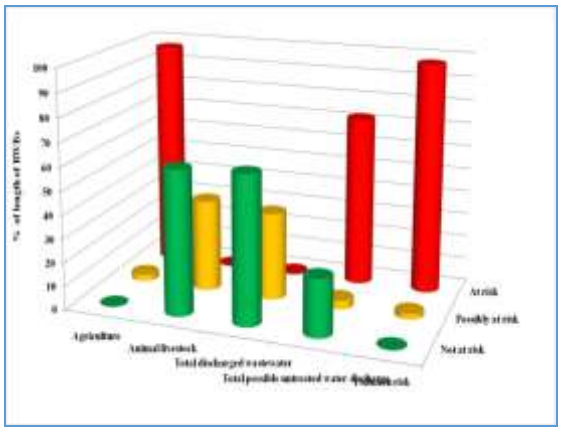


Figure 2.21. Percentage of length of RWBs under pollution risk

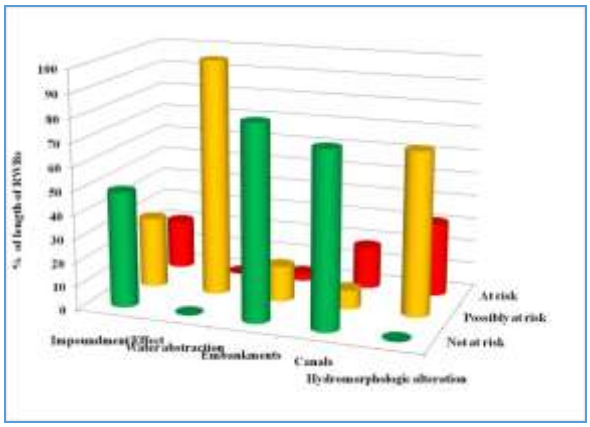


Figure 2.22. Percentage of length of RWBs under hydro morphological alteration

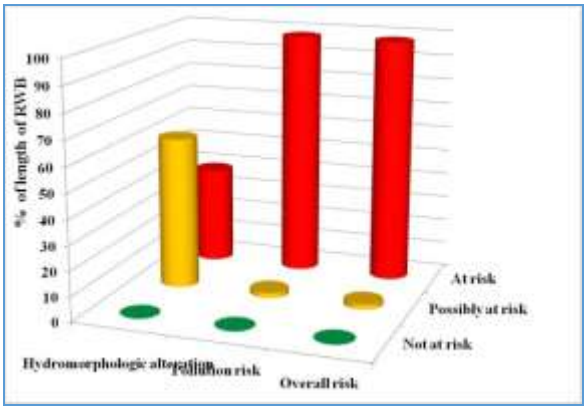


Figure 2.23. Risk assessment results

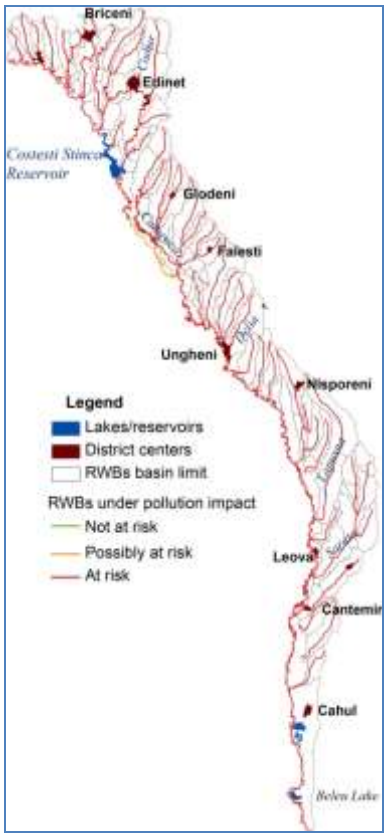


Figure 2.24. RWBs under pollution influence. Principle: One-Out-All-Out)

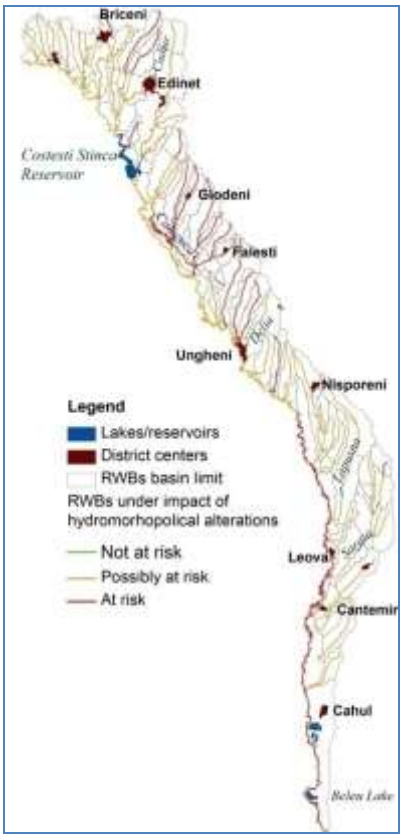


Figure 2.25. RWBs under influence of hydro morphological alteration (Principle: One-Out-All-Out)

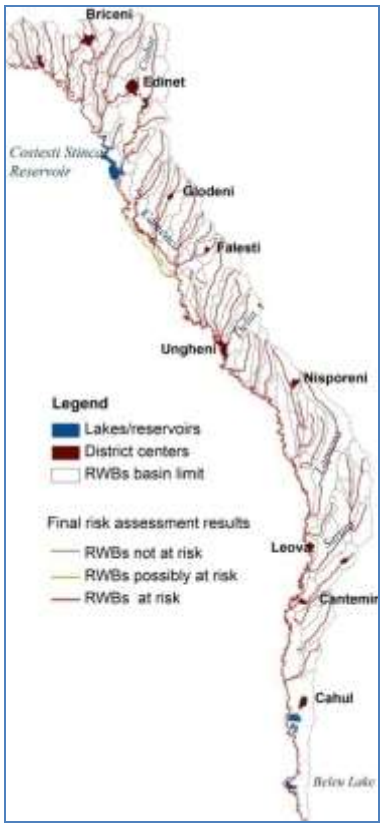


Figure 2.26. RWBs under final risk assessment results (Principle: One-Out-All-Out)

2.3. Pressure/impact analysis and risk assessment of lake water bodies

Although, within the limits of the Prut River basin there are a big number of water accumulations, the largest of those that have important and more significant features have been attributed to LWBs. Seven lake water bodies are located in the Moldovan share of the Prut River Basin. One of them (ponds of the Cahul fish farm) has been identified as the artificial water body (fig. 2.27, fig. 2.28).

The Costesti-Stinca reservoir is the biggest LWB, an HPP, situated on Prut River and has been identified as **HMWB**. It is a multipurpose reservoir, main purposes are: fisheries, irrigation, power generation, recreation, flow regulation.

The Costesti-Stinca reservoir has a total volume of 582 mln. m^3 and a useful volume of 450 mln. m^3, indices that are in a continuous decrease compared to the initial stage, the volume and deepth are reducing, this was caused by the siltation processes that affect all water bodies within the basin. Thus, a decrease in this regard is observed in the case of depth (average depth decreased from 12.5 m to 10.63 m and the maximum depth which decreases from 34 m to 27.6 m) and volumes (the total volume decreased from 735 to 582 mln. m^3) (tab. 2.13).

Table 2.13. Quantitative parameters of the Costesti-Stinca reservoir

Year	Average depth (m)	Maximum depth (m)	Total volume (mln.m^3)	Water surface NRN (km^2)
1978 (initial parameters)	12,5	34,0	735	59,0
2014	10,63	27,5	582	58,4

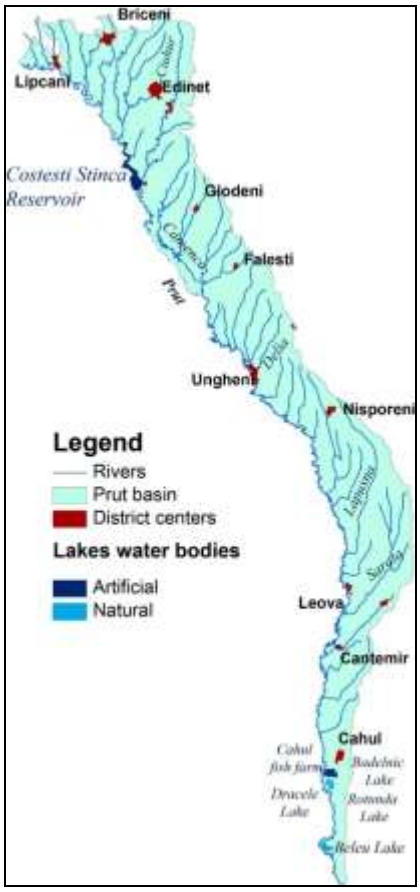


Figure 2.27. Natural and artificial Lake water bodies

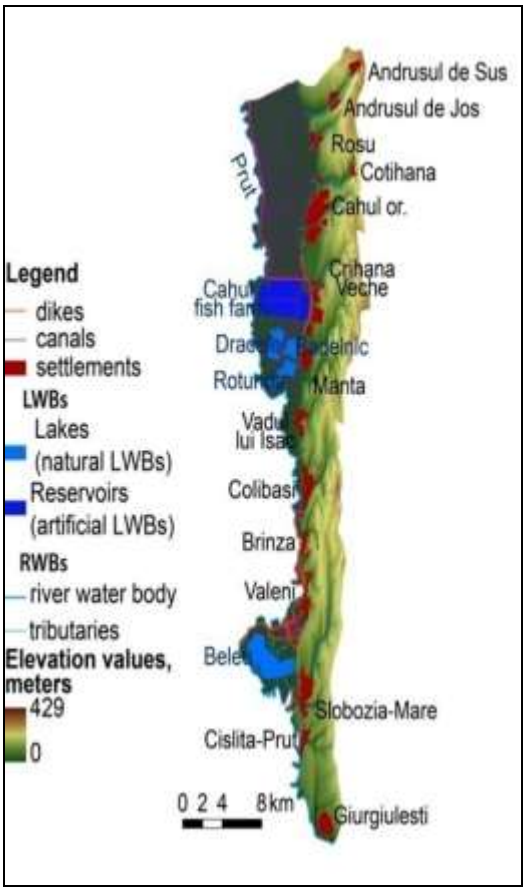


Figure 2.28. Location of natural LWBs

Other reservoir, by importance, is Cahul reservoir, with the 8 fish farm sections, its primary use is the fishery (Annex 2.2).

LWBs of natural genesis (natural lakes) are located in the southwest part of the Republic of Moldova, in the lower course of the Prut River, in Cahul district. They are included in Ramsar Zone Nr.1029 "Lacurile Prutului de Jos", the wetland of international importance.

The largest of them is Beleu, which is also situated in „Prutul de Jos" scientific reservation and occupies about two thirds of the territory of the reservation. The LWB area is 8.5 sq.km and water volume is 8,39 mln.m^3. The Beleu lake is one of the biggest lakes from the Republic of Moldova. The lake has connections with the Prut River through a system of streams.

The water level in the lake depends on the water level of the Prut River and, in particular, of the Danube River. The lake banks consist of sands and clays. In the western part, the lake is delimited by the Prut River terrace, which is highly fragmented by a network of ravines. These represented one of the significant sources of lake siltation up to construction of railway in 2007-2008 years. Currently, especially in dry seasons, it is recorded the decreasing of lake area and its transformation into pasture.

The Manta lakes system is formed by 3 natural lakes which were attributed to 3 lake water bodies: Badelnic, Dracele, and Rotunda (fig. 2.27-2.28). Manta lakes system has a total area of 6.5 km^2, floodplain area is approximately 2400 ha. This lake cuvette was filled with water during the Prut River floods thus step by step forming the present Manta lake. It was formed in postwiurmian period, evaluating during the last 10,000 years of the Holocene, has kept its natural shape until the 60s of the twentieth century, namely, until the transformation of the South Prut valley into agrocenoses. Until that time the Manta lake had a water depth of 6-8 m, in some places reaching up to 10 m., and water was clear and transparent. At present the maximum water depth comes to 1 m and the average depth is 50-60 cm.

The Manta and Beleu lakes are surrounded by floodplain meadows and small forest. Their main water sources are the atmospheric precipitation, groundwater recharge, Prut River (through a system of drainage channels). At present the drainage system of Manta was damaged which caused a big decrease of water in lake. Currently, Manta and Beleu lakes system is in danger of disappearing due to the siltation processes, and as a result, can be considerably affect the entire lakes ecosystem. Among recent problems there can be mentioning the interruption of connection of lake with the Prut River, which in recent years is recorded.

The main sources of pollution are transport routes – (Cahul – Giurgiulești) railway and the state auto road R26 (Hîncești – Leova – Cahul - Slobozia Mare). Other important problem is the overfishing, the Beleu lake, de facto, was divided into plots by local inhabitants and exploited for fisheries, in the same time the Manta lakes are being influenced by the dams of Cahul Fish farm.

Based on identified morphological changes (the origin: natural, artificial, HMWB; siltation, interruption of connectivity, etc.) and the chemical quality of water in southern lakes all water bodies are assigned to be at risk (tab. 2.14).

Table 2.14. Risk assessment of lake water bodies

Lake	Position	Genesis	Type	Area, sq. km.	Risk type
Costesti-Stinca	Riverbed	HMWB	Reservoir	42,56	At risk
Badelnic	Floodplain	Natural	Lake	1,443	At risk
Dracele	Floodplain	Natural	Lake	2,774	At risk
Rotunda	Floodplain	Natural	Lake	2,329	At risk
Beleu	Floodplain	Natural	Lake	8,538	At risk
Prut nameless	Floodplain	Natural	Lake	0,986	At risk
Cahul fish farm	Floodplain	Artificial	Reservoir	12,597	At risk

3. Protected areas

Based on the WFD (Article 6 and Annex IV), the register of Protected Areas in the Prut River Basin in Moldova includes (fig. 3.1):

1. Areas designated for the abstraction of drinking water from surface sources[3], managed by municipal water utility companies, including: Apa-Canal Edinet – 1 662 200 m^3, Glodeni sugar factory (Magt-Vest SRL, IM) – 310 500 m^3, Apa-Canal Ungheni – 2 304 500 m^3, Apa-Canal Leova – 22 100 m^3, Apa-Canal Cantemir – 13 000 m^3 , and Apa-Canal Cahul – 1 898 300 m^3 (2010 data). Every Apa-Canal is a municipal enterprise, part of Apa-Canal Moldova.

2. Areas designated for the protection of economically significant aquatic species – Cahul fish farm (Crihana Veche village, Cahul District) and Stanca-Costesti Reservoir.

3. Water bodies designated as recreational waters, including areas designated as bathing waters under Directive76/160/EEC– Recreational Area Costesti (Costesti, Riscani District) of national importance.[4]

4. Nutrient-sensitive areas, including areas designated as vulnerable zones under Directive 91/676/EEC and areas designated as sensitive areas under Directive 91/271/EEC – firstly, locations without wastewater treatment facilities (Briceni, Costesti, Bretuseni, Ocnita); secondly, locations of discharge of inadequately treated wastewater and locations without systems for biological treatment of wastewater (Lipcani, Edinet, Falesti, Ungheni, Cantemir, Leova).

5. 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, including over 100 sites, specified under Law of the Republic of Moldova "On the Fund of Natural Areas Protected by the State" (No 1538-XIII of 25 February 1998). The Fund of Natural Areas Protected by the State includes three categories of natural objects and complexes (fig. 3.1):

5.1. Established in accordance with the classification of the International Union for Conservation of the Nature (IUCN):

a. Scientific nature reserves: Lower Prut Reserve (Prutul de Jos), 1691 ha, near Slobozia Mare (Cahul District), and Royal Forest Reserve (Padurea Domneasca), 6032 ha, in Glodeni and Falesti districts;

b. Nature monuments: numerous, including 19 geological and paleontological, one hydrological, and 25 botanical monuments;

c. Nature reserves: 24, including two complex nature reserves – Cantemir Nature Reserve and the Ledaba Alba aquatic ecosystem reserve, and 16 forest reserves: Rososeni, Baurci, Ciobalaccia, Dancu, Nemteni, Sarata-Galbena, Caracui Dacha, Sarata-Razesi, Poganest, Ostiyanova, Seliste-Leu, Cabac, Zberoaiya-Lunca, Ocnita, Mestecanis, Climauti, Stanca, Pociumbeni, Lucacieni, Saptebani, Vadullui Isac, Flaminda;

d. Protected landscape areas: 13 protected landscape areas;

e. Resource reserves: four nature resource reserves;

f. Multifunctional areas: one floodplain meadow with marsh vegetation;

5.2. Established in addition to the IUCN classification: monuments of garden-landscape art;

5.3. Established by other international documents: one wetland of international importance – Lower Prut Lakes, 19 152 ha (Ramsar site No 1029) (fig. 3.1).

In accordance with the Article 7 of the Framework Directive were identified the water bodies used for abstraction of water for human consumption, which provides, on average, more than 10 m^3/day or

[3]Information about water extraction sites for irrigation and industrial purposes from ponds, reservoirs and directly from the Prut is limited.

[4]Moldova, Government Regulation No 737 "Privitor la reglarea activității zonelor de recreație a obiectelor acvatice," 11.06.2002.

serving more than 50 people. Also, according to WFD, Moldova should monitor all water bodies that provide more than 100 m^3/day (on average).

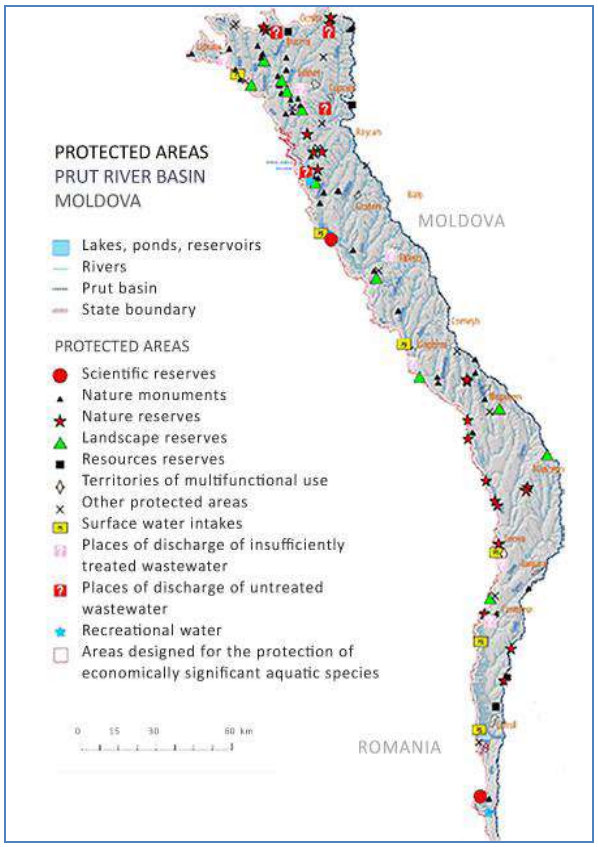


Figure 3.1. Protected areas in the Prut River basin, Moldova

For surface water in the Prut river basin 7 water abstractions have been identified, setting monitoring sections only into two points (Ungheni and Cahul).

National groundwater monitoring network in the Prut river basin of the Republic of Moldova consists of 32 monitoring stations installed into unconfined and artesian aquifers and is used for the routine observations of quantity and quality of impacted by abstraction underground aquifers.

The parameters and frequency of monitoring is carried out according to the Water Law and Government Decision no. 932 of 11/20/2013.[5]

Environmental objectives for protected areas are those provided by the specific legislation that is defined in **Chapter 6 - Environmental Objectives and Exceptions**.

The program of measures for the protected areas is presented in Chapter 8 - The Program of Measures, where there are defined:

- Measures to protect water bodies used for abstraction of water for human consumption;

- Measures to reduce pollution from point sources and other activities with an impact on water status;

- Measures to reduce pollution;

- Measures for water bodies at risk not to achieve the environmental objectives etc.

[5]HG Nr 932.20.11.2013 pentru aprobarea Regulamentului privind Monitorizarea și evidența sistematică a stării apelor de suprafață și a apelor subterane. Monitorul Oficial Nr. 276-280 din 29.11.2013

4. Monitoring program and network

4.1. Introduction

Article 8 of the WFD 2000/60 EC establishes the requirements for the monitoring of surface water status, groundwater status and protected areas. Monitoring programs are required to establish a coherent and comprehensive overview of water status within each river basin district. The two key environmental objectives of the WFD for surface waters are:

- to achieve good surface water status.
- to prevent deterioration of the status of all bodies of surface water;

Article 13 of the MD Water Law states that monitoring and systematical evidence of the surface water status will be done by the central organ of public administration in the environmental field as established in a regulation[6] approved by the MD Government (Regulation on monitoring and systematic record of the status of surface and groundwater - GD 932 of 11.20.2013).

Surface water quality monitoring in the Republic of Moldova was conducted beginning with the 60's of the last century, but systematic and comprehensive character has been acquired only in the 80's, with an emphasis on the monitoring of transboundary rivers: Nistru and Prut. Ever since the main purpose of monitoring was to determine the level of contamination of surface waters, to identify cases of very high pollution, to monitor pollution sources, as well as to send timely notifications to local and central authorities authorized to take decisions for the elimination or mitigation of the effects.

Surface water quality monitoring at national level is carried out on the basis of legal acts, among which the most important are the Laws of the Republic of Moldova:

- Water Law, nr. 272 of 23.12.2011;
- Law on Environmental Protection nr. 1515-XII, June 16th 1993;
- Law on Hydrometeorological Activity, nr. 1536-XIII from 25 February 1998;
- Law on Protection Zones and Strips of water, rivers and reservoirs, nr. 440-XIII from April 27, 1995;
- Law on Natural Resources, nr. 1102-XIII from 6 February 1997;
- Law on drinking water, nr. 272-XIV of 10 February 1999;
- Law on Access to Information, nr. 982-XIV of 11 May 2000;

and Government-decrees:

- Regulation on monitoring systematic evidence of the surface and ground waters' status (GD 932 of 20.11.2013);
- Regulation on surface water environmental quality requirements (GD 890 of 12.11.2013);
- On some Measures for regulating the use of aquatic basins nr. 1202 from 8 November 2001;
- On approval of program for the development Water Management and hydro-melioration in the Republic of Moldova for 2011-2020 nr. 751 from 05.10.2011
- On measures establishing riparian areas and files of protection for rivers and water basins, nr 32 from 16.01.2001.

[6] Regulation regarding monitoring and systematical evidence of the surface and groundwaters' state, GD 932 of 20.11.2013

4.2. Existing monitoring network of surface waters

State Hydro meteorological Service is responsible for hydrological and hydro chemical monitoring of rivers and lakes. Systematical monitoring of surface water quality in the Prut River Basin was carried out at 14 monitoring points until 2013 (fig. 4.1). Beginning of 2014 another monitoring program has been introduced for the Prut River Basin in accordance with the EU WFD which consists of 30 monitoring stations: 8 points situated on the Prut River, 1– artificial lake, 2 – natural lakes and 19 – on tributaries.

In the process of monitoring programme development the data and information from the EPIRB project JFS-I, JFS-II and JFS-III and national monitoring programs conducted in the Prut River basin (MD) were used. Furthermore, the Typology Report, the Pressure and Impact Analysis and Risk Assessment Reports were used as basic documents in selecting the sampling locations for the Operational Monitoring. Thus, the monitoring program,- surveillance subprogram for 2015 also included two of the Prut tributaries: r. Medveja and r. Glodeanca. So far the surface waters monitoring in BH Prut include: i) six locations of surveillance monitoring program on a monthly basis, ii) two sections for surveillance program with a frequency 6 times / year, iii) 15 points for the surveillance program with a quarterly frequency and iv) operational program 11 monitoring points on a quarterly basis.

Physico-chemical monitoring includes the following indicators: temperature, pH, conductivity, transparency, turbidity, colour, dissolved oxygen, oxygen saturation, biochemical oxygen demand, chemical oxygen demand with bichromate, chemical oxygen demand with manganese, total suspended solids, mineralization, ammonium nitrogen, nitrate nitrogen, nitrite nitrogen, mineral nitrogen, mineral phosphorus, total phosphorus, chloride ions, sulphates, total iron, phenols, petroleum products, anion active detergents, alkalinity, calcium ions, magnesium ions, total hardness, sodium, potassium, ions' summ, silicates, heavy metals (copper, zinc, nickel, lead and cadmium), polyaromatic hydrocarbons and organochlorine pesticides.

The ***biological quality elements*** include

- for rivers: Bacterioplankton, Phytoplankton, including chlorophyll "a", Benthic Macroinvertebrates, Phytobenthos and Zooplankton;
- for lakes: Bacterioplankton, Phytoplankton, including chlorophyll "a", Benthic Macroinvertebrates, Phytobenthos, Zooplankton and Macrophytes.

Bacterioplankton reflects the degree of development and activity of microflora of a water body. To perform a microbiological analysis the water is being sampled from the surface layer (5-20 cm) in sterile glass containers with a volume of 0.25 l each. As a result of the analysis is calculated the total number of bacteria, saprophytes and the ratio value between them. For filtration equipment there are being used membrane filters. For sampling and analysis are used methods given in the "Guidelines for hydrobiological analysis of surface waters and benthic deposits".

Phytoplankton samples are being taken from the surface layer in polyethylene containers with a volume between 0.25 to 1 and it is fixed with 40% formalin or Lugol solution. The calculation of the algae number is is performed in Goreaev Chamber. For the determination of diatoms is prepared a fixed sample with a solution of pleurax in butanol. The biological mass is determined by the calculation of algae cell volume according to standardized methods. For the determination of systematic algae basic groups are used key determinators for each taxonomic group. Water quality assessment is performed according to the Saprobic Pantle & Buck method.

Spectrophotometric determination of the content of chlorophyll "a" is performed in accordance with ISO 10230. Samples are being taken from the photic layer in brown glass containers with a volume between 0.5-2 l. In order to isolate and concentrate the vegetal plankton and other suspended solids a certain volume of water is filtered on a membrane filter. The extraction of the pigments from the residue of the filtrate is carried out in warm ethanol, and then chlorophyll "a" from the extract is

measured by spectrometry.. Calculating the concentration of chlorophyll "a" is based on the difference between the measured absorbance at 665 nm and 750 before and after the acidification of the extract.

Zooplankton samples are taken by filtering 100 liters of water taken from the shallow layer of surface water (0.2-0.5 m) After that it is preserved with formalin (40%). The surface water quality is estimated using the Pantle and Buck method which represent a statistical analysis of saprobic values of zooplankton organisms detected. To determine the species composition of zooplankton specialized literature is being consulted .

For the phytobenthos samples analyses are collected algae from the submerged strong supports by scraping (blade, spatula) or by washing the stones. Also, samples can be collected from the surface of fine mobile sediments,]n such case the collection can be made directly with the spoon, spatula, syringe (Janet type) or the core samplers. If the sample is not analyzed within 24 hours, it should be fixed with 40% formalin or alcohol 1: 3. For the identification of diatoms the fixed sample is prepared with a solution of pleurax in butanol. Water quality is determined according to Saprobic index, according to the Pantle and Buck method (1955).

The specific composition and quantitative development of macrozoobenthos characterizes certain levels of pollution in the lower water layer. Sampling is done using a kick-net. Samples should be taken from an area of 1 m^2. Sampling includes various sublayers. The samples are washed in a net, then they are fixed with 40% formalin or alcohol 70% (1: 2) solution. Afterwards the number of organisms is calculated. The biological mass of macrozoobenthos organisms is determined by weighing them, previously dried on a filter paper until the disappearance of wet spots. Water quality assessment according to benthic invertebrates is performed by several methods, one of which is the Saprobic method after Pantle and Buck. As an alternative to the Saprobic method is the biotic one developed by Woodiwiss, being one of the most suitable for assessing benthic samples taken near the river bank. This method is based on the presence or absence of certain groups of organisms (Plecoptera, Ephemeroptera, Gammaridae) at the sampling place. Both Saprobic index, as well as biotic index are suitable for use in waters polluted with organic matter, especially after wastewater discharge, because the indicator organisms are usually sensitive to decreased levels of dissolved oxygen content.

The study of aquatic macrophytes is performed in order to obtain information on plant species diversity of aquatic, riparian, grassland, which are growing near the river or lake. Sampling includes collecting plants for subsequent determination until species and herbarium composition. Since macrophytes are used in the current monitoring activity, their collection stations are identical with those for physico-chemical and biological samples stations. It is acceptable to move upstream or downstream with a few tens of meters in order to identify optimal locations or representative sampling, choosing a river segment that has a suitable sublayer for collecting the samples . As a general rule, it should be about 100 m long, but also longer lengths are acceptable, considering the physical uniformity of the river and substrate availability.

Transboundary monitoring on the Prut River with Romania is conducted according with the Regulation of bilateral cooperation with the National Administration “Apele Române” and Basin Department Prut-Bârlad (Iasi) in seven monitoring points:

- joint monthly monitoring sampling and equivalent exchange of information with experts from Romania is being conducted at the following sections: Ungheni Town, Valea Mare and Giurgiulesti villages;
- quarterly sampling monitoring and equivalent exchange of information with experts from Romania is being conducted at sections: Lipcani, Costesti, Leova, Cahul.

Transboundary monitoring on the Prut River with Ukraine: Since 2009, quarterly joint monitoring is taking place regarding sampling and exchange of information on Prut River with Ukraine. The program of joint water sampling at the border between the Republic of Moldova and Ukraine has been prepared by a respective working group and agreed with the laboratories that should be involved in joint sampling and sharing of information. Sampling and exchange of information on the Prut River at

the monitoring station "Mamaliga-Criva" (border crossing) is conducted together with the Nistru - Prut River Basin Water Resources Management (Cernauti town).

Within the Transnational Monitoring Network (TNMN) within the cooperation framework of the International Commission for the Protection of the Danube River (ICPDR) 5 monitoring points have been selected on the Prut River (Lipcani, Costesti, Braniste, Valea Mare and Giurgiulesti). Analyses are conducted monthly including a set of hydrochemical and hydrobiological parameters, and indicators of quality for sediments.

Surface water resources of the Prut river are also assessed based on data from three hydrological stations Sirauti (situated at the border with Ukraine), Costesti-Stinca Hydropower plant and Ungheni. Ungheni hydrological station provides the most comprehensive data series covering 55 years. Hydro morphological monitoring and assessment in the Prut River Basin has not been conducted so far due to lack of finance and insufficient capacities.

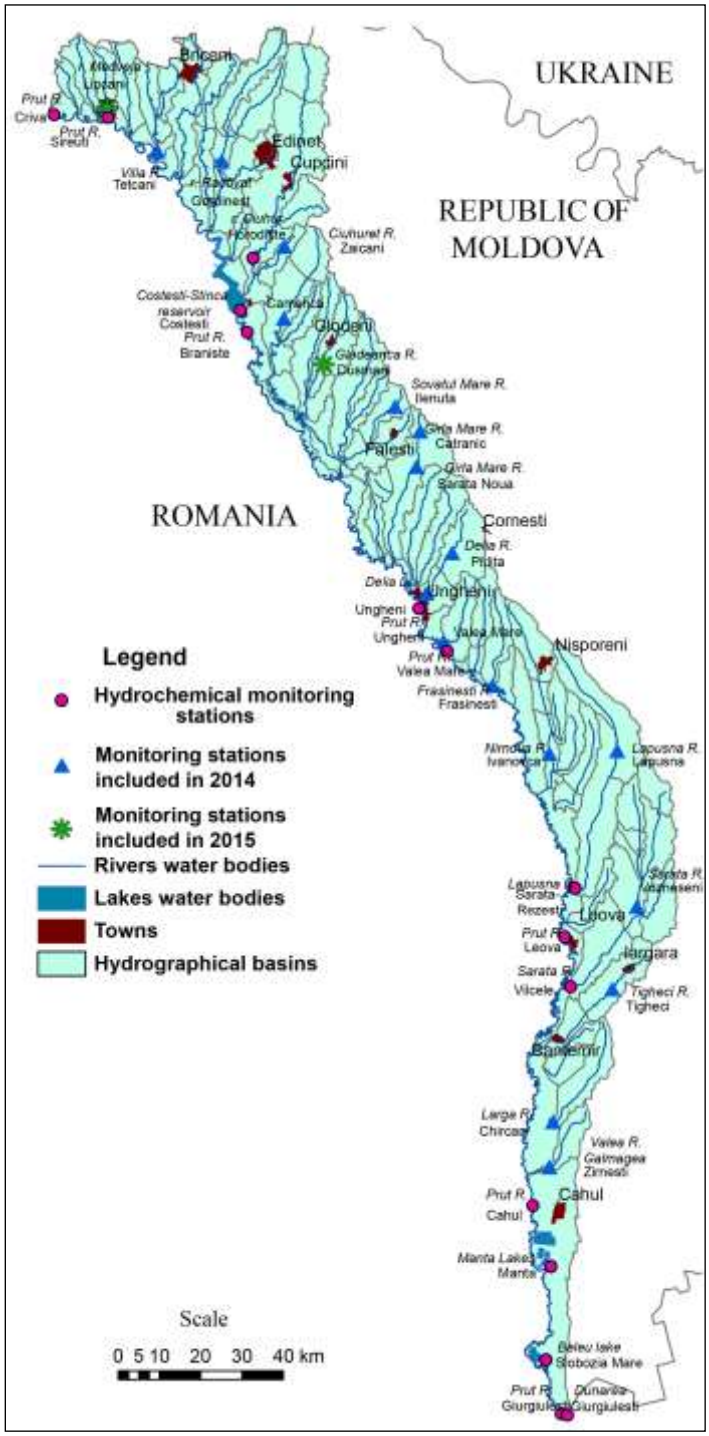


Figure 4.1. Hydro chemical and hydro biological monitoring stations

4.2.1. Assessment of the ecological water status of RWBs

The quality of surface waters in the limits of the Prut River Basin was assessed based on information provided by SHS for 2013-2014 years and that obtained as a result of annual expeditions in the Prut river basin deployment within the EPIRB project.

Analysis of surface water status was done using two principles: (i) analysis of annual averages and percentiles for 2013-2014, when quality classes of monitored parameters were established for each sector of the river according to Regulation on Environmental Quality requirements for surface waters (GD. 890 of 12.11.2013), and (ii) analysis of monthly values, in order to observe the monthly variation of qualitative parameters values based on MAC taken from Methodology for assessing damage caused to environment as a result of violation of water laws (Ministry of Ecology, Constructions and Land Development of the Republic of Moldova, nr. 163 of 07.07.2003); Hygienic Regulation "Protection water basins against pollution" (Ministry of Health of the Republic of Moldova, nr. 06.6.3.23of 03.07.1997).

The water quality by hydro chemical indices, during the 2013 – 2014, corresponded to quality classes from "moderately polluted" to "very polluted" (tab. 4.2, fig. 4.2). According hydrogeological parameters the quality of Prut river water is assigned quality classes from "good" to "very polluted" (Annex 4.6). Physio-chemical parameters which had a decisive role in establishing of quality class according to the "lowest points" principle are as follows: chemical oxygen demand, ammonium nitrogen, sodium and potassium ions, phenols and oil products. In some sections of Prut river increased concentrations of total iron were detected (Lipcani, Valea Mare and Giurgiulești villages, Leova and Cahul towns), dissolved copper (Criva village), total and dissolved zinc (Lipcani village, Leova town) and dissolved cadmium (Giurgiuleşti village) (Annex 4.1).

According to hydro-biological quality parameters to the Prut river water is assigned the quality grades from "good" to "very polluted" (Annex 4.6, tab. 4.2). The Phytoplankton had a decisive role in determining the water status, for Saprobic index, as well as its bimass. Since for the biological parameters have not been developed a Multimetric index, they are still considered "less reliable" than chemical parameters. However, the hydrobiological monitoring system of surface water quality does not supervise the fish fauna, an important indicator WFD.

Small rivers are highly polluted and their water quality is assigned according to hydro biological elements from "good" to "very polluted" class quality. According to hydro-chemical parameters, the water quality of Prut river tributaries is characterized as "polluted" or "very polluted" (tab. 4.2). This situation is proven by the increased values of chemical and biochemical oxygen consumption, mineralization, sulphate ions, sodium and potassium ions, the concentration of total iron, oil products and phenols. Also, in the small rivers heavy metals were monitored: copper and zinc which concentration largely falls within up to III quality class, with the exception of dissolved zinc concentration in Frasinesti, Racovăţ and Varsava rivers, which reached the IV quality class values that is "polluted". The fact that Prut river tributaries are highly polluted has been demonstrated once again at the result of the expedition that carried out this year. The results of the JFS-3 are shown in Annex 4.7.
The JFS 2013-2015 results showed that the hydromorphological changes affect considerably the ecological status of the rivers. The most significant pressures in the Prut river basin are interrupting the continuity of the river by dams and abstraction. Small tributaries are adjusted and consequently have poor ecological potential (Fig. 4.4).
At the same time, during this period, in accordance with Annex X of the WFD the priority substances from the organochlorine pesticides, polyaromatic hydrocarbons and polychlorinated biphenyls groups have been monitored. Although sometimes small amounts of naphthalene, fluoranthene, DDD, DDE and DDT were detected (Annex 4.4) these not exceeded established norms.

During the JFS-1 in the three samples persistent organic pollutants were detected (tab. 4.1) with concentrations above Environmental Quality Standard expressed as an annual average value (EQS - AA) according to Directive 2013/39 / EU for total DDT at the point of monitoring Lăpușna river-Lăpușna village. This monitoring location was not revisited during JFS-2 because it was included in the annual monitoring program (fig. 4.1).

According to the analysis results obtained in the JFS-2, organochlorine pesticide concentrations that exceed the limit of quantification in the Valea Galmage tributary, Zîrnești village were detected (tab. 4.1). So, heptachlor concentration has exceeded MAC (EQS MAC) according to Directive 2013/39 / EU and total DDT has exceeded environmental quality standard expressed as an annual average value (EQS - AA) according to the same directive.

At the same time, for water bodies whose quality according to biological, morphological and physicochemical elements is not known, data interpolation was performed according to the following principle: data interpolation was performed according to the following principle: class quality has been established according of the downstream water body quality (fig. 4.2, 4.3, 4.4).

Figure 4.2. Quality class according hydrobiological elements for Prut HB

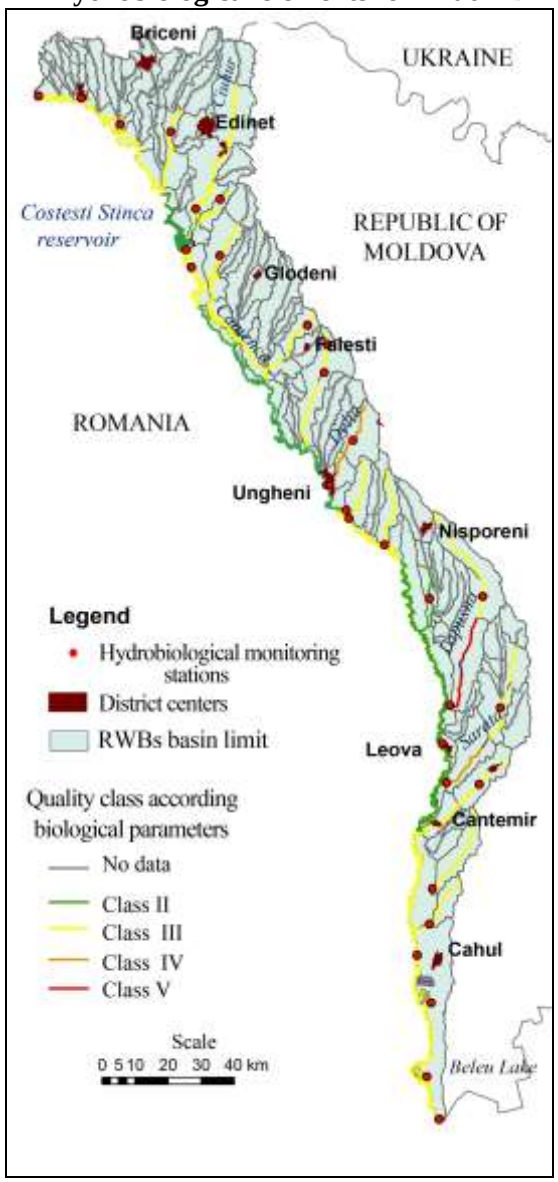


Figure 4.3. Quality class according physico-chemical parameters for Prut HB

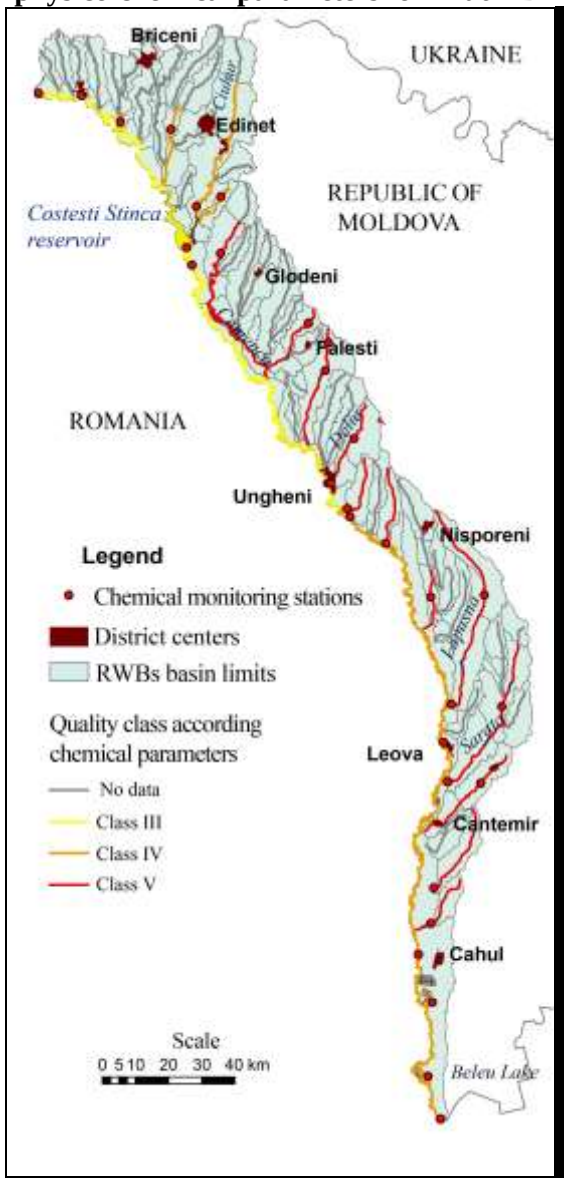


Figure 4.4. Final quality class for Prut HB

Table 4.1. The water bodies with a organic micropollutants concentration (µg/l) higher than the limit of quantification (LOQ) detected during JFS-1, JFS-2 and JFS-3 expeditions

JFS nr.	Sampling Location	Alfa-HCH	2,4-DDE	4,4-DDE	2,4-DDD	4,4-DDD	2,4-DDT	4,4-DDT	DDT total	Heptachlor	Heptachlor epox. B	Mirex
JFS-1	Lăpușna r.- Lăpușna v.	<LOQ	<LOQ	0,019	<LOQ	0,039	0,024	0,044	0,126	<LOQ	<LOQ	<LOQ
	Tigheci r.- Tigheci v.	0,006	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
	Șovățul Mare r.- Ilenuța v.	<LOQ	<LOQ	0,019	0,003	0,004	<LOQ	<LOQ	0,023	<LOQ	<LOQ	<LOQ
JFS-2	Valea Galmage r., Zîrnești v.	<LOQ	0,014	0,020	0,024	0,017	0,035	<LOQ	0,072	0,008	0,009	0,011

JFS-3	Sampling Location	Naphthalene	Phenantrene	Anthracene	Fluoranthene	Pyrene	Benzo(a)anthracene	Chrysene	Trichlormethane
	Prut r.- Lipcani v.	0,012	0,057	0,012	0,032	0,032	0,022	0,021	20,384
	Prut r. - Valea Mare v.	0,023	0,058	<LOQ	0,030	0,034	0,022	0,021	4,155
	Prut r. - Giurgiulești v.	0,013	0,070	<LOQ	0,036	0,040	0,021	0,026	0,765

Figura 4.3 Clasa de calitate conform parametrilor fizici-chimici pentru BH Prut

According to expert comments (Paul Buijs), the river water bodies with water quality parameters that qualify as Class III or worse could be regarded as being 'at risk'. In this regard, fig. 4.5 shows the water bodies at risk according to ecological status.

4.2.2. Ecological water status of LWBs

Analysis of water quality for LWBs was executed using the same principles as in case of RWBs: analysis of annual averages and percentiles was quality parameters with comparison of 5 quality classes.

Overall, it is observed that the ecological status of Costesti – Stinca reservoir corresponds to quality class III, which is "moderately polluted" (tab. 4.2). According to hydro-biological parameters the Costesti – Stinca reservoir quality of water can be attributed to class II, but physico-chemical indicators indicate a moderate water lake pollution after chemical oxygen demand, content of total iron, phenols and petroleum products (Annex 4.2). At the same time, as a result of monitoring of priority substances, low concentrations of naphthalene and fluoranthene were detected (Annex 4.4).

As regards the other lakes within Prut river basin monitored - Manta and Beleu - natural lakes situated in the southern part of the republic, the water quality corresponds to the IV class, that is "polluted" (tab. 4.2). Even if the study of hydrobiological parameters indicate that the water quality corresponds to class III, according physico-chemical elements water of these two lakes is polluted after following indicators:

Figure 4.5. Water bodies at risk from Prut HB

dissolved oxygen, chemical oxygen demand, sulphates, sodium and potassium ions and dissolved zinc (Annex 4.2). Priority substances were not detected in these water bodies.

So, all three monitored lakes can be considered as lakes water bodies at risk of not achieving environmental objectives (fig. 4.5).

Table 4.2. Water status of water bodies in the Prut river basin (principle: one out – all out)

The monitoring location	Biological Water Status	Chemical Water Status	Hydromorphological Water Status	Ecological status
Prut r.– Criva v.		III		III
Prut r.– Lipcani v., 0,2 km upstream	III	III	I	III
Prut r.– Branişte v., 0,2 km upstream	III	III		III
Prut r.– Ungheni t., 1,2 km downstream of bridge	II	III	I	III
Prut r.– Valea Mare v., downstream of Jijia r.	III	IV	II	IV
Prut r.– Leova t., 0,2 km upstream	II	IV	I	IV
Prut r.– Cahul t., 3,5 km downstream	III	IV		IV
Prut r.– Giurgiuleşti v.	III	V	II	V
Şovăţul Mare r.- Ilenuţa v.	III	V		V
Camenca r. – Camenca t.	III	V	IV	V
Ciuhureţ r. – Zaicani v.	III	IV		IV
Ciuhur r. –Horodişte v.	III	IV	IV	IV
Delia r.- Ungheni t.	III	V		V
Delia r. - Pîrlița v.	IV	V		V
Frăsineşti r.- Frăsineşti v.	III	V		V
Larga r.- Chircani v.	III	V	IV	V
Nîrnova r.- Ivanovca v.	II	V	III	V
Racovăţ r.- Gordineşti v., upstream	III	IV	IV	IV
Sărata r.- Vozneseni v.	III	V	III	V
Sărata r. – Vîlcele v., downstream	IV	V	I	V
Tigheci r. – Tigheci v.	III	V	IV	V
Valea Calmage r.- Zîrneşti v.	III	V	IV	V
Varşava r.- Valea Mare v.	III	V		V
Vilia r.- Teţcani v.	III	IV	II	IV
Gîrla Mare r.- Catranîc v.	III	V	III	V
Gîrla Mare r. - Sărata Nouă v.	III	V		V
Lăpuşna r. - Lăpuşna v.	III	V	IV	V
Lăpuşna r. – Sărata Rezeşi v.	V	V	II	V
Costeşti r. - on the Prut river, Costeşti t.	II	III		III
Manta l. – Manta v.	III	IV		IV
Beleu l. – Slobozia Mare v.	III	IV		IV

4.2.3. Quality Control and Quality Assurance

Quality assurance of testing results and data obtained as a result of hydrobiological, physicochemical and morphological monitoring is an important aspect stipulated by the WFD. For this purpose, the Department of Environmental Quality Monitoring laboratories, within the State Hydrometeorological Service - the national institution responsible for monitoring of surface waters are accredited since 2002, and according to the latest assessment from February 21, 2014 hold the accreditation certificate no. LI-023. At the same time, to demonstrate the capability of testing

laboratories annually participates in testing efficiency of internationally organized by the Educational and Scientific International Center Wessling, Budapest, Hungary. Also, current methods for investigating of water quality are gradually replaced by international standard methods in accordance with WFD.

4.2.4. The deficiencies of the monitorimg`s system

The WFD and the guidance state that the frequency of monitoring programme for chemical parameters should be monthly (SM) or quarterly (OM) – Annex 4.5. However, in Moldova it is done less often due to technical and financial resources incapacity for insurance with chemical reagents and adequate consumables, certified reference materials, as well as equipment maintenance. Also for these reasons, there are being monitored in some places only general conditions.

It is important for the surface water monitoring programme to ensure that data generated by WFD physio-chemical and biological monitoring parts are reliable and representative, and this could be done by implementing of international standards that stipulate stages of laboratory analysis starting from the collection of qualitative samples to the analysis itself in order to achieve this goal the institution responsible for monitoring should have the appropriate financial support for purchasing new equipment much precisely, maintaining the existing one to ensure traceability, buying new ISO standards and training the staff accordingly, acquiring traceable reference materials for quality control assurance, also chemical reagents and lab ware, and participating in proficiency testings and international laboratory comparisons.

As the hydrobiological assessment is based on well-trained staff in a narrow field (flora and fauna, planton or benthic), special laboratory equipment (trinocular microscopes, stereomicroscopes), specialized literature and international standards, adequate sampling of hydrobiological samples, etc. in this report "less confidence" of this kind of evaluation was attributed. However, lately, due of trainings in the field, is maintaining a close collaboration with experts from Romania, Czech Republic and Spain. Regarding fisheries monitoring of water quality it has never been done in our country and is an issue that needs to be implementing.

A significant shortcoming in evaluating the chemical status would be one that not all priority substances under WFD 2000/60 / EC (Annex X) and Directive 2013/39 / EU are analyzed, due to the lack of adequate endowment of the laboratory responsible for monitoring and methods development for those substances.

Also, unfortunately, after a fairly long period of monitoring in this basin, there are still some Prut river tributaries on the water quality of which nothing is known. To address this problem would be appropriate to develop a monitoring program for a longer period of time or annual field expeditions performing to fill the gaps of data. However, a good planning must be obvious in both cases, because in the summer usually smaller rivers dries up due to frequent droughts and these activities would not achieve its objectives.

4.3. Hydro morphological status/ecological potential of river water bodies

RWBs hydro morphological status/potential was assessed based on measurements data from: the report Joint Field Survey Report: Surface Waters 2013. Armenia, Azerbaijan, Belarus, Georgia, Moldova, Ukraine. During the 2013 JFS, 24 sampling sites were selected in Prut River Basin from which 24 water sample taken with on-site measurements of pH, dissolved oxygen, NH_4, CBO_5, P_{total}, mineralization, sulphates, nitrate. Most of these samples demonstrated moderate and poor status/potential of water bodies (fig. 4.6, 4.7).

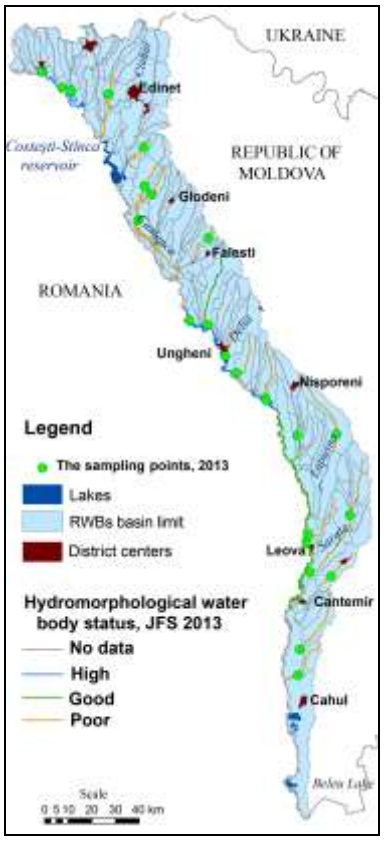


Figure 4.6. Water body status/potential according to hydro morphological survey results, JFS 2013

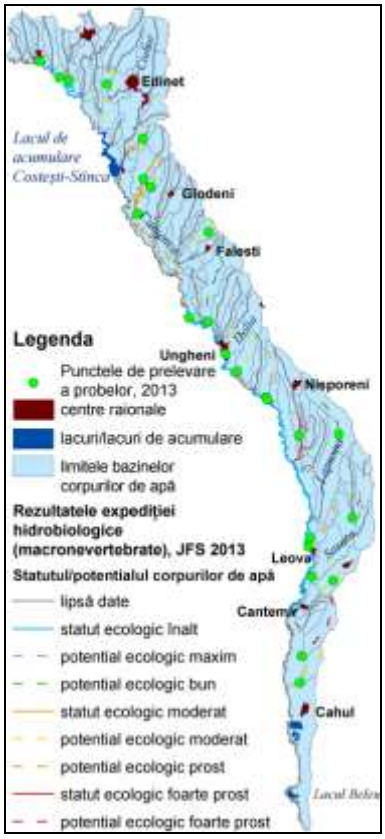


Figure 4.7. RWBs ecological status/potential, JFS 2013

The JFS 2013-2015 results have shown that hydro morphological alterations considerably affect the ecological status of rivers. The most significant pressures in Prut river basin is the interruption of the river continuity by dams and water abstraction. All small tributaries are regulated accordingly and have a poorly ecological potential (fig. 4.6).

Collected information during the JFS was insufficient to classify the water status of all water bodies in accordance of the WFD principles. However, the information can give an idea about the water quality especially in those water bodies where till the JFS 2013 there was no information. Additional samples are necessary for classification of the water status of all water bodies in accordance of the WFD principles.

4.4. Existing groundwater monitoring network

National groundwater monitoring network in the Prut River Basin consists of 32 monitoring stations installed into unconfined and artesian aquifers and is used for the routine observations of quantity and quality of impacted by abstraction underground aquifers. List of monitoring stations is presented in the Annex 4.22.

Distribution of monitoring network by the delineated groundwater bodies (GWB) is the following:

- Alluvial (aA_3), G100 – 8 monitoring wells
- Badenian-Sarmatian (N_1S_1), G200 – 4 monitoring wells
- Upper Sarmatian-Meotic (N_1S_3-m), G300 – 2 monitoring wells
- Middle Sarmatian (Congerian, N_1S_2), G400 – 7 monitoring wells
- Pontian (N_2p), G500 – 2 monitoring wells
- Silurian-Cretaceous (K_2S_1), G600 – 9 monitoring wells

Agency for Geology and Mineral Resources which is subordinated to the Ministry of Environment performs routine national groundwater monitoring. Local observers employed by the Agency for Geology and Mineral Resources measure water levels and send paper data on a monthly basis. The staff of this institution once-twice/year depending on the available budget collects groundwater samples. Due to the absence of pumps, monitoring wells are not purged before sampling. Results of groundwater monitoring are annually reported to the Geological fund (archive) and are published in 5-year bulletins in which analysis of environmental and human induced changes in groundwater levels and quality are analyzed and presented.

It is proposed to maintain all existing monitoring wells as it will be difficult from the economic point of view to drill new monitoring wells in Moldova in the nearest future. It is recommended to install (rehabilitate) 7 additional monitoring points to make at least five surveillance monitoring stations in each delineated groundwater body. Total number of surveillance monitoring wells for the WFD compliant programme will then be 39.

Specific feature of Moldovan aquifers is elevated mineralization (total dissolved solids) which is related to availability of soluble gypsum minerals in water bearing sediments. Due to the increased salinity in all productive aquifers the content of dry residue reaching 1,5 g/l is approved in the Moldavian drinking water standard (EU norm is 1,0 g/l). It is assumed that groundwater abstraction accelerates saline water intrusion and this has to be monitored. Investigative monitoring is proposed for detecting of the reason of such salinity.

Operational monitoring and drinking water protection areas monitoring shall be also performed by the water supply companies, which provide > 100 m/d for human consumption as an average.

Monitoring of polluted sites (prevent & limit monitoring) shall be organized obliging potential polluters to carry out groundwater monitoring.

Changes in water legislation shall be made for obliging water uses and polluters to monitor impact of their economic activities to the environment.

Agency for Geology and Mineral Resources is planning to refurbish existing monitoring network and install electronic data loggers into 14 existing monitoring wells. One new monitoring well will be drilled and equipped with the telemetric data transfer devise. Modern groundwater monitoring equipment will provide reliable data, which will be used for surveillance and operational monitoring programmes.

4.5. Proposed WFD compliant monitoring programme for GWBs

Programmes for groundwater monitoring in the Prut river basin, are based on current conceptual understanding of underground hydrosphere and human pressures, considering existing national monitoring network and observation schedules, and to a possible extent reflecting requirements of the WFD and GWD.

Nine groundwater bodies (temporary codes G100-G602) have been identified and delineated in the Prut river basin of Moldova. All nine delineated groundwater bodies are of good quantitative and chemical status, although often groundwater has rather high (presumably natural) mineralisation. Surveillance monitoring programme shall be developed for the groundwater bodies of good chemical status.

WFD compliant groundwater monitoring programme in the Prut River Basin shall consist of quantitative and chemical monitoring which will be further sub-divided into surveillance, operational and investigative sub-programmes. As per WFD requirements drinking water protection areas and monitoring of polluted sites (prevent&limit monitoring) shall also be included and addressed.

Existing groundwater monitoring network has been reviewed to determine its suitability to the WFD requirements. Newly proposed groundwater monitoring programme is based on the present conceptual understanding of the hydrogeology and anthropogenic pressures within each delineated

groundwater body and will be reviewed as this understanding improves or at least once in each monitoring planning cycle (every 6 years).

Surveillance monitoring programme shall be proposed for all nine groundwater bodies with good quantitative and chemical status (temporary codes G100-G602). The minimum number of monitoring points in each groundwater body is three: covering recharge, transit and discharge areas (source: "The EU Water Framework Directive: Statistical aspects of the identification of groundwater pollution trends, and aggregation of monitoring results"). Holms et. al proposes to install five monitoring wells in each groundwater body with the homogenous hydro chemical and hydrodynamic features. Five monitoring points will guarantee confident characterization of the body of groundwater (source: Irrigation Sector Reform Activity (ISRA) River Basin Management Sub-activity Identification, Delineation, and Classification of Water Bodies).

Operational monitoring programme shall focus on observation of „at risk" groundwater bodies, establishing the presence of any long-term anthropogenically induced upward trend in the concentration of pollutants, supporting the design of PoMs and assessing the effectiveness of such measures within groundwater bodies.

Available monitoring information reveals that there are no groundwater bodies at risk in the Prut basin of Moldova. The source of elevated salinity in the aquifers has to be detected and impact of groundwater abstraction carefully analyzed. If groundwater salinity is natural than GWB shall be assigned a good status. If increased salinity is influenced by groundwater abstraction then GWB are assigned "at risk" category. Operational monitoring shall be carried out not only in GWB at risk but also around the major well fields which abstract >100 m^3/day of groundwater for human consumption in order to observe their impact on subsurface and surface environments.

In a specific case, which needs further investigation an investigative monitoring is required. Investigative monitoring will be proposed for detecting the origin of saline water intrusion in the groundwater bodies.

Observation of surface-groundwater interaction is an important WFD requirement. It is well known that increasing abstraction is negatively influencing surface waters - bogs, peat lands and small streams, firstly. Surface-groundwater interaction is not a separate branch of monitoring but it should be considered in all types of monitoring: surveillance, operational and investigative monitoring programmes. It is suggested to observe flow regime of surface streams in the low-flow periods when rivers are mainly fed by the groundwater discharge.

4.5.1. Quantitative monitoring

The overall objectives of the quantitative monitoring include observation of long-term water level trends and assessment of saline or other intrusions caused by groundwater abstraction. This information will also be used for validating risk assessments.

Groundwater level monitoring stations shall be located across a groundwater body to achieve a good spatial variation of information within groundwater body's recharge and discharge areas.

Groundwater level and flow measurements shall be carried out in:

- Monitoring boreholes, and/or production wells in the delineated groundwater bodies for the observation and prevention of negative human impact (at least 5 monitoring stations in each homogenous groundwater body);
- Transboundary aquifers with Romania and Ukraine;
- Groundwater abstraction sites (operational monitoring near the well fields);
- Surface water bodies during the drought periods.

The installation of data loggers is recommended in all quantitative groundwater monitoring boreholes because continuous and frequent data recording provides an opportunity to achieve a greater understanding of the aquifer response to changes of discharge-recharge regimes and behavior

to pollution/abstraction events. It is planned to refurbish existing groundwater monitoring network in Prut River Basin installing 15 electronic water level, temperature and conductivity meters (Annexes 4.23 and 4.24). One monitoring well will be equipped with telemetric station for the transfer of information to the computers of Agency for Geology and Mineral Resources.

Refurbished monitoring network will be sufficient for the quantitative monitoring and will be used for the surveillance and operational monitoring programmes.

4.5.2. Surveillance chemical monitoring

The main objective of the surveillance chemical monitoring programme is the assessment of long-term water quality trends, caused by changes in natural conditions and through anthropogenic activity. Surveillance monitoring data will be also used for assisting design and evaluation the effectiveness of programme of measures.

As mentioned above, at least five monitoring wells in each homogenous groundwater body are required for further monitoring and confident characterization of the body of groundwater. Artesian groundwater bodies in Moldova are rather inconsistent due to variations of salinity, therefore it is advisable to install (rehabilitate) at least five (and preferably more than five) monitoring stations in each groundwater body.

During the surveillance monitoring programme, some parameters have to be measured in the field at the well/river before collection of samples: pHs, temperature, DO, conductivity, TDS, etc. Monitoring wells must be properly purged before collecting groundwater samples. EPIRB project has rented field-monitoring equipment (pH, temperature, conductivity, TDS-meters and purge pump) which was used for measurement groundwater parameters during the field surveys.

The Agency for Geology and Mineral Resources, Ministry of Environment, Republic of Moldova shall conduct surveillance (national) monitoring of groundwater according to the annually approved plans. The frequency of monitoring is not specified by the WFD, and it should be adapted to the local hydrogeological conditions. As a minimum surveillance monitoring should be carried out once per planning period (6 years).

Chemical analysis of collected samples for general indicators (main cations and anions, nutrients, permanganate index, etc.) characterizes the chemical status and quality of groundwater formed under natural conditions and anthropogenic loads. These components have to be analyzed in groundwater samples at least twice a year.

Such specific chemical components as organic compounds and pesticides, with usually very low concentrations shall be monitored once in six years, and trace elements shall be monitored once in a two-year period in wells where these components are likely to be detected.

The following groundwater monitoring frequency for the surveillance monitoring is proposed for the Prut river basin of Moldova (Annexes 4.25-4.26).

4.5.3. Operational monitoring

Operational monitoring programme shall be organized in and around the groundwater abstraction sites which pump >100m3/day for human consumption. Significant and sustained upward trends in the concentration of pollutants will be monitored and if such trends are identified - the starting points for trend reversal shall be defined. For the analysis of specific problem of increased salinity, the investigative monitoring programme will be proposed. Pilot sub-project on refurbishment of groundwater monitoring network in the Prut basin will be implemented by the EPIRB project.

It would be advisable to oblige water supply companies to perform drinking water protected areas monitoring and entities – the potential groundwater polluters - to carry out prevent and limit monitoring

Operational monitoring is used for:

- Determining the chemical status of groundwater bodies that are at risk of failing to meet the WFD environmental objectives. There are no GWB at risk in Moldova at this stage;
- Detecting the upward trends in pollutant concentrations due to either natural or human impacted causes (salinity problem);
- Defining the starting points for trend reversal;
- Assisting the design and evaluating the effectiveness of programmes of measures;

Operational monitoring frequency shall generally be based on the characteristics of the aquifer and human impact. The following groundwater monitoring frequency for the operational monitoring is proposed for the Prut river basin of Moldova (Annex 4.26).

Water supply companies and other economic entities, which abstract >100 m^3/d of groundwater for human consumption shall be obliged to carry out groundwater monitoring. Water companies may use abandoned exploitation wells for impacted groundwater monitoring.

Information from the refurbished national groundwater monitoring stations, located nearby water abstraction sites will be also included into the operational monitoring programme.

4.5.4. Monitoring of drinking water protected areas

The WFD requires monitoring of drinking water protected areas (DWPA) for assessment of the achievements of the environmental objectives for groundwater bodies, which provide more than 100 m^3/d for the human consumption as an average. Chemical composition of groundwater will have to be analyzed for all DWPA that are categorized as being significant drinking groundwater abstractions. Major water supply companies in Moldova shall monitor their drinking water protection areas. Changes of environmental legislation shall be planned to make this monitoring obligatory.

4.5.5. Monitoring of abstractions

Chemical operational monitoring of groundwater shall be also performed by the entities and enterprises engaged in potentially polluting economic activities. Monitoring shall be conducted in order to establish development of groundwater extraction, the amount of pollutants discharged, assess the impacts of the economic activity on the natural environment, and ensure the prevention and limiting such pollution. Water supply companies and potential polluters shall be obliged by legislation to perform groundwater monitoring in their abstraction points. Abandoned abstraction wells can be used for monitoring. Changes in legislation (procedure for issuing permits for water use) shall be foreseen in order to oblige water users that abstract >100 m^3/day and potential polluters to monitor impact of abstraction and pollution on groundwater bodies.

4.5.6. Investigative monitoring

In Moldova, increased salinity needs additional investigation. The WFD indicates that the presence of human induced intrusion in a groundwater body will result in it being at a poor status. However, measuring the extent of an anthropogenic intrusion in Moldavan groundwater is complex, as some groundwater bodies have naturally elevated levels of salinity due to the geochemistry of the aquifer. On the other hand, human impact due to groundwater abstraction is also obvious: groundwater levels are decreasing in major groundwater bodies. Investigative monitoring shall be performed to detect the reason and source of saline intrusion. Refurbished groundwater monitoring network (5 wells with electronic conductivity meters) will serve as a good tool for investigative monitoring.

5. Environmental objectives and exemptions

The environmental objectives provided in the WFD, represent one of the main elements of the Management Plan, with the aim of protection and sustainable use of water resources from Prut River basin. The environmental objectives and the related requirement are part of WFD Article 4 (în special point 1) which, largely, are valid for the territory of Moldova. However, the implementation of Article 4 differs from country to country, due to different pre-requisites, economic potential and current quality of water resources. Due to the aforementioned, the applied environmental objectives will be directed to:

1) **Prevention of further deterioration of current state of surface waters** (art. 4.1. (a) (i), art. 4.1. (b) (i)). This objective is applied for the surface water bodies, for which several risks and pressures have been identified (fig. 5.1), and achievement of good *"status"* and *"quantity"* is practically impossible for the next 6 years, namely in the first planning cycle 2017-2023.

2) **Progressive reduction of pollution** with priority substances and cessation of priority hazardous substances discharges into surface waters by implementation of necessary measures. The objective is applicable to the water bodies, where both point sources pollution (municipal and industrial wastewater discharges) as well as an evidence of the volume and quality of discharged wastewater (to perform monitoring) is present (fig. 5.2), in accordance with Directive no. 91/271/EEC regarding urban wastewater treatment, harmonized by the Government Decision of the Republic of Moldova no.950 from 25/11/2013 for approving the Regulation on requirements for collection, treatment and discharge of wastewater into the sewage system and/or in water bodies in urban and rural areas.

3) **Ensuring sustainable management of water resources** is applied for lakes water bodies (the Costești-Stânca reservoir; complex of the natural lakes Manta and Beleu - tab. 5.1) and for surface water bodies of the Prut river and groundwater bodies. This objective is valid for those surface water bodies, which currently have sufficient water resources (main channel, most of the tributaries from north part of the basin as Ciuhur, Racovet, Draghiste, Vilia, Lopatnic etc) and for the next 6 years, represents a potential source of expansion of drinking water supply system for population (fig. 5.3).

4) **Achieving the standards and objectives for protected areas** established by Community legislation (art. 4.1. (c)). In the case of protected areas, at the moment, it is necessary, first of all, to make a correct delineation and mapping for all abstraction sources (both surface waters and groundwater) and creation of respective register. Assigning the protected area status to these territories, with all advantajes that will result, represents an achievable objective for the next 6 years (fig. 5.4), also with reference to the Management Plan for the Danube River Basin (2009) and next one (2015)[7].

[7]The respective management objectives describe the steps towards the 2015 environmental objectives in an explicit way - they are less detailed than at the national level and more detailed than expressed in the Danube River Protection Convention and Danube Declaration. The Danube River Basin District basin-wide management objectives:
a. describe the measures that need to be taken to reduce/eliminate existing significant pressures for each Significant Water Management Issues and groundwater on the basin-wide scale and
b. help to bridge the gap between measures on the national level and their agreed coordination on the basin-wide level to achieve the overall WFD environmental objective.

Table 5.1. Proposed environmental objectives for each lake water bodies

Code	Name	Prevention of further deterioration of current state of surface waters	Progressive reduction of pollution	Ensuring of sustainable management	Achieving of standards and objectives set for protected areas
MDHMWB020101	**Costesti-Stinca Reservoir**	+	-	+	+
MDN020104	**Badelnic**	+	+	+	+
MDN020103	**Dracele**	+	+	+	+
MDN020102	**Rotunda**	+	+	+	+
MDN020101	**Beleu**	+	+	+	+
MDN020106	**Prut nameless**	+	+	+	+
MDAWB020104	**Cahul fish farm**	+	+	+	+

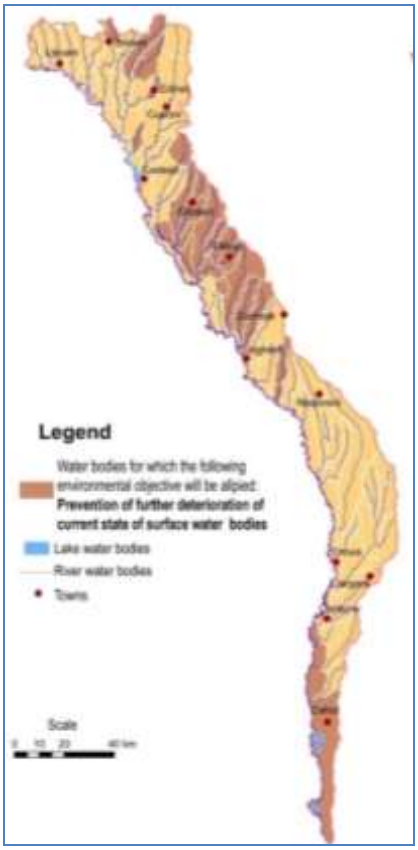


Figure 5.1. Water bodies for application of the environmental objective „Prevention of further deterioration of the current state of surface water bodies"

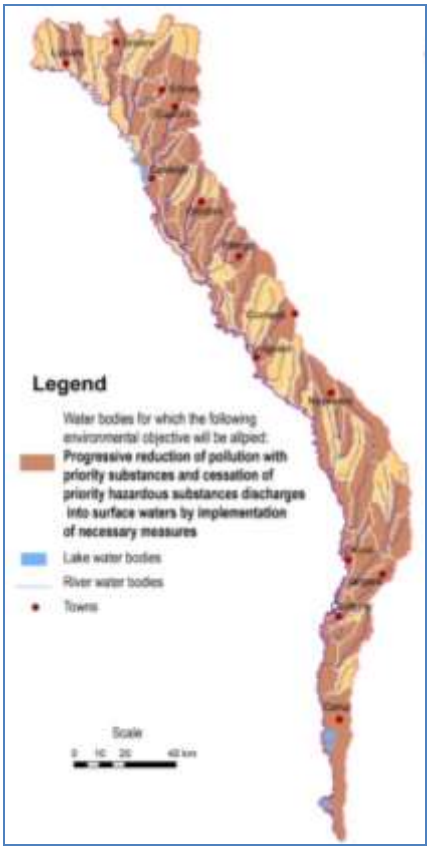


Figure 5.2. Water bodies for application of the environmental objective „Progressive reduction of pollution"

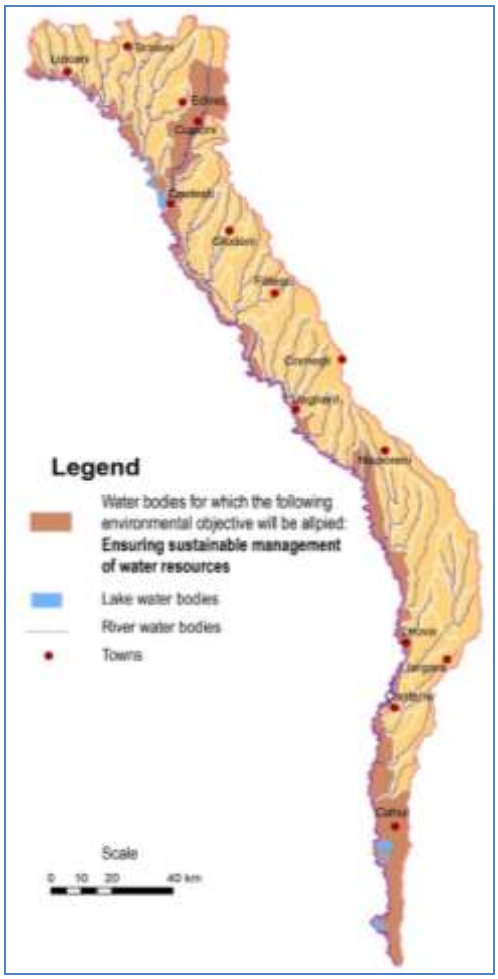


Figure 5.3. Water bodies for application of the environmental objective „Ensuring the sustainable management of water resources"

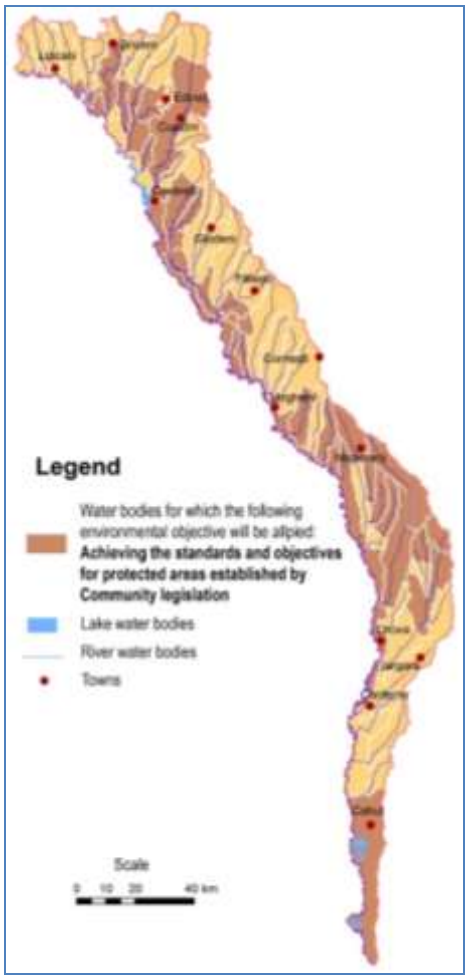


Figure 5.4. Water bodies for application of the environmental objective „Achieving the standards and objectives for protected areas"

Among the environmental objectives, which will be practically impossible to achieve in the next 6 years there are mentioned **enhancing and restoring of all surface water bodies**, including Heavily Modified Water Bodies, and **groundwater bodies in order to maintain a "good status"** (art. 4.1. (a) (b) (ii)).

Essentially, achieving the environmental objectives for Prut river basin until 2021, is assuming the following:

1) For surface water bodies: achieving a satisfactory ecological and chemical status, respectively, a satisfactory chemical status and ecological potential for heavily modified water bodies;
2) For groundwater bodies: maintaining a good chemical and quantitative status;
3) For protected areas: achieving the environmental objectives provided by specific legislation;
4) No deterioration of surface and groundwater bodies status in the Prut river basin.

When the environmental objectives cannot be achieved (which is likely for most surface water bodies), as provided in the **Art. 4 (4), (5), (6) and (7)** of WFD, as well as in Art. 38 (p. 5) of Water Law, **exemptions from achieving the environmental objectives may be required.** Therefore, for many surface water bodies (SWB) these exceptions are proposed. In exceptional circumstances (floods, frequent droughts) river basin district committee may request to the Government an exemption from compliance with environmental objectives. This is also possible in cases when the expected benefit would be possible only at a disproportionate cost in relation to technical feasibility.

However, the minimum content of plan of measurements and the exemption criteria are established by the Government (according to the Water Law and additional national regulations). The exceptions to the environmental objectives will be based on Cost-Benefit Analysis and Disproportionality Analysis. Cost-Benefit Analysis (C.B.A.) aims to determine the net benefit of a program of measures applicable to a specific scale (water body/subbasin/basin/national).

The exemptions from the environmental objectives applicable to water bodies from the Management Plan are classified into the following categories:

1) **Exemption of the deadline for achieving the "good status";**
2) **Achievement of "less stringent environmental objectives"**;
3) **Temporary deterioration of water bodies status**;
4) **New modifications of physical characteristics of a surface water body, changes of groundwater level,** or **deterioration of surface water body status (including from "very good" to "good state") as a result of the new sustainable human development activities.**

For all categories of exemptions identified in the RBMP two principles are applicable (Art. 4. (8), (9)):

- the exemptions that are applied to a water body should not permanently exclude or affect/compromise achieving the environmental objectives in other water bodies from the same basin district;
- application of the exemptions must be correlated with implementation of other legislative regulations at community level; at least the same degree of protection should be achieved by applying the exceptions as provided by existing Community legislation.

Achieving the environmental objectives depends directly on the value and the type of pressure identified. Some types of pressure, such as diffuse pollution from agriculture can be relatively easier to be solved by planting the protection of riparian strips, reduction of agricultural lands and greening of agricultural activities; other pressures exercised by the discharge of untreated wastewater from cities are more expensive to resolve. Classification of water bodies, in relation to the possibility of achieving environmental objectives, has been achieved by indexing the categories of pressure versus status of water bodies. The total pressure was calculated by adding all types of pressure with specific risk criteria by assigning water bodies a coefficient depending on the type of risk, from 1 (low risk) to 3 (at risk). The resulting values, which range from 10 to 22 points, were classified into 3 classes, each class corresponding to a cycle of the management plan implementation (figures 5.5-5.8).

Thus, in the first cycle (2017-2022) 19 water bodies with a total length of 461.2 km (of the total 2152 km) will achieve the environmental objective quality/good status (fig. 5.6); in the the second cycle (2023-2028) – 37 water bodies with a total length of 1120.8 km (fig. 5.7); and in the third cycle (2029-2034) – the latest 27 water bodies with a length of 570 km (fig. 5.8).

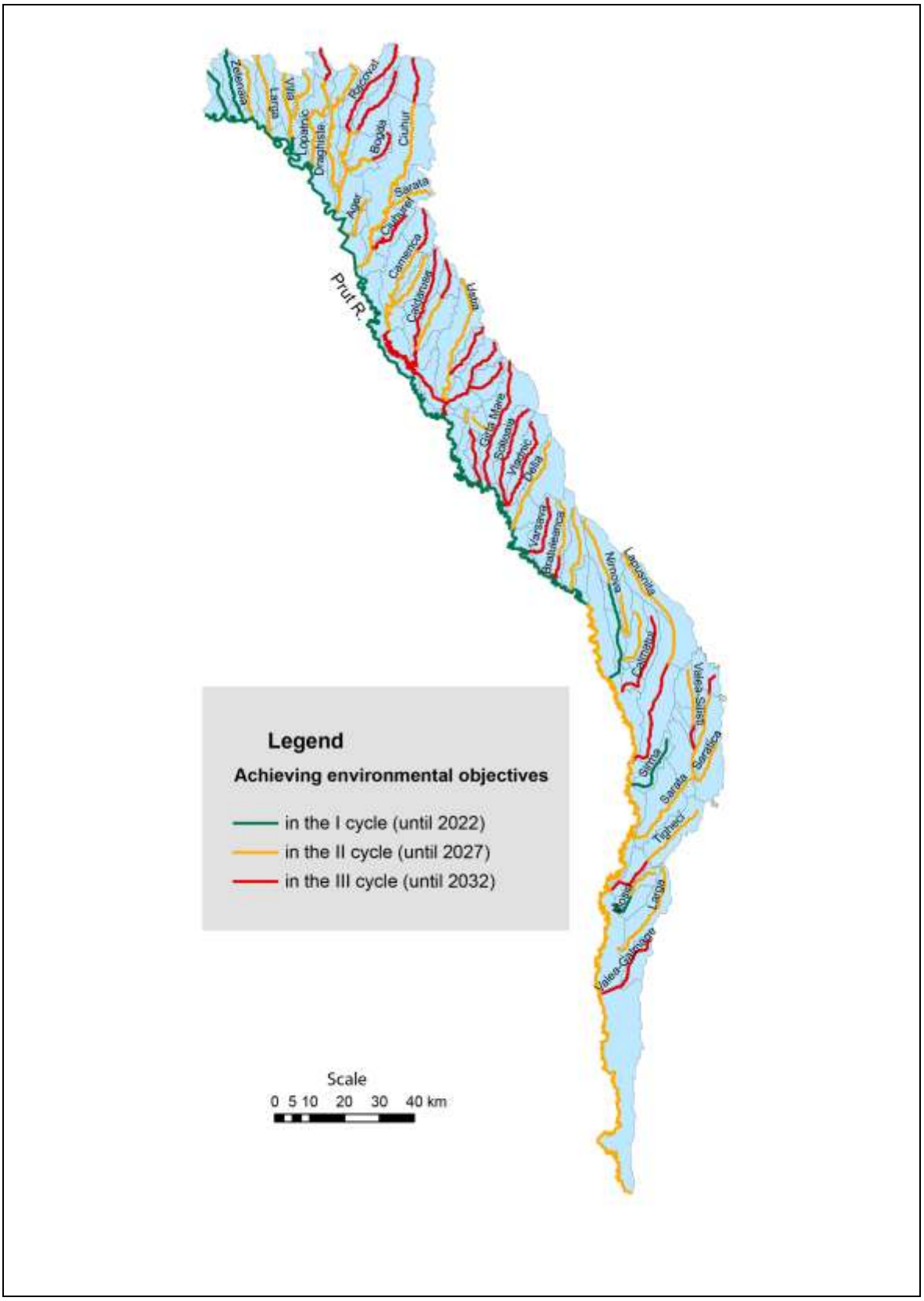


Figure 5.5. Achieving environmental objectives

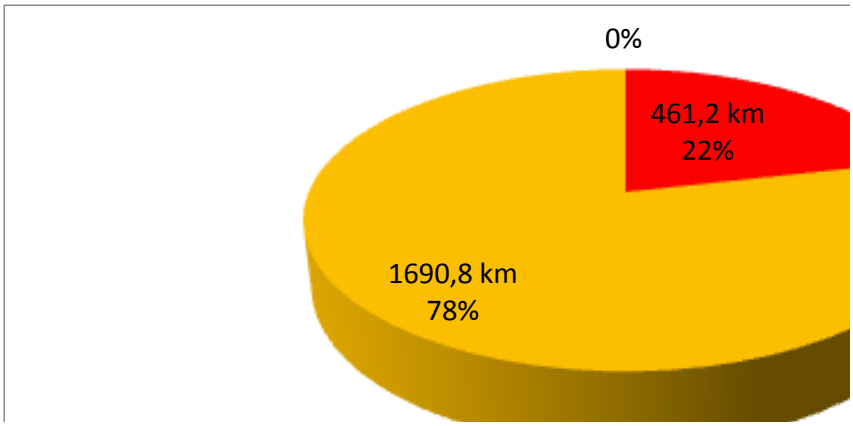


Figure 5.6. Achieving environmental objectives in the first cycle (until 2022)

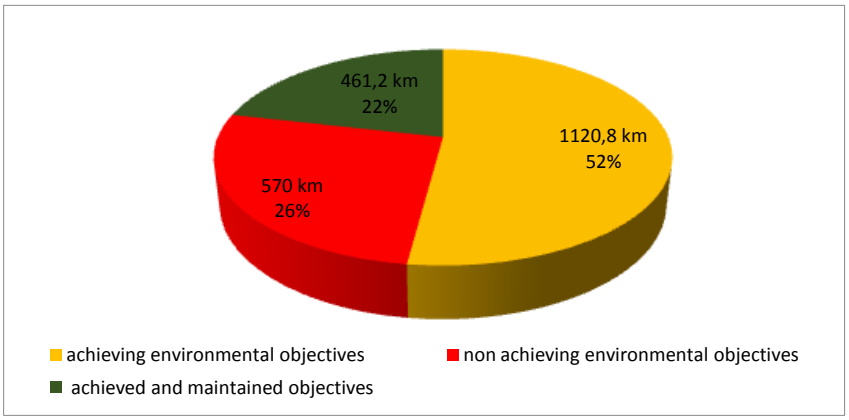


Figure 5.7. Achieving and maintaining environmental objectives in the second cycle (until 2027)

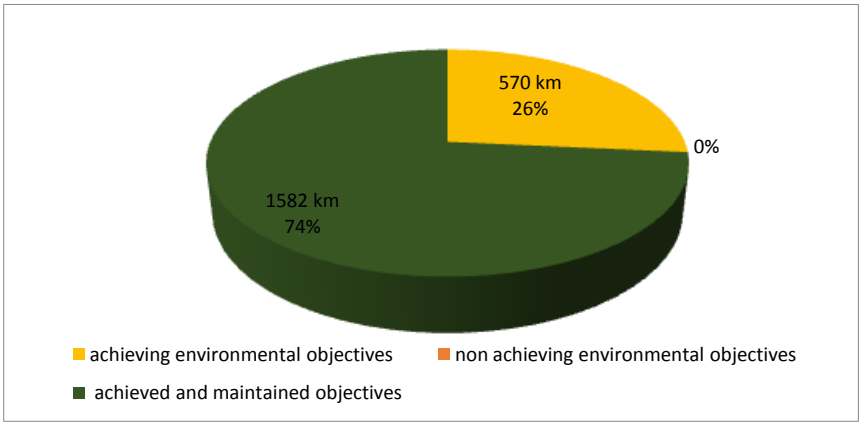


Figure 5.8. Achieving and maintaining environmental objectives in the third cycle (until 2032)

6. Economic analysis of water use

Section "Economic Analysis of Water Use" is developed in accordance with the WATECO Guidelines on the methodology of economic assessment of water use[8] for the implementation of the Water Framework Directive 2000/60 /EC, with River Basin Management Plans implemented in neighboring states[9],[10] and the economic mechanism of use and protection of water resources applied in the Republic of Moldova.

6.1. The legal regulation of use and protection of water resources

Regulatory and legislative framework for the use and management of water resources, regulating the provision of services of water supply and sewage is stipulated in Water Law no. 272 of 23.12.2011, Law no. 1102 of 06.02.1997 on Natural Resources, Law no. 272 of 10.02.1999 on Drinking Water, Law no. 1440 of 27.04.1995 on the River and Water-Basin Water Protection Areas and Strips, Law no. 303 of 12.13.2013 on public services of water supply and sewage, Law no. 397 of 16.10.2003 on Local Public Finance, Title VIII of the Tax Code with respect to the Tax Liabilities for Natural Resources Fees, National Agency for Energy Regulation (ANRE) Decision no. 164 of 29.11.2004 on Methodology for determination, approval and application of tariffs for public water supply services, sewage systems and wastewater treatment.

Core competencies of local public authorities (LPA): a) approval, in accordance with the ANRE's methodology, the tariffs for public water supply and sewage services; b) management of these services, based on competitiveness and management efficiency; c) approves the functioning specifications and regulations for the local operators; h) allocates compensation for some household consumer categories that are considered vulnerable.

The main powers of the *Agency "Apele Moldovei"* are: a) to develop policies and strategies for the use and protection of water resources; b) to apply the water resources basin management; c) to design, build and repair[11] the water supply and sewage systems, irrigation and drainage systems, reservoirs and protection dams; d) to keep data recording of water fund; e) to elaborate the State Water Cadaster; f) to approve the general and special water use authorizations; g) to coordinate the management of transboundary water resources; h) to provide management assistance and logistics to achievement the objective and goal stipulated in the Strategy Regarding Water Supply and Sanitation[12].

6.2. Economic analysis of water supply and sewage services

6.2.1. The production indices of water supply services

The information regarding the services area of water supply and sewage is fully recorded only by the enterprises of the Association„ Apă-Canal"[13]. These contribute to over 50% of water supply and sewage and over 80% of the total waste water purification in the country. Due to the predominantly agrarian type, only ¼ of the water used in the Prut river basin is provided by the „Apă-Canal". The contribution of others categories of providers is established according to the index table of water management in the annual reports of the local environmental and statistical authorities[14].

During the 2007-2014 years, the total amount of water used in the Prut river basin was, on average 18.8 mil. m^3 or only 2.4% of the total on republic and 16% - in the Nistru right bank (tab. 6.1). About 40% of water abstracted is used in the Prut river bed area, especially in Ungheni, Cahul, Cantemir, Leova urban centers and surrounding agricultural lands.

[8]Guidance document no. 1. Economics and the Environment.– The Implementation Challenge of the Water Framework Directive.Luxembourg: Office for Official Publications of the European Communities, 2003.

[9]Management Plan of the Hydrographic Area Prut-Bârlad.

[10]Danube River Basin Management Plan. In: icpdr.org/main/publications/danube-river-basin-management-plan.

[11]The building and re-building works, operating work frecvently delegated to economic agents

[12]GD no. 199 of 20.03.2014 regarding the approval of the Strategyof Water Supply and Sanitation (2014 – 2028). In: Monitorul Oficial no. 72-77 of 28.03.2014.

[13]amac.md.

[14]Annual reports on environmental quality and Ecology Agencies and Inspection's activity

Table 6.1. The volume and share of waters per category of use (average 2007-2014)

	total	household		technological		agriculture		irrigation	
	mil. m³	mil. m³	%	mil. m³	%	mil. m³	%	mil. m³	%
Prut	18,8	3,7	20	1,8	9,3	13	70	4,7	25
Prut riverbed	7,1	2,9	42	1,1	16	3	41	1,3	18

Number of municipal water supply utility systems in the districts located within the Prut basin is 160 units (Annex 6.1), of which 142 (90%) are functioning. Most water supply enterprises are registered in Cahul, Hâncesti Râşcani and Glodeni, and the least – in Făleşti, Ocniţa, Leova.

The total length of water supply networks is 2133 km, of which more than ¼ (555 km) belong to municipal enterprises „Apă-Canal" located in urban centers. The largest aqueducts are registered in the districts of Cahul (375 km), Ungheni (281 km), which is primarily conditioned by the number and size of urban centers in these districts. The minimum length aqueducts is found in the districts of Ocniţa (50 km) and Făleşti (44 km), where, in the recent years, major projects are being implemented to extend the network of water supply and sewage. Such projects are implemented in the other districts of the Prut River basin, particularly in rural settlements. Also in Râşcani and Edineţ districts, it takes place the supply network interconnection of the Prut River Basin with the Dniester one.
According to the National Bureau of Statistics, in the years 2007-2014, the number of centralized water supply systems in the Prut river basin increased from 100 to 160 units (+ 60%) and their length with 1100 km which is over 2 times (fig. 6.1). In central and southern districts the growth rate of the number and length of water supply systems is higher than in the northern districts of the basin area, except Râşcani district, where the maximum increase is observed (4,8 and 6,5 times). Also, a maximum increase in the length of water supply networks is found in Cantemir district (7,3 times), Hânceşti (5,9 times) and Ungheni (2,4 times).

Furthermore, data provided by central statistical authorities does not contain full information in this regard, particularly in the districts of Făleşti, Leova and Cahul. If we consider completed or nearing completion recent projects (the years 2012-2014) supported by NEF, RDA and other important sources of funding, the pace of infrastructure rehabilitation and expansion of centralized water supply is significantly high. It is important to turn these plausible input indicators as quickly as possible into outcome indicators, such as increasing access to quality water and concerned services, condition improvement of water bodies and water resources etc.

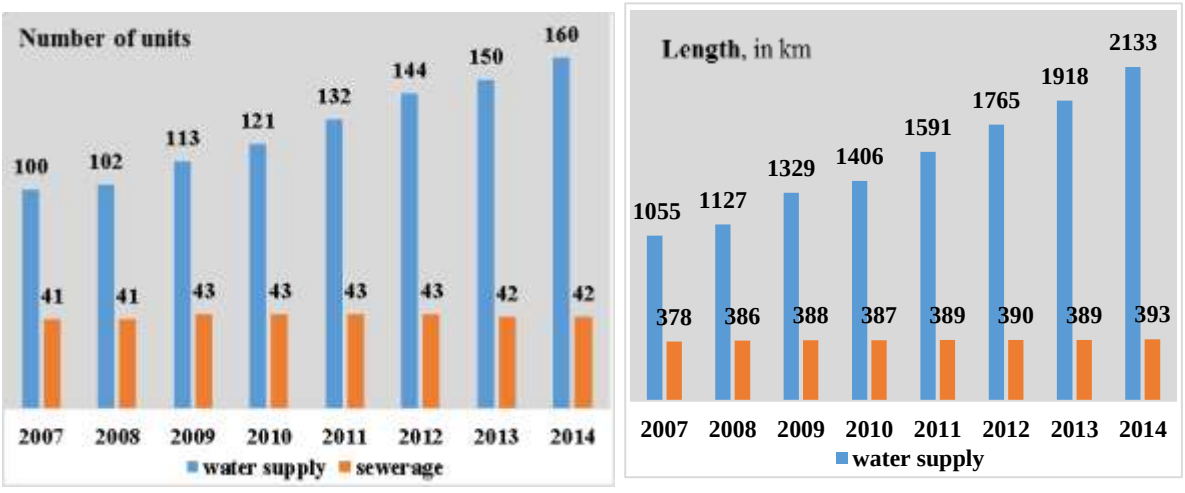


Figure 6.1 Dynamics of water supply and sewage systems in the Prut river Basin

Source: elaborated by author after NBS Reports on water supply and sewage systems

Despite the rapid expansion of water supply networks, water consumption per capita is very low - only 4,3 liters or 2 times less than the country average, which is explained by the lower degree of

urbanization and absolute share of rural population, which has a limited access to centralized water supply systems and to those of centralized sewage and waste water treatment. In the urban areas served by the companies of the Association „Moldova Apă-Canal" per capita consumption is about 10 times higher than the average consumption in this basin, but 3 times lower than the country average.

In the Prut River basin water is supplied by 226 pumping stations and 235 artesian wells, with a total capacity of 120 thousand m^3. The enterprises of the Association „Moldova Apă-Canal" have 33 pumping stations, including 32 functional and 54 artesian wells, of which 32 (60%) are functional. The summary capacity of pumping stations and artesian wells at these enterprises is 82 400 m^3/day or 60% of total capacity in the Prut river basin. At the same time, it is being used only about ¼ of the project capabilities of existing stations, which is explained by the high degree of wear and damage and continuous decreasing of water consumption in agriculture and industry in the last two decades.
The total water volume supplied by the „Apa-Canal" enterprises is, on average, about 3,5 mil. m^3, which represents only 5,4% of the Republic (Annex 6.2), which is explained, as it is mentioned, by the number and size of urban and industrial centers and their corresponding consumption capacity. The maximum water volume is supplied by the utility enterprises of the larger towns, like Ungheni (1239 thousand m^3), Cahul (947 thousand m^3) and Edinet (445 thousand m^3) and the minimum volume – by Ocniţa (50 thousand m^3) and Nisporeni (54 thousand m^3).

For population it is delivered 2,7 mln m^3 or ¾ of the total volume. This proportion is similar in all cities of the Prut river basin, except Edineț, where the share of the domestic consumption does not exceed ½ of the total volume of water delivered. Second position is held by the economic agents that use more than 600 thousand m^3 per year or 17% of total water supplied by the enterprises of "Apă-Canal". The volume of water delivered to the economic agents is determined by the number and production capacity of the enterprises, which do not have their own sources of water supply, especially the commercial and service centers, as well as the agricultural and complex markets, service stations, car washes, petrol stations, etc. For budgetary organizations it is delivered only 275,000 m^3 of water which is only 8% of the total. In this category of water consumers are listed the medical and training centers, local and district governmental buildings.

Irrevocable losses exceed an average of 70% of the total volume of captured water (tab.6.1), which is significantly lower than the country average share (21%), including the right bank of the Dniester river (55%). About 80% (57 mln m^3) of total final losses of water represents technological losses. The large volume of technological losses is due to both advanced wear of water supply infrastructure in the area of the Prut river basin and technological peculiarities of water supply in agriculture, which predominates in the branch structure of this basin.

Table 6.2. Irrevocable losses from the total captured water volume per river basins

River Basins	Total		Technological		Transport	
	mln m³	%	mln m³	%	mln m³	%
Prut basin	17,2	70	13,9	57	3,3	13
Prut river	7,7	78	4,9	49	2,8	29
Nistru basin	155	19	98	12	57	7,0
Nistru river	164	74	111	50	53	24
Totally RM	181	21	119	14	62	7,3

Source: Tables 6.1-6.2 are elaborated by the author according to the generalized Annual Reports (2007-2013) regarding the Indices of Water Management in Moldova. Basin Department of the Agency "Apele Moldovei"

Despite its great share, we discovered a considerable reduction of final collected water loss. Only during the years 2007-2014, the total final water loss of in the Prut basin has diminished by 1/3 (fig.6.2). Similar to captured water, the volume loss has recorded a downward trend, much more pronounced (40% and 50%) in technological loss, especially in irrigation. Water transportation loss has decreased slightly, particularly in public utility and industrial enterprises.

Table 6.3. Dynamics of irrevocable losses of captured water in the Prut River Basin, in mil m^3

Indices	Basin	2007	2008	2009	2010	2011	2012	2013	2014	*Average*
Total losses	Prut	21,05	17,67	20,54	16,2	16,14	18,08	14,19	14,0	17,2
	Prut riverbed	9,74	8,35	8,76	7,33	7,22	7,93	6,06	5,97	7,7
Technological losses	Prut	17,89	14,23	17,17	12,85	12,7	14,28	11,18	11,29	13,9
	Prut riverbed	7,02	5,35	5,86	4,48	4,28	4,58	3,51	3,72	4,9
Transport losses	Prut	3,16	3,44	3,37	3,34	3,44	3,8	3,01	2,7	3,3
	Prut riverbed	2,72	3,0	2,9	2,85	2,94	3,35	2,55	2,25	2,8

Final loss of captured and distributed water by the enterprises of "Apa-Canal" in the Prut river basin is about 36% (Annex 6.2) compared with the average 71% (tab.6.3) for all registered water supplying enterprises in that basin. This difference is explained by the fact that 'Apa-Canal' supplies with water almost exclusively all households in urban areas, industrial and service centers, budget organizations, where the technological loss is significantly lower compared to water loss in agriculture, particularly in irrigation. The amount of loss and usage degree of water supply and sewage system infrastructure (fixed funds) is conditioned to a great extent by its wear and damage degree, as well as the low strategic and operational management efficiency of the concerned companies. Therefore, a maximum loss is observed in towns of Edineţ (58%) Fălești (45%) and Nisporeni (52%). The degree level of fixed funds is 39% on the average or with 12% lower than the country average. This is explained by the massive expansion and modernization of water supply networks in rural areas, which population is highly predominant (75%) in that basin area.

Another difficult issue is the use of fixed funds (17%), which is conditioned both by multiple industrial consumption reducing, and by disproportionately quality-price ratio in the most "Apa-Canal" enterprises. The significant increase of tariffs for these services that is not accompanied by a corresponding increased quality and efficiency, which requires from economic agents and budgetary organizations to build their own water supply systems or look for other more convenient providers, even in the private sector.

6.2.2. The production indices of sewage and wastewater treatment services

Within the Prut river basin are 42 centralized waste water discharge systems or 3 times less than the water supply systems work (fig. 6.1, Annex 6.3). Total length of sewage network is 393 km (Annex 6.3), including 292 km (72%) of Association companies "Apă-Canal". The length of sewage networks is conditioned by the size of the served urban centers. Thus, the maximum length is registered in the districts of Ungheni (86 km), Edineț (57 km), Cahul (66 km), and the minimum (<10 km) in Ocniţa, Nisporeni and Cantemir districts.

Unlike water supply systems, the sewage and treatment systems do not register high growth rates (fig. 6.1). Overall, according to the NBS, the number and length of sewage networks in the years 2007-2013 remained practically unchanged (+ 2%) and in the districts Râşcani, Nisporeni showed a negative trend. Moreover, the coverage of water supply and sewage networks decreased during the period by ≈ 2 times (from 36% to 20% reported to their length). In addition, even more, decommissioning and abandonment of sewage networks is mostly observed in rural areas and mono-specialized and intensive ruralized small towns in the last 2 decades. Therefore, the extension of water supply infrastructure requires to be accompanied by a similar expansion of the sewage network. These requirements have recently been included both in the legislative acts regulating this field and the regulations of water supply business, environmental and regional funds, which also finance such projects. Dispite their mandatory character these requirements are often not respected.
Summed waste water treatment capacity is over 90,000 m^3/day and only 12% of it is used on average that is conditioned by economic and demographic decline of the served towns, as well as very high (over 50%) of the wear and tear sewage and waste water treatment installations. Disastrous technical

condition and superficial control of the sources of pollution, water pollution, very low payments and the episodic punishment of the offenders generate, on the whole, a great impact on water and human body.

The total volume of wastewater discharged through the sewage network is 3,1mln m^3, out of which 2,5 mln m^3 by the "Apa-Canal"enterprises (Annex 6.4). The amount of discharged wastewater is subject to urban and industrial center size. The maximum volume of discharged wastewater is found in the districts of Ungheni, Cahul and Edineț, and the minimal one in the districts of Ocnița, Cantemir and Leova. Also, the minimum values in the Hânceşti and Râşcani districts are conditioned by the location of these district centers outside of the Prut river basin.

On average, ≈ 60% of discharged wastewater comes from households, and 30% from economic agents. In the last time, significantly has decreased the share of industrial enterprises, but has increased the share of budgetary organizations, commercial and service centers. Over half of the discharged wastewater is insufficiently treated as confirmed by local environmental authorities.

6.2.3. Economic and financial analysis of water supply and sewage services

Despite significant tariff growth, in the majority of enterprises of "Apă-Canal" the expenses related to water supply and sewage services exceed those incomes with 12% on average or with more than 8,2 million MDL (Annex 6.5). Maximum negative differences can be seen in Cahul (44% or 6,4 million MDL), where tariffs are the lowest, and in the enterprises with smaller capacities in Briceni (14%) and Nisporeni (12%). Thus the significant negative differences are not depending only by the tariff level, but by the supplied and discharged water volume, increased network wear and the low level of use of the production funds and available work force, orographic peculiarities and local production, as well as the low management efficiency.

However, despite the unfavordable situation, there is a faster increase in income over expenditure. This positive trend is observed in most enterprises in this basin. Besides this, these positive consequences were largely possible due to higher subsidies from the NEF, state budget and external sources contributing to the implementation of the Strategy for Water Supply and Sewage[15]and other strategical documents in the field. It is necessary that these funds contribute not only to the increased access to accounted and centralized services of water supply and some current issue solving of the enterprises of "Apă-Canal", but to increase the access and quality of sewage and wastewater treatment and ensure operating sustainability of municipal public enterprises and other authorized operators to provide the services of water supply, sewage and waste water treatment.
On average, the expenditures for water supply service overcome the incomes with more than 11% (4,8 mln MDL). Despite the substantial tariff increase in the recent years, in the majority of the enterprises of "Apa-Canal" the expenditures exceed income and the largest negative differences are found in smaller enterprises from Nisporeni (17%) Briceni (15%) and those in Cahul (24%) and Ungheni (Annex 6.6), which have minimal tariffs.

Despite the considerable increase in tariffs, expenditures for sewage service exceed on average with 13% (3,4 mil. MDL) the incomes. In addition, this difference is slightly higher (5%) than in water supply service. However, in the Prut river basin, that difference is inferior to the country average of 49% which is conditioned, in particular, by the situation in the municipality of Chisinau. The most overrun is found in Cahul, where expenses for sewage service exceed almost the income, which is due to minimal tariffs for sewage service in this town. Also, the maximum expenditure overrun the income is seen in the small enterprises in Cantemir (32%), Ocniţa (13%) and Nisporeni (8%). At the same time, revenue from sewage services exceeds the costs for these services with 20% in Falesti and with 9% in Glodeni.

[15]RM Government Decision no. 662 of 13.06.2007. In: Monitorul Oficial no. 86-89 of 13.06.2007

6.3. Economic and financial mechanism in the use and protection of water

Economic and financial mechanism in the water use and protection focuses on some basic principles, such as: a) the beneficiary and the polluter pays[16]; b) full recovery of water usage costs[17]; c) optimization of economic, environmental and health performance of water supply sources and installations; d) decentralization and local financial autonomy; e) rational use and protection of water resources; f) norming the water consumption and waste water discharges; g) preventing accidental and critical situations.

6.3.1. Taxes for water consumption

In the Republic of Moldova, the tax system for water use is regulated by Title VIII of the Tax Code[18]. According to the Law on Natural Resources[19], the payments for the use of natural resources reflect the beneficiary's monetary compensation of public spending on exploration, conservation and restoration of water resources. When water is used according to regulations, the payment is included in the cost of the manufacturing and outcome service, but in case of irregular usage the payment is charged from beneficiary's net income after income tax payment.
Taxes for water consumption are applied to primary users, who collect surface water or groundwater, for the purpose of their production activities, work and provision services. The water tax is calculated by the payer on the basis of used water volume, according to the meter or in accordance with water consumption norms.

Taxes for water consumption are transferred to the local budget, being used mostly for current financial assistance to essential local public works and services. As a result, the economic and environmental effect of the application of these taxes is reduced. Due to the small tarifs, not connected to the inflation rate, it is an acute lack of funds for efficient operation and modernization of water supply systems and improving the ecological and medical status of water sources.
According to recent changes[20],[21] the water tax is levied at the following rates: a) for 1 m^3 of water extracted from water fund – 0,3 MDL; b) for each 1 m^3 of extracted bottling intended natural mineral water – 16 MDL; c) for every 10 m^3 of water used for hydropower stations – 0,06 MDL (tab.6.3.).

Table 6.4. Tax quotas for water consumption

Usage purpose	Years			
	1996-2002	**2003-2005**	**2006-2007**	**2008 - 2014**
For every 1 m^3 of water extracted from the water fund, in MDL	0,18	0,5	0,5	0,3
For water bottling, mineral and healing water production, in MDL	10%[22] 1,8	5 8[23]	8	16
For irrigation, in MDL for each 1 m^3	0,09	0,1	0,1	0,3
For hydro-power stations, in MDL for each 10 m^3	0,05[24]	0,03[25]	0,03	0,06
For cooling technological equipment of power plants, in MDL for each 1 m^3	0,06	-	-	-

Source: elaborated by the author according to the mentioned Annexes of State Budget Law for the years 1996-2005 and Annex 1 of Title VIII of Tax Code

[16]Art. 9 of Water Framework Directive 60/2000/EC
[17] Art. 54 of Water Low no. 272 of 23.12.2011
[18]Tax Code of the Republic of Moldova (no. 67 of 05.05.2005).TitleVIII.Taxes on Natural Resources. In: Monitorul Oficial no. 080 of 10.06.2005.
[19]Law no. 1102 of 06.02.1997 on natural resources. In: Monitorul Oficial no. 40 of 19.06.1997.
[20]Law 177-XVI of 20.07.2007. In: Monitorul Oficial no. 117 of 10.08.2007.
[21]Law 172-XVI of 10.07.2008. In: Monitorul Oficial no. 134-137 of 25.07.2008.
[22] Conform anexei respective a Legii Bugetului de Stat, în anul 1999 nu au fost prevăzute astfel de taxe
[23]Pentru anii 2004-2005
[24] 10 % din veniturile obţinute de la comercializarea apelor minerale, fără TVA
[25] Această cotă este valabilă pentru anii 2000-2006

Therefore, the current methodology of tax calculation for water consumption can be easily applied by the beneficiaries. The tax is not applied to: a) water extracted from the basement along with useful minerals; b) water extracted and delivered to population, public authorities and state institutions; c) water extracted for firefighting; d) water extracted by the enterprises for blind, deaf, disabled people's associations and public health care institutions; e) water extracted by prisons or delivered to them.

Despite its simplicity, the current methodology of tax calculation for water consumption contains a number of gaps: a) the equal tax to 1 m^3 of water from surface sources and groundwater; b) poorly reflected water supply provision of the territory; c) tax quotas are not subjected to water value and price, but reduced financial assurance; d) it is not taken into account the ecological status of surface water and groundwater; e) the water taxes do not adequately express the water confining and transport costs; f) it does not stimulate recycling and water saving; g) it is not based on State Water Cadaster; h) tax quotas are not set regarding the river basins, but to administrative-territorial units.

Taxes and tariffs for water consumption should also include the cost of scientific research on the basis of cost/benefit analysis to determine not only a fair price, but also optimal usage variants and norms for drinking water, water courses and basins[26].
Every year for water consumption are collected 20-25 million lei, of which about ¼ (5-6 mln MDL) are collected in the area of the Prut river basin. Maximum receipts are found at mineral water bottling enterprises, followed by the irrigation, food and agricultural ones. Application of these taxes is aimed at obtaining almost exclusively tax effects for district and city budgets and the economic and environmental effects are greatly reduced. These taxes do not stimulate water saving measurements and are insufficient to achieve the necessary public measures related to restoration and improvement of water resources as required by national and European legislation.

6.3.2. Tariffs for public water supply and sewage

Conditions and principles of application
Tariffs for public water supply, sewage and wastewater treatment are applied to secondary users which are supplied by public or private enterprises authorized to provide these services. They are intended for mainly 3 categories of consumers, which are assigned separate tariff quotas: 1) population and households, including nutrition and sanitation, irrigation of the lots nearby the house, and maintaining livestock; 2) budgetary organizations; 3) economic agents performing various entrepreneurial activities and requesting the purchase of such services.

The amount and procedure of charging for public water supply, sewage and treatment are set out in Decision no.164.of National Agency for Energy Regulation (NAER) from 29.11.2004 on "Methodology of determination, approval and application of tariffs for public water supply, sewage and waste water treatment". This methodology is developed in accordance with the provisions of the Law on public utility service no. 1402-XV of 24.10.2002, on Drinking Water Act no.272-XIV of 10.02.1999, Law no. 303 of 12.13.2013 on public water supply and sewage, Law no. 397 of 16.10.2003 on local public finance.

Also, recent methodology amendments are adjusted to Article 9 of the Water Framework Directive 2060/EC and focuses on the "beneficiary and polluter pays" principle, also water supply and sewage cost recovery from the service tariffs. Meanwhile, the tariff shares for water supply and sewage services are set only on categories of users and their ability to pay, but not on the complex value (economic, recreational and ecological) of the water objectives and sources, the cost – efficiency analysis[27] in accordance with the WATECO Guidelines on the methodology of economic evaluation of water use and restoration and the ecological status of water sources.

[26]Bacal P. Gestiunea protecţiei mediului înconjurător în Republica Moldova. Chişinău: ASEM, 2010, p. 116.
[27]Guidance document no. 1. Economics and the Environment.– The Implementation Challenge of the Water

The mechanism applied to determine the tariff is based on the following principles:
1) providing to consumers reliable water services, sewage and waste water treatment to actual costs that are needed for the efficient use of the company production capacity; 2) priority covering of consumption and expenditure for water capturing, pumping, treatment, filtration, transportation, distribution and supply, and wastewater transportation and treatment from the tariffs collected for this purpose; 3) efficient and profitable company conduct that would offer the opportunity to recover the funds invested in the development and reconstruction of production capacity

Tariffs are calculated separately for the services of drinking water supply, technological (industrial) water supply, also sewage and waste water treatment starting from consumption and expenditures determined according to this Methodology. Their quotas are approved by local public authorities and the public service tariffs for technological (industrial) water supply which is provided centralized by city and district afterwords are approved by the Board of Directors of NAER, in coordination with local public authorities. The enterprises calculate the tariffs according to the present methodology and submit them for approval to competent authorities, which have the abilities to approve these tariffs.

Under the new legislative provisions[28] *if the local council approves tariffs at a lower level than those provided in The Opinion delivered by the The Agency, it is obliged to establish in its decision of tariff approval the source and specific amount to be allocated to the operators to cover their lost incomes due to low tariffs.*

6.3.3. Tariff quotas for water supply, sewage and waste water treatment

Average quota for the years 2007-2014 of the general tariff for water supply and sewage services provided by the enterprises of the Asociation "Moldova Apă-Canal" located in the Prut river basin is 25,5 MDL/m^3 or 2.0 MDL/m^3 higher than the country average (Annex 6.6).

Most „Apă-Canal" enterprises in the Prut basin capture water from underground sources. Exploitation of artesian wells and fountains is more expensive than that of surface water pumping and capture. In addition, due to the low volume of water supplied from capture points, it is not possible to achieve „scale economies", as in the case of surface water intended for the larger urban center water supply (ex. Chisinau and Soroca). Thus, in Ungheni and Cahul, which are supplied from surface sources, are set minimum quotas (14-15 MDL/m^3) for the tariffs. Moreover, low tariff quotas for the population in these towns are possible due to much higher incomes from the economic agents and budgetary organizations which are located here and have a much higher water consumption compared to other places. Also, the amount of lower tariffs in some areas is due to, at a large extent, social pressure and the resulting political consensus in these local councils.
The maximum level of tariffs in some district centers, such as Glodeni, Nisporeni and Leova are explained by the fact that municipal companies from these settlements, besides the water supply and sewage services, render sanitation and household waste disposal services which are paid only by a small share of the population. To compensate the expenses and lost incomes from these services, these companies set higher tariffs for services of water supply and sewage to the local population. For this reason, some „Apă-Canal" enterprises have a negative profitability, despite the fact that some established tariffs fully cover the expences related to the services of water supply and sewage[29].

In the analyzed period, the amount of general tariffs has registered a significant increase of 75%, inclusively 66% for population and 51% for economic agents and budgetary organizations (tab.6.4).

Framework Directive.Luxembourg: Office for Official Publications of the European Communities, 2003. p. 116-167.
[28]Article 35.9 from Law no. 303 of 13.12.2013 regarding public service ofwater supply and sewerage (in effect from 14.09.2014).Monitorul Oficial no. 60-65 of 14.03.2014.
[29]Financial and production indices of the water supply and sewage business of the Association "Moldova Apă-Canal".The year 2013, Chişinău, 2014, p. 74. În: amac.md

The vast majority of the enterprises of "Apă-Canal", except those in Briceni and Cahul, substantially increased tariff quotas. Triple tariffs are registered in the town of Leova and double ones in Edineţ, Ocniţa and Nisporeni (Annex 6.6). A similar situation is also observed in the general tariffs for all consumer categories, but for population it is higher than for other categories (fig. 6.2).

Table 6.5. Tariffs for public water supply and sewage services for the Association "Apă-Canal" in the Prut river basin per consumer categories, MDL/m^3

Category	2007	2008	2009	2010	2011	2012	2013	2014	Average	Growth, %
Average tariff	18,08	18,95	22,64	24,67	28,42	28,26	31,63	31,63	25,53	175
Population	13,11	13,75	15,74	17,53	20,36	19,96	21,73	21,73	17,99	166
Budgetary organization	38,90	38,90	41,49	45,75	49,57	50,79	54,06	54,06	46,69	139
Economic agents	39,19	39,19	45,79	49,32	53,33	54,15	59,03	59,03	49,88	151

The maximum rate, of over 100 MDL/m^3, of tariffs for these services is provided to economic agents from Glodeni and minimum (10-12 MDL/m^3) – Cahul and Ungheni (fig. 6.3). Maximum increase these rates is registered in small towns – Ocniţa, Nisporeni and Leova. At the same time, it should be mentioned that, compared to the Dniester river basin and national average, in the Prut river basin growing rate of the general tariff, and tariffs for budgetary organizations and economic agents is 20% higher and that of the tariffs for population is nearly 6% lower. This speaks about continuing subsidizing policy of tariffs for water supply in the Prut river basin. For this reason, and because of the low quality services, there are high losses in water transportation, a significant number of economic agents disconnect from centralized water supply and build their own system for collecting and supply[30] or search for private operators.

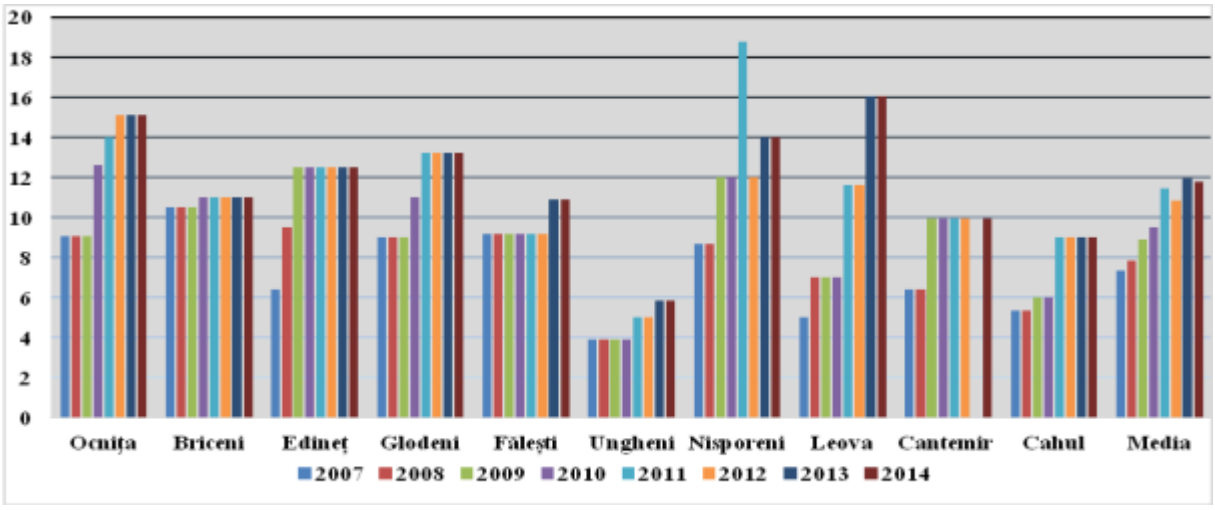


Figure 6.2. Tariff dynamics for providing the water supply and sewage services to population, MDL/m^3

[30]Annual reports of Ecologic Agencies and Inspection.Compartment Water Resources.

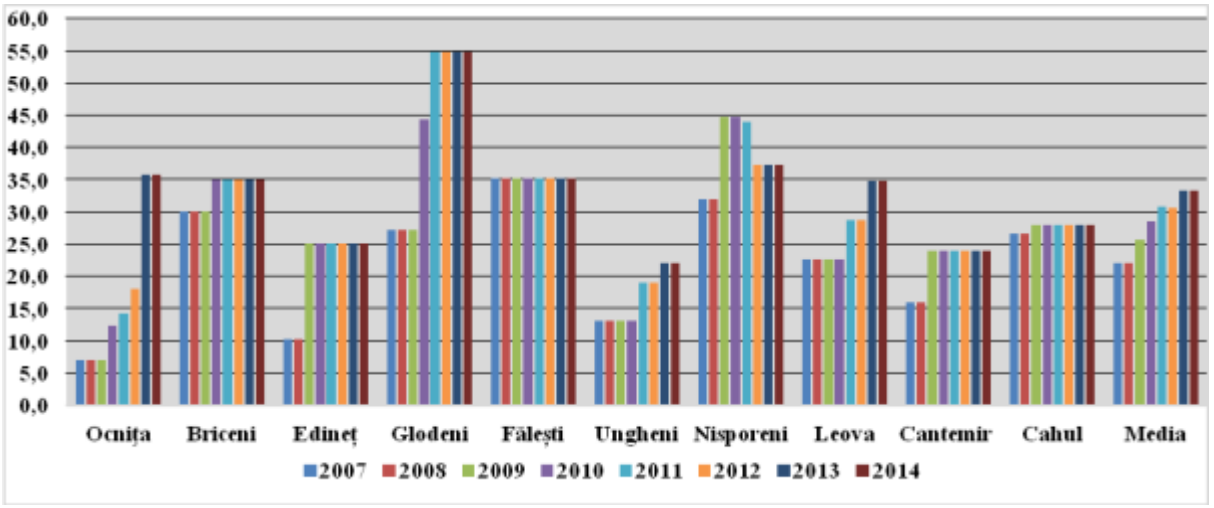


Figure 6.3. Tariff dynamics of economic agents for water supply and sewage services, MDL/m^3

Unlike the Republic's general situation, in the Prut river basin, the average general tariffs for water supply and sewage services overcome those of prime-costs with about 0,8 MDL (Annex 6.7). This is due to the significant tariff increase (+ 75%) (tab.6.5), and slower growth in prices and production cost in the analyzed period. Usually, in the town where are approved the peak tariffs, such as Glodeni, Edinet and Leova, there is maximum positive difference. In enterprises where there are minimum tariffs, such as those in Cahul, Cantemir and Briceni, the prime-costs exceed considerably the tariffs. At the same time, despite high tariffs, in small capacity enterprises in Ocnița and Nisporeni, there is a negative difference.

In this context, to enhance the effectiveness of enterprises in smaller towns it is necessary to extend the coverage area of water supply networks both in those towns and, especially, in rural areas. In this way it can significantly reduce the logistical and administrative expenses, more efficiently used the available workforce of the "Apă-Canal" enterprises, and to increase sales income and increase the rural population's access to the service.
It is also necessary that the tariff increase and difference towards the prime-cost to contribute not only to the profitability increase of the enterprises, improvement of the quality of water supply and sewage service optimizing the ratio quality-price, but also to the more economical use, diminished harmful impact and improved water resources quality.

6.4. Subsidies for rational use and protection of water resources

The vast majority of subsidies for water protection are funded by the National Ecological Fund (NEF).Moreover, about 2/3 of the number and amount of projects approved by the NEF are intended to protect water, followed, at a great distance, by projects of sanitation and greening of settlement (tab. 6.5). These are allocated to LPA for the extension and modernization of water supply and sewage, running water works, wells and springs arranging and other public works in this field.

In the 2000s, there were usually funded only 1-5 projects annually in each district and up to 25 projects for all settlements in the Prut river basin (Annex 6.8). The majority of projects funded by NEF and other sources were involving small and medium costs (several tens and hundreds of thousands MDL), designed for executing some separate building works and setting wells and springs in rural areas, cleaning small rivers and designing land protection zones for water bodies. The amounts allocated for the Prut river basin districts did not exceed 1 mln MDL (Annex 6.9), being significantly lower than the amounts required to achieve the objectives set in the strategic documents in this field and to ensure efficient and sustainable management of water resources. A small number of projects have been funded to extend sewage systems and upgrade treatment plants, which require higher costs and more sophisticated technical equipment. They were intended, as a rule, for some

urban areas such as Nisporeni, Falesti and Edinet being used to expand sewage network, in particular on the account of the peripheral sectors and suburbs.

Table 6.6. Dynamics and structure of subsidies allocated by NEF for the Prut river basin, mil. MDL

Field of funding	Years											
	2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
Water protection	1,2 (15)	1,5 (18)	1.8 (21)	5,6 (47)	2,6 (21)	11 (25)	17,7 (23)	31,2 (31)	26,2 (41)	28,9 (26)	82,4 (58)	113 (93)
Hydrotechni-cal measures	0,05 (4)	0,75 (3)	0	0,5 (2)	0	0,5 (1)	0,4 (1)	16,7 (12)	13,2 (7)	13,2 (4)	24,2 (9)	12,9 (4)
Greening of localities	0,14 (7)	0,2 (7)	0,7 (9)	0,8 (10)	1,1 (14)	0,4 (7)	0,32 (5)	2,1 (16)	1,3 (10)	0,5 (4)	1,0 (7)	1,5 (8)
Waste management	0	0,28 (3)	0,16 (3)	1,5 (7)	0,7 (7)	1,6 (8)	0,2 (1)	7,6 (7)	8,3 (5)	6,9 (7)	1,0 (1)	1,0 (1)
Total	**3,9 (28)**	**2,8 (33)**	**2,8 (33)**	**8,2 (69)**	**4,6 (47)**	**13,4 (43)**	**18,6 (30)**	**56,5 (66)**	**48,5 (63)**	**41,2 (41)**	**111 (78)**	**136 (105)**

Sources: elaborated by the author according to NEF data

As a result of the expansion of tariff headings by which it is applied the payment on the import goods that, in the utilization process, caused environmental pollution[31], since 2008 there has been a rapid increase in earnings and available income of NEF, which is directly reflected in the sum of funded projects. Therefore, since 2008 it is stated an increase in about 10 times (from 11 mln MDL to 113 mln MDL) of the subsidies allocated by NEF to implement projects for water resources protection (Annex 6.9). The allocated amounts to districts have increased accordingly and reach millions or even tens of millions MDL annually as in Făleşti, Ungheni, or Hânceşti.

Multiple increasing financing capacities have contributed to the implementation of an ascending number of complex projects of appropriate infrastructure expansion and modernization of water supply, sewage and discharged wastewater treatment systems. Moreover, it is attested the beginning of some inter-communities projects in this area, especially in Leova, Cantemir, Falesti districts. At the same time, there is a disproportionate allocation of NEF's subsidies. The amount allocated to the central districts and some southern ones (Cantemir, Leova) is much higher than that one for the most northern districts. This situation is typical not only for the Prut river basin, and shows frequent application of the political criteria in this area.

NEF increasing budget also produces benefit to the complex hydro-technical project financing, particularly for fighting and preventing flood consequences in the areas of the Prut meadow. The amounts allocated for these purposes have increased from a few hundreds of thousands MDL in 2000 to 20 million MDL in 2013. The maximum amount is allocated to the districts Râşcani (Costesti-Stânca Hydro technical Node), Hâncesti and Cantemir, where in 2008 and 2010 have been disastrous floods. At the same time, similar to projects for water supply and sewage it is showed implication of the political factor in the allocation of those subsidies.

Foreign and budget sources attracted through the Social Investment Fund and Regional Development Fund have a significant contribution to the subsidizing the protection and enhancement of water resources. However, due to insufficient coordination between design programs and the investment allocation ones, some of the projects are not fully implemented.

Projects for the expansion and modernization of water supply and sewage systems are implemented with the financial support from the state budget transfers to local budgets. In the years 2007-2013, in the Prut river basin, were funded annually from the state budget about 15 projects amounting to 11-16 million MDL (Annex 6.10).

[31]Annex 8 of Law regarding Payment for Pollution.

As a result, in the years 2006-2013, there was a very rapid expansion (over 50%) of water supply networks and services (fig. 6.1), and a slow increase in the sewage networks (up to 5%). Besides this, the number of sewage systems shows a negative trend, and most of the functioning ones have an advanced degree of wear and a poor management. Therefore, we can conclude a disproportionate implementation of the objectives set in the Programme and Strategy of Water Supply and Sewage drawn for the period 2006-2015.

According to the Operational Plans and Annual Activity Reports of Regional Development Agencies, in the Prut river basin in the years (2010-2014), there were implemented 9 complex projects for water supply and sewage, amounting to over 100 million MDL (Annex 6.11), including two inter-community projects in Ungheni and Cahul districts. In addition, the last 4 projects are financed by the Germany's Assistance Fund (GIZ). Of the 9 projects, 6 ones are implemented in Cahul district, including the modernization of the treatment plant and sewage system building and to increase the efficiency of the „Apă Canal" enterprise from Cahul. In Ungheni district was implemented an inter-community project to provide connection of the population in 12 settlements to the centralized quality drinking water supply service. Despite these achievements, coverage area of the projects funded by the European Regional Development Fund in cooperation with GIZ is small and their contribution to the improvement of water quality and increasing people's access to quality water is insignificant. Also the majority of these projects are designed to expand centralized water supply and network service and do not provide the restoration of water bodies, saving and improving water resources.

The increase in the number and amount of projects funded in the years 2013-2014 is conditioned by relatively successful start of the implementation strategy on water supply and sewage for the years 2014-2028[32]. The strategy is based on modern principles, including: a) integrated management of water resources; b) cost-effectiveness; c) full cost-recovery and investments; d) enhancing access to quality Services of water supply and sanitation; e) decentralization and regionalization of water supply, sewage and treatment services; f) basin management of water resources. Also, this strategy is supposed to be implemented in accordance with EU Directives in the field of water, Water Framework Directive 2000/60/EC, Directive 91/271/EEC concerning urban waste water treatment and Directive 98/83/EC concerning quality of water intended for human consumption.

For the full achievement of the objectives set out in this Strategy, in the initial period (2014-2028) it is required an annual contribution of 1,2% of consolidated budget incomes. In the next two periods it is expected to increase the contribution with 0,1%, so that in 2028 to reach 1,4% of the consolidated budget incomes (fig. 6.4). It is also expected the gradual increase in internal sources and stabilization of the external sources share and amount of money to about 20 million euros per year. To our opinion, in terms of increased inflation, much higher above forecasts in 2013, achieving this goal will be very difficult and the external sources will need to be increased to compensate the inflation rate and deficit of external sources. Besides this, the scenario included in this strategy does not take into account the possible geopolitical Moldova's reorientation, which will have major negative implication and enormous missed benefits not only in water and sanitation provision, but in the priority areas assisted by the EU. These reasons should be widely publicized for both decision factors and population.

Also, according to the stipulations of this Strategy, budget support for investment projects for the years 2014-2028 will double and reach 6,4 billion MDL (tab.6.6), including 1,5 billion MDL or 375 million MDL annually in the first period (2014-2017), 2,1 billion MDL or 414 million MDL annually in the second period (2018-2022) and 2,9 billion MDL or 570 million MDL annually in the third period (2023-2028). Considering subsidies for these purposes in 2014 from NEF (384 million MDL in the first 10 months) and transfers from the state budget (Annex 6.10), we can say that the financial goal for the first year of the strategy implementation has already been exceeded and it

[32]GD no. 199 of 20.03.2014 regarding the approval of the Strategy of Water Supply and Sanitation (2014 – 2028). In: Monitorul Oficial no. 72-77 of 28.03.2014.

remains to transfer it into the expected technical, economic, social and environmental effects. At the same time, as it has been mentioned, the scenario set out in this strategy is insufficiently adjusted to the real rate of inflation and recent geopolitical and geo-economic events. Thus, for the first implementation period, the contribution of domestic sources has been calculated at the reference exchange rate of 15,5, which was at the moment of strategy writing and approval (end of 2012 and beginning of 2013), for the second period – 16,0, and the third period – 16,5 Euro/MDL. Due to recent dynamics of the official exchange rate, the budgetary contribution was adjusted to the reference exchange rate of 19 Euro/MDL. Therefore, only at this average reference exchange rate there will additionally be required more than 1,2 billion MDL and 300 million for each implementation period, which is why the foreign sources will retain a major share in the investments for water and sanitation provision.

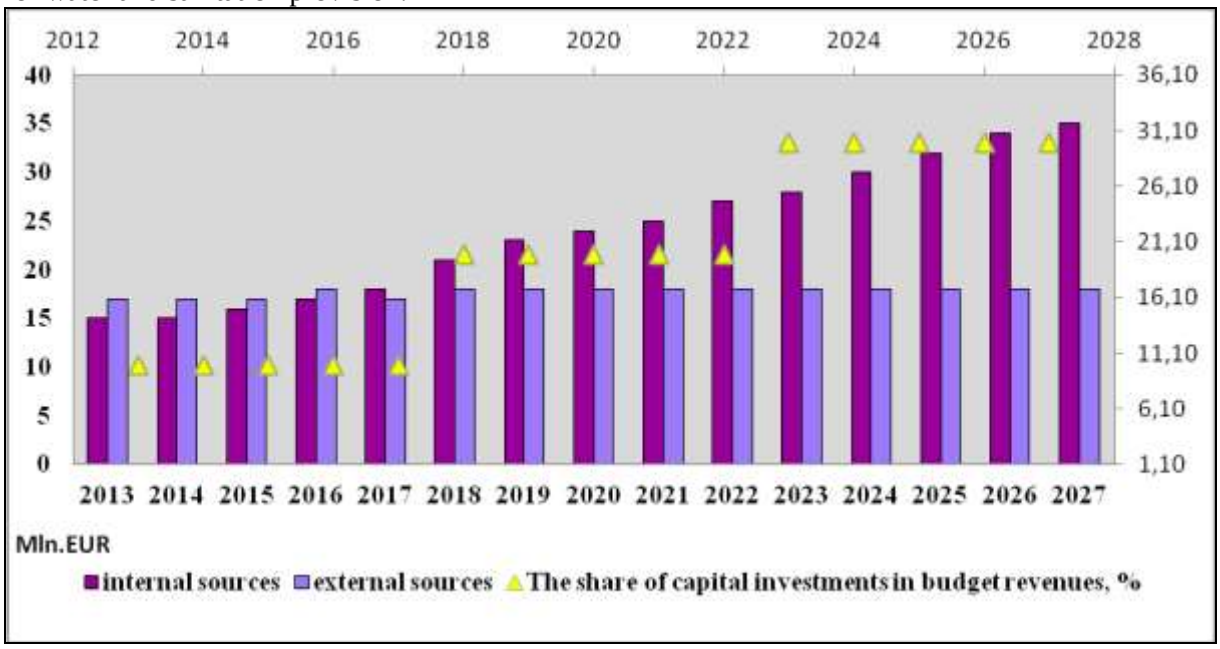


Figure 6.4. Estimated capital investments in WSS (2014-2027)

Sources: Strategy for Water Supply and Sanitation (2014 - 2028)

Taking into account the share of settlements in the Prut river basin in subsidizing water sources protection by NEF, the transfers from the state budget for these purposes, the final period of implementation of the regional projects for extending water supply networks in the Dniester river basin (aqueduct Soroca Balti-Râşcani and Vadul lui Voda-Chisinau-Străşeni Calaraşi) and the initial phase of the Prut River basin projects (Leova-Ceadâr-Lunga Taraclia, Zagarancea-Cornești etc.), we can conclude that the Prut river basin will benefit from budgetary support at the extent of about 30%. Thus, during the implementation of the Strategy on water supply and sanitation, for the needs of the communities in area of the Prut river basin it will be necessary to allocate about 2 thousand million lei or 120 million Euro. The annual contribution will be 120-150 million MDL for the first two periods (2014-2022) and 170-200 million MDL for the last one. Starting from the fact that in 2014, only from NEF (113 mln. MDL) and transfers from the state budget (12,4mln MDL) there were allocated 125 million MDL, we can say that the financial targets of implementation of this strategy were achieved in the Prut river basin, too.

Another important strategic document aimed at increasing access to water resources development program is the Programme for Water Management and Hydroamellioration in Moldova for 2011-2020[33]. For this program are required about 11,5 billion MDL, including for :1) to increase the irrigated land areas up to 300 thousand hectares – 11,1 billion MDL (96%); to repair the flood protection dams – 270 million MDL; 3) to clean drainage canals – 64,3 million MDL; 4) the water-

[33]Approved by GD no. 751 of 05.10.2011. In. Monitorul Oficial no. 170-175 of 14.10.2011.

resource management – 14,4 million MDL; 5) the scientific argumentation – 4,5 million MDL. The assumed costs to repair 166 km ant flood protection dams in the Prut river basin during the years 2011-2017 are 180 million MDL (tab.6.8) or 2/3 of the total.

Table 6.7. Projected budget support for WSS sector in the period 2014-2027

Budget support	2014-2017		2018-2022		2023-2027		Total	
	Total	Prut	Total	Prut	Total	Prut	Total	Prut
Contribution from national sources, in million MDL	1,5[34] (1,8)[35]	0,45 (0,55)	2,1 (2,5)	0,62 (0,74)	2,8 (3,3)	0,85 (0,98)	6,4 (7,6)	1,9 (2,3)
Equivalent (mln EURO)	96,7	29	130	39	173	52	399	120
Foreign sources contribution, million EURO	64	19	90	27	100	30	247	75

Source: Annex 1 of the Strategy of Water Supply and Sanitation (2014-2028)

Table 6.8. Indices regarding the repairing of flood protection dams in the Prut river basin

	2011	2012	2013	2014	2015	2016	2017	Total
km	39	32	25	25	20	15	10	166
Million MDL	45	44	23	23	19	15	11	180

Source: Table 1 in the Programme for Water Management and Hydroamellioration

However, according to information provided by Moldovan Waters Agency, the degree of achievement of the objectives set for the Prut River Basin is very low and the planned works were executed only partially at two hydro technical objectives: Gotesti from Cantemir district (0,3 km and 5,1 million MDL) and Leuşeni/Nemteni from Hincesti district (0,6 km and 4,1million MDL).

Conclusions:

Despite its low share, the Prut river basin has an essential contribution to population and agricultural water supply in the west of the country. For agricultural needs are used about 70% of water use in the basin, including ¼ - for irrigation. For household needs it is used about 20% of all used water. In the analyzed period, the total water used show a negative trend. This is due to a significant reduction (-15%) of the volume of water used in agriculture, particularly for irrigation. The volume of water used for domestic needs does not record a negative dynamics and the rapid expanding of water supply networks will contribute to the increased water consumption of household.

A difficult and widespread problem is the superficial and even the lack of recording at many mining and agricultural enterprises, which considerably reduce the water consumption data and tax receipts for water. Also, due to free use of water by households that are not connected to centralized networks, a large part (over 60%) of users in that category are not involved in the direct bearing of the cost of supervision and restoration of water sources.
At the same time, the spread of irrigated agriculture has a pronounced azonal nature and the volume of water used for this purpose decreases from north to south, according to financial assurance. At the same time, in rural areas and in small towns, most of the volume of water assigned to household purposes is used for growing and processing of agricultural products.
Most existing sewage systems and treatment plants are in an advanced state of wear and tear and a large part (about 30%) of the previously built ones do not work.
Major irrevocable losses (36%) in transportation, technological and drinking water use are conditioned by similar degree (39%) of the wear of fixed assets in this field. In addition, there are

[34]Pentru anii 2014-2017 a fost luat cursul de referință 15,5MDL/1€, pentru 2018-2022 – 16,0 MDL/1€și pentru 2023-2027 - 16,5 MDL/1€
[35]Cifrele din paranteze sunt calculate în baza cursului de referință Euro/MDL de 19.

used only about 20% of fixed assets, which is conditioned both by multiple reducing of industrial consumption and disproportionate ratio between quality-price of these services.

Despite multiple increases (3 times) of tariffs and sales revenue, total expenditure and consumption exceeds income in the majority of enterprises "Apa-Canal" in the Prut river basin. Thus, the average profitability is only 10% and in some companies it is observed even a negative profitability (Cahul, Nisporeni).

In the analyzed period (2007-2014), the quotas of general tariffs for water supply and sewage register a significant increase (+75%). However, the average quota of the tariff for water supply services to the population is ≈3 times smaller than the amount of tariffs for economic agents and budgetary organizations.

The vast majority of subsidies allocated for water resources by the state budget and NEF have been allocated for public works of expansion and modernization of settlement water supply systems. A small number of projects have been funded for the development of modern sewage systems and very few for building modern treatment plants in rural space.

Based on the amounts allocated in the years 2013-2014, we can conclude that financial targets (input indices) of the implementation of this Strategy on Water Supply and Sanitation in the Prut river basin can be achieved, so that these amounts will be evidenced by the result and impact indices and the economic and environmental goals achieved.

7. Programme of measures

Each EU Member State shall ensure the establishment of the Programe of Measures for each river basin district (WFD Art. 11) or for the part of an international river basin district within its territory (such as our case). For identifying the measures of the results of the pressure/impact analysis (see the Pressure/Impact Report) and established environmental objectives (see the Environmental Objectives Report) were taken into account (tab. 7.1). The Programme of Measures also refers to the national legislation (the Water Law). In the case of Prut River Basin, this RBMP will be coordinated with the Ukrainian side and partially adjusted by the Romanian.

It is important to mention that in the process of identifying of the Significant Water Management Issues (SWMI) for the International Danube River Basin District (2009) four major categories of important SWMIs in water management have been identified (pollution by organic substances, nutrient pollution, pollution from priority/dangerous substances and hydro morphological alterations) for which specific a Joint Programme of Measures has been established (Annex 7.1). It is also important to point out that the internationally agreed specific measures which in International Danube Basin Management Plan - Part A are presented were taken respectively and partially integrated at nation level.

Table 7.1 Pressures → Objectives → Measures

№	Significant identified pressures (or pressure groups)	Established environmental objectives	Proposed Measures
1.	**Impounded length of river[36], flood protection – embankment[37]; specific wastewater discharge; Water abstraction; Diffuse pollution.**	**Prevention of further deterioration of current state of surface** (art. 4.1. (a) (i), art. 4.1. (b) (i)). This objective is applied for the surface water bodies, for which several risks and pressures have been identified (fig. 5.1), and achievement of good *"quality"* and *"quantity"* is practically impossible for the next 6 years, namely in the first planning cycle 2016-2021.	Implementation of several measures, following prioritization scheme. The most important measure can be selected, according to identified pressures.
2.	**Specific wastewater discharge**	**Progressive reduction of pollution** from priority substances and ceasing of priority hazardous substances discharges in surface waters through the implementation of necessary measures. The objective is implemented for those water bodies, where significant point sources pollution exists (municipal and industrial wastewater discharges), but also a strict record on the volume and quality of wastewater (to perform a monitoring).	**Monitoring program improving (both surface and groundwater bodies); Improving and construction of wastewater treatment system; The progressive reduction of pollution from point sources; Elaboration of technical solutions regarding the use of sludge from the treatment plants**
3.	**Water abstraction for irrigation – high density of irrigation channel; Water abstraction**	**Ensuring the sustainable management of water resources** of lakes water bodies is applied (Costești-Stânca, Manta and Beleu) and of water bodies within the Prut riverbed and groundwater. This applies to water bodies that have, at times,	**The creation of wetlands; The creation of protection riparian strips; Prevention of unauthorized use of water**

[36] In the first Management Plan for hydromorphological pressures will not be provided measures to improve
[37]The same

	for public supply	sufficient water resources and represents for the next six years, a potential source of aqueduct network expansion for supplying the population with drinking water.	**resources;** **Abstractions control;** **Efficiency and reuse measures, including promotion of technology with efficient use of water in industry and economical irrigation techniques;** **Recovery of costs for water consumption.**
4.	**Diffuse pollution for agriculture**	**Achieving the standards and objectives for protected areas** by Community legislation (art. 4.1. (c)). In the case of protected areas in the first place, at required the time their proper demarcation and mappingfor all sources of water abstraction (both surface and groundwater). Assigning these surfaces protected area status, with all the positive consequences that will result, an achievable objective in the next 6 years represents, but also with reference to the Danube River Basin Management Plan.	**Creating the protection riparian strips of water bodies ;** **The progressive reduction of pollution from diffuse sources;** **Reduction of pesticide use in agriculture.**

The Programme of Measures includes “basic” and “supplementary” measures.

"The basic measures" are minimum requirements that must be fulfilled (Water Framework Directive, 60/2000 / EC and other directives which are harmonized in Republic of Moldova).

The basic measures for solving the requirements of other European Directives, which support the achievement of the Water Framework Directive, are targeted (tab. 7.2). These measures were partially transposed into national law (Annex 7.2).

Table 7.2. The EU Directives relevant to elaboration of basic measures

Directive on Urban Wastewater Treatment 91/271 / EEC	**Directive on major accidents (Seveso) 96/82/EC**
Directive on Nitrates 91/676/EEC	**Directive on Environmental Impact Assessment 85/337/EEC**
Directive on Drinking Water 98/83/EC	**Directive on Birds 79/409/EEC**
Directive on Habitats 92/43/EEC	**Directive on integrated pollution prevention and control 96/61/EC**
Directive on Bathing Water76/160/EEC	**Directive on Plant protection products 91/414/EEC**
Directive on sewage sludge86/278/EEC	

Red color: priority directives for the first planning cycle within the EPIRB project
Source: according to Annex VI, Part A, of the Water Framework Directive
Birgit V., 2014 Pilot Project EPIRB Testing in River basins.
Draft Guidance Document on the Development of Programme of Measures and the Achievement of Environmental Objectives According to the EU WFD

Table 7.3. Programme of Measures on the implementation of the Prut River Basin Management Plan (2017-2022)

No.	Measure	Priority class	Estimated cost, thousands MDL
Basic measures			
1	Improving the monitoring program for the surface water bodies	2	9000
2	Improving the monitoring program for the groundwater bodies	2	2300
3	Progressive reduction of pollution from point sources	1	685759
4	Extending and restoration of natural habitats	2	26 474
5	Sustainable use of water resources	1	-
6	Progressive reduction of pollution from diffuse sources	2	-
7	Improvement the population access to water and sanitation	1	738 567
Supplementary measures			
8	Flood risk management measures	1	317 300
9	Climate changes	1	1 050
	Total expenses		**1 780 450**

7.1. Measures 1 and 2. Improving the monitoring program for surface and groundwater

Monitoring program for surface and groundwaters for the next six years was developed by the Department of State and Hidrometeorolgic respectively Hydrogeological Expedition, with the assistance of experts of EPIRB Project. The estimated costs are EUR 9 mil. lei for surface waters monitoring and 2.5 mil. MDL for the groundwater (see the chapter for monitoring).

7.2. Measure 3. Progressive reduction of pollution from point sources

It involves improving of wastewater treatment system as well as technical solutions regarding the use of sludge from sewage plants, etc.

Most cities do not have wastewater treatment plants, and existing ones are worn out. Priority for the next six years will be the construction of these treatment plants in major cities within the basin (Ungheni, Cahul, Leova, etc.). These measures are specified in the Strategy for Water and Sanitation (2014-2028).

The progressive implementation of the **Directive on urban wastewater treatment 91/271/CEE** in all Member States resulted in the increas of the quantity of sewage sludge that is needed to be eliminated or deposited into the environment. This increase is mainly due to the implementation of this Directive, with a constant increase in the number of connected to the sewage networks dwellings and, thus, to the treatment plants and increasing the level of treatment. The recycling of sewage sludge on agricultural land is generally considered as the best practical option for the environment. However, sewage sludge containing heavy metals, can affect soil fertility and agricultural productivity.

The assessment of the amount of sludge from the treatment plants in the settlements located in the Prut River Basin was performed on the basis of methodologies widely used in other countries. The production of sludge from wastewater treatment is calculated based on the fact that the sludge with humidity of 95% is approximately 0.5-1% of the wastewater (Iacovlev, Lascov, 1987) or taking into account the production of sludge which belongs to a person which uses the sewage systems and

calculated by different authors is 24-26 kg/year (EPA,1984; Evilevici, 1978). These data can serve as a basis for the assessment of both the volume of semiliquid sludge, and the dry sediment.

In tables 7.4 and 7.5 are presented the quantities of sludge which are formed at the treatment plants including at the Association "Moldova Apa-Canal" enterprises localized in the Prut River basin. The total quantity of sludge is estimated at over 60 000 m^3 gross semiliquid sludge **(W = 95%)** or calculated on the dry matter - over 3,000 t. This quantity will increase significantly in the following years, due to the progressive implementation of Directive **91/271/EEC.** Almost one third of sludge is accumulated at the enterprises of the Association „Moldova Apa-Canal".

Table 7.4. The annual average (2007-2013) quantity of sludge formed from the treatment plants

No.	Receiver	The total discharged wastewater, mln. m^3	The quantity of gross sludge (W=95%),m^3	The quantity of sludge dry substance (DS),t
1	The Prut River basin	8,1	60750	3037,5

Source: calculated according to the State Ecological Inspectorate reports, 2007-2013

Table 7.5. Volume of wastewaters and quantity of sludge formed at Association „Moldova Apa-Canal" in the limits of the Prut River Basin (2013)

Nr. crt.	District	Treatment capacity, ths m^3/24 h	Volume of discharged wastewater, ths m^3	Sludge volume (W=95%), m^3	Volume of sludge dry matter, t
1	Ocnița	1,2	56,8	426	21,3
2	Briceni	10	106	795	39,8
3	Edineț	5,5	367	2753	137,7
4	Glodeni	0	80,5	604	30,2
5	Fălești	10	148	1110	55,5
6	Ungheni	15,0	881	6608	330,4
7	Nisporeni	1,5	128	960	48,0
8	Leova	4,7	74	555	27,8
9	Cantemir	3,5	62	465	23,3
10	Cahul	13,7	749	5618	280,9
	Total	65,1	2652	19890	994,5

Source: calculated according to the State Ecological Inspectorate reports, 2007-2013

To date, there is no approved technology regarding the use of sludge from the treatment plants. For the future, this gap can be very problematic, because of intense process of connecting people to the water supply and sanitation services.

The total cost of the direct application of sludge, including loading, transportation (up to 6 km), and distribution on arable land and plowing is equal to 260 MLD for 1 ton of sludge. Calculations were performed according to the work-paper "Ghid de utilizare a îngrășămintelor organice" (Guide on Using Organic Fertilizers), 2012, by employees of the Institute of Ecology and Geography, for the year 2014. In case of composting, several steps are added to the process and the costs reach 422 MLD per 1 ton of sludge (according to the same method of cost calculation). The processing cost of annually obtained sludge (994.5 t dry matter) for the basin surface can vary from 260,000to 420,000 MLD. For the whole amount (3037.5 ton of dry matter), the cost will be from 790,000 to 1,282,000 MLD.

In order to improve process of progressive reduction of pollution from point sources it is necessary the inventory and mapping of point sources of pollution. This measure is provided partially within a small project funded by the EPIRB Consortium and implemented by the State Enterprise "Basin Water Management Authority " of the „Apele Moldovei" Agency.

Another important source of pollution of water resources are the unauthorized dumps. Practically in every locality there are at least 1-2 unauthorized dumps. Most of them are located in depressions

near water resources. Has been established, that between the number of dumps and the level of nitrate pollution is a direct relationship. As a measure for solving this problem is the the arrangement and liquidation of unauthorized dumps, including the pesticide ones, objectives provided and partially initiated within "Waste Management Strategy in Moldova for the 2013-2027 years ".

7.3. Measure 4. Extending and restoration of natural habitats

The territory of the Prut River Basin, as all over the country territory, is vulnerable to flooding and drought. These natural hazards were quite frequent in recent years, often dry years succeeding those with excess rainfall (as they were 2007 and 2008 years). One of the solutions that would reduce the negative effects of these hazards represents the creation (or restoration) of the wetlands.

The Convention on Wetlands of International Importance, especially as Waterfowl Habitat (Ramsar, 1971) was ratified by Moldova via Parliament Decision no. 504-XIV of 14 July 1999 and became a member of the Convention in June 2000, when the "Lower Prut Lakes", was included in the List of Wetlands of International Importance. "Lower Prut Lakes" (19 152.5 ha), in the basin of r. Prut, which comprise the largest natural lakes in Moldova, Beleu and Manta, in the perimeter of which there were rare, remarkable species of flora, 39 species of mammals, 203 species of birds, 5 species of reptiles, 9 species of amphibians and 41 species of fish.

Draft of National Strategy on Wetlands for the period 2013-2022, supposes that financing sources are from the State Budget, the National Environmental Fund, development partners and donors (about 105 mil. MLD ≈ 5.6 mil. Euros). In order to create and/or extend the 4 wetlands, 20 mln MLD were planned. To create the Biosphere Reserve "Prutul de Jos" and extend the Scientific Reserve "Pădurea Domnească" about 10 mln MLD will be allocated of the planned amount.

One of the most significant pressures on water is the diffuse pollution. As a consequence of agricultural land privatization, the riparian protection strips have been destroyed almost completely. Currently, almost all the rivers do not have protection strips and the agricultural lands extend to the riverbed. According to Law no. 440 of 27.04.1995 regarding areas and protection strips of river and basins, the width of protection strips for the r. Prut and fl. Danube should be at least 1000 meters. Protection strips should be for the small rivers (below 50 km) - at least 20 meters, for the medium (50-200 km) - at least 50 meters, and for those exceeding 200 km - at least 70 m. This value can be adjusted to the nature of related slopes, erosion processes, and the peculiarities of river and water use, also the existence of the swampy meadow. Unfortunately these values are not respected.

According to the G.D. no. 101 of 10.02.2014 on the approval of the National Plan for Expansion of Forest Areas for the years 2014-2018 within the Southern Region (especially in the Prut River Basin – the districts of Leova, Cantemir and Cahul), and also in the Cogâlnic și Lăpușna river basins, there will be undertaken the afforestation of protection strips for rivers and water basins (during 2015-2018) on an area of 1613.1 ha, as follows: in 2015 - 400 ha, in 2016 - 400 ha, in 2017 - 400 ha, in 2018 - 413.1 ha. The estimated cost is 15573.6 thousand lei. The source of funding will come from and within the financial means provided annually from the state budget, the National Ecological Fund and international donations. Responsible for the Action is the Agency "Moldsilva".

In some sectors, on the rivers, which in the past have been subject to the regularization, naturalization activities are required, particularly of floodplain rivers lands.

In order to conduct an effective afforestation works it is necessary to review the current delimitation of lands, in particular there where it coincides with the protection riparian strips. For this purpose, in order to avoid the possible disagreements from the population in these areas, information and awareness activities are required, but also the develop a system of economic and fiscal stimulation of the landowners.

7.4. Measure 5. Sustainable use of water resources

It includes a number of measures, more administrative and institutional, involving in particular the Ministry of Environment with subordinated institutions - State Ecological Inspectorate and the Agency "Apele Moldovei". Although the environmental institutional protection scheme seems

organized and functional a number of constraints and problems in its work are attested. It highlights the lack of clear delimitation of attributions principle (and sometimes conflicts of interest is observed) within the Ministry of Environment and its subordinated institutions, namely of the environment policy development attributions, their implementation and control over legal compliance, ignoring the Law. 98 of May 4, 2012 on specialized central public administration. For example,The State Ecological Inspectorate issued authorizations for the use of water resources and also monitored compliance with the provisions of this authorization. These measures include some obligations that are included in their regulations, but which are less respected: prevent unauthorized use of water resources, control of water abstraction, and recover the water use. Also, here can be assigned measures for efficiency and reuse, including the promotion of water-efficient technologies in industry and economical irrigation techniques.

The identified problems will be resolved with the establishment of the Environment Agency and respectively, division of responsibilities and avoid future conflicts of interest.

Totally, for measures of improving the institutional system for the management and protection of water resources (according to the Action Plan on implementation of National Environmental Strategy for the years 2013-2023) 11.1 mln MLD are planned and some actions are not covered by funding yet.

Also, for purposes of efficient planning of the extending measures of drinking water supply networks, irrigation and other water uses, hydrological modeling is needed on the amount of available water resources within the basin.

7.5. Measure 6. Progressive reduction of pollution from diffuse sources

The main measures to reduce nitrate pollution are the rehabilitation or the plantation of riparian protection strips along water bodies (see measure 3), but also the implementation of a code of good agricultural practice which must include at least the items listed in section A of Annex II of the Nitrates Directive. In addition to this developing code, the training programs and information for farmers are more important in order to promote and implement the code of good agricultural practice. In order to estimate nutrients which come from agricultural land, modeling should be carried out using MONERIS software (already used for the development of the Danube River Basin Management Plan).

In floodplain areas, another problem is the overgrazing. Therefore, it is necessary to be regulated by local public authorities of livestock on pasture or even prohibition of grazing in the floodplain.

7.6. Measure 7. Improvement the population access to water and sanitation

This measure is given in details in the national **"Strategy of water supply and sanitation (2014-2028)"**.

In the last 6 years (2008-2013), the total cost for implementation of these objectives was of 1910 mln MLD (120 mln euros). This year these costs are equal to 382 mln MLD, including 260 mln MLD from foreign assistance. In the basin, the amounts allocated were about 80-90 mln MLD annually.

For extension of water supply and sewage systems until 2023, over 4.7 billion MLD were planned, inclusively about 59% for Insurance of Municipal Waste Water Treatment according to Directive 91/271/EEC and 40% for the Implementation of the Plans to Ensure Drinking Water Safety and Drinking Water Quality in accordance with the requirements of Directive CE 98/83 EC. At the Prut river level, these costs are estimated at 1,175,000,000 MLD or 117,500,000 MLD annually.

8. SUPPLEMENTARY MEASURES

8.1. Climate change and flood risk

These are those measures designed and implemented in addition to the basic measures in order to achieve the environmental objectives. Part B of Annex VI of WFD contains a non-exclusive list of such measures. Among them, at the first stage of priority may be the appropriate legislative, administrative, economic measures, but not only.

8.1.1. Mitigation of the droughts and water conservation in agriculture risks

Climate change within the Prut River basin through its accelerated pace of manifestation, has been one of the main threats to sustainable development in this area and is one of the biggest environmental problems having consequences and negative impact in terms of ensuring water resources. Thus, in the first decade (2000-2010) of the XXIst century, within the lower Prut River Basin, the average annual temperature constituted 11.1°C, compared to 10.2°C for the last decade (1989-1999) of the XXth century, which until recently was considered the warmest decade during the instrumental observations series. The difference of 0.9°C between these two decades is the most significant throughout the country. In the upper basin, the difference is 0,7°C and the annual average temperature in the period 2000-2010 constituted 9.1°C compared to 8.4°C recorded during the years 1989-1999.

It is important to know the annual average air temperature change - an indicator of the warming process in coming years. Moreover, according to the Fifth Assessment Report (IPCC, 2014), climate change not only is already occurring but will continue to happen, even if emissions of greenhouse will be reduced. Currently, according to this Assessment Report, there is a concern that global warming has the potential to affect climate patterns in all geographical regions (IPCC, 2014). Given the accelerated pace attested in this area, emerges that the climate within the Prut basin does not make an exception.

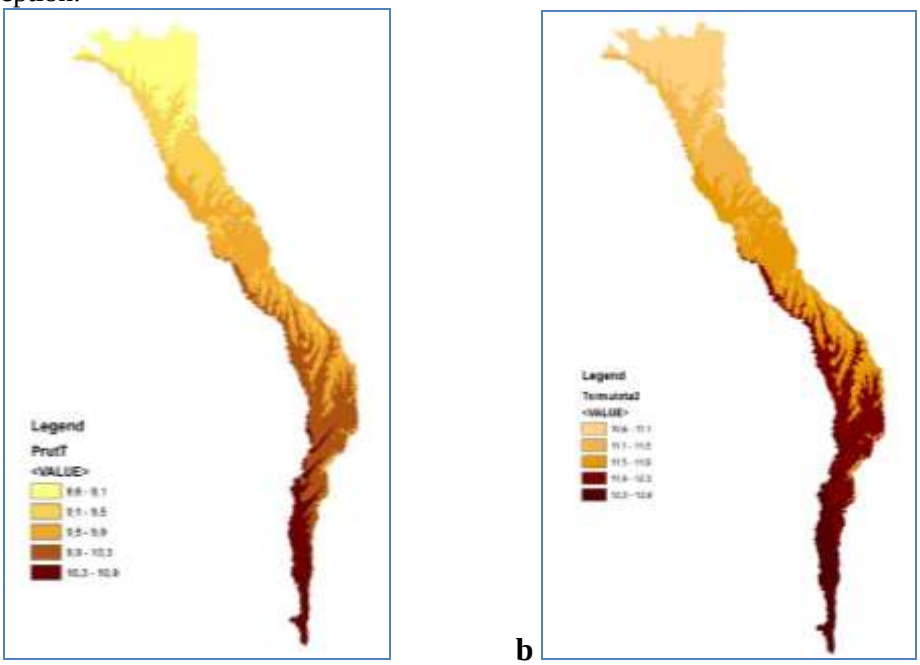


Figure 8.1. Spatial distribution of mean annual air temperature in the period 1986-2005 (a) and the simulated one for the years 2016-2035 according to RCP4.5 (b)

In this context, the simulated thermal regime of the Prut basin and cartographic models developed in accordance with the requirements included in the most recent Global and Regional Climate Atlas of Projections (AR5), which reveals that in the coming years (2016-2035) the annual average

temperature could rise by 2°C, according to the most drastic climatic scenario (RCP4.5) and being in the upper course 10.5... 11.1°C and 12.3... 12,9°C - in the lower course (fig.7.1.b). These projections were developed in accordance with the reference period 1986-2005. At this time, upstream of the Basin, the annual average temperature had varied within 8.6... 9.1°C and 10.3... 10.9°C in the lower part (fig.7.1.a). But as previously mentioned, within the lower Prut River basin the average annual temperature currently (2000-2010) has went beyond the 11°C and cartographic models developed for this period show that in some areas, it exceeds 11.5°C, which undoubtedly once again confirms the fact that in this area is registered a significant climate change.

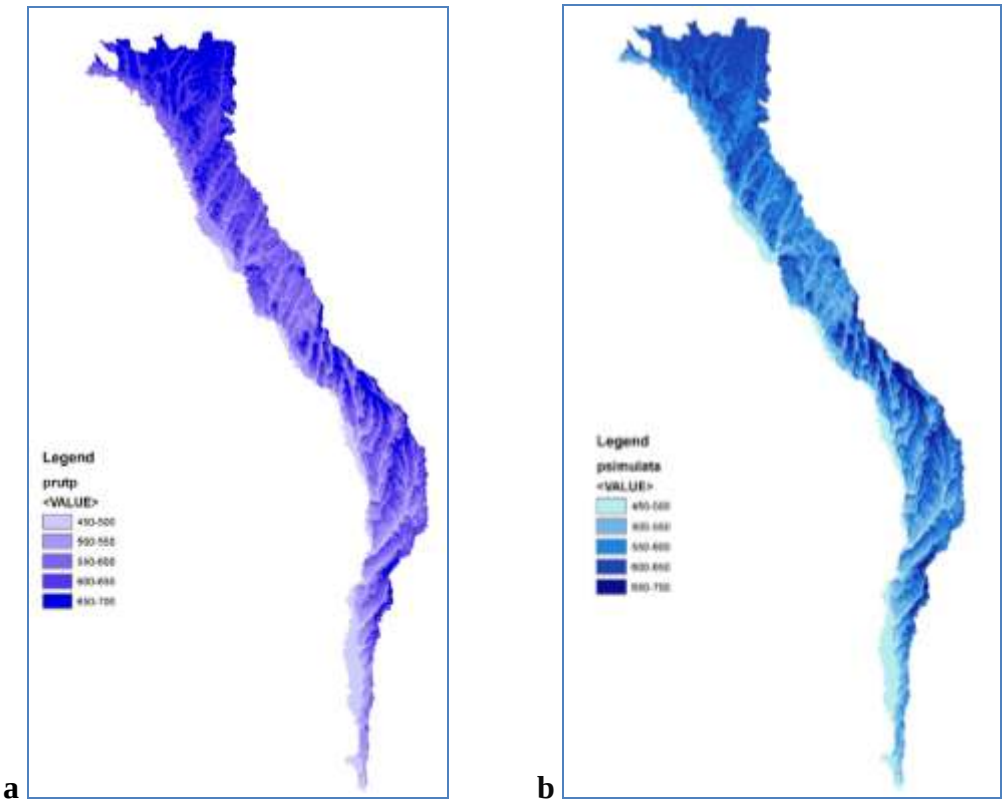


Figure 8.2. Spatial distribution of annual amount of precipitation in the period 1986-2005 (a) and the simulated model for the years 2016-2035 according to RCP4.5 (b)

In the case of atmospheric precipitation, the cartographic models developed in accordance with requirements included in the same Atlas of Global and Regional Climate Projections (AR5). It reveals that in the coming years (2016-2035) the annual amount of atmospheric precipitation will decrease by 10% in the lower course of Prut River basin and in the upper course the annual atmospheric precipitation amounts will increase by 10%, according to the most drastic climate scenario (RCP4.5). In terms of value, they will decrease by 50 mm and will constitute 450 mm in the lower course, at the same time will increase by 60 mm and will constitute 680 mm in the middle and upper course (Fig.2b). As concerning the mean annual temperature, values indicating the annual amount of atmospheric precipitation recorded in this basin were developed in accordance with the reference period 1986-2005 (fig. 2a). Currently (2000-2010), upstream are recorded annual amounts of 648 mm, which is by 20 mm more than the annual average calculated for the last 50 years (1961-2000), and the within the lower course the annual amount of atmospheric precipitation is 475 mm, already with 64 mm less (compared to 539mm) than the annual average for mentioned above period. In conclusion we notice that in the lower course of Prut River basin will be recorded an aridization of the territory compared with the rest of the basin's territory, but at the same time, with a more frequent alternation of dry and rainy periods, confirmed by climate and hydrological risks manifested within this basin in recent years.

In order to ensure the implementation of the assignations of The Framework Convention of the United Nations referring to climate change, approved by Parliament Decision no. 404-XIII of 16 March 1995(Official Monitor of the Republic of Moldova, 1995, no. 23, art. 239), as well as mechanisms and assignations of Kyoto Protocol to the Framework Convention of the United Nations about climate changes, to which Moldova joined by Law no.29-XV of 13 February 2003 (Official Monitor of the Republic of Moldova, 2003, no. 48, art. 193).

According to the Government Decision no. 1009, December 10, 2014 was approving: The Republic of Moldova Strategy adaptation to the climate change until 2020 and, according to the Annex no. 2. The plan of action for the implementation of the Republic of Moldova Strategy of adaptation to climate change until 2020.

Strategy of the Republic of Moldova about the climate change 2013-2020, approach the climate change issues grouped into three specific objectives:

1. *Creation until 2018 the institutional framework on climate change, which will ensure an effective implementation of the adaptation measures at national, sectorial and local level.* The direction provides: Integration of policies of adaptation to climate change in sectorial policies of the national economy; elaboration of strategies and/or action plans about adaptation to climate change of the sectors with high degree of vulnerability, ensuring the amendment / revision process of sectorial policies development, in order to integrate climate risks in all existing and future sectorial policies, development of communication and institutional cooperation in order to implement the adaptation policies etc.
2. *Creating until 2020 of a mechanism for the impact monitoring of climate change, social and economic vulnerability associated and of information management/dissemination about risks and climate disaster,* which provides continuous monitoring and research of climate change impacts, of associated social and economic vulnerability and regular updating of the climate models. Creating of a national database relating to climate change; the awareness of all stakeholders involved, especially of population, regarding to the risks of the climate change and measures of adaptation to this change.
3. *Ensuring the development of climate resilience by reducing the climate change risks at least by 50% until 2020 and easing adaptation to climate change* in six priority sectors (agricultural, water resources, health, forestry, energetic and in the transport sector).

In order to establish some measures about adapting to climate change were provided (accomplished) the following actions relating to the adaptation managing waters to climate change:

a) The strategies and the action plans

In the action Plan for implementing the Strategy of the Republic of Moldova to adapting to climate change until 2020 have been set for water domain, an adaptation measures system at national, regional and local level, with reference to:

b) adaptation measures at the local level:

- The creation of some databases at the local level related to climate change, which will focus the regular hydro meteorological and climate information;
- Publicly awareness about the climate change risk and adaptation to this change;
- The creation of forest strips for agricultural fields, roads and waters protection.

c) adaptation measures at local and regional level:

- The intensifying expansion process of the covered territories with forestry vegetation and ecological restoration of the forests, creating interconnection corridors between wooded massifs.
- The reassessment of water resources at the basins and hydrographical sub-basins level in climate changes conditions.
- The use in agriculture of some species/varieties resistant to intense and persisting droughts.
- The reviewing and completing the school curriculum for primary and secondary education, including the topic "Climate Change" in the objects of the baseline studies.
- The development and implementing of the programs and accessible training materials regarding the climate change adaptation, with the purpose to improving of the ability of the farmers, specialists in medicine, of civil protection and emergency situations, engineers from the energy sector, transports and constructions, other specialists;

- Ensuring a suitable management on floods risk.

d) the development measures of the scientific research:

The development measures stipulated in The actions plan for the implementation of the Republic of Moldova Strategy for adaptation to climate change until 2020 are included more several activities.

- The mapping of regional climate risks (for northern, central and southern part of the country) and sectorial (agriculture, forestry sector, energetic, transports, human health etc.);
- The development of climate scenarios for Republic of Moldova, for medium and long term, based on general patterns of global circulation and regional climate patterns;
- The temporal and spatial evaluation of the climate change impact on surface waters and underground waters;
- The evaluation of available water resources in the conditions of climate change;
- Undertaking measures to mitigate the effects of drought / water scarcity.

e) **International cooperation in water** domain in order to achieve common actions to reduce the negative effects of water - floods, droughts, accidental pollution, etc., effects that are accentuated by climate change orders and by the impact of human activities on water resources.

8.1.2. Flood risk management

Currently was finalized the project of the European Investment Bank "Management Support and Technical Assistance to Flood Protection of Moldova territory" with a total funding of 1.6 mil. EUR. This project will contribute to the reduction of natural disasters, flooding, that affect the population and goods by implementing preventive measures in most vulnerable areas. Within the project it was developed a master plan for flood prevention and protection for all Moldovan territory; will be created and will operate a system of management and monitoring of the Dniester and Prut which will be based on the use of Geographic Information System (GIS) and will be strengthened the capacities structures of the Ministry of Environment (through training) to apply the system management and ensure the project continuity. In Annex 7.3. the risk to flooding map for Prut River basin developed in this project is presented and also the necessary measures (with costs) to prevent the risk of flooding.

Preferred strategic options for each river basin

The Multi-Criteria Analysis has been applied to all of the river basins and preferred strategic options have been identified. The Prut river basins were divided into the upper and lower Prut, as different strategic options apply in each section. The river basins used for the development of the strategic options:

Upper Prut (upstream of Costesti-Stanca dam)

The Prut upstream of Costești Stânca dam flows through a narrow valley with low flood risk except for an extensive floodplain area at the towns of Criva, Drepcauti and Lipcani near the Ukraine border.

Serious flooding occurred here in July 2008. The selected strategic options for the Upper Prut are shown below.

The preferred structural option for the **Upper Prut** is to ***construct new flood protection dykes*** for the main flood risk areas (Criva, Drepcauti and Lipcani) (See Annex 7.3). Also will be required including

flood forecasting and warning for all riverside settlements where there is a flood risk.

Lower Prut (downstream of Costesti-Stanca dam)

Much of the River Prut floodplain downstream of Costesti-Stanca dam is protected by dykes. The floodplains on the Lower Prut can be divided into separate flood compartments where each compartment (or 'flood cell') has an independent system of dykes. This provides the opportunity to undertake works on individual flood cells with little impact on other parts of the system.

Some important features of the Prut are as follows:

1) The Costesti-Stanca reservoir has a very large impact on flood flows, reducing flood peaks by the order of 50%. The major dykes downstream of the dam are higher than the

flood level for the 0.1% flow (typically by 1 to 3m), partly because they were constructed before the Costesti-Stanca dam and partly because of the effect of the Trifesti overflow (see below).

2) The floodplain downstream of Costesti-Stanca dam is generally wide, with flood cells on both the Moldovan and Romanian banks.
3) Flows above about 950 m3/s are diverted into the floodplain at Trifesti (Romania). This is an important feature that limits the downstream flows in the Prut. Thus the 1%, 0.5% and 0.1% flows are all about 950 m3/s further downstream.

The preferred measures for **the Lower Prut** are to ***rehabilitate the dykes*** in high risk areas and modify the operation of the Costesti-Stanca dam. Dyke rehabilitation will also require improvements to the drainage systems. The main high risk areas are Ungheni and Cotul Morii.

There are also locations where the dykes should be improved to increase the standard of protection for some medium risk settlements. Also will be required flood forecasting and warning for all riverside settlements in the flood risk area.

Prut tributaries

The tributaries of the Prut generally have narrow valleys with dams and reservoirs at some locations. Each river has medium risk settlements but there are no high risk areas. The proportion of the river lengths where are settlements is high for most of these rivers. The tributaries of the Prut that are covered in the Master Plan are listed in Table 8.1. Some of the tributaries have dykes where they cross the Prut floodplain (Narnova, Calmatui, Lapusna, Tigheci, Larga and Lea Balea). These dykes form part of the Prut flood cells.

Table 8.1.Tributaries of the River Prut covered by the Master Plan

Tributary	Flood risk areas
Lopatnic	Four medium risk settlements.
Ciuhur	Six medium risk settlements.
Delia	Three medium risk settlements and a high risk area at Ungheni.
Nârnova	Three medium risk settlements.
Calmaţui	Three medium risk settlements. The village of Calmaţui is a low risk area assuming that the dams are in good coodition. This was flooded in 1994 following a cascade failure of dams. Over 30 people died.
Lapuşna	Two medium risk settlements. There is a flood storage area with control gates at Carpineni vilage.
Tigheci	Four medium risk settlements.
Larga	Two medium risk settlements.
Lea Balea	All settlements are low risk.

Source: Master Plan Report, Annex 7, Map of flood protection measures, Management and Technical Assistance Support to Moldova Flood Protection Project, Service contract No TA2011038 MD EST

The preferred measures for the Prut tributaries are combinations of:

- rehabilitating and improving dykes in high risk areas
- providing flood storage in existing or new reservoirs
- increasing the capacity of the river channels

The integrated set of measures has been sub-divided into the following categories: preventive measures, flood protection measures and institutional measures. These are defined as follows:

Measures for flood protection include:

- **Construction of new dykes.**
- **Repair and improvement of existing dykes (including raising the crest levels).**
- **New dams and reservoirs for flood management.**
- **Repair and improvement of existing dams.**
- **Changes to the operation of the existing dams.**

Preventive measures related to spatial planning which include:

- Land use planning measures including the promotion of building development outside flood hazard areas, avoiding or stopping building development on the floodplains (land use control), developing appropriate building codes to reduce flood damage (using appropriate building materials or methods of construction) and floodplain zoning to restrict the types of development in areas with different flood hazard.
- Changes in land use, for example reforestation.

Institutional measures include:

- Flood warning including flood detection, flood forecasting and dissemination of flood warnings.
- Emergency response including actions by those potentially at risk and by civil protection agencies.
- Public education and awareness raising.
- Provision of flood insurance.

The total cost of the measures amounts 317.3 million Moldavian lei or 14.7 million euros.

9. Information, consultation and public participation

The description of priority issues and problems of water resource management within the river basin districts have been published on the Ministry of Environment page on 11.29.2013. In Republic of Moldova the legal framework regarding the information, consultation and public participation in accordance with Art. 14 of the Water Framework Directive, is provided by: Water Law no. 272 of 23.12.2011 (Art. 20 Information and consultation of civil society); Government Decision no. 250 of 03.04.2014 on approval of members of the committees of river basin districts, Government Decision no. 866 of 11.01.2013 on the procedure of drafting the Management Plan of the river basin district, Government Decision no. 867 from 01.11.2013 to approve the Regulation standard on the setting up and functioning of the river basin district committee, the law on access to information, etc.

The main objective of public participation and consultation is to improve the decision-making process, by applying an effective cooperation procedures. Public participation is defined generally as public involvement in making decisions in the planning process. In this regard, informing the public is highly important. The public consultation is a more sustained form of public association, being an interactive exchange of information, by organizing consultative groupss, interviews and public debates with the participation of the media.

The active participation of stakeholders is a more intense form the involvement and does not concern the audience, but the people organized in various target groups which are actively involved in the elaboration of Community laws: Water Framework Directive, other Directives in the field of water throughout its implementation (Committee basin, NGOs, public institutions, local administrative authorities, professional associations, economic units, etc).

In preparation of this management plan a particular importance is given to information, consultation and public participation. Each stage in the preparation of Prut River Basin Management Plan will be completed through public debates and meetings with key agencies in 2015.

In order for the stakeholders to support EPIRB project, with the help of REC Hungary has been developed a communication strategy and the list of interested institutions in the protection and management of water resources within Prut river basin[38].

The first public consultation meeting was held on May 5, 2015 in Chisinau. The draft of the Prut river basin management plan was placed at the end of March on the EPIRB project website (http://blacksea-riverbasins.net/en/downloads-lib), „Apele Moldovei" Agency (www.apele.gov.md), Basin Water Management Authority (www.dbga.md), Institute of Ecology and Geography of the Academy of Sciences (www.ieg.asm.md).

On 28 May, together with the Ukrainian side in the Yaremche city, Ukraine have started discussions opposite the Prut River Basin Management Plan which were highlighted especially cross-border issues, given the fact that have been invited representatives of relevant institutions from Romania.

In August, 2015 the public consultations were held in Edinet town (4 August) to which have been invited representatives of Briceni, Ocnita, Glodeni and Rascani districts; in Ungheni town (11 August) to which have been invited representatives of Făleşti, Nisporeni, Hincesti districts and in Cahul town (13 August) have invited representatives from Leova and Cantemir districts.

Summary of public discussions with proposals and other relevant materials to be attached in the respective Annexes.

[38] http://blacksea-riverbasins.net/en/downloads-lib

Table 9.1. List of received written comments and responses

Institution/ Organization[39]	Reference[40]	Comment	Response/Action	Comment has been integrated in the RBMP [YES/ NO]
NGO "Ecological Movement"	**Measure 3. Extending and restoration of natural habitats (under the habitats directive)**	It is proposed to increase the allocation of funds and at least five times the financial resources planned for this measure.	We support this proposal, but it's unlikely that such resources will be allocated for theimplementation of the Plan.	YES
NGO "Ecological Movement"	**Supplementary measure „Flood risk management measures"**	According to the Development Program of Water Management and Hydroamelioration in Moldova for 2011-2020 (approved by Government Decision no. 751 of 05.10.2011), during the years 2015-2017 it is proposed to rehabilitate 45 km of dams within the basin, with a total cost of 45 mil. MLD. **The resources allocated for this measure are necessary to be reduced, they are exaggerated and reallocation to other activities is needed.**	Sources are planned in the state budget within available resources. Typically, these amounts are not allocated and currently state of the dams are disastrous.	YES
NGO "Ecological Movement"	**Measure 5. „ Sustainable use of water resources"**	It is proposed to complement the array of activities indicated in an action plan that would cover the decrease of environmental impacts of sectorial policies, particularly in the river Prut, inventorying the existing and planned sectorial policies and developing a	The development and implementation of theenvironmental policies are the responsibility of the Ministry of Environment.	NO

[39] Please ask respondents whether the name of their organization can be published, if not feasible the sector to which they belong should be included: agriculture, industry, civil society etc.

[40] Chapter of the draft RBMP

Institution/ Organization[39]	Reference[40]	Comment	Response/Action	Comment has been integrated in the RBMP [YES/ NO]
		mechanism for monitoring sectorial policies.		
Ecological Inspection Briceni	**Measure 3. „Progressive reduction of pollution from point sources”**	It is proposed to „build wastewater treatment plant for the Briceni city”.	Priorities for the next six years will be theconstruction of these spaces in major cities in the basin. Briceni City enrol in this list.	YES
Ecological Inspection Briceni	**Measure 3. „Progressive reduction of pollution from point sources”**	It is proposed to „construct sewage system and wastewater treatment plant in Corjeuti, Larga and other places to Briceni district”.	Priorities for the next six years will be construction of these spaces in major cities in the basin. These localities (Corjeuti, Larga) are partially enroled in this list.	YES
Ecological Inspection Briceni	**Measure 3. „Progressive reduction of pollution from point sources”**	It is proposed to „improve waste management for not allowing the formation of illegal dumps”.	These objectives are in the "waste management strategy of Moldova for the 2013-2027 years"	NO
Ecological Inspection Briceni	**Measure 3. „Progressive reduction of pollution from point sources”**	It is proposed to „to eliminate all waste in the protection area of of rivers and water basins”.	These objectives, also, are in "waste management strategy in Moldova for 2013-2027 years"	NO
Ecological Inspection Briceni	**Measure 4. „Extending and restoration of natural habitats (under the habitats directive)”**	It is proposed to „Plant protection strips in riparian forest vegetation, in accordance for their size”.	This aim is reflected in Measure 4 and in Measure 6.	YES
Ecological Inspection	**Measure 1. „Improving the monitoring program for the**	The created a centres for water resources monitoring	This aim is reflected in Measure 1.	YES

Institution/ Organization[39]	Reference[40]	Comment	Response/Action	Comment has been integrated in the RBMP [YES/ NO]
Briceni	**surface water bodies"**			

Table 9.2. List of comments and responses received during the public consultation meeting (Public consultations in Chisinau, May 5)

Reference[41]	Comment	Response/Action	The omment has been integrated in the RBMP [YES/ NO]
Chapter 7			
Measure 1. **Improving the monitoring program for the surface water bodies**	*It is proposed to change the word* ~~**Completing**~~ *with* **[Extending]**	This proposal is being implemented. Until 2013 there were 13 monitoring points. In 2014 – 30 points and 2015 – 32 points.	YES
	It is proposed to introduce the following changes: **The introduction of hydro morphological [and biological] monitoring of water bodies.**	It is important, but there are no estimates of their cost.	No
Measure 2. **Improving the monitoring program for the**	*It is proposed to add the following activity:* **Completing the monitoring system of the**	This proposal is being implemented.	YES

[41] Chapter of the draft RBMP

Reference[41]	Comment	Response/Action	The omment has been integrated in the RBMP [YES/ NO]
groundwater bodies	**groundwater bodies.**		
Measure 3. **The progressive reduction of pollution from point sources**	*It is proposed to add the following activity:* **Inventory and Mapping of the pollution from point sources**	This activity is performed during the project "Initial Development of Water Resource Management Information System (WRMIS) including GIS mapping of water abstraction and wastewater discharge locations for the Prut pilot area in the Republic of Moldova"	YES
Measure 4. **Sustainable use of water resources**	*It is proposed to add the following activities:* **To delineate the property right on the lands from the water fund**	It is the prerogative of Agency of Land Resources and Cadastre	No
	Is proposed to add the following activities: **Inventory / Database of the catchment sources**	This activity is performed during the project "Initial Development of Water Resource Management Information System (WRMIS) including GIS mapping of water abstraction and wastewater discharge locations for the Prut pilot area in the Republic of Moldova"	YES
	It is proposed to add the following activities: **To provide MONERIS modeling**	Because agriculture is the main source of diffuse pollution, this activity is included in the program of measures.	YES

Reference[41]	Comment	Response/Action	The omment has been integrated in the RBMP [YES/ NO]
	It is proposed <u>to add</u> the following activities: **Re-naturalizing the river valleys**	This activity is partially included in the program of measures, particularly related to the creation / restoration of wetlands and riparian protection strips.	YES
	It is proposed <u>to add</u> the following activities: **Hydrological modeling of water resources**	Partially realized in the project „Management and Technical Assistance Support to Moldova Flood Protection Project Service contract No TA2011038 MD EST"	YES
Measure 5. **Progressive reduction of pollution from diffuse sources**	*It is proposed <u>to add</u> the following activity:* **Elimination of the unauthorized landfills of solid waste from the hydrological basin according to the approved methodology**	These activities are planned in The Waste Management Strategy for the Republic of Moldova for the period 2013-2027	YES
	It is proposed <u>to add</u> the following activity: **Elimination of the Obsolete pesticides stocks and remediation of the contaminated soils / buildings with pesticides and POPs from the from the hydrological basin according to the approved methodology**	Work is done by the Office POPs for priority criteria	YES
	It is proposed <u>to add</u> the following activity: **Rehabilitation of the protection forest strips of water resources and land forest belts**	This activity is planned. Government Decision nr. 101 from 10.02.2014 for the period 2014-2018. The responsible is Agency „Moldsilva"	YES

Reference[41]	Comment	Response/Action	The omment has been integrated in the RBMP [YES/ NO]
Measure 6. **Protection of drinking water sources**	*It is proposed to add the following activity:* **Inventory of the sanitary zones of catchment sources**	The proposal was included	YES
	It is proposed to exclude the following activity: **Elaboration of the Law on drinking water**	The activity was excluded	YES
Measure 7. **Improvement the population access to water and sanitation**	*It is proposed to change the word* **[~~Approval~~** *with* **[Implementation the relevant components]**	The proposal was included	YES
Under Measure Public awareness	*It is proposed to add the following activity:* **To develop the economic and fiscal stimulation system for landowners**	It is included in Chapter 6. „Economic analysis"	YES
	It is proposed to add the following activity: **Awareness and informational campaigns**	This includes, partially. In Measure 6 „**Progressive reduction of pollution from diffuse sources (nitrates directive)"** it is proposed the implementation of a code of good agricultural practice which must include at least the items listed in section A of Annex II of the Nitrates Directive (see Annexes II). In addition of this developing code, more important are the training programs and information for farmers in order to promote and implement the code of good agricultural	YES

Reference[41]	Comment	Response/Action	The omment has been integrated in the RBMP [YES/ NO]
		practice.	
	Is proposed <u>to add</u> the following activity: **To develop the integrated information system and online platform**	It will be created by Government Decision the Information System of Water Resources.	NO
Supplementary Measures	*It was proposed to introduce the measure:* **Measures for improving the condition of leisure and swimming waters**	At the moment, one water body (Costești-Stânca reservoir) corresponds in all qualities the EU Bathing Water Directive 2006/7/EC. For other water bodies it is practically impossible to achieve good quality of this Directive. However, the other measures will help improve water quality and the advancement of this measure will be valid for the next cycle.	NO
	It was proposed to introduce the measure: **Measures for nutrients management**	In **Measure 6. „Progressive reduction of pollution from diffuse sources"** is are proposed the rehabilitation or the plantation of riparian protection strips along water bodies (which also exists in measure 3), but also the implementation of a code of good agricultural practice (according to the section A of Annex II of the Nitrates Directive), the training programs and information for farmers. In	YES

Reference[41]	Comment	Response/Action	The omment has been integrated in the RBMP [YES/ NO]
		order to estimate nutrients which come from agricultural land, modelling should be carried out using MONERIS software. We believe that all these planned activities are sufficient at the moment.	
	It was proposed to introduce the measure: **Measures for pasture management**	In **Measure 6. „Progressive reduction of pollution from diffuse sources"** it was added: „In the nearby meadow, another problem is overgrazing. Therefore, it requires regulation by the Local Public Authorities livestock on pasture or even ban the grazing in the meadow."	YES
Priority class of measures	*It was proposed to reprioritize the measure:* **„Measures to mitigate drought risk"** from class 3 to class 1.	We agree with this proposal. However, this measure will remain in priorities group of the Ministry of Agriculture and Ministry of Environment and the amounts allocated to this issue.	YES
	It was proposed to introduce the measure: „**Measures for the management of nutrients**" and to assign class 2.	This is rejected because, as mentioned above, the measure is found in measures 4 and 6, with priority class 2.	YES

10. The competent authorities

Implementation of the management plan, program of measures shall be performed by the Ministry of Environment and its subordinated institutions.

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Annexes

Annex 1.1

Groundwater resources in water-bearing horizons, 01.01.2010, Prut River basin, Republic of Moldova

No	Aquifer/complex	Exploited underground water reserves (thousand m3/d)											Projected reserves (thousand m3/d)	
Section: Prut River basin, Moldova, from Ukraine border to river mouth		Total	Approved by *ГКЗ*[42]				Adopted at STC meeting[43]				Proven		Total	Mineralization
			total	including			total	including			total	HDW		≥ 1.5 g/l	≥ 3.0 g/l
				HDW	ITW	TRRW		HDW	ITW	TRRW					
1	Holocene (aA3)	78.1	25.8	25.8			49.2	35.5	13.7				3.05	1.41	1.64
2	Pliocene ($N2^{2-3}$)	7.1					7.1	7.1							
3	Pontian (N2p)	33.9	19.5	19.5			14.4	14.4							
4	Upper Sarmatian-Meotian (N1s3-m)	39.6	9.88	9.8			0.08	29.8	25.5	4.2	0.0				
5	Middle Sarmatian (N1s2)	69.4	19.0	19.0			41.4	22.0	19.0	0.38			8.91	8.91	
6	Badenian-Sarmatian (N1b3+s1)	93.4	35.45	15.6	18.5	1.23	57.4	2.3	53.4	1	0.6	0.6			
7	Cretaceous-Silurian (K2+S)	54.1	29.09	19.3	9.3	0.4	21.0	5.35	15.4	0.3	4.0	4.0			
Total in section		376	139	109	27.8	1.94	221	112	105	2.8	4.6	4.6	11.9	10.32	1.64
Million m3/y		137	50.72	39.84	10.16	0.71	80.62	40.98	36.62	1.022	1.68	1.68	4.36	3.77	0.6

Source: EHGeoM

HDW – household and drinking water,
ITW – industrial-technical water,
TRRW- therapeutic, resort and recreational water

[42]Approved by the State Commission for useful mineral reserves

[43]Adopted at a meeting of the Science-technical council

Annex 1.2

System A: Rivers and Lakes

Fixed typology	**RIVERS Descriptors**	**LAKES Descriptors**
Ecoregion	16, 12	16,12
Type	Altitude typology • high: >800 m • mid-altitude: 200 to 800 m • lowland: <200 m	Altitude typology • high: >800 m • mid-altitude: 200 to 800 m • lowland: <200 m
	Size typology based on catchment area • small: 10 to 100 km^2 • medium: >100 to 1 000 km^2 • large: >1 000 to 10 000 km^2 • very large: >10 000 km^2	Size typology based on surface area • 0.5 to 1 km^2 • 1 to 10 km^2 • 10 to 100 km^2 • >100 km^2
		Depth typology based on mean depth • <3 m • 3 to 15 m • >15 m
	Geology • calcareous • siliceous • organic	Geology • calcareous • siliceous • organic

Annex 1.3

Waterbody code identification scheme for the Prut River Basin

System	First order tributary	Second order tributary	Third order tributary	Fourth order tributary	Fifth order tributary
02 = Danube	01 = Prut River	01 = ValeaGalmagei			
	0201/xx – the water bodies of the Prut River; 0201YY/xx – the water bodies of the second order tributary; 0201YYZZ/xx – the water bodies of the third order tributary	02 = Larga 1			
		03 = Mosia			
		04= Tigheci			
		05= Sarata	01=Saratica 02=Valea-Seliste		
		06 = Sirma			
		07 =Lapusna			
		08 = Calmatui			
		09 = Nirnova	01 = Tributary 1 02 = Tributary 2		
		10 = Prut Tributary			
		11 = Bratuleanca			
		12 = Varsava			
		13 = Delia			
		14 = Soltaia	01 = Vladnic		
		15 = Girla Mare			
		16 = Girla Mica			
		17 = Camenca	01 = Ustia	01 = Tributary Ustia 1	01= Tributary Ustia 1_1
				02 = Tributary Ustia 2	
			02 = Galdarusa 03 = Camencuta		
		18 = Ciuhur	01 = Sarata (Ciuhur)		
		19 = Ager (Racovat)			
		20 = Racovat	01 = Draghiste 02 = Bogda 03 = RacovatUscat		
		21 = Lopatnic			
		22 = Vilia	01 = Tributary		
		23 = Larga 2			
		24 = Medveja			
		25 = Zelenaia			
		26 = Prut Tributary (Dona, UA)			

For example: the identifier for the Ustia River WB is MD02011701

Annex 1.4

Identified and delineated groundwater bodies in the Prut river basin, Republic of Moldova

Name of the aquifer	Water bearing sediments	Number of identified GWB	Temporary codes of GWB
Holocene alluvial aquifers in Prut river valley and all its terraces (aA_3)	Sand, gravel, sandy loams	1	G100
Badenian- Sarmatian aquifer system (N_1b+S_1)	Limestone with interlayers of fine grained sand sometimes clays and marls	1	G200
Upper Sarmatian Meotic aquifer system (N_1S_3+m)	Fine grained sands in a form of disconnected lenses	1	G300
Middle Sarmatian (Congeriev) aquifer (N_1S_2)	Fine grained sands with interlayers of clays, sandstones and limestones	2	G401, G402
Upper Neocene Pontian aquifer (N_{2p})	Sandy clays with interlayers of sand and shell limestone	2	G501, G502
Silurian-Cretaceous aquifer system (S_2-K_2)	Limestone, sandstone, with interlayers of Silurian marls and argillites	2	G601, G602
	Total:	**9**	

Annex 2.1.

Location and length of the protective dams in the floodplain of the river Prut, Republic of Moldova

Title of the leveed flood plain, settlements	Leveed area, hectare	Length of embankment, km
Bolotinsky floodplains	1400	7
Taxobeni	-	3.2
Sculeni	-	0.9
Nemteni-Leuseni floodplains	3436	15.6
Leuseni-Poganeshti floodplains	1658	26
Dams in the Leova district	359	11.2
Tochile-Răducani	-	5.8
Floodplains of the river Prut, I polder	479	11.1
Floodplains of the river Prut, II polder	1456	13.6
Floodplains of the river Prut, III polder	2204	26.8
Floodplains of the river Prut, IV polder	5739	28.9
Floodplains of the river Prut, V polder	6810	39.4
Total in the floodplains of the river Prut	23541	189.5

Source: „Apele Moldovei" Agency

Annex 2.2

Quantitative parameters of Cahul fish farm

Water reservoir	Length (km)	Width (m)		Depth (m)		Water surface NRN (km^2)	Volume (mln.m3)	
		aver	max	aver	max		total	useful
Cahul reservoir, №1 fish farm	1.6	800	1000	1.2	2.2	1.28	1.54	1.54
Cahul reservoir, №2 fish farm	1.7	750	830	1.2	3.0	1.28	1.54	1.54
Cahul reservoir, №3 fish farm	1.7	760	770	1.2	2.9	1.3	1.56	1.56
Cahul reservoir, №4 fish farm	1.7	760	1050	1.3	3.0	1.3	1.69	1.69
Cahul reservoir, №5 fish farm	1.6	1100	1200	1.2	2.84	1.74	2.09	2.09
Cahul reservoir, №6 fish farm	1.8	1200	1400	1.2	2.84	2.15	2.58	2.58
Cahul reservoir, №7 fish farm	1.3	1000	1000	1.15	2.3	1.32	1.52	1.52
Cahul reservoir, №8 fish farm	1.2	1000	1000	1.15	2.4	1.18	1.36	1.36

Annex 4.1.

Qualitative chemical parameters variation (state the oxygen regime, acidification, biogenic elements, mineralization, heavy metals and organic substances) during the 2013-2014 years into river water bodies from the Prut river basin

Monitored station	The investigated parameter	2013		2014		2013-2014				
		Percentile	Class	Percentile	Class	Minimum	Maximum	Average	Percentile	Class
Prut r, – Criva v.	Oxygen	7,28	II	7	III	7,00	12,37	9,56	**7,196**	**II**
	CBO_5	2	I	2,17	I	2,00	2,39	2,26	**2,369**	**I**
	CCO_{Cr}	8,89	I	13,1	II	8,89	31,40	15,94	**21,95**	**III**
	CCO_{Mn}	8,18	I	7,95	I	7,95	8,59	8,33	**8,492**	**I**
	pH	0,91	I	0,5	I	0,00	1,75	0,73	**1,225**	**II**
	Nitrate	0,042	II	0,005	I	0,00	0,05	0,02	**0,0316**	**II**
	Ammonium nitrate	0,35	II	0,34	II	0,00	0,50	0,15	**0,43**	**III**
	Mineral phosphorus	0,009	I	0,015	I	0,01	0,05	0,02	**0,0367**	**I**
	Total phosphorus	0,026	I	0,03	I	0,03	0,07	0,05	**0,0622**	**I**
	Mineralization	283	I	332	I	283,00	690,00	422,88	**546,5**	**II**
	Chlorides	24,8	I	21,3	I	21,30	53,20	33,90	**50,68**	**I**
	Sulphates	63,4	I	45,9	I	45,90	142,00	78,86	**114,7**	**II**
	Sodium and potassium ions	23,5	I	22,7	I	22,70	57,00	35,26	**49,86**	**II**
	Iron	0,02	II	0,02	II	0,02	0,08	0,04	**0,066**	**III**
	Dissolved copper	N<4		13,57	III	0,00	18,30	4,36	**10,54927**	**III**
	Dissolved zinc	N<4		13,51	I	0,00	16,16	6,16	**12,40025**	**I**
	Phenols	N<4		N<4		0,00	0,01	0,00	**0,0036**	**III**
	Petroleum products	0,02	I	0,60	II	0,00	0,12	0,06	**0,106**	**III**
Prut r. –Lipcani v., 0,2 km upstream	Oxygen	8,172	I	8,456	I	7,18	13,52	10,41	**8,215**	**I**
	CBO_5	3,24	II	2,6	I	1,83	3,66	2,42	**2,995**	**I**
	CCO_{Cr}	16,66	III	17,02	III	8,10	21,20	13,31	**17,1**	**III**
	CCO_{Mn}	3,234	I	2,743	I	1,40	3,25	2,31	**3,204**	**I**
	pH	8,606	II	8,44	I	8,00	8,65	8,31	**8,485**	**I**
	Nitrate	1,224	II	1,37	II	0,15	1,70	0,78	**1,26**	**II**
	Nitrite	0,0352	II	0,0196	II	0,00	0,08	0,02	**0,03**	**II**
	Ammonium nitrate	0,42	III	0,286	II	0,00	0,53	0,14	**0,33**	**II**

	Mineral phosphorus	0,0328	I	0,0362	I	0,00	0,06	0,02	**0,035**	**I**
	Total phosphorus	0,062	I	0,0636	I	0,01	0,09	0,05	**0,063**	**I**
	Mineralization	474,6	I	477,8	I	268,00	613,00	402,04	**480,5**	**I**
	Chlorides	56,7	I	38,64	I	14,20	56,70	30,31	**51,05**	**I**
	Sulphates	112,2	II	100,8	II	42,40	136,00	82,55	**111**	**II**
	Sodium and potassium ions	45,24	II	38,02	I	17,20	53,50	30,43	**38,45**	**I**
	Iron	0,192	IV	0,116	IV	0,00	0,24	0,07	**0,125**	**IV**
	Total copper	18,5802	II	9,30812	I	1,32	20,39	7,20	**14,09204**	**I**
	Dissolved copper	1,0722	I	1,69544	I	0,00	4,00	0,87	**1,67598**	**I**
	Dissolved zinc	4,9081	I	42,946	III	0,00	59,57	11,19	**34,9276**	**III**
	Total zinc	46,0493	II	92,33892	III	0,00	133,43	33,99	**83,09828**	**III**
	Dissolved cadmium	0,0872	I	0,04858	I	0,00	0,11	0,03	**0,07846**	**I**
	Dissolved mercury	0,1456	I	0,0542	I	0,00	0,16	0,03	**0,1187**	**I**
	Total mercury	0,1544	I	0,3106	I	0,00	0,45	0,11	**0,2754**	**I**
	Total nickel	10,7158	II	2,70089	I	0,95	27,88	3,90	**6,424**	**I**
	Dissolved nickel	1,6594	I	1,44206	I	0,00	2,04	1,00	**1,55959**	**I**
	Total lead	0,44298	I	0,95735	I	0,00	6,44	0,44	**0,4709**	**I**
	Phenols	0,0047	III	0,0028	III	0,00	0,01	0,00	**0,003**	**III**
	Petroleum products	0,296	III	0,134	III	0,00	0,35	0,09	**0,166**	**III**
Prut r.– Braniște v, 0.,2 km upstream	Oxygen	8,205	I	7,806	II	6,82	13,68	10,48	**7,929**	**II**
	CBO_5	2,608	I	2,019	I	1,40	3,01	2,00	**2,23**	**I**
	CCO_{Cr}	19,07	III	18,07	III	7,20	21,50	14,33	**18,87**	**III**
	CCO_{Mn}	8,58	II	8,467	I	7,76	8,58	8,32	**8,562**	**II**
	pH	1,186	II	1,043	II	0,37	1,40	0,74	**1,12**	**II**
	Nitrate	0,0178	II	0,0194	II	0,00	0,04	0,01	**0,0194**	**II**
	Ammonium nitrate	0,218	II	0,079	I	0,00	0,23	0,06	**0,2**	**I**
	Mineral phosphorus	0,0178	I	0,0208	I	0,00	0,03	0,01	**0,0204**	**I**
	Total phosphorus	0,0447	I	0,0498	I	0,01	0,07	0,03	**0,0494**	**I**
	Mineralization	428,9	I	467,8	I	250,00	480,00	378,50	**451,6**	**I**
	Chlorides	39	I	29,93	I	17,70	40,80	26,29	**36,87**	**I**
	Sulphates	89,2	I	102,12	II	58,80	104,00	79,87	**99,66**	**I**
	Sodium and potassium	39,98	I	38,5	I	17,80	49,50	30,85	**39,56**	**I**

	ions									
	Iron	0,057	III	0,049	III	0,00	0,06	0,02	**0,05**	**III**
	Total copper	12,5728	I	8,50306	I	2,40	19,76	7,08	**12,29**	**I**
	Dissolved copper	1,58464	I	1,70937	I	0,00	3,68	1,06	**1,6832**	**I**
	Dissolved zinc	58,8876	II	61,15243	II	0,00	111,09	27,18	**61,4627**	**II**
	Total zinc	5,62474	I	40,2495	III	0,00	59,72	9,64	**33,5643**	**III**
	Dissolved cadmium	0,07568	I	0,0254	I	0,00	0,08	0,02	**0,0756**	**I**
	Dissolved mercury	0,1336	I	0,05316	I	0,00	0,14	0,04	**0,1156**	**I**
	Total mercury	0,4183	I	0,17726	I	0,00	1,00	0,15	**0,20436**	**I**
	Total nickel	4,6974	I	1,97966	I	0,75	5,06	2,09	**4,364**	**I**
	Dissolved nickel	1,792	I	1,06975	I	0,47	1,80	1,04	**1,5519**	**I**
	Total lead	0,2774	I	4,8576	I	0,00	5,13	0,74	**2,5905**	**I**
	Phenols	0,0019	III	0,0029	III	0,00	0,01	0,00	**0,0027**	**III**
	Petroleum products	0,163	III	0,098	II	0,00	0,27	0,07	**0,121**	**III**
Prut r.– Ungheni t., 1,2 km downstream to bridge	Oxygen	7,852	II	7,742	II	7,48	13,19	10,20	**7,722**	**II**
	CBO_5	2,667	I	2,252	I	1,74	2,97	2,17	**2,592**	**I**
	CCO_{Cr}	16,7	III	16,284	III	3,09	18,60	12,76	**16,72**	**III**
	CCO_{Mn}	3,76	I	3,033	I	1,98	4,15	2,70	**3,528**	**I**
	pH	8,437	I	8,409	I	8,23	8,57	8,37	**8,417**	**I**
	Nitrate	1,275	II	0,931	I	0,28	1,37	0,70	**1,041**	**II**
	Nitrite	0,0173	II	0,0088	I	0,00	0,03	0,01	**0,0159**	**II**
	Ammonium nitrate	0,224	II	0,07	I	0,00	0,37	0,07	**0,158**	**I**
	Mineral phosphorus	0,0436	I	0,0294	I	0,01	0,07	0,02	**0,0376**	**I**
	Total phosphorus	0,0826	I	0,0624	I	0,01	0,17	0,05	**0,0798**	**I**
	Mineralization	533,7	II	493,4	I	272,00	590,00	429,33	**502,6**	**II**
	Chlorides	39	I	31,72	I	19,50	39,00	27,03	**37,41**	**I**
	Sulphates	136,5	II	110,8	II	60,50	195,00	99,44	**129,3**	**II**
	Sodium and potassium ions	57,15	III	50,4	II	28,50	71,50	41,88	**55,05**	**III**
	Iron	0,06	III	0,077	III	0,00	0,18	0,04	**0,074**	**III**
	Dissolved copper	1,35305	I	3,86992	I	0,00	4,43	1,38	**3,27064**	**I**
	Dissolved zinc	5,70365	I	48,4547	III	0,00	118,43	14,54	**44,4067**	**III**
	Phenols	0,0019	III	0,003	III	0,00	0,01	0,00	**0,003**	**III**

	Petroleum products	0,18	III	0,117	III	0,00	0,26	0,09	**0,174**	**III**
Prut r.– Valea Mare v., downstream to Jijia r.	Oxygen	7,571	II	7,379	II	7,24	12,86	9,90	**7,378**	**II**
	CBO_5	3,581	II	2,91	I	2,05	3,96	2,74	**3,23**	**II**
	CCO_{Cr}	20,6	III	19,5	III	6,00	21,30	16,40	**20,44**	**III**
	CCO_{Mn}	4,16	I	3,52	I	2,37	5,32	3,30	**3,88**	**I**
	pH	8,434	I	8,349	I	8,01	8,76	8,33	**8,422**	**I**
	Nitrate	2,019	II	1,477	II	0,15	2,25	1,24	**1,791**	**II**
	Nitrite	0,0463	II	0,0216	II	0,00	0,09	0,02	**0,0298**	**II**
	Ammonium nitrate	0,328	II	0,204	II	0,00	0,36	0,15	**0,307**	**II**
	Mineral phosphorus	0,1091	III	0,0938	II	0,02	0,14	0,07	**0,0989**	**II**
	Total phosphorus	0,3064	III	0,1232	II	0,02	1,00	0,14	**0,2176**	**III**
	Mineralization	667,4	II	558,2	II	319,00	681,00	497,00	**639,5**	**II**
	Chlorides	42,15	I	38,64	I	21,30	49,60	31,07	**39,84**	**I**
	Sulphates	194,8	III	131,6	II	64,00	219,00	120,38	**169,6**	**III**
	Sodium and potassium ions	85,65	IV	69,5	III	31,70	101,00	56,58	**75,9**	**IV**
	Iron	0,137	IV	0,11	IV	0,00	0,19	0,07	**0,131**	**IV**
	Total copper	19,402	II	8,19919	I	1,00	27,71	7,40	**13,6013**	**I**
	Dissolved copper	4,0542	I	2,01704	I	0,00	5,82	1,55	**3,612**	**I**
	Dissolved zinc	60,2814	II	83,17665	III	0,00	91,56	35,98	**75,9042**	**II**
	Total zinc	3,6254	I	62,03429	IV	0,00	80,60	12,30	**40,931**	**III**
	Dissolved cadmium	0,2414	III	0,12218	I	0,00	0,29	0,06	**0,1444**	**I**
	Dissolved mercury	0,1339	I	0,02091	I	0,00	0,14	0,03	**0,1312**	**I**
	Total mercury	0,1586	I	0,2837	I	0,00	0,44	0,10	**0,2466**	**I**
	Total nickel	7,4512	I	4,4124	I	1,39	14,31	3,93	**5,736**	**I**
	Dissolved nickel	2,928	I	1,59157	I	0,02	2,95	1,48	**2,5277**	**I**
	Total lead	0,5116	I	1,1937	I	0,00	5,46	0,54	**0,8922**	**I**
	Phenols	0,0018	III	0,002	III	0,00	0,01	0,00	**0,002**	**III**
	Petroleum products	0,422	III	0,145	III	0,04	0,90	0,16	**0,365**	**III**
Prut r.– Leova t., 0,2 km upstream	Oxygen	7,748	II	7,876	II	7,65	13,52	9,92	**7,728**	**II**
	CBO_5	2,368	I	2,511	I	1,68	2,52	2,19	**2,46**	**I**
	CCO_{Cr}	18,66	III	34,96	IV	10,30	81,60	18,87	**19,4**	**III**
	CCO_{Mn}	3,728	I	3,245	I	2,22	3,76	3,03	**3,488**	**I**

	pH	8,586	II	8,471	I	7,92	8,60	8,35	**8,576**	**II**
	Nitrate	1,958	II	1,342	II	0,25	2,12	1,18	**1,518**	**II**
	Nitrite	0,0384	II	0,014	II	0,00	0,07	0,02	**0,0308**	**II**
	Ammonium nitrate	0,286	II	0,157	I	0,00	0,31	0,09	**0,248**	**II**
	Mineral phosphorus	0,0818	II	0,0679	II	0,01	0,09	0,05	**0,0708**	**II**
	Total phosphorus	0,2216	III	0,1096	II	0,03	0,38	0,09	**0,124**	**II**
	Mineralization	685,2	II	565,8	II	336,00	724,00	502,40	**588**	**II**
	Chlorides	41,1	I	35,49	I	21,30	46,10	31,34	**37,6**	**I**
	Sulphates	196	III	139,9	II	67,70	219,00	121,87	**148,4**	**II**
	Sodium and potassium ions	94,9	IV	65,85	III	35,00	100,00	57,82	**75,18**	**IV**
	Iron	0,162	IV	0,249	IV	0,00	0,28	0,10	**0,224**	**IV**
	Total copper	13,1164	I	12,69798	I	2,52	24,82	8,07	**13,0161**	**I**
	Dissolved copper	3,4179	I	3,0107	I	0,49	7,38	1,89	**3,0247**	**I**
	Dissolved zinc	9,0476	I	30,50148	III	0,00	33,79	10,17	**30,5507**	**III**
	Total zinc	48,464	II	121,90135	III	2,58	123,17	43,18	**111,406**	**III**
	Dissolved cadmium	0,16742	I	0,06379	I	0,00	0,31	0,05	**0,111**	**I**
	Dissolved mercury	0,1446	I	0,02324	I	0,00	0,15	0,03	**0,1296**	**I**
	Total mercury	0,1966	I	0,1849	I	0,00	0,43	0,10	**0,186**	**I**
	Total nickel	11,667	II	11,50871	II	1,06	28,49	7,17	**11,5711**	**II**
	Dissolved nickel	2,6208	I	1,88906	I	0,67	3,05	1,59	**2,1198**	**I**
	Total lead	0,45728	I	0,94219	I	0,00	3,49	0,45	**0,9423**	**I**
	Phenols	0,0085	IV	0,0038	III	0,00	0,01	0,00	**0,0075**	**IV**
	Petroleum products	0,169	III	0,119	III	0,00	0,20	0,09	**0,157**	**III**
Prut r.– Cahul t., 3,5 km downstream	Oxygen	7,616	II	7,48	II	7,16	12,70	9,48	**7,416**	**II**
	CBO_5	2,332	I	2,48	I	1,72	2,90	2,33	**2,7**	**I**
	CCO_{Cr}	26,4	III	12,1	II	12,10	31,40	18,98	**30,76**	**IV**
	CCO_{Mn}	N<4		2,82	I	2,53	3,44	3,00	**3,302**	**I**
	pH	8,428	I	7,84	I	7,84	8,67	8,28	**8,502**	**II**
	Nitrate	1,64	II	0,68	I	0,68	1,80	1,24	**1,648**	**II**
	Nitrite	0,028	II	0,03	II	0,00	0,03	0,02	**0,028**	**II**
	Ammonium nitrate	0,2	I	0,11	I	0,00	0,20	0,08	**0,2**	**I**
	Mineral phosphorus	0,0788	II	0,047	I	0,01	0,15	0,07	**0,1026**	**III**

	Total phosphorus	0,07	I	0,054	I	0,04	0,27	0,10	**0,1812**	**II**
	Mineralization	643,4	II	380	I	334,00	695,00	501,11	**602,2**	**II**
	Chlorides	41,86	I	21,3	I	21,30	46,10	32,31	**40,42**	**I**
	Sulphates	184,2	III	72,4	I	72,40	207,00	126,24	**161,4**	**III**
	Sodium and potassium ions	87,88	IV	35,5	I	35,50	96,80	58,72	**78,96**	**IV**
	Iron	0,144	IV	0,03	III	0,00	0,30	0,12	**0,276**	**IV**
	Dissolved copper	N<4		1,4597	I	0,96	2,23	1,62	**2,0264**	**I**
	Dissolved zinc	N<4		40,12	III	0,00	44,25	11,96	**35,9871**	**III**
	Phenols	0,0054	IV	0,00	III	0,00	0,01	0,00	**0,0058**	**IV**
	Petroleum products	0,172	III	0,07	II	0,00	0,20	0,09	**0,144**	**III**
Prut r.- Giurgiuleşti v.	Oxygen	7,49	II	7,528	II	7,00	13,35	9,56	**7,49**	**II**
	CBO_5	2,633	I	2,896	I	1,67	3,04	2,48	**2,864**	**I**
	CCO_{Cr}	18,85	III	21,98	III	10,10	27,50	15,72	**20,1**	**III**
	CCO_{Mn}	4,64	I	3,558	I	0,00	7,51	3,41	**4,471**	**I**
	pH	8,343	I	8,09	I	7,86	8,37	8,12	**8,276**	**I**
	Nitrate	1,986	II	1,334	II	0,47	2,08	1,09	**1,492**	**II**
	Nitrite	0,0308	II	0,0192	II	0,00	0,04	0,01	**0,0262**	**II**
	Ammonium nitrate	0,197	I	0,154	I	0,00	0,20	0,09	**0,188**	**I**
	Mineral phosphorus	0,0639	II	0,0714	II	0,02	0,08	0,05	**0,0682**	**II**
	Total phosphorus	0,1436	II	0,0916	I	0,03	0,17	0,08	**0,1224**	**II**
	Mineralization	633	II	622,8	II	333,00	704,00	516,64	**635,2**	**II**
	Chlorides	39	I	39	I	21,30	49,60	32,46	**39**	**I**
	Sulphates	185,8	III	165	III	73,10	195,00	129,40	**182,2**	**III**
	Sodium and potassium ions	89,98	IV	83,3	IV	34,50	92,30	60,84	**86,48**	**IV**
	Iron	0,139	IV	0,196	IV	0,03	0,27	0,10	**0,172**	**IV**
	Total copper	14,8556	I	9,5684	I	2,49	25,33	6,87	**12,47715**	**I**
	Dissolved copper	3,2828	I	2,404	I	0,48	6,31	1,80	**2,5265**	**I**
	Dissolved zinc	11,6724	I	27,33114	II	0,00	31,31	8,20	**26,70413**	**II**
	Total zinc	55,9166	II	89,33102	III	5,13	118,33	36,09	**79,491**	**II**
	Dissolved cadmium	1,772	V	0,70343	IV	0,00	2,53	0,50	**1,0185**	**V**
	Dissolved mercury	0,1323	I	0,01598	I	0,00	0,13	0,03	**0,129**	**I**

	Total mercury	0,1641	I	0,2635	I	0,00	0,50	0,11	**0,2275**	**I**
	Total nickel	6,91112	I	6,41037	I	1,79	12,51	4,51	**6,4152**	**I**
	Dissolved nickel	2,26366	I	2,49748	I	0,80	4,37	1,85	**2,41253**	**I**
	Total lead	N<4		0,93897	I	0,00	7,06	0,46	**0,9018**	**I**
	Phenols	0,002	III	0,0028	III	0,00	0,00	0,00	**0,0026**	**III**
	Petroleum products	0,204	III	0,152	III	0,00	0,32	0,09	**0,19**	**III**

Source: The State Hydrometeorological Service

Annex 4.2

Qualitative chemical parameters variation (state the oxygen regime, acidification, biogenic elements, mineralization, heavy metals and organic substances) during the 2013-2014 years into lake water bodies from the Prut river basin

Monitored station	The investigated parameter	2013		2014		2013-2014				
		Percentile	Class	Percentile	Class	Minimum	Maximum	Average	Percentile	Class
Costeşti res. – Prut r., Costeşti t.	Oxygen	9,048	I	8,452	I	7,34	13,19	10,79	**8,537**	**I**
	CBO_5	2,467	I	2,646	I	1,83	2,69	2,25	**2,595**	**I**
	CCO_{Cr}	18,83	III	19,35	III	0,1	30,40	13,47	**19,39**	**III**
	CCOMn	2,502	I	2,881	I	1,95	3,36	2,39	**2,836**	**I**
	pH	8,549	II	8,567	II	8,06	8,73	8,44	**8,564**	**II**
	Nitrate	1,016	II	0,842	I	0,25	1,04	0,58	**0,947**	**I**
	Nitrite	0,023	II	0,0229	II	0	0,05	0,01	**0,023**	**II**
	Ammonium nitrate	0,214	II	0,1	I	0	0,26	0,06	**0,191**	**I**
	Mineral phosphorus	0,0202	I	0,0198	I	0,004	0,03	0,01	**0,0207**	**I**
	Total phosphorus	0,061	I	0,0536	I	0,01	0,08	0,03	**0,0596**	**I**
	Mineralization	391,3	I	448,8	I	243	451,00	363,25	**432,9**	**I**
	Chlorides	28,4	I	31,55	I	17,7	42,50	25,03	**30,85**	**I**
	Sulphates	87,3	I	95,74	I	52,6	99,20	76,34	**93,88**	**I**
	Sodium and potassium ions	38,67	I	34,3	I	20,3	39,00	28,30	**37,44**	**I**
	Iron	0,04	III	0,05	III	0	0,06	0,02	**0,05**	**III**
	Dissolved copper	0,75765	I	3,66064	I	0	4,22	1,18	**2,85936**	**I**
	Total copper	9,82687	I	10,18542	I	1,7874	10,92	6,37	**10,23083**	**I**
	Dissolved zinc	11,42979	I	58,48716	IV	0	65,70	12,16	**27,06524**	**II**
	Total zinc	55,8321	II	87,30134	III	2,175	139,59	32,23	**75,01126**	**II**
	Dissolved cadmium	0,07744	I	0,02647	I	0	0,09	0,02	**0,07728**	**I**
	Total cadmium	0,09896	I	0,07242	I	0	0,12	0,04	**0,09632**	**I**
	Dissolved mercury	0,1511	I	0,0371	I	0	0,16	0,04	**0,1175**	**I**
	Total mercury	0,2202	I	0,2029	I	0	0,45	0,11	**0,2183**	**I**
	Total nickel	5,9016	I	1,68715	I	0,6318	6,29	2,13	**4,0044**	**I**
	Dissolved nickel	1,58196	I	1,2987	I	0,0779	1,68	0,96	**1,51012**	**I**
	Total lead	0,05121	I	3,25266	I	0	5,75	0,55	**1,30834**	**I**
	Phenols	0	I	0,0038	III	0	0,01	0,00	**0,002**	**III**
	Petroleum products	0,227	III	0,192	III	0	0,57	0,09	**0,228**	**III**
Manta lake –Manta v.	Oxygen	5,374	IV	3,971	V	3,44	11,07	7,91	**3,769**	**V**
	CBO_5	3,377	II	3,819	II	2,16	3,90	3,16	**3,711**	**II**

	CCO_{Cr}	23,53	III	29,04	III	15,9	30,60	22,39	**26,96**	**III**
	pH	8,662	II	8,306	I	7,54	8,68	8,27	**8,638**	**II**
	Nitrate	0,989	I	3,781	III	0	4,90	1,04	**2,345**	**II**
	Nitrite	0,0249	II	0,0367	II	0	0,04	0,02	**0,033**	**II**
	Ammonium nitrate	0,146	I	0,23	II	0	0,26	0,11	**0,197**	**I**
	Mineral phosphorus	0,0629	II	0,0536	II	0,013	0,07	0,04	**0,0626**	**II**
	Total phosphorus	0,1421	II	0,0762	I	0,038	0,17	0,07	**0,1107**	**II**
	Mineralization	811,2	III	1006,9	IV	431	1093,00	680,00	**945,3**	**III**
	Chlorides	59,02	I	111,51	II	31,9	135,00	55,20	**88,87**	**II**
	Sulphates	312,8	IV	300,5	IV	101	368,00	203,00	**332,3**	**IV**
	Sodium and potassium ions	78,4	IV	105,55	V	37,8	112,00	69,71	**96,95**	**IV**
	Iron	N<4		0,07	III	0,04	0,11	0,07	**0,086**	**III**
	Dissolved copper	N<4		2,73924	I	0,1412	3,15	1,73	**2,57556**	**I**
	Dissolved zinc	N<4		59,76876	IV	0	66,12	19,58	**55,535**	**IV**
	Petroleum products	0,108	III	0,169	III	0	0,19	0,08	**0,141**	**III**
Beleu lake –Slobozia Mare v.	Oxygen	9,635	I	7,558	II	7	10,74	9,43	**8,302**	**I**
	CBO_5	3,244	II	4,397	II	2,61	4,73	3,36	**3,953**	**II**
	CCO_{Cr}	23,77	III	20,29	III	15,1	25,90	19,21	**22,12**	**III**
	pH	8,685	II	8,532	II	7,82	8,70	8,39	**8,679**	**II**
	Nitrate	1,501	II	0,525	I	0	1,63	0,51	**1,329**	**II**
	Nitrite	0,0325	II	0,0161	II	0	0,03	0,02	**0,0305**	**II**
	Ammonium nitrate	0,07	I	0,221	II	0	0,23	0,10	**0,209**	**II**
	Mineral phosphorus	0,0566	II	0,0443	I	0,028	0,06	0,04	**0,0515**	**II**
	Total phosphorus	0,2045	III	0,0814	I	0,034	0,25	0,09	**0,1425**	**II**
	Mineralization	563,6	II	624,1	II	373	631,00	515,63	**614,9**	**II**
	Chlorides	43,97	I	49,26	I	24,8	56,70	35,45	**49,28**	**I**
	Sulphates	166,5	III	202,5	IV	100	213,00	146,38	**188,5**	**III**
	Sodium and potassium ions	74,54	IV	68,1	III	36	77,00	56,63	**74,55**	**IV**
	Iron	N<4		0,095	III	0	0,11	0,05	**0,092**	**III**
	Dissolved copper	N<4		3,87915	I	0,1463	4,52	1,78	**3,2409**	**I**
	Dissolved zinc	N<4		49,7529	III	0	50,30	16,63	**49,3905**	**III**
	Phenols	0,0049	III	0,0014	III	0	0,01	0,00	**0,0035**	**III**
	Petroleum products	0,194	III	0,121	III	0	0,23	0,10	**0,16**	**III**

Source: The State Hydrometeorological Service

Annex 4.3.

Qualitative chemical parameters variation (state the oxygen regime, acidification, biogenic elements, mineralization, heavy metals and organic substances) in the Prut river tributaries, 2013-2014

Monitored station	The investigated parameter	2013-2014				
		Minimum	Maximum	Average	Percentile	Class
Șovățul Mare r. – Ilenuța v.	Oxygen	3,77	13,52	8,72	**4,702**	IV
	CBO_5	3,38	8,85	5,61	**8,51**	V
	CCO_{Cr}	27,4	133,10	68,18	**110,9**	V
	pH	8,06	8,73	8,44	**8,698**	II
	Ammonium nitrate	0,23	0,66	0,39	**0,54**	III
	Nitrate	0,28	10,60	5,85	**9,86**	IV
	Nitrite	0	0,12	0,05	**0,0958**	III
	Mineral phosphorus	0,081	0,31	0,22	**0,3084**	IV
	Total phosphorus	0,096	0,41	0,29	**0,3836**	III
	Chlorides	70,9	110,00	92,92	**105,72**	II
	Sulphates	316	1835,00	1245,20	**1763**	V
	Iron	0,03	0,37	0,15	**0,278**	IV
	Phenols	0	0,01	0,00	**0,0041**	III
	Petroleum products	0,05	0,15	0,11	**0,141**	III
Camenca r. – Camenca t.	Oxygen	6,19	13,35	10,49	**7,182**	II
	CBO_5	3,38	8,17	5,48	**7,614**	V
	CCO_{Cr}	4,9	54,40	23,74	**47,36**	IV
	pH	8,29	8,81	8,54	**8,714**	II
	Ammonium nitrate	0	0,40	0,25	**0,384**	II
	Nitrate	1,77	5,30	3,31	**4,82**	III
	Nitrite	0,013	0,06	0,03	**0,0458**	II
	Mineral phosphorus	0,021	0,19	0,09	**0,1648**	III
	Total phosphorus	0,032	0,26	0,14	**0,2416**	III
	Chlorides	14,2	28,40	19,16	**24,84**	I
	Sulphates	49,6	486,00	177,52	**358,4**	V
	Iron	0,02	0,55	0,16	**0,382**	IV
	Phenols	0	0,00	0,00	**0,002**	III
	Petroleum products	0,04	0,12	0,09	**0,117**	III
Ciuhureț r. – Zaicani v.	Oxygen	6,21	11,56	8,99	**6,542**	III
	CBO_5	2,88	7,19	4,36	**6,154**	IV
	CCO_{Cr}	10	43,30	23,66	**36,38**	IV
	pH	7,82	8,51	8,22	**8,454**	I
	Ammonium nitrate	0,1	0,23	0,16	**0,218**	II
	Nitrate	0,4	9,30	5,61	**8,94**	IV
	Nitrite	0,009	0,08	0,04	**0,0674**	III
	Mineral phosphorus	0,066	0,13	0,09	**0,1154**	III
	Total phosphorus	0,078	0,33	0,16	**0,2674**	III
	Chlorides	10,6	24,80	18,78	**23,4**	I
	Sulphates	28,6	46,30	35,62	**43,62**	I
	Iron	0	0,30	0,12	**0,26**	IV
	Phenols	0	0,00	0,00	**0,0021**	III
	Petroleum products	0,04	0,12	0,09	**0,114**	III
Ciuhur r. –Horodişte v.	Oxygen	6,98	13,35	10,10	**7,337**	II
	CBO_5	3,88	7,18	5,52	**6,683**	IV
	CCO_{Cr}	15,1	36,80	26,53	**32,6**	IV
	pH	8,41	8,71	8,58	**8,696**	II
	Ammonium nitrate	0,07	0,63	0,22	**0,49**	III
	Nitrate	1,2	3,55	2,22	**2,815**	II
	Nitrite	0,007	0,25	0,05	**0,103**	III
	Mineral phosphorus	0,017	0,14	0,09	**0,1289**	III
	Total phosphorus	0,088	0,25	0,18	**0,2315**	III

	Mineralization	997	1254,00	1091,38	**1214,8**	IV
	Chlorides	35,4	46,10	40,31	**43,58**	I
	Sulphates	248	377,00	306,75	**345,5**	IV
	Sodium and potassium ions	129	204,00	151,13	**176**	V
	Iron	0,02	0,10	0,05	**0,086**	III
	Dissolved copper	0,2028	3,73	1,98	**3,68316**	I
	Dissolved zinc	0	46,96	8,51	**24,7506**	II
	Phenols	0	0,03	0,00	**0,0111**	IV
	Petroleum products	0,03	0,44	0,15	**0,265**	III
Delia r. – Ungheni t.	Oxygen	3,83	12,05	8,15	**4,702**	IV
	CBO_5	3,94	7,83	6,83	**7,806**	V
	CCO_{Cr}	39,2	108,20	78,20	**103,72**	V
	pH	8,39	9,00	8,69	**8,916**	II
	Ammonium nitrate	0,16	0,66	0,35	**0,528**	III
	Nitrate	0,14	2,73	1,02	**2,398**	II
	Nitrite	0	0,06	0,01	**0,0406**	II
	Mineral phosphorus	0,014	0,11	0,07	**0,1066**	III
	Total phosphorus	0,018	0,19	0,13	**0,1836**	II
	Mineralization	1530	4778,00	3105,00	**4631,6**	IV
	Chlorides	31,9	206,00	145,38	**198,8**	III
	Sulphates	272	2290,00	1302,60	**2220**	V
	Sodium and potassium ions	262	1254,00	744,00	**1226,8**	V
	Iron	0,04	0,36	0,13	**0,256**	IV
	Dissolved copper	2,6114	7,78	4,23	**6,56164**	II
	Dissolved zinc	0	18,23	5,98	**14,4087**	I
	Phenols	0	0,01	0,00	**0,0059**	IV
	Petroleum products	0,03	0,27	0,16	**0,264**	III
Delia r. – Pîrlița v.	Oxygen	5,86	11,24	9,22	**6,784**	III
	CBO_5	4,99	6,57	5,88	**6,558**	IV
	CCO_{Cr}	66,3	214,00	120,08	**181,96**	V
	pH	8,02	9,32	8,68	**9,257**	V
	Ammonium nitrate	0,23	0,40	0,34	**0,4**	II
	Nitrate	0,35	3,75	1,76	**3,315**	III
	Nitrite	0	0,04	0,01	**0,0279**	II
	Mineral phosphorus	0,059	0,61	0,23	**0,4902**	IV
	Total phosphorus	0,092	0,62	0,27	**0,4966**	IV
	Mineralization	5212	8432,00	6647,75	**7925**	V
	Chlorides	234	518,00	333,25	**456,2**	V
	Sulphates	2595	4950,00	3511,25	**4450,5**	V
	Sodium and potassium ions	1205	2184,00	1663,75	**2065,8**	V
	Iron	0,06	0,19	0,12	**0,175**	IV
	Dissolved copper	3,1771	6,36	5,01	**6,0792**	II
	Dissolved zinc	0	7,36	1,91	**5,2354**	I
	Phenols	0	0,00	0,00	**0,0027**	III
	Petroleum products	0,11	0,19	0,16	**0,19**	III
Frăsinești r. – Frăsinești v.	Oxygen	6,49	10,91	8,95	**6,898**	III
	CBO_5	2,8	7,82	5,32	**7,216**	V
	CCO_{Cr}	41	108,00	67,52	**101,72**	V
	pH	8,18	8,43	8,32	**8,41**	I
	Ammonium nitrate	0,1	0,69	0,26	**0,506**	III
	Nitrate	0,15	0,62	0,32	**0,532**	I
	Nitrite	0	0,03	0,01	**0,0218**	II
	Mineral phosphorus	0,011	0,23	0,09	**0,1752**	III
	Total phosphorus	0,024	0,25	0,13	**0,2084**	III

	Mineralization	42,5	78,00	54,88	**68,68**	I
	Chlorides	244	658,00	373,40	**530**	V
	Sulphates	0,04	0,35	0,14	**0,262**	IV
	Sodium and potassium ions	3,474	12,87	6,04	**10,23091**	III
	Iron	0,9001	138,58	42,51	**105,67391**	IV
	Dissolved copper	0	0,00	0,00	**0,003**	III
	Dissolved zinc	0,07	0,68	0,28	**0,554**	IV
Larga r. – Chircani v.	Oxygen	4,9	13,20	8,85	**6,1**	III
	CBO_5	2,66	6,22	4,33	**5,85**	III
	CCO_{Cr}	36,7	121,60	67,87	**105,8**	V
	pH	8,08	8,52	8,33	**8,49**	I
	Ammonium nitrate	0,07	0,53	0,24	**0,395**	II
	Nitrate	1,43	9,30	4,20	**7,75**	IV
	Nitrite	0,014	0,09	0,04	**0,086**	III
	Mineral phosphorus	0,041	0,13	0,09	**0,1235**	III
	Total phosphorus	0,066	0,21	0,14	**0,1865**	II
	Mineralization	958	2195,00	1653,50	**2021**	IV
	Chlorides	85,1	305,00	236,35	**298**	IV
	Sulphates	196	755,00	458,67	**646,5**	V
	Sodium and potassium ions	148	348,00	275,33	**345,5**	V
	Iron	0,01	0,27	0,11	**0,255**	IV
	Dissolved copper	0	4,69	2,67	**4,33298**	I
	Dissolved zinc	0	44,95	13,33	**34,33084**	III
	Phenols	0	0,01	0,00	**0,0052**	IV
	Petroleum products	0	0,11	0,06	**0,106**	III
Nîrnova r. – Ivanovca v.	Oxygen	6,35	15,40	10,30	**6,595**	III
	CBO_5	3,26	7,27	4,71	**6,55**	IV
	CCO_{Cr}	53,2	177,20	101,22	**160**	V
	pH	7,95	9,10	8,44	**8,825**	II
	Ammonium nitrate	0,3	0,63	0,46	**0,61**	III
	Nitrate	0,45	5,50	1,81	**3,54**	III
	Nitrite	0	0,17	0,06	**0,1215**	IV
	Mineral phosphorus	0,085	0,47	0,24	**0,377**	IV
	Total phosphorus	0,134	0,48	0,34	**0,466**	IV
	Mineralization	2012	3922,00	3255,40	**3867,6**	IV
	Chlorides	110	248,00	188,00	**230,5**	III
	Sulphates	884	1720,00	1352,83	**1685**	V
	Sodium and potassium ions	394	892,00	665,00	**845**	V
	Iron	0,08	0,12	0,11	**0,12**	IV
	Dissolved copper	0,3055	5,23	3,05	**4,7838**	I
	Dissolved zinc	0	1,23	0,45	**1,1474**	I
	Phenols	0	0,00	0,00	**0,0026**	III
	Petroleum products	0	0,15	0,10	**0,146**	III
Racovăț r. – Gordinești v., upstream	Oxygen	7,81	11,24	9,28	**8,142**	I
	CBO_5	2,63	4,94	3,48	**4,38**	II
	CCO_{Cr}	23,4	29,40	25,98	**28,92**	III
	pH	8,05	8,47	8,29	**8,462**	I
	Ammonium nitrate	0,1	1,10	0,51	**1,016**	IV
	Nitrate	2,25	4,95	3,60	**4,89**	III
	Nitrite	0,014	0,11	0,05	**0,1044**	III
	Mineral phosphorus	0,041	0,15	0,08	**0,1268**	III
	Total phosphorus	0,064	0,22	0,12	**0,1804**	II
	Mineralization	578	876,00	724,40	**845,2**	III
	Chlorides	23	31,90	28,00	**31,9**	I

	Sulphates	54,4	124,00	94,58	**116**	II
	Sodium and potassium ions	18,3	72,00	47,90	**67,6**	III
	Iron	0,03	0,30	0,12	**0,228**	IV
	Dissolved copper	1,5415	3,78	2,70	**3,54316**	I
	Dissolved zinc	2,1101	64,58	23,86	**52,04246**	IV
	Phenols	0	0,00	0,00	**0,002**	III
	Petroleum products	0,03	0,12	0,09	**0,12**	III
Sărata r. – Vozneseni v.	Oxygen	6,19	11,72	8,35	**6,238**	III
	CBO_5	3,29	6,87	5,20	**6,735**	IV
	CCO_{Cr}	30,5	142,80	102,43	**135,6**	V
	pH	7,95	8,54	8,22	**8,48**	I
	Ammonium nitrate	0,07	0,82	0,34	**0,673**	III
	Nitrate	0,1	2,18	0,98	**1,871**	II
	Nitrite	0,005	0,15	0,05	**0,1158**	III
	Mineral phosphorus	0,021	0,16	0,08	**0,1393**	III
	Total phosphorus	0,078	0,23	0,15	**0,2162**	III
	Mineralization	2531	4041,00	2987,25	**3643,5**	IV
	Chlorides	248	532,00	334,75	**457,6**	V
	Sulphates	990	1772,00	1251,00	**1588,4**	V
	Sodium and potassium ions	544	943,00	655,00	**832,6**	V
	Iron	0,06	0,16	0,11	**0,154**	IV
	Dissolved copper	0	4,37	2,64	**4,03449**	I
	Dissolved zinc	0	2,06	0,52	**1,44529**	I
	Phenols	0	0,01	0,00	**0,0044**	III
	Petroleum products	0,06	0,23	0,13	**0,206**	III
Sărata r. –Vîlcele v., downstream	Oxygen	3,7	7082,00	892,09	**4,988**	IV
	CBO_5	4,91	10,50	6,73	**8,071**	V
	CCO_{Cr}	69,6	142,80	99,06	**135,24**	V
	pH	8,14	8,90	8,48	**8,746**	II
	Ammonium nitrate	0,17	0,50	0,29	**0,402**	III
	Nitrate	0	3,30	0,75	**1,767**	II
	Nitrite	0	0,01	0,01	**0,0133**	II
	Mineral phosphorus	0,048	0,16	0,10	**0,1455**	III
	Total phosphorus	0,114	0,29	0,19	**0,2703**	III
	Mineralization	2741	4264,00	3427,00	**3976,3**	IV
	Chlorides	354	496,00	422,88	**471,5**	V
	Sulphates	1115	1720,00	1386,25	**1691,3**	V
	Sodium and potassium ions	653	1018,00	796,13	**953,6**	V
	Iron	0,01	0,49	0,17	**0,385**	IV
	Dissolved copper	0,715	3,74	1,89	**3,11151**	I
	Phenols	0	0,01	0,00	**0,0056**	IV
	Petroleum products	0	0,15	0,07	**0,144**	III
Tigheci r. – Tigheci v.	Oxygen	4,9	9,93	7,66	**5,676**	III
	CBO_5	2,86	5,73	4,16	**5,214**	III
	CCO_{Cr}	36,8	60,80	51,24	**59,04**	IV
	pH	8,18	8,82	8,43	**8,704**	II
	Ammonium nitrate	0,23	0,66	0,41	**0,62**	III
	Nitrate	0,35	16,70	8,13	**14,94**	V
	Nitrite	0,022	0,23	0,13	**0,2232**	IV
	Mineral phosphorus	0,112	0,35	0,19	**0,2862**	IV
	Total phosphorus	0,168	0,64	0,36	**0,5596**	IV
	Chlorides	163	206,00	185,00	**201,6**	III
	Sulphates	420	826,00	550,60	**708,8**	V
	Iron	0,03	0,16	0,09	**0,144**	IV

	Dissolved copper	2,7635	4,12	3,37	**4,02307**	I
	Dissolved zinc	0	18,03	6,91	**15,50375**	I
	Phenols	0	0,00	0,00	**0,0028**	III
	Petroleum products	0,07	0,16	0,12	**0,16**	III
Valea Calmage r. – Zîrnești v.	Oxygen	6,21	16,20	9,60	**7,18**	II
	CBO_5	2,01	3,94	2,79	**3,615**	II
	CCO_{Cr}	40,3	98,80	63,92	**84,1**	IV
	pH	8,15	8,64	8,35	**8,545**	II
	Ammonium nitrate	0,07	0,23	0,13	**0,2**	I
	Nitrate	10	24,50	19,48	**23,85**	V
	Nitrite	0,041	0,18	0,09	**0,1575**	IV
	Mineral phosphorus	0,028	0,12	0,07	**0,1145**	III
	Total phosphorus	0,046	0,22	0,12	**0,176**	II
	Chlorides	227	234,00	229,67	**232**	III
	Sulphates	702	1002,00	787,50	**898**	V
	Iron	0,05	0,18	0,10	**0,155**	IV
	Dissolved copper	1,9639	5,57	3,07	**4,7859**	I
	Dissolved zinc	0	44,26	8,85	**26,55372**	II
	Phenols	0	0,00	0,00	**0**	I
	Petroleum products	0	0,13	0,07	**0,118**	III
Varșava r. - Valea Mare v.	Oxygen	5,56	11,07	9,13	**6,32**	III
	CBO_5	4,68	7,83	6,03	**7,334**	V
	CCO_{Cr}	36,8	118,70	60,72	**94,74**	V
	pH	8,18	8,84	8,40	**8,652**	II
	Ammonium nitrate	0,13	1,32	0,54	**1,108**	IV
	Nitrate	0,5	3,20	2,02	**3,128**	III
	Nitrite	0,005	0,13	0,07	**0,1168**	III
	Mineral phosphorus	0,036	0,37	0,17	**0,2978**	IV
	Total phosphorus	0,046	0,39	0,24	**0,3656**	III
	Chlorides	17,7	167,00	58,88	**117,2**	II
	Sulphates	61,2	1544,00	426,24	**1010,8**	V
	Iron	0,07	0,17	0,11	**0,158**	IV
	Dissolved copper	2,1143	5,67	4,12	**5,41967**	II
	Dissolved zinc	0	106,01	37,15	**86,81556**	IV
	Phenols	0,001	0,01	0,01	**0,0087**	IV
	Petroleum products	0,05	0,22	0,12	**0,187**	III
Vilia r. – Tețcani v.	Oxygen	6,67	13,35	9,51	**7,125**	II
	CBO_5	2,23	6,59	3,72	**5,815**	III
	CCO_{Cr}	10,2	40,50	23,32	**35,85**	IV
	pH	8,15	8,71	8,52	**8,705**	II
	Ammonium nitrate	0	0,36	0,14	**0,305**	II
	Nitrate	0,9	6,10	3,65	**6**	IV
	Nitrite	0,013	0,07	0,03	**0,058**	II
	Mineral phosphorus	0,019	0,11	0,04	**0,0765**	II
	Total phosphorus	0,04	0,14	0,08	**0,1275**	II
	Mineralization	431	673,00	574,67	**668,5**	II
	Chlorides	21,3	42,50	28,10	**35,5**	I
	Sulphates	41,8	120,00	83,03	**111,5**	II
	Sodium and potassium ions	21,7	50,50	36,45	**47,25**	II
	Iron	0	0,17	0,09	**0,145**	IV
	Dissolved copper	1,153	4,81	2,37	**3,69064**	I
	Dissolved zinc	0	54,79	17,99	**42,69654**	III
	Phenols	0	0,00	0,00	**0,0028**	III
	Petroleum products	0	0,15	0,06	**0,13**	III
Gîrla Mare r. – Catranîc v.	Oxygen	2,63	10,74	7,32	**3,989**	V
	CBO_5	5,91	13,00	8,45	**11,506**	V

	CCO_{Cr}	81	168,30	128,93	**165,21**	V
	pH	7,92	9,09	8,61	**9,003**	V
	Ammonium nitrate	0,56	1,65	0,89	**1,383**	IV
	Nitrate	0,19	36,20	9,23	**25,43**	V
	Nitrite	0	0,99	0,25	**0,693**	V
	Mineral phosphorus	0,108	1,22	0,77	**1,1842**	V
	Total phosphorus	0,19	2,06	1,12	**1,8222**	V
	Chlorides	177	496,00	297,75	**440,8**	V
	Sulphates	257	2608,00	1570,50	**2393,5**	V
	Iron	0,04	0,18	0,13	**0,168**	IV
	Phenols	0	0,00	0,00	**0,0034**	III
	Petroleum products	0,04	0,25	0,12	**0,208**	III
Gîrla Mare r.- Sărata Nouă v.	Oxygen	4,4	12,70	9,41	**5,816**	III
	CBO_5	7,4	8,66	8,15	**8,657**	V
	CCO_{Cr}	50,8	122,40	82,33	**112,92**	V
	pH	8,56	9,15	8,85	**9,057**	V
	Ammonium nitrate	0,33	0,59	0,43	**0,542**	III
	Nitrate	0,15	1,68	0,71	**1,422**	II
	Nitrite	0	0,01	0,00	**0,0035**	I
	Mineral phosphorus	0,06	0,27	0,16	**0,246**	IV
	Total phosphorus	0,144	0,44	0,27	**0,3878**	III
	Chlorides	145	213,00	172,75	**200,1**	III
	Sulphates	275	2340,00	1515,25	**2248,8**	V
	Iron	0,12	0,26	0,16	**0,224**	IV
	Phenols	0	0,01	0,00	**0,0075**	IV
	Petroleum products	0,1	0,14	0,11	**0,128**	III
Lăpușna r. – Lăpușna v.	Oxygen	2,63	9,44	6,42	**4,05**	IV
	CBO_5	2,92	6,32	4,76	**6,172**	IV
	CCO_{Cr}	44,4	72,60	57,74	**69,68**	IV
	pH	7,58	8,60	8,02	**8,46**	I
	Ammonium nitrate	0,07	0,46	0,24	**0,448**	III
	Nitrate	0,1	2,55	0,78	**1,738**	II
	Nitrite	0	0,02	0,01	**0,0116**	II
	Mineral phosphorus	0,007	0,22	0,13	**0,1956**	III
	Total phosphorus	0,008	0,25	0,18	**0,2376**	III
	Mineralization	1908	2321,00	2093,80	**2256,2**	IV
	Chlorides	120	142,00	130,40	**142**	II
	Sulphates	875	1100,00	1002,80	**1092**	V
	Sodium and potassium ions	217	260,00	239,80	**254**	V
	Iron	0,04	0,24	0,10	**0,192**	IV
	Dissolved copper	1,1938	4,67	2,45	**3,8793**	I
	Dissolved zinc	0	2,48	1,32	**2,20928**	I
	Phenols	0	0,00	0,00	**0,0007**	I
	Petroleum products	0,11	0,13	0,12	**0,127**	III
Lăpușna r.– Sărata Rezeşi v.	Oxygen	2,48	12,37	6,83	**3,936**	V
	CBO_5	2,68	8,07	4,38	**6,342**	IV
	CCO_{Cr}	47,6	108,00	75,28	**98,08**	V
	pH	7,62	8,52	8,05	**8,344**	I
	Ammonium nitrate	0,01	1,06	0,44	**0,868**	IV
	Nitrate	0	5,85	1,49	**3,81**	III
	Nitrite	0	0,06	0,01	**0,0266**	II
	Mineral phosphorus	0,044	0,26	0,09	**0,1252**	III
	Total phosphorus	0,066	0,32	0,15	**0,212**	III
	Mineralization	1809	2471,00	2124,11	**2396,6**	IV
	Chlorides	93,9	266,00	189,43	**240,4**	III
	Sulphates	720	1164,00	888,00	**1020**	V

	Sodium and potassium ions	253	499,00	369,89	**467**	V
	Iron	0	0,11	0,06	**0,11**	IV
	Dissolved copper	0,1586	2,99	1,29	**2,25471**	I
	Dissolved zinc	0	4,09	0,81	**2,57418**	I
	Phenols	0	0,01	0,00	**0,001**	II
	Petroleum products	0	0,79	0,16	**0,31**	III

Source: The State Hydrometeorological Service

Annex 4.4

Priority substances identified in the Prut river basin, 2013-2014

Monitored station	Parameter	2013-2014		
		Minimum	Maximum	Average
Prut r.– Lipcani v., 0,2 km upstream	Fluoranthene	<LOD	0,019	0,0024
	Naphthalene	<LOD	0,040	0,0032
Prut r.–.Leova t., 0,2 km upstream	Naphthalene	<LOD	0,008	0,0009
Delia r.- Ungheni t.	Naphthalene	<LOD	0,012	0,0038
Delia r.- Pîrlița v.	Naphthalene	<LOD	0,007	0,0023
Valea Galmage r. – Zîrnești v.	o, p-DDD	<LOD	0,024	0,0120
	o, p-DDE	<LOD	0,014	0,0070
	Total DDT	0,035	0,035	0,0350
	p-p DDD	<LOD	0,017	0,0085
	p-p DDE	<LOD	0,020	0,0100
Lăpușna r. – Lăpușna v.	Naphthalene	<LOD	0,007	0,0018
Costești rez.- Prut r., Costești t.	Fluoranthene	<LOD	0,034	0,0026
	Naphthalene	<LOD	0,028	0,0022

Source: The State Hydrometeorological Service

Annex 4.5.

Monitoring frequencies according to WFD Annex V.1.3.4

	Rivers	Lakes
Biological quality elements		
Phytoplankton	6 months	6 months
Other aquatic flora	3 years	3 years
Benthic invertebrate fauna	3 years	3 years
Fish	3 years	3 years
Hydromorphological quality elements		
Continuity	6 years	
Hydrology	continuous	1 month
Morphology	6 years	6 years
Physico-chemical quality elements		
Thermal conditions	3 months	3 months
Oxygenation	3 months	3 months
Salinity	3 months	3 months
Nutrient status	3 months	3 months
Acidification status	3 months	3 months
Other pollutants	3 months	3 months
Priority substances	1 month	1 month

Annex 4.6.

Water quality in the river according to hydrobiological elements in the Prut river basin, 2013-2014

Monitored station	The investigated parameter	2013		2014		2013-2014			
		Average	Class	Average	Class	Minimum	Maximum	Average	Class
Prut r.–Lipcani v., 0,2 km upstream	Benthic invertebrates, Saprobic index after Pantle and Buck	2,07	II	1,86	II	1,8	2,07	1,94	II
	Phytoplankton, Saprobic index after Pantle and Buck	1,9	II	2,14	III	1,77	2,22	2,02	III
	Phytoplankton, biomass	1,016	II	0,784	II	0,112	1,548	0,9	II
	Chlorophyll "a"	3,51	I	1,58	I	1,18	6,58	2,55	I
Prut r. –Branişte v., 0,2 km upstream	Benthic invertebrates, Saprobic index after Pantle and Buck	2,00	II	2,04	II	1,87	2,11	2,03	II
	Phytoplankton, Saprobic index after Pantle and Buck	1,91	II	1,86	II	1,78	2,04	1,88	II
	Phytoplankton, biomass	0,969	II	0,504	II	0,280	1,462	0,736	III
	Chlorophyll "a"	2,57	I	1,18	I	1,18	3,95	1,88	I
Prut r.– Ungheni t., 1,2 km downstream of the bridge	Benthic invertebrates, Saprobic index after Pantle and Buck	1,87	II	1,96	II	1,88	2,01	1,90	II
	Phytoplankton, Saprobic index after Pantle and Buck	1,85	II	2,08	III	1,80	2,17	1,97	II
	Phytoplankton, biomass	0,555	II	0,824	II	0,441	1,208	0,690	II
	Chlorophyll "a"	1,97	I	2,37	I	1,18	4,74	2,17	I
Prut r.–Valea Mare v., downstream to Jijia r.	Benthic invertebrates, Saprobic index after Pantle and Buck	1,87	II	1,96	II	1,72	2,03	1,92	II
	Phytoplankton, Saprobic index after Pantle and Buck	2,19	III	2,14	III	2,0	2,48	2,17	III
	Phytoplankton, biomass	0,639	II	0,634	II	0,383	0,832	0,637	II
	Chlorophyll "a"	3,29	I	22,5	III	7,10	37,89	12,90	II
Prut r.– Leova t., 0,2 km upstream	Benthic invertebrates, Saprobic index after Pantle and Buck	1,98	II	2,02	II	1,83	2,13	1,99	II
	Phytoplankton, Saprobic index after Pantle and Buck	2,01	III	1,98	I	1,81	2,14	2,0	II
	Phytoplankton, biomass	0,150	I	0,399	I	0,13	0,532	0,275	I
	Chlorophyll "a"	1,97	I	3,55	I	1,18	4,74	2,76	I
Prut r. – Cahul t., 3,5 km downstream	Benthic invertebrates, Saprobic index after Pantle and Buck	1,81	II	1,83	II	1,45	2,07	1,82	II

	Phytoplankton, Saprobic index after Pantle and Buck	2,13	III	2,03	III	1,95	2,21	2,08	III
	Phytoplankton, biomass	0,25	I	0,231	I	0,088	0,494	0,24	I
	Chlorophyll "a"	3,51	I	1,97	I	1,18	6,58	2,74	I
Prut r. – Giurgiuleşti v.	Benthic invertebrates, Saprobic index after Pantle and Buck	1,84	II	1,89	II	1,52	2,2	1,86	II
	Phytoplankton, Saprobic index after Pantle and Buck	2,57	III	2,08	III	1,90	3,6	2,33	III
	Phytoplankton, biomass	1,79	III	0,337	I	0,15	5,07	1,064	II
	Chlorophyll "a"	3,29	I	2,37	I	1,18	3,95	2,83	I
Șovățul Mare r. – Ilenuța v.	Benthic invertebrates, Saprobic index after Pantle and Buck			2,14	II	2,14	2,14	2,14	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,22	III	2,18	2,25	2,22	III
	Phytoplankton, biomass			0,554	II	0,52	0,587	0,554	II
	Chlorophyll "a"			3,55	I	3,55	3,55	3,55	I
Camenca r. – Camenca t.	Benthic invertebrates, Saprobic index after Pantle and Buck	2,08	II	1,98	II	1,93	2,08	2,01	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,31	III	2,3	2,32	2,31	III
	Phytoplankton, biomass			0,471	I	0,381	0,560	0,471	I
	Chlorophyll "a"			2,37	I	2,37	2,37	2,37	I
Ciuhureț r. – Zăicani v.	Benthic invertebrates, Saprobic index after Pantle and Buck	1,84	II	1,71	II	1,66	1,84	1,75	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,22	III	2,02	2,41	2,22	III
	Phytoplankton, biomass			0,853	II	0,303	1,403	0,853	II
	Chlorophyll "a"			2,37	I	2,37	2,37	2,37	I
Ciuhur r. – Horodişte v.	Benthic invertebrates, Saprobic index after Pantle and Buck	2,08	II	1,8	II	1,66	2,56	1,97	II
	Phytoplankton, Saprobic index after Pantle and Buck	2,27	III	2,13	III	2,09	2,56	2,20	III
	Phytoplankton, biomass	0,765	II	0,918	II	0,329	1,529	0,842	II
	Chlorophyll "a"	19,29	II	15,99	II	3,95	27,62	17,64	II
Delia r. – Ungheni t.	Benthic invertebrates, Saprobic index after Pantle and Buck	2,02	II	2,01	II	2,01	2,02	2,02	II
	Phytoplankton, Saprobic index after Pantle and			2,19	III	2,03	2,34	2,19	III

	Buck								
	Phytoplankton, biomass			1,989	III	0,605	3,372	1,989	III
	Chlorophyll "a"			8,29	I	7,10	9,47	8,29	I
Delia r. – Pîrlița v.	Benthic invertebrates, Saprobic index after Pantle and Buck			1,60	II	1,60	1,60	1,60	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,11	III	2,0	2,21	2,11	III
	Phytoplankton, biomass			3,327	IV	0,334	6,319	3,327	IV
	Chlorophyll "a"			2,96	I	2,37	3,55	2,96	I
Frăsinești r. – Frăsinești v.	Benthic invertebrates, Saprobic index after Pantle and Buck	1,81	II	2,12	II	1,81	2,12	1,97	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,21	III	2,15	2,27	2,21	III
	Phytoplankton, biomass			0,330	I	0,268	0,391	0,330	I
	Chlorophyll "a"			2,37	I	2,37	2,37	2,37	I
Larga r. – Chircani v.	Benthic invertebrates, Saprobic index after Pantle and Buck			1,78	II	1,78	1,78	1,78	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,16	III	2,07	2,26	2,16	III
	Phytoplankton, biomass			0,408	I	0,408	0,408	0,408	I
	Chlorophyll "a"			10,06	II	7,1	13,02	10,06	II
Nîrnova r. - Ivanovca v.	Benthic invertebrates, Saprobic index after Pantle and Buck	2	II	2,16	II	2	2,16	2,08	II
	Chlorophyll "a"			5,33	I	1,18	9,47	5,33	I
Racovăț r. – Gordinești v., upstream	Benthic invertebrates, Saprobic index after Pantle and Buck	1,96	II	2,09	II	1,96	2,2	2,05	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,35	III	2,23	2,47	2,35	III
	Phytoplankton, biomass			1,034	II	0,743	1,324	1,034	II
	Chlorophyll "a"			5,33	I	1,18	9,47	5,33	I
Sărata r. – Vozneseni v.	Benthic invertebrates, Saprobic index after Pantle and Buck			2,09	II	2,09	2,09	2,09	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,20	III	2,13	2,37	2,20	III
	Phytoplankton, biomass			0,845	II	0,218	1,471	0,845	II
	Chlorophyll "a"			5,33	I	1,18	9,47	5,33	I
Sărata r. –Vîlcele v., downstream	Benthic invertebrates, Saprobic index after	1,97	II	1,95	II	1,84	2,12	1,96	II

	Pantle and Buck								
	Phytoplankton, Saprobic index after Pantle and Buck	2,45	III	2,22	III	2,20	2,23	2,45	III
	Phytoplankton, biomass	8,098	V	0,875	III	0,481	23,04	4,487	IV
	Chlorophyll "a"	20,17	III	9,47	I	7,10	39,46	14,82	II
Tigheci r. – Tigheci v.	Benthic invertebrates, Saprobic index after Pantle and Buck	1,81	II	1,79	II	1,79	1,81	1,8	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,19	III	1,75	2,52	2,19	III
	Phytoplankton, biomass			0,354	I	0,29	0,567	0,354	I
	Chlorophyll "a"			1,18	I	1,18	1,18	1,18	I
Valea Calmage r. – Zîrnești v.	Benthic invertebrates, Saprobic index after Pantle and Buck			1,99	II	1,99	1,99	1,99	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,26	III	2,19	2,32	2,26	III
	Phytoplankton, biomass			0,552	II	0,303	0,8	0,552	II
	Chlorophyll "a"			3,56	I	2,37	4,74	3,56	I
Varșava r. - Valea Mare v.	Benthic invertebrates, Saprobic index after Pantle and Buck	1,9	II	1,96	II	1,9	1,96	1,93	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,21	III	2,20	2,22	2,21	III
	Phytoplankton, biomass			0,983	II	0,216	1,75	0,983	II
	Chlorophyll "a"			4,74	I	3,55	5,92	4,74	I
Vilia r. – Tețcani v.	Benthic invertebrates, Saprobic index after Pantle and Buck	1,91	II	1,42	II	1,42	1,91	1,67	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,38	III	2,23	2,52	2,38	III
	Phytoplankton, biomass			1,534	III	1,061	2,007	1,534	III
	Chlorophyll "a"			5,33	I	3,55	7,10	5,33	I
Gîrla Mare r. – Catranîc v.	Benthic invertebrates, Saprobic index after Pantle and Buck			1,94	II	1,89	1,98	1,94	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,01	III	1,85	2,17	2,01	II
	Phytoplankton, biomass			0,81	II	0,62	1,0	0,81	II
	Chlorophyll "a"			20,13	III	9,47	30,78	20,13	III
Gîrla Mare r. - Sărata Nouă v.	Benthic invertebrates, Saprobic index after Pantle and Buck			2,05	II	2,02	2,08	2,05	II

	Phytoplankton, Saprobic index after Pantle and Buck			2,25	III	2,13	2,37	2,25	III
	Phytoplankton, biomass			0,845	II	0,62	0,882	0,845	II
	Chlorophyll "a"			17,76	II	16,58	18,94	17,76	II
	Benthic invertebrates, Saprobic index after Pantle and Buck	1,62	II	1,82	II	1,62	1,82	1,72	II
	Phytoplankton, Saprobic index after Pantle and Buck			2,19	III	2,18	2,19	2,19	III
	Phytoplankton, biomass			1,059	II	0,39	1,728	1,059	II
Lăpușna r. - Lăpușna v.	Chlorophyll "a"			4,15	I	2,37	7,10	4,15	I
	Benthic invertebrates, Saprobic index after Pantle and Buck	1,93	II	2,19	II	2,10	2,42	2,06	II
	Phytoplankton, Saprobic index after Pantle and Buck	2,27	III	2,36	III	2,30	2,44	2,37	III
	Phytoplankton, biomass	8,455	V	4,347	IV	0,389	23,386	6,401	V
Lăpușna r. – Sărata Rezeşi v.	Chlorophyll "a"	3,95	I	4,74	I	1,97	7,1	4,35	I
	Benthic invertebrates, Saprobic index after Pantle and Buck	1,88	II	2,06	II	1,85	2,1	1,99	II
Costeşti rez. – Prut r., Costeşti t.	Phytoplankton, Saprobic index after Pantle and Buck	2,02	III	1,95	II	1,91	2,13	1,99	II
	Phytoplankton, biomass	0,477	I	2,026	III	0,69	3,853	1,25	II
	Chlorophyll "a"	2,11	I	1,18	I	0,4	3,95	1,65	I
	Benthic invertebrates, Saprobic index after Pantle and Buck	1,89	II	2,04	II	1,71	2,08	1,97	II
	Phytoplankton, Saprobic index after Pantle and Buck	2,14	III	2,23	III	2,09	2,41	2,19	III
	Phytoplankton, biomass	0,315	I	1,465	II	0,233	2,686	0,89	II
Manta lake –Manta v.	Chlorophyll "a"	3,95	I	2,37	I	1,18	3,95	3,16	I
	Benthic invertebrates, Saprobic index after Pantle and Buck	1,79	II	1,89	II	1,68	1,91	1,84	II
	Phytoplankton, Saprobic index after Pantle and Buck	1,94	II	2,15	III	1,71	2,32	2,05	III
	Phytoplankton, biomass	0,813	II	0,648	II	0,327	0,867	0,731	II
Beleu lake –Slobozia Mare v.	Chlorophyll "a"	4,61	I	2,37	I	2,37	5,02	3,49	I

Source: The State Hydrometeorological Service

Annex 4.7

Physico-chemical results obtained following the expedition in Prut river hydrographic basin, 2015 [44]

The location of the monitoring point	Date	Temperature, °C	Smell	Turbidity, FTU	Conductivity, µs/cm	pH	Solid suspensions, mg/L	Dissolved oxygen, mg/L	Oxygen saturation %	CBO_5, mg O2/l	CCO_{Cr} mg O2/l	Alkalinity, mg/l	SO4, mg/L	Cl, mg/L	Ca, mg/L	Mg, mg/L	Na+K, mg/L	The amount of ions, mg/L	Hardness, mg/L	Mineralization, mg/L
Prut r.- Lipcani v.	20.07.2015	27,7	0	9,9	456	7,97	17	9,23	119	2,17	11,8	141	48,4	30,5	70,1	2,43	12,2	305,0	3,70	234
Zelenaia r.- Drepcăuți v.	20.07.2015	24,5	1	133,0	1155	7,93	21	8,07	98	2,56	30,6	432	203,0	29,8	72,1	43,80	120,0	901,0	7,20	685
Medveja r.- Lipcani, v. upstream	20.07.2015	24,1	1	139,0	1320	7,96	116	7,16	86	5,56	21,2	455	176,0	53,2	86,2	57,10	90,5	918,0	9,00	690
Larga r.- Slobozia-Şireuți v.	20.07.2015	24,6	0	40,3	823	8,01	56	6,93	84	2,39	15,3	354	77,6	31,9	80,2	21,90	62,7	628,0	5,80	451
Prut r.- Pererîta v.	20.07.2015	27,0	0	8,9	424	7,97	49	8,30	105	2,15	11,9	151	42,7	26,9	56,1	4,86	23,2	305,0	3,20	229
Vilia r. – Teţcani v.	21.07.2015	21,2	1	41,2	922	8,03	40	7,65	87	4,58	22,7	373	65,0	37,6	48,1	58,40	33,2	615,0	7,20	428
Lopatnic r.- Lopatnic v.	21.07.2015	18,1	1	7,6	1052	7,69	47	8,79	94	2,12	11,4	398	149,0	29,8	72,1	38,90	91,5	779,0	6,80	580
Draghişte r.- Feteşti v., downstream	21.07.2015	21,4	1	32,0	978	7,63	54	4,72	54	3,26	27,6	420	97,3	33,7	80,2	34,00	76,2	741,0	6,80	531
Racovăț r.-Gordinești v.	21.07.2015	25,6	1	193,0	1023	8,18	69	7,82	97	3,07	26,6	494	88,9	29,1	60,1	60,80	62,2	795,0	8,00	548
Ciuhur r.- Stolniceni v.	21.07.2015	30,4	1	125,0	1905	8,44	79	7,33	99	3,93	37,4	573	468,0	41,8	28,0	107,00	243,0	1461,0	10,20	1174
Camenca r.–Camenca v.	21.07.2015	29,0	1	94,6	2080	8,54	41	8,95	118	3,28	50,4	769	441,0	47,5	40,1	97,30	315,0	1710,0	10,00	1325
Glodeanca r.-Duşmani v.	21.07.2015	30,5	1	490,0	3190	9,11	486	17,80	241	5,3	109,0	952	812,0	89,3	40,1	97,30	600,0	2591,0	10,00	2115
Girla Mare r.- Blindesti v.	22.07.2015	25,4	1	140,0	2900	8,45	89	1,50	18	18,1	73,0	1306	484,0	70,9	80,2	73,00	563,0	2577,0	10,00	1924
Prut r. – Ungheni t.	22.07.2015	28,6	1	8,7	421	8,17	11	6,84	89	2,02	11,9	161	47,6	21,3	44,1	17,00	15,7	307,0	3,60	226
Prut r.- Valea Mare v.	22.07.2015	27,6	1	11,3	487	8,11	22	6,51	84	2,57	17,8	176	59,6	22,7	52,1	12,20	29,0	352,0	3,60	264
Lăpuşna r.- Lăpuşna v.	22.07.2015	24,2	1	22,2	2780	7,69	50	4,07	49	3,71	71,2	410	1029,0	149,0	152,0	165,00	267,0	2172,0	21,20	1967
Sarata r.- Vozneseni v.	22.07.2015	31	1	302,0	6550	8,73	395	11,35	155	6,18	188,0	567	2055,0	737,0	96,2	214,00	1211,0	4880,0	22,40	4596
Prut r.- Cantemir t., downstream	23.07.2015	27,6	1	22,7	422	8,45	27	6,35	82	2,50	10,9	139	48,6	26,2	44,1	7,30	30,7	296,0	2,80	226
Larga r.- Chircani s.	23.07.2015	25,3	1	254,0	2610	8,27	164	7,20	88	2,97	74,8	478	556,0	280,0	80,2	102,00	358,0	1854,0	12,40	1615
Valea-Galmage r.- Zîrneşti v.	23.07.2015	28,2	1	>1100	3070	8,07	1119	3,91	51	3,70	74,0	532	766,0	248,0	128,0	112,00	385,0	2171,0	15,60	1905
Prut r.- Giurgiulesti v.	23.07.2015	28	1	124,0	480	7,84	37	7,16	92	2,83	11,9	148	50,5	24,1	52,1	7,30	23,7	306,0	3,20	232

[44] The colors in the table correspond to the indications in Chapter III of the Regulation on quality requirements for surface water, GD. 890 of 11.12.2013 and are established in accordance with Annex no. 1 of the same regulation

The location of the monitoring point	The anionic active detergent, mg/L	Petroleum products, mg/L	Iron, mg/L	Ammonium nitrate, mg/L	Nitrogen nitrite mg/L	Nitrogen nitrate, mg/L	Mineral nitrogen, mg/L	Orthophosphate, mg/L	Total phosphorus, mg/L	Cu, µg/L	Zn, µg/L	Ni, µg/L	Pb, µg/L	Cd, µg/L	Hg, µg/L
Prut r.- Lipcani v.	<LOD	0,07	0,03	<LOD	<LOD	<LOD	<LOD	0,013	0,014	<LOQ	<LOQ	1,1320	<LOQ	<LOQ	<LOQ
Zelenaia r.- Drepcăuţi v.	0,021	0,09	0,03	<LOD	0,040	1,75	1,79	0,106	0,130	<LOQ	<LOQ	6,6324	<LOQ	<LOQ	<LOQ
Medveja r.- Lipcani, v. upstream	0,021	0,05	0,10	<LOD	0,059	11,00	11,06	0,115	0,120	<LOQ	<LOQ	2,8306	<LOQ	<LOQ	<LOQ
Larga r.- Slobozia-Şireuţi v.	0,023	0,11	0,16	<LOD	0,020	1,63	1,65	0,046	0,070	<LOQ	<LOQ	4,0156	<LOQ	<LOQ	<LOQ
Prut r.- Pererîta v.	0,021	0,07	0,04	<LOD	0,005	0,19	0,20	0,015	0,016	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
Vilia r. – Teţcani v.	0,019	0,11	0,13	0,07	0,031	5,60	5,70	0,082	0,126	<LOQ	<LOQ	2,5719	<LOQ	<LOQ	<LOQ
Lopatnic r.- Lopatnic v.	0,008	0,04	0,03	<LOD	0,022	2,43	2,45	0,038	0,042	<LOQ	<LOQ	1,8648	<LOQ	<LOQ	<LOQ
Draghişte r.- Feteşti v., downstream	0,026	0,05	0,07	0,16	0,116	1,77	2,05	0,180	0,276	<LOQ	<LOQ	3,3286	<LOQ	<LOQ	<LOQ
Racovăţ r.-Gordineşti v.	0,015	0,12	0,15	<LOD	0,108	3,68	3,79	0,086	0,102	<LOQ	12,6868	4,1473	<LOQ	<LOQ	<LOQ
Ciuhur r.- Stolniceni v.	0,013	0,15	0,32	<LOD	<LOD	0,35	0,35	0,057	0,080	<LOQ	<LOQ	7,1436	<LOQ	<LOQ	<LOQ
Camenca r.–Camenca v.	0,021	0,08	0,19	<LOD	0,023	1,24	1,26	0,146	0,188	<LOQ	4,2092	7,3147	<LOQ	<LOQ	<LOQ
Glodeanca r.-Duşmani v.	0,030	0,11	0,68	0,430	<LOD	0,22	0,65	0,057	0,150	<LOQ	21,4387	8,0723	<LOQ	<LOQ	<LOQ
Girla Mare r.- Blindesti v.	0,017	1,09	0,02	0,76	<LOD	<LOD	0,76	1,288	1,320	<LOQ	6,9070	5,4079	<LOQ	<LOQ	<LOQ
Prut r. – Ungheni t.	0,013	0,09	<LOD	<LOD	0,005	0,28	0,29	0,028	0,056	<LOQ	<LOQ	1,0158	<LOQ	<LOQ	<LOQ
Prut r.- Valea Mare v.	0,013	0,07	<LOD	0,070	0,007	0,45	0,53	0,042	0,056	<LOQ	3,7337	1,1426	<LOQ	<LOQ	<LOQ
Lăpuşna r.- Lăpuşna v.	0,014	0,14	<LOD	0,200	0,014	0,75	0,96	0,096	0,116	<LOQ	<LOQ	3,4264	<LOQ	<LOQ	<LOQ
Sarata r.- Vozneseni v.	0,020	0,17	0,02	0,330	<LOD	<LOD	0,33	0,013	0,136	5,1082	<LOQ	7,5550	<LOQ	<LOQ	<LOQ
Prut r.- Cantemir t., downstream	0,010	0,12	<LOD	0,100	<LOD	<LOD	0,10	0,041	0,042	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ
Larga r.- Chircani s.	0,020	0,07	<LOD	0,070	0,037	0,75	0,86	0,023	0,056	<LOQ	<LOQ	4,7751	<LOQ	<LOQ	<LOQ
Valea-Galmage r.- Zîrneşti v.	0,027	0,11	0,01	0,200	0,117	19,10	19,42	0,056	0,080	<LOQ	<LOQ	3,6224	<LOQ	<LOQ	<LOQ
Prut r.- Giurgiulesti v.	0,022	0,08	0,03	<LOD	0,005	<LOD	0,01	0,046	0,068	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ	<LOQ

Source: EPIRB project, State Hydrometeorological Service

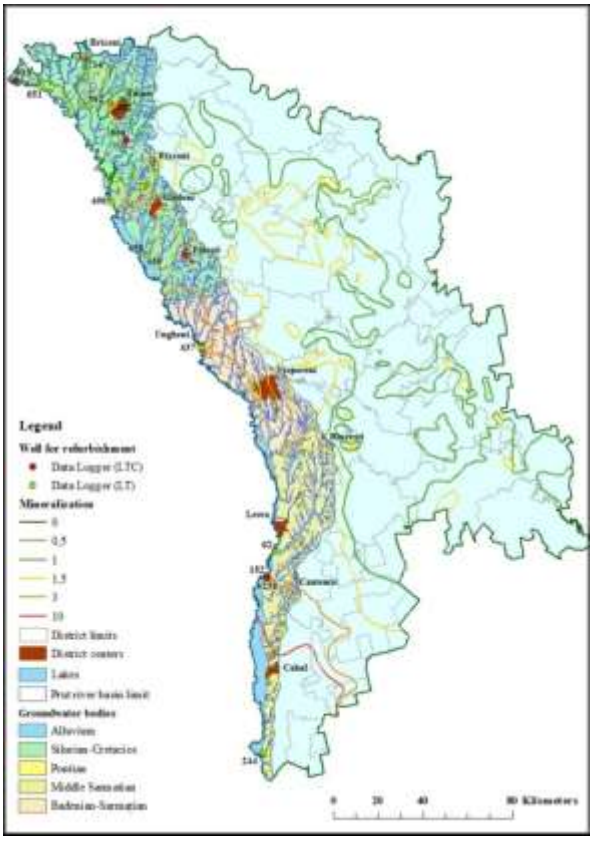
Annex 4.8.

Existing groundwater monitoring stations in the Prut River Basin, Republic of Moldova

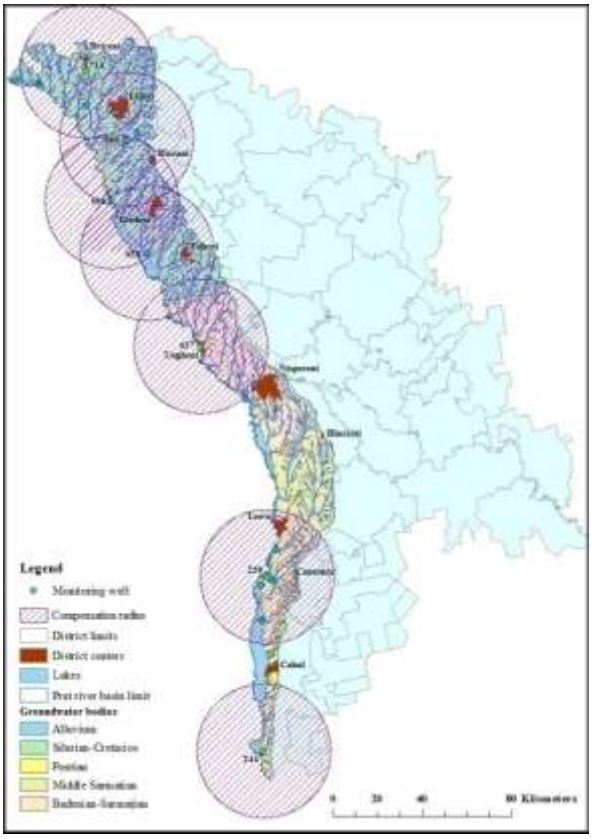
No/No.	Well No.	Location	Altitude, m	Litologhy, geological index and GWB code
1	1-640	Lipcani	168	Sand, aA_3, G100
2	1-650	Şireuţi	105	Limestone, S_2V, G600
3	1-651	Şireuţi	105	Limestone, K_2S_2, G600
4	1-913	Criva	115,3	Limestone, K_2S_1, G600
5	2-792	Ocniţa	209	Llimestone, sandstone K_2, G600
6	2-714	Tabani	196,2	Limestone, sandstone, $N_1S_1+N_1b_3+K_2S_2$, G200
7	4-392	Feteşti	135,2	Limestone N_1S_1,G200
8	4-393	Feteşti	135,4	Limestone N_1S_1,G200
9	4-486	Brătuşeni	168,8	Sand, aA_3, G100
10	4-492	Alexandreni	168,5	Limestone $N_1S_1+K_2$, G600
11	4-866	Stoliniceni	119,7	Sandstone, limestone K_2S_1, G600
12	4-867	Stolniceni	119,8	Sandstone, limestone K_2S_1, G600
13	4-952	Stolniceni	117,9	Sandstone, limestone K_2S_1, G600
14	8-498	Branişte	70,41	Sand aA_3, G100
15	8-642	Branişte	64,1	Sand aA_3, G100
16	13-458	Călineşti	51	Limestone K_2, G600
17	13-459	Călineşti	50,5	Limestone with sandy layers, N_1S_1, G200
18	17-437	Ungheni	61	Sand, aA_3, G100
19	21-285	Soltăneşti	78,8	Limestone, N_1S_2, G400
20	21-681	Grozeşti	24,89	Sand, aA_3, G100
21	21-689	Grozeşti	27,32	Sand with limestone and sandstone, N_1S_2, G400
22	21-690	Grozeşti	27,4	Sand, aA_3, G100
23	25-62	Nicolaeuca	17,38	Sand, aA_3, G100
24	29-150	Cania	44,57	Sand, N_1S_2, G400
25	29-151	Cantemir	72,81	Sand, N_1S_2, G400
26	29-152	Cantemir	72,81	Fine grained sand, N_1S_3-m, G300
27	29-153	Cantemir	62,24	Fine grained sand, N_1S_3-m, G300
28	29-239	Cantemir	53,99	Sand, N_1S_2, G400
29	29-241	Cantemir	41	Sand, N_1S_2, G400
30	29-244	Cantemir	61,21	Sand, N_1S_2, G400
31	33-244	Slobozia Mare	48,9	Sand, N_2p, G500
32	33-245	Slobozia Mare	6,28	Sand, N_2p, G500

Annex 4.9.

Location of wells proposed for refurbishment in the Prut river basin
(elaborated by Victor Jeleapov, Agency for Geology and Mineral Resources)



Location of monitoring network wells in the Prut river basin that will be equipped with groundwater level, conductivity and temperature data logger.



Location of monitoring network wells in the Prut river basin that will be equipped with compensation of atmospheric pressure data logger.

Annex 4.10.

Wells to be refurbished by installing electronic data loggers

No.	Well No.	Location of monitoring well	Geological index and GWB name and code
1	1-651	Şireuţi	K_2S_2, Cretaceous-Silurian, G600
2	1-913	Drepcauţi	K_2S_1, Cretaceous-Silurian, G600
3	2-714	Tabani	$N_1S_1+N_1b_3+K_2S_2$, Badenian-Sarmatian+ Cretaceous-Silurian, G200+G600
4	4-392	Feteşti	N_1S_1, Badenian-Sarmatian, G200
5	4-492	Alexandreni	$N_1S_1+K_2$, Badenian-Sarmatian+ Cretaceous, G200+G600
6	4-866	Stolniceni	K_2S_1, Cretaceous-Silurian, G600
7	8-498	Branişte	aA_3, Alluvial, G100
8	13-458	Călineşti	K_2, Cretaceous, G600
9	13-459	Călineşti	N_1S_1, Badenian-Sarmatian, G200
10	17-437	Ungheni	aA_3, Alluvial, G100
11	21-689	Grozeşti	N_1S_2, Middle Sarmatian (Congeriev), G400
12	25-62	Nicolaeuca	aA_3, Alluvial, G100
13	29-152	Cantemir	N_1S_3-m, Upper Sarmatian-Meotic, G300
14	29-239	Cantemir	N_1S_2, Middle Sarmatian (Congeriev), G400
15	Newly drilled well	Petresti	N_1S_1, Badenian-Sarmatian, G200

Annex 4.11.

Recommended surveillance groundwater monitoring network

No / No	Name and code of GWB	Number of monitoring wells	What is monitored	Purpose of monitoring
1	Quaternary alluvial unconfined, G100	8 existing wells	Level and chemistry	GWB recharge – discharge zones; Transboundary with Romania and Ukraine
2	Badenian-Sarmatian, G200	4 existing wells + 1 new well, total 5 wells	Level and chemistry	GWB discharge zones*; Transboundary with Romania and Ukraine?
3	Upper Sarmatian-Meotic, G300	2 existing wells + 3 new ones, including 1 new well which will be drilled soon.	Level and chemistry	GWB discharge zones*; Transboundary with Romania
4	Middle Sarmatian (Congeriev), G400	7 existing monitoring wells	Level and chemistry	GWB discharge zones*; Transboundary with Romania
5	Pontian, G500	2 existing + 3 new wells, total 5 wells	Level and chemistry	GWB discharge zones*; Transboundary with Romania
6	Cretaceous-Silurian, G600	9 existing wells	Level and chemistry	GWB recharge – discharge zones; GWB recharge – discharge zones; Transboundary with Romania and Ukraine
	Total:	**39 monitoring wells**		

** It is assumed that recharge areas of marked GWB are located in the Dniester river basin.*

Annex 4.12.

Groundwater monitoring parameters and sampling frequency

Parameters and indices	**Frequency, at least**
Main anions and cations (Na, K, Ca, Mg, Fe^{tot}, NH_4, HCO_3, Cl, SO_4, NO_3, NO_2) and physical properties (pH, specific conductivity, permanganate index, or TOC)	2-4 times a year
Trace elements (Fe, As, Hg, Cd, Pb, Zn, Cu, Cr, etc.)	Once per 2 years
Pesticides[45]	Once per 6 years
Polycyclic aromatic hydrocarbons, Phenols, Trichloroethylene, Tetrachlorethylene[46]	Once per 2 years
Groundwater levels in monitoring wells, boreholes and flow of natural springs	Electronic data loggers – every 6-12 hrs. Other monitoring wells 3 times/month. Rivers- during the low flow periods (2-4 times/year)

Annex 6.1.

Status of water supply systems in the Prut river basin (2014)

No.	**TAU**	**Water supply systems**, units		**Aqueducts length**, km		**Consumption**, liters/inhabitant		**Pumping stations (PS) and artesian wells (AW)**			
		Total	In operation	total	Apă-Canal	total	Apă-Canal	Number PS	Number AW	Capacity, m^3/day	Used degree, %
1	Ocnița	3	3	50,0	36,6	2	*16,9*	7	6	3,5	10,2
2	Briceni	18	15	177	47,1	2,6	*30,3*	18	24	6,9	27,8
3	Edineț	5	5	138	118	3,6	*46,9*	9	8	12,3	34,3
4	Râșcani	19	17	196		4,8		*22*	*40*	5	
5	Glodeni	24	18	164	34,9	4,6	*26,2*	21	16	10,7	
6	Fălești	2	2	44,4	41,4	2,2	*38,7*	24	22	3,2	39,5
7	Ungheni	15	15	281	88,7	10,6	*88,4*	27	26	18,3	42,5
8	Nisporeni	13	13	193	19,5	2,8	*13,8*	16	6	6	15,5
9	Hâncești	16	16	237		2,9		14	20	4	
10	Leova	8	6	104	41,6	4,4	*38,2*	3	1	4,9	7,8
11	Cantemir	12	9	172	23	2,3	*49,6*	18	20	19,3	6,0
12	Cahul	25	20	375	104	8,8	*54,3*	47	46	25,4	32,3
	Total Prut	**160**	**139**	**2133**	**555**	**4,3**	***41***	**226**	**235**	**120**	**24**
	Total R M	**836**	**677**	**10484**	**4593**	**8,5**	***119***	***1341***	***1389***	**1323**	**43/14**

Sources: Elaborated by the author according to data in statistica.md, amac.md

[45]pesticides have to be analysed only at monitoring stations located in the agricultural areas; their choice depends on local usage, land-use framework and observed occurrences in groundwater;

[46]PAH, phenols, TCE&PCE have to be analysed in the wells located in urban territories and near the industrial sites. Precise choice depends on the local pollution sources.

Annex 6.2.

The use and effectiveness of water supply systems at the enterprises of the Association "Moldova Apă-Canal" located in the Prut river basin (2014)

Nr.	TAU	**Supplied water volume**, thousand m^3				**Loss of captured water**, %	**Wear degree of fixed fonds**, %	**Usage degree of fixed fonds**, %
		Total	Population	Budgetary organizations	Economic agents			
1	Ocnița	58,1	49,5	5,1	3,5	23	31	0,09
2	Briceni	109	95,1	8	6,3	33	33	0,24
3	Edineț	445	239	12,7	193	58	64	0,19
4	Glodeni	109	87,1	16,3	5,5	17	0,3	0,08
5	Fălești	239	206	8,5	24,1	45	32	0,16
6	Ungheni	1239	937	105	197	28	61	0,22
7	Nisporeni	72,6	54,1	15	3,5	43	29	0,08
8	Leova	152	116	31,3	5,1	20	45	0,27
9	Cantemir	105	76,2	25,7	3	18	51	0,16
10	Cahul	947	791	41,7	114	39	48	0,16
	Total Prut	**3476**	**2651**	**269**	**555**	**36**	**39**	**0,17**

Sources: Elaborated by the author according to data in statistica.md, amac.md

Annex 6.3.

Disposal and purification service of waste water in the Prut river basin (2014)

No.	TAU	**Number of sewerage systems**		**Length of sewerage network**, km		**Number of pomping stations**		**Treatment stations**		
								Capacity, thousand m^3/day		Usage degree, %
		Total	Apă-Canal	Total	Apă-Canal	Total	Apă-Canal	Total	Apă-Canal	Apă-Canal
1	Ocnița	4	3	15,0	4,6	3	1	3	1,2	12,2
2	Briceni	3	2	33,1	30,1	3	2	11,4	10	2,2
3	Edineț	4	2	56,6	52,7	9	7	5,8	5,5	16,4
4	Râșcani	3		17,1		4	3	1,2		
5	Glodeni	8	1	24,6	18,2	10	3	11,2		
6	Fălești	2	1	43,8	31,8	5	3	12,1	10	4,4
7	Ungheni	5	1	85,6	63,2	7	3	18,3	15,0	15,0
8	Nisporeni	2	1	8,5	6,8	*2*	3	1,5	1,5	16,4
9	Hâncești	4		11		4		2		
10	Leova	2	1	25,2	24,2	3	3	4,7	4,7	4,3
11	Cantemir	1	1	8,9	8,9	0	0	3,5	3,5	6,3
12	Cahul	4	1	64	51,6	5	3	14,3	13,7	14,7
	Totally Prut	**42**	**14**	**393**	**292**	**55**	**31**	**90**	**65,1**	**9,2**
	Totally RM	**166**	**48**	**2691**	**2253**	**209**	**128**	**687**	**652**	**27**

Sources: elaborated by the author on the basis of NBS Reports on the water supply and sewagesewage systems, amac.md

Annex 6.4.

Wastewater discharged into the Prut river basin per categories of users

No.	TAU	Total		Population			Economic agents			Insuficiently purified	
		Total	Apă-Canal	Total	Apă-Canal	Total	Total	Apă-Canal	Total	Apă-Canal	
		thousand m^3		thousand m^3		%	thousand m^3		%	thousand m^3	%
1	Ocnița	56,8	53,6	38,5	43	80	2,5	1,8	3,6	53,6	100
2	Briceni	122	104	85,1	77	74	5,4	0,7	0,7	104	100
3	Edineț	439	330	138	134	41	183	183	56	0	0
4	Râșcani	17		16			1				
5	Glodeni	90,6	85,2	59,2	62,8	74	6,2	6,2	10		
6	Fălești	190	161	127	110,7	69	39,8	38,4	25	161	100
7	Ungheni	826	824	566	566	69	155	155	19	824	100
8	Nisporeni	94,1	89,6	46	46	51	13,4	13	18		
9	Hâncești	17		10			6,0				
10	Leova	74,0	74,0	38,9	38,9	53	5,8	5,8	8	73,7	100
11	Cantemir	81,1	81,1	53,9	53,9	67	8	8	12	81,1	100
12	Cahul	1104	734	462	458	62	232	232	32	0	0
	Total Prut	**3112**	**2536**	**1641**	**1590**	**63**	**658**	**654**	**26**	**1297**	**51**
	Total R M	**66575**	**65151**	**37648**	**37308**	**57**	**8974**	**8943**	**18**	**6119**	**9**

Sources: elaborated by the author on the basis of NBS Reports on the water supply and sewagesewage systems, amac.md

Annex 6.5.

Relationship between income and expenditure of water supply and sewagesewage services, in thousand MDL (2014)

No.	Settlement	**Wate**r, thousand m^3		Total			Water supply			Sewage and treatment		
		Delivered	Discharged	Income	Expenditure	Difference	Income	Expenditure	Difference	Income	Expenditure	Difference
1	Ocnița	58,1	53,6	1900	2023	-123	1055	1120	-66	846	903	-57
2	Briceni	109,4	104	3279	3730	-451	1527	1751	-224	1752	1979	-227
3	Edineț	444,7	330	12894	13689	-795	7604	8855	-1251	5290	4834	456
4	Glodeni	108,9	85,2	4380	4240	140	2329	2190	139	2051	2049	2
5	Fălești	238,7	161	6025	5461	564	3322	3322	0	2703	2139	564
6	Ungheni	1239	824	18265	18572	-307	11261	11455	-194	7005	7117	-113
7	Nisporeni	72,6	89,6	2867	3212	-345	1291	1508	-217	1576	1704	-128
8	Leova	152,1	73,7	4156	4465	-309	3008	3277	-269	1148	1188	-40
9	Cantemir	104,9	81,1	1864	2068	-203	1442	1512	-70	423	556	-133
10	Cahul	947,3	734	14584	20941	-6358	10827	13439	-2612	3757	7502	-3745
	Total Prut	**3476**	**2536**	**70215**	**78401**	**-8186**	**43664**	**48429**	**-4765**	**26551**	**29972**	**-3421**
	Totally Apă Canal	**64624**	**65151**	**850690**	**1020430**	**-169740**	**617808**	**662047**	**-44239**	**232882**	**358383**	**125501**

Sources: annexes 6.5-6.6,7 are elaborated by author after: Financial and production indices of water supply and sewage business of the enterprises of the Association „Moldova Apă-Canal". In: amac.md

Annex 6.6.

Tarifs for public services of water supply and sewagesewage of the enterprises of the Association "Moldova Apă-Canal" in the Prut River Basin (general tariff), MDL/m^3 (without VAT)

No.	TAU	2007	2008	2009	2010	2011	2012	2013	average	growth, %
1	Ocnița	16,5	16,5	16,5	26,59	29,8	37,29	37,29	25,78	226
2	Briceni	23,59	23,59	23,59	27,16	27,16	27,16	27,16	25,63	115
3	Edineț	16,37	20,75	38,92	39,24	39,24	39,24	39,24	33,29	240
4	Glodeni	35,69	35,69	35,69	42,04	48,59	48,59	48,59	42,13	136
5	Fălești	20,82	20,82	20,82	20,82	25,83	25,83	31,22	23,74	150
6	Ungheni	9,73	11,9	11,9	11,9	15,18	15,18	17,56	13,34	180
7	Nisporeni	18,25	18,25	27,16	27,16	31,92	22,77	36,64	26,02	201
8	Leova	13,57	15,72	15,72	15,72	30,24	30,24	42,2	23,34	311
9	Cantemir	13,57	13,57	20,34	20,34	20,53	20,53	20,53	18,49	151
10	Cahul	12,67	12,67	15,75	15,75	15,75	15,75	15,82	14,88	125
	Totally	**18,08**	**18,95**	**22,64**	**24,67**	**28,42**	**28,26**	**31,63**	**24,64**	**175**
	Totally Apă-Canal	**17,5**	**18,48**	**21,04**	**22,56**	**24,79**	**25,88**	**28,7**	**22,71**	**164**

Annex 6.7.

The ratio of tariff and prime-cost of water supply and sewagesewage services, in thousand MDL (2014)

	Localities	Total			Water supply			sewerage		
		Tarif	Prime-cost	Diference	Tarif	Prime-cost	Diference	Tarif	Prime-cost	Diference
1	Ocnița	37,3	37,1	0,19	19,19	19,1	0,1	18,1	18	0,1
2	Briceni	27,2	35	-7,84	12,82	16	-3,2	14,34	19	-4,7
3	Edineț	39,2	34,5	4,74	21,35	19,9	1,5	17,89	14,6	3,3
4	Glodeni	48,6	44,2	4,39	23,61	20,1	3,5	24,98	24,1	0,9
5	Fălești	31,2	27,6	3,62	14,51	13,9	0,6	16,71	13,7	3,0
6	Ungheni	17,6	17,8	-0,24	8,98	9,2	-0,2	8,58	8,6	0,0
7	Nisporeni	36,6	43,6	-6,96	16,92	20,8	-3,9	19,72	22,8	-3,1
8	Leova	42,2	37,6	4,6	21,03	21,5	-0,5	21,17	16,1	5,1
9	Cantemir	20,5	22,7	-2,17	14,05	14,4	-0,4	6,48	8,3	-1,8
10	Cahul	15,8	24,4	-8,58	11,25	14,2	-3,0	4,57	10,2	-5,6
	Total Prut	**31,6**	32,45	**-0,83**	**16,4**	**16,9**	**-0,5**	**15,3**	**15,5**	**-0,3**
	Total Apă-Canal	***28,8***	**30,5**	**-1,77**	**9,6**	**10,2**	**-0,6**	***4,7***	**7,2**	**-2,5**

Annex 6.8.

Dynamics of the number of NEF-funded projects for water protection in the Prut basin

No.	Districts	Years											
		2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
1	Briceni	3	1	1	5	1	3	3		1		5	3
2	Ocnița				1	2	2	2				1	1
3	Edineț	1	2	2	2			1	1		1	7	2
4	Râșcani	1	1	4	4		1	1	2	5	2	3	5
5	Glodeni		1	3	2		1	*0*	3	2	1	0	4
6	Fălești	*0*	1	2	3		1	2	5	5	3	5	14
7	Ungheni	1		1	3	2	1	3	2	4	5	8	13
8	Nisporeni			3	11	5	6	4	6	6	4	8	9
9	Hâncești	4	1	1	6	2	4	2	3	5	3	4	10
10	Leova	3	3	1	5	1	3	3	0	1	2	4	13
11	Cantemir	1	5	2	1	7	1	1	2	5	2	7	13
12	Cahul	1	3	1	4	1	2	1	7	7	3	6	6
	Total	**15**	**18**	**21**	**47**	**21**	**25**	**23**	**31**	**41**	**26**	**58**	**93**
	Total RM	**46**	**96**	**133**	**156**	**88**	**85**	**94**	**100**	**126**	**105**	**188**	**305**

Annex 6.9.

Dynamics of NEF grants allocated for the protection of the Prut river basin, in mln MDL

Nr.	Districts	Years											
		2003	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
1	Briceni	0,27	0,02	0,97	0,68	0,29	3,7	0,37	0	5	0	2,5	1,7
2	Ocnița				1,0	0,19	2,5	6,0	0	0	0	0,51	0,5
3	Edineț	0,8	0,13	0,2	0,16	0	0	0,04	0,09	0	1,5	7,1	1,5
4	Râșcani	0,03	0,1	0,43	0,55	0	0,12	0,04	1,2	3,6	0,95	2,7	4,5
5	Glodeni	0	0,1	0	0,32	0,21	0,005	0	3,9	1,6	1,3	0	2,2
6	Fălești	0	0,3	0,17	0,3	0	0,01	0,015	9,6	5,7	2,0	20,5	19,9
7	Ungheni	0,1	0	0,1	0,18	0,2	0,005	0,9	1,1	1,9	7,8	7,9	11,6
8	Nisporeni	0	0	0,21	0,82	0,12	1,5	0,4	1,1	0,64	5,8	8,3	2,7
9	Hâncești	0,4	0,31	0,1	0,5	0,3	1,9	0,015	3,8	3,8	4,3	11,5	41,3
10	Leova	0,15	0,21	0,1	0,65	0,15	0,4	10,0	0	0,1	1,6	5,1	15,3
11	Cantemir	0,1	0,44	0,22	0,1	1,1	0,01	0,036	1,1	2,9	1,9	7,1	6,0
12	Cahul	0,1	0,17	0,13	0,34	0,88	0,75	0,2	9,4	6,0	1,6	9,8	5,7
	Total Prut	**1,2**	**1,5**	**1,8**	**5,6**	**2,6**	**11**	**17,7**	**31,2**	**26,2**	**28,9**	**82,9**	**113**
	Total RM	**3,6**	**9,3**	**13,6**	**25,6**	**22,6**	**31,6**	**64,2**	**94,7**	**124**	**156**	**297**	**386**

Annex 6.10.

Dynamics of water supply and sewagesewage subsidies allocated through transfers from the state budget in the settlements of the Prut river basin, million MDL

No.	TAU	Years							
		2007	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**
1	Briceni	1,5	0	0	0,4	0	0	0,3	0
2	Ocniţa	0,24	0	0,5	0,25	0,1	0	0	0
3	Edineţ	0,3	0,3	0,7	0,2	0	0	0,25	0,85
4	Râşcani	0,86	0	0	0	0,35	0,15	0,1	0,75
5	Glodeni	0	0	2,2	0	0,15	0	0,3	4,1
6	Făleşti	0,55	0	1,0	2,4	0	0,2	0,4	1,2
7	Ungheni	2,0	12,5	1,3	2,9	0,36	0,28	0,47	1,7
8	Nisporeni	2,65	2,3	2	1,55	0,25	0,3	1,22	0,62
9	Hânceşti	0,8	0	1,3	0,8	0,5	0,15	0,23	1,3
10	Leova	1,4	0,33	1,9	1,0	0	0	0	0,23
11	Cantemir	1,00	0	0,6	0,25	0,2	0	0,58	0,78
12	Cahul	1,00	0,3	0,5	1	0,5	0,3	0,65	0,93
	Total Prut	**12,3**	**15,7**	**12,0**	**10,8**	**2,4**	**1,4**	**4,5**	**12,5**

Sources: State Budget Law for the years 2007-2014

Annex 6.11.

Implementation of projects in the water sector by Regional Development Agencies

	Project name	Coverage area	**Period**	**Sum**, mln. MDL
1	Supplying the town Făleşti with water from the Prut river	Făleşti town	2011-2012	18,9
2	Supplying drinking water to 12 settlements in the communes Mănoileşti, Unţeşti, Alexeevca, Cetireni and FloriţoaiaVeche	district Ungheni	2012-2014	28,8
3	Clean water for the communities of the Prut river basin	Cahul, Manta and Crihana Veche	2011-2012	18,9
4	Drinking water supplying to the inhabitants of the village Roşu	village Roşu, district Cahul	2011-2013	3,5
5	"LaculSărat" rest and recreation area rehabilitation	Cahul town	2011-2013	12,1
6	Supllying water and sewagesewage services to the inhabitants of DuruitoareaVeche	district Râşcani	2012-2013	3,1
7	Improving operational management of the company *Apă Canal Cahul*	town Cahul and village Roşu	2013-2014	2,3
8	Building the sewagesewage system in the village Roşu	villgeRoşu, district Cahul	2013-2014	12,1/ 720 thousand €
9	Rehabilitation of the treatment station in the town Cahul	Cahul town	2013-2014	7,6 / (445thousand €

Sources: prepared by the author after the Annual Reports on Achieving Operational Plans of Development Strategies of North, Central and South Regions, years 2010-2013. In: adr.nord.md; adr.centru.md; adr.sud.md

Annex 7.1.

The Plan of Measures on the implementation of Prut River Basin Management Plan

No.	Measure	Deadline for implementation of actions	The responsible institution	Monitoring indicators	The estimated cost in thousands lei	Source of funding
1.	**General Objective 1. Improved monitoring program**					
1.1.	**Specific Objective 1.1. Improving the monitoring program of surface water bodies**					
1.1.1.	Completing the system for surface waters monitoring	Permanent	SHS	Monitoring reports	9 000	Nationnal Ecological Fund (NEF), State Budget, Foreign Aid
1.1.2.	The Development of the regulation on hydromorphological monitoring of the water bodies	2017	SHS	Regulation developed		
1.1.3.	Entering the hydromorphological monitoring of the water bodies		SHS	Monitoring reports		
1.2.	**Specific Objective 2. Improving the monitoring program of groundwater bodies**					
1.2.1.	Completing the groundwater monitoring system	Permanent	Agency for Geology and Mineral Resources	Monitoring reports	2 300	NEF, State Budget, Foreign Aid
1.2.2.	Maps elaboration on volumes and groundwater quality for each body of water	2018	Agency for Geology and Mineral Resources	Maps elaborated	-	NEF, State Budget
1.3.	**Specific objective 3. The inventory of the water bodies status**					
1.3.1.	Passports elaboration for surface water bodies	2018	Institute of Ecology and Geography, SHS, Agency „Apele Moldovei”	Passports elaborated	450	NEF, Foreign Aid
1.3.2.	Passports elaboration for groundwater bodies	2018	Institute of Ecology and Geography, Agency for Geology and Mineral Resources	Passports elaborated	300	NEF, State Budget Foreign Aid
1.3.3.	Delimitation and inventory of protection areas (digital format)	2019	Ministry of Environment, Agency „Apele	Delineated areas (map drawn)	150	NEF, State Budget Foreign Aid

			Moldovei"			
2.	**The overall objective 2. The progressive reduction of pollution**					
2.1.	**Specific Objective 2.1 .: The progressive reduction of pollution from point sources**					
2.1.1.	Improvement of the wastewater treatment system (in accordance with the Directive 91/271 / EEC).	2020	Ministry of Environment, Water service providers	50% reduction of epidemics and water-related diseases; 65% of the population connection to sewerage systems; progress in implementing the urban wastewater treatment in accordance with the requirements of Directive 91/271 / EEC.	678 017	NEF, State Budget Foreign Aid, Tariffs
2.1.2	Delineation and establishment of sensitive areas					
2.1.3.	Develop technical solutions regarding the use of sludge from the sewage plants	2022	Association „Moldova Apă-Canal"	Technologies implemented	1 282 every year 7 692	NEF, State Budget Foreign Aid, Tariffs
2.1.4.	Mapping waste water discharge points	2017	Agency „Apele Moldovei", Basin Water Management Authority, State Ecological Inspectorate	Digital system created, GIS layers developed and published	50	NEF, State Budget Foreign Aid, Tariffs
2.2.	Specific Objective 2.2 .: The progressive reduction of pollution from diffuse sources					
2.2.1.	Development and publication of the code of good agricultural practices under the Annex II of the Nitrates Directive	2018	Ministry of Environment, Ministry of Agriculture and Food Industry	Code elaborated and published	Within the available budget	NEF, State Budget, Foreign Aid
2.2.2.	Modeling using MONERIS software to determine nutrient pollution from agricultural lands	2019	Ministry of Environment, Institute of Ecology and Geography	Performed modeling	600	NEF, State Budget, Foreign Aid

2.2.3.	Regulating the overgrazing in the meadow areas	Permanent	Ecological inspections within the basin district boundaries	Inspection documents	Within the available budget	State Budget
2.2.4.	Delimitation of river's protection strips	2022	Agency „Apele Moldovei", Agency „Moldsilva"	Delimited strips (km and ha) Terminal Indicators	Within the available budget	NEF, State Budget, Foreign Aid
2.3.	***Specific Objective 2.3 .: Expanding and restoring natural habitats***					
2.3.1.	Creating The Wetlands of International Importance "Lower Prut"	2019	Ministry of Environment, Agency „Moldsilva"	Created area	5 000	NEF, State Budget, Foreign Aid
2.3.2.	Creating Wetlands of International Importance "Middle Prut" (based on the scientific reserve „Pădurea Domnească")	2022	Ministry of Environment, Agency „Moldsilva"	Created area	5 000	NEF, State Budget, Foreign Aid
2.3.3.	Creating the riparian protective strips (according to law no. 440 of 27.04.1995)	2019	Ministry of Environment, Agency „Moldsilva"	Created and afforested strips (km ha)	15 574	NEF, State Budget, Foreign Aid
3.	**The overall objective 3: Sustainable exploitation of water resources**					
3.1.	Specific Objective 3.1 .: The legal framework for water management of surface and groundwater resources in the basin r. Prut					
3.1.1.	Creating and signing a trilateral agreement on the exploitation regime of water resources in the basin of r. Prut	2018	Ministry of Environment	Regulation approved	Within the available budget	State Budget
3.1.2.	Preventing unauthorized use of water resources	Permanent	State Ecological Inspectorate	Annual inspection reports	Within the available budget	Fines and damages compensated
3.1.3.	Water resources management planning in common with the land use planning in urban and rural areas	Permanent	Ministry of Environment, Agency „Apele Moldovei", Basin Water Management Authority, State	Annual report		The water tax, State budget
3.1.4.	The development of the guidance book on management plans for river basins under the WFD	2017				Foreign Aid, State budget
3.1.5.	Abstraction Control from water sources for different uses	Permanent				Water tariffs and

			Ecological Inspectorate			fees for from the institution's budget
3.1.6	Efficiency measures and reuse of the water resources	Permanent	Agency „Apele Moldovei”, Basin Water Management Authority, Water users, Local Public Authorities (LPA), Basin committees	Annual report		State budget, NEF, Foreign Aid, Water tariffs and fees
3.1.7.	Cost recovery on water consumption	Permanent	National Agency for Energy Regulation (NAER), "Moldova Apa-Canal" Association			Tariffs for water supply services, taxes for water consumption
3.1.8.	Planning the transboundary Prut river basin management plan the for three countries: Romania, Ukraine and Moldova.	2022	Ministry of Environment, Agency „Apele Moldovei”, Danube River Protection Convention Secretariat	Trilateral composite Plan UA-MD-RO	20 000	State budget, Foreign Aid
3.1.9.	The implementation of Strategic Environmental Assessment recommendations that are related to the management plans	Permanent	Ministry of Environment, Agency „Apele Moldovei”, Agency for Geology and Mineral Resources, SHS	Performance Report		The state budget, external assistance
3.2.	**Specific Objective 3.2 .: Improving people's access to water and sanitation**					
3.2.1	Extension of Centralized water supply and sanitation, also increasing the population's access to these services	2023	Ministry of Environment (ME),	Providing access to approximately 80% of the population to safe	117 500 per year 705 000	Tariffs for water supply and sanitation, The

			Regional Development Agency (RDA) and local operators	water supply services and about 65% to sewerage systems	(apprx 130 thousand. lei per year)	state budget, NEF, external assistance
3.2.2.	The construction of the aqueduct Nisporeni-Prut for water supply of the residents in the Nisporeni town and the localities of Grozeşti and Vărzăreşti.	2015-2017	Ministry of Environment, Regional Development Agency and local operators	Built aqueduct		
3.2.3.	Improvement of water supply in villages Sarata Veche (Falesti disctrict) and Risipeni (Falesti)			Aqueduct built and renovated		Kuwaiti Fund for Arab Economic Development (FKDEA)
3.2.4.	Providing drinking water to villages in the Hincesti district. Stage I - settlements from the Prut river meadow - Cotul Morii, Obileni Sarateni and Leuşeni			Aqueduct built and renovated		NEF
3.2.5.	Planning a new aqueduct (Cimislia-Basarabeasca-Prut-Leova-Ceadir-Lunga) and the maintenance of grouped aqueducts					
3.2.6.	Regionalization of Water Supply and Sanitation	2017-2022	Ministry of Regional Development and Construction (MRDC), ME, LPA	Founding 4-5 regional companies (Cahul, Leova, Nisporeni, Mănoilești, Fălești)	Within the available budget	State budget, external assistance
3.2.7.	Coordinating the development plans of water supply and sanitation in districts	2017	ME, RDA, LPA	Elaborated plans	20 000	Within the available budget, external assistance
3.2.8.	The coordination of feasibility studies elaboration activities for infrastructure projects of water supply and sanitation sector in the regions in which plans have been approved for water supply and sanitation	2018	Ministry of Environment (ME)	Feasibility studies developed and approved	10 000	Within the available budget, external assistance
3.2.9.	Formulating the policy on tariffs and business plan for water utility companies	2016	Ministry of Environment (ME), National Agency for Energy Regulation (NAER)	Legislation published in the Official Monitor of Moldova	864 (per total)	Within the available budget, external assistance

3.2.10.	Strengthening the capacity of competent authorities and personnel training for all stages of the project cycle for water supply and sanitation	2017	Ministry of Environment (ME)	Regular staff training plans	1 152	Within the available budget, external assistance
3.3.	Specific Objective 3.3 .: Promoting the principles of market economy and attracting private capital					
3.3.1.	Continuous monitoring of performance indexes on water supply systems and sewerage service quality	2018	National Agency for Energy Regulation (NAER), Ministry of Health	Monitoring reports	1 056	Within the available budget, external assistance
3.3.2.	Ensuring rigorous control of tariffs and service quality	2018	NAER		495 total	Within the available budget
3.4.	**Specific Objective 3.4 .: Mitigation of drought and water conservation in agriculture**					
3.4.1.	Creating the institutional framework on climate change, to ensure effective implementation of adaptation measures at national, sectoral and local levels.	2018	Ministry of Environment (ME), Ministry of Agriculture and Food Industry (MAFI)	Created Institutional framework		
3.4.2.	Creating a mechanism to monitor the impact of climate change	2020	Ministry of Environment (ME)	Created mechanism		
3.4.3.	Creation of local databases on climate change	2020	SHS	Databases created in the information system SIRA		Within the available budget, external assistance
3.4.4.	Raising awareness of climate change risk and adaptation to this change	2020	Ministry of Environment, SHS, Institute of Ecology and Geography	Published brochures	250	NEF, Foreign aid
3.4.5.	Intensified expansion of territories covered with forest vegetation and ecological restoration of forests, creation of interconnection corridors between wooded massifs	2020	Agency „Moldsilva”	Woodland, forests reconstructed, corridors created		Within the available budget, external assistance

3.4.6.	Reassessing the water resources at basinal level and sub-basins under the climate change	2020	Agency „Apele Moldovei", Institute of Ecology and Geography, SHS	Resources evaluated, maps drawn	300	NEF, Foreign aid
3.4.7.	Climate Risk Mapping and developing climate scenarios	2020	Institute of Ecology and Geography, Office "Climate Change"	Maps drawn	500	NEF, Foreign aid
3.5.	**Specific Objective 3.5 .: Floods risk management**					
3.5.1.	Rehabilitation and improvement of dams in areas with high risk	2022	Agency „Apele Moldovei"	According to the master plan developed by "Studio Beta"	317 300	Within the available budget, NEF, Foreign aid
3.5.2.	Providing water from existing or new flood storage reservoirs	Will vary depending of each case separately	Agency „Apele Moldovei	The amount of water stored (m^3)		Within the available budget, NEF, Foreign aid
3.5.3.	Zoning the riverbeds in order to restrict the types of development in different flood risk areas and changes in land use	2018	Agency „Apele Moldovei	Performed zoning		Within the available budget

Annex 7.2.

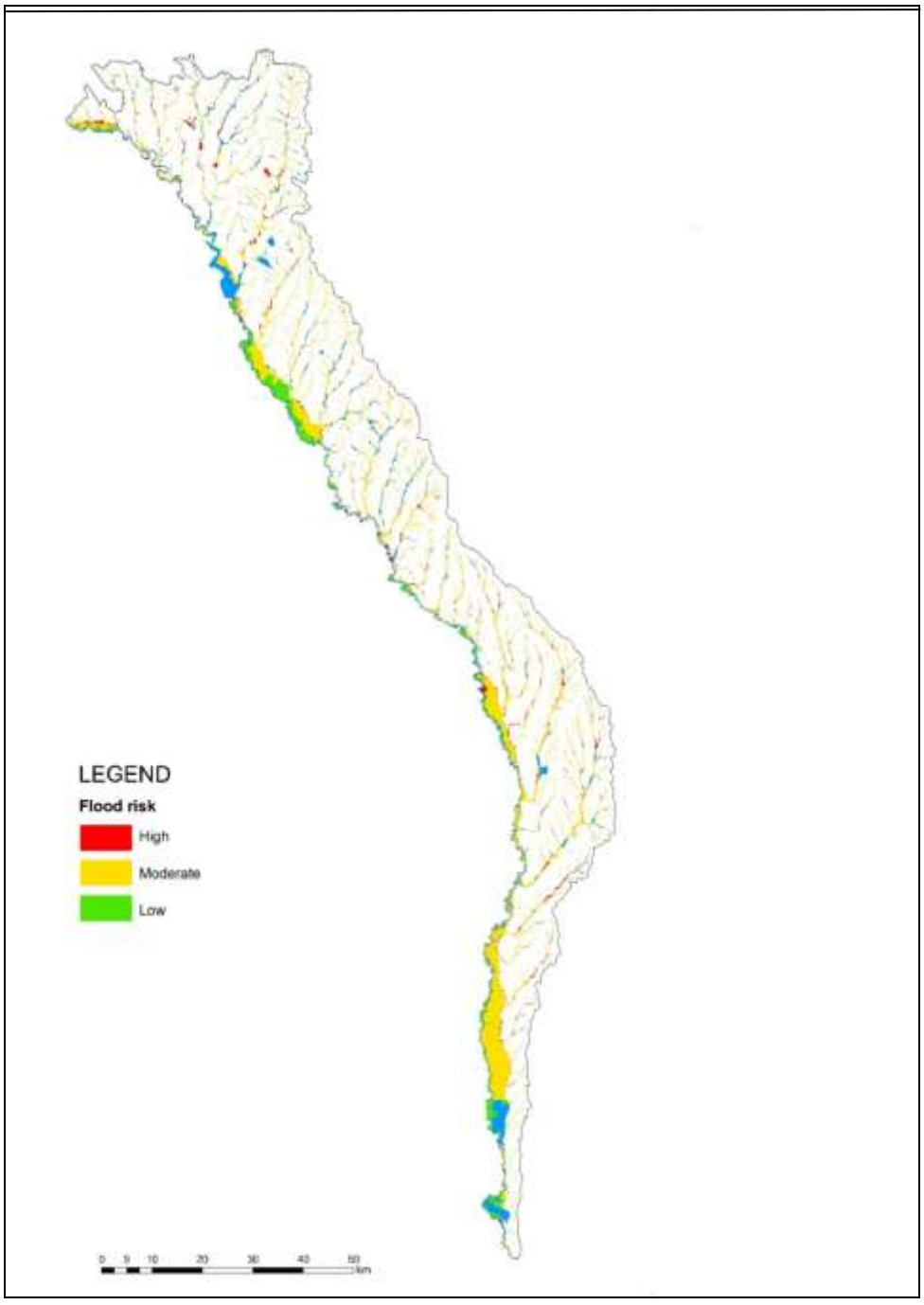
Transposition of European directives (priority) into national legislation

Nr.	EU Directives	National legislation
1.	**Directive on Urban Wastewater Treatment 91/271/EEC of 21 May 1991** That Directive aims to improve the process of collecting, treatment and discharge of urban waste water and the treatment of wastewater from certain industrial sectors.	**Government Decision no. 950 of 25.11.2013 approving the Regulation on requirements for the collection, treatment and discharge of wastewater into the sewagesewage system and/or water bodies for urban and rural areas.** That Regulation partially implements the provisions of Directive on Urban Wastewater Treatment and maximum allowable concentration in wastewater of the polluting substances at their discharge. **The Water Law**(Nr. 272) of 23.12.2011, entered into force on 26.10.2013. Art.39. The requirements for wastewater treatment in urban areas. Art.40. The requirements for wastewater treatment in rural areas. Art.41. The regulation of wastewater discharges.
2.	**Directive on Nitrates 91/676/EEC** Regulates the negative influence of agriculture, especially of mineral fertilizers on drinking water sources and ecosystems by regulating the use of mineral and organic fertilizers in agricultural regions. Regulates theNO_3 MAC in water of 50 mg / l.	Government Decision no. 802 of October 9, 2013on approving the **Regulations on conditions for waste water discharge into water bodies.** The quantities of nitrogenous fertilizers are specified which allows to introduce in surface waters for fishing or aquaculture (CMA 2 mg / l).At regulation of NO_3contentinto groundwater the quality classes specified in Directive (CMA 50 mg / l)is applied.
3.	**Directive on Drinking Water 98/83/EC** The Directive quality standards regulatesin terms ofcontent of48 microbiological and chemical compounds.	**Elaboratingon Drinking WaterLaw (harmonized with the Directive 98/83 / EC on the quality of water intended for human consumption) in the Action Plan of the Government in the years 2014-2016is provided by The Ministry of Health and Ministry of Environment. Elaboration of law in the Action Plan of the Ministry of Environment is foreseen and will be financed from the state budget.** **Water Act, Art. 24.** Satisfying the need for the population in drinking water; Government Decision no. 890 of 12.11.2013 approving the **Regulation on Environmental Quality requirements for surface waters.** Government Decision no. 931 of 11.20.2013 approving the **Regulation on groundwater quality requirements.** Government Decision no. 932 of 11.20.2013 approving the **Regulation on monitoring and systematic record of the surface and groundwater state.** **The environmentalStrategyfor 2014-2023years(Annex 1 to Government Decision no.301of 24April 2014)**has as premise the

		reform implemented in the environmental protection, so as to functionan institutional, administrative and managingsystemadjusted to the **EU norms**,which ensureenvironmental sustainabilityand increasingquality of environmental factors.The basic measuresin the **field ofwater resourcesstrategy**providewater resource management,water supply andsanitationinfrastructure,promotion ofintegrated management ofwater resources,development of management plansfordistrictsandriverbasinsandsub-basins,improvement of institutional capacity water resource management,focusing on flood prevention systems, etc. *Monitoring the implementation of the Strategyby the Ministry of Environmentwill be conducted,while direct implementation in practice - by the competent institutions,identified in the Plan of Actions for the 2014-2023 period.*
4.	**Directive on Habitats 92/43/EEC** The purpose of this Directive is to contribute to biodiversity ensuring through the conservation of natural habitatsand of wild fauna and flora.	Strategy on Biological Diversity of the Republic of Moldovafor the 2014-2020 years reflects the current state of biological diversity in Republic of Moldova, change trends of biodiversity components, purpose and objectives for biodiversity protection activities. **The Strategic Plan for Biodiversity for 2011-2020 years.** The main objective - reducing the current rate of biodiversity lossand which must be properly transposed at national level. *Monitoring the implementation of the Strategy and Strategic Planby the Ministry of Environmentwill be conducted,while direct implementation in practice - by the competent institutions,identified in the Strategy.*
5.	**Directive on use of sewage sludge in agriculture 86/278/CEEof 12 June 1986.** The Directive regulates use of sludge in agriculture; it MAC for heavy metals (Cd, Cu, Ni, Pb, Zn, Hg)in sludge and soil establishes.	Government Decision no. 1157 of 13.10.2008 on the approval of **Technical Regulation"Soil protection measures in agricultural practices".** The document sludge quality requirements regulatesthat can be used in agriculture, heavy metal content in sludge and soil, etc.

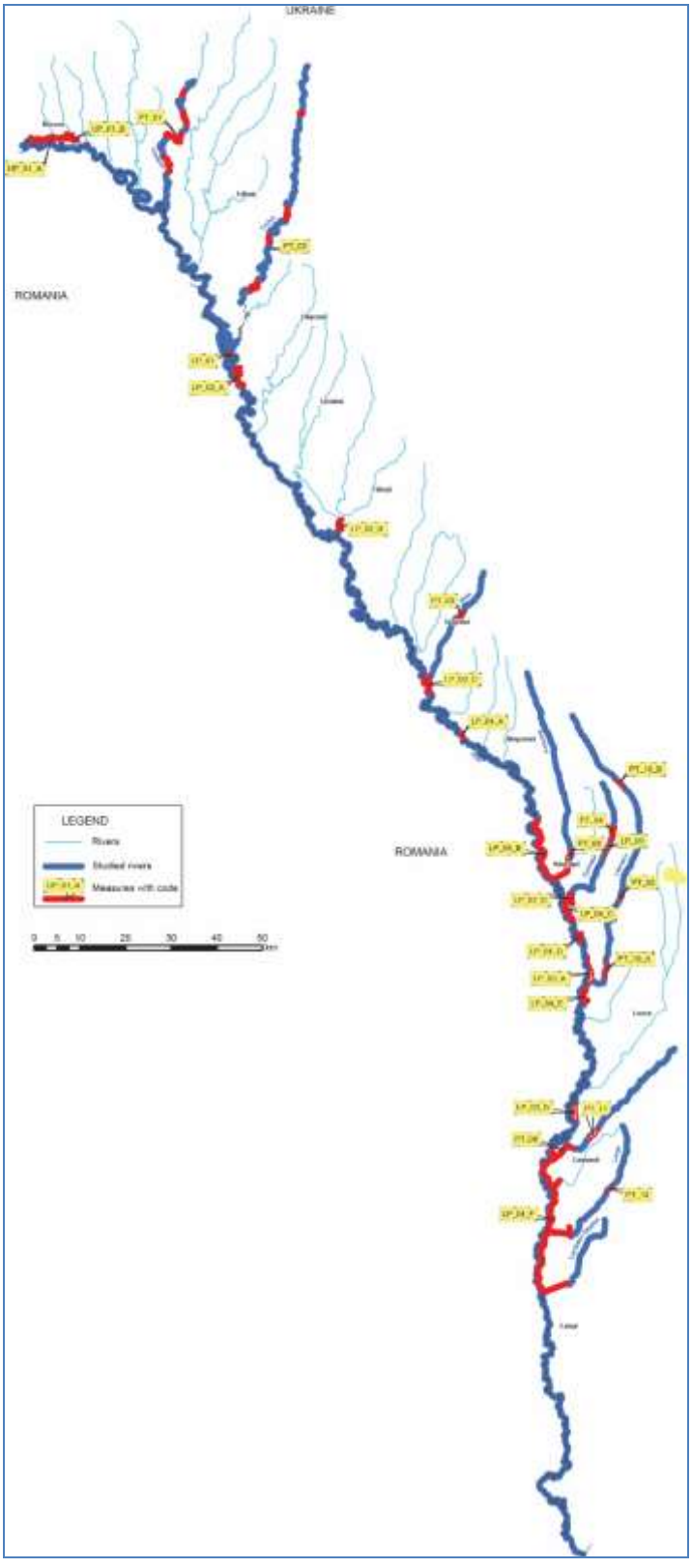
Annex 7.3.

Susceptibility to flooding



Annex 7.4.

Map of flood protection measures



Source: Master Plan Report, Annex 7, Map of flood protection measures, Management and Technical Assistance Support to Moldova Flood Protection Project, Service contract No TA2011038 MD EST

Annex 7.5

Prioritised list of structural measures for flood risk management in Moldova

code	River Basin	River	District	Description	Detailed description	Time (months)		Cost for Implementation [€]	Priority				Constraints
						Tender approval, design	Construction		Urgency	People protected	Benefit / Costs	Total	
UP_01_A	Upper Prut	Prut	Briceni	New dykes to protect Criva and Drepcăuți	New dykes 11.1 km long (height of the dykes ranges from 1.00 m to 6.00 m).	12	19	4 060 000	M	M	M	H	CS1, CS2, CS3, CS4
UP_01_B	Upper Prut	Prut	Briceni	New dykes to protect Lipcani	New dykes 2.1 km long (height of the dykes ranges from 1.00 m to 5.50 m).	12	8	570 000	M	L	H	H	CS1, CS2, CS3, CS4
LP_01	Lower Prut	Prut	Râșcani	Provide more flood storage: modify Costeşti Stânca management rules and repair existing gates	Provide more flood storage: modify Costeşti Stânca management rules and repair existing gates	12	18	2 920 000	M	M	H	H	CS1, CS2, CS4, CS7(1)
LP_02_A	Lower Prut	Prut	Râșcani	New dykes along the River Prut to protect Reteni, Braniste and	New dykes 6.1 km long (height of the dykes ranges from 1.00 m to 3.00 m).	12	8	530 000	M	M	H	H	CS1, CS2, CS3, CS4

				Avrameni									
LP_02_B	Lower Prut	Prut	Fălești	New dykes along the River Prut to protect Pruteni	New dykes 3.0 km long (height of the dykes ranges from 2.50 m to 4.50 m).	12	13	860 000	M	L	L	L	CS1, CS2, CS3, CS4
LP_02_C	Lower Prut	Prut	Ungheni	New dykes along the River Prut to protect Ungheni	New dykes 5.0 km long (height of the dykes ranges from 1.10 m to 3.50 m) and improve 510 m of existing road (increasing 1.5 m).	12	12	920 000	M	H	H	VH	CS1, CS2, CS3, CS4
LP_02_D	Lower Prut	Prut	Hâncești	New dykes along the River Prut to protect Dancu	New dykes 2.7 km long (height of the dykes ranges from 2.80 m to 3.20 m).	12	9	550 000	L	L	M	L	CS1, CS2, CS3, CS4
LP_03	Lower Prut	Prut	Hâncești, Leova, Cantemir.	Reconnect floodplain with the River Prut in two areas near Sărata-Răzeși and Antonești	Reconnection of floodplain with the River Prut system on two areas: Sărata-Răzeşi (358 ha) and Antonesti (297 ha). New dyke 3.9 km long and 1.0 m high and improve 610	12	3	1 660 000	L	L	L	L	CS1, CS2, CS3, CS4

					m of existing road (increasing 1.0 m) at Sărata-Răzeși; new dyke 430 m long and 1.5 m high at Antonești								
LP_04_A	Lower Prut	Prut	Ungheni	New dyke in Costuleni	New dyke 1.1 km long and 2 m high.	12	2	170 000	L	L	L	L	CS1, CS2, CS3, CS4
LP_04_B	Lower Prut	Prut	Hâncești	Rehabilitate dykes in Leuseni, Cotul Morii and Nemțeni	Repair 15.9 km of existing dykes.	12	14	820 000	M	L	H	H	CS1, CS2, CS4
LP_04_C	Lower Prut	Prut	Hâncești	Rehabilitate dykes in Cioara and Dancu	Repair 10.5 km of existing dykes.	12	12	640 000	L	L	L	L	CS1, CS2, CS4
LP_04_D	Lower Prut	Prut	Hâncești	Rehabilitate dykes in Pogănești	Repair 2.0 km of existing dykes.	12	3	120 000	M	L	L	L	CS1, CS2, CS4
LP_04_E	Lower Prut	Prut	Leova	Rehabilitate dykes in Tochile-Răducani	Repair 1.0 km of existing dykes.	12	2	70 000	L	L	M	L	CS1, CS2, CS4
LP_04_F	Lower Prut	Prut	Cantemir and Cahul	Rehabilitate dykes in Țiganca, Goteşti, Cantemir, Zîrnești, Chircani and Cucoara	Repair 10.0 km of existing dykes.	12	5	820 000	H	L	L	M	CS1, CS2,

Total costs								14 710 000					

. Source: Master Plan Report,
Management and Technical Assistance Support to Moldova Flood Protection Project,
Service contract No TA2011038 MD EST