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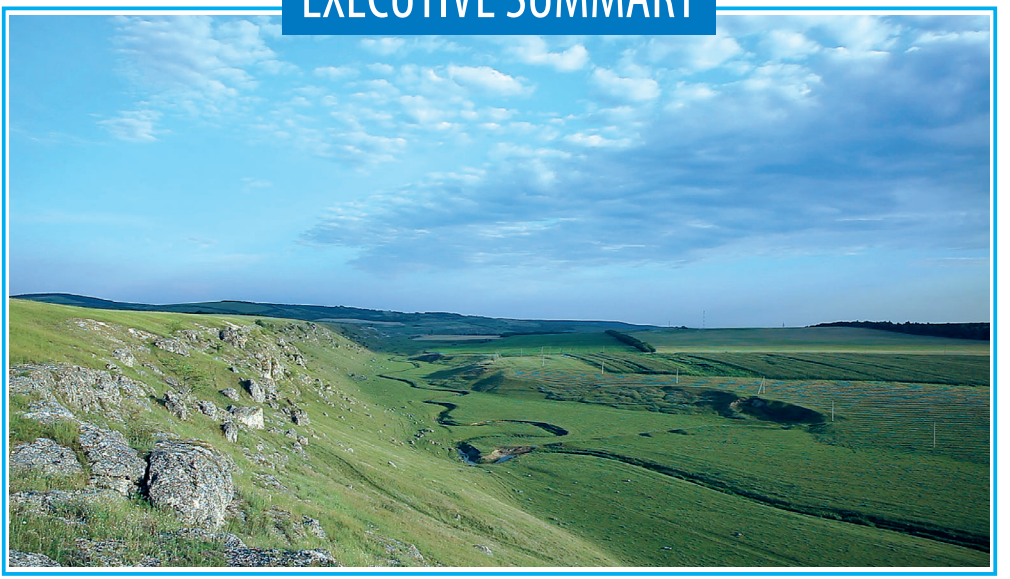
WOMEN'S ASSOCIATION FOR THE ENVIRONMENT PROTECTION AND SUSTAINABLE DEVELOPMENT

THE CAMENCA river basin MANAGEMENT PLAN

CYCLE II (2019-2024)

EXECUTIVE SUMMARY



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Document is approved by of Camenca sub-basin Committee.
Minutes no. 3 of 11.12.2018

This document was discussed and approved
at the meeting of the Scientific Council
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Minutes no. 1 of 21.01.2019

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During project implementation and elaboration of the Camenca River Basin Management Plan, a considerable support has been given by: Glodeni District Council; Fălești District Council; Camenca sub-basin Committee; halls of settlements located in Camenca HB within Râșcani, Glodeni and Fălești districts (34 village halls and 2 town halls - Glodeni and Fălești), Environmental Protection Inspectorates within given region, "Pădurea Domnească" reserve, other institutions in the field.

CONTENTS

INTRODUCTION

Through this project, we aim to change the behavior of the riparian communities towards the small rivers of the Camenca river basin, which flow through their settlements, to start the collective responsibility of all settlements within the basin of a middle-sized river, to provide training to the people regarding responsibility and love to the nature, to help them to participate by themselves in their ecosystem environment care, to know the value of natural and cultural heritage of their settlement, the way of preserving and utilization of landscapes, natural monuments, etc. But the most important thing within the project is to create the necessary tools for river basin protection: creation and development of the Camenca sub-basin Committee, elaboration of the Camenca RB Management Plan and implementation of good practices on local mobilization and development initiatives.

Figure 1. Implementation of good practices on local development

OBJECTIVES AND APPROACH TO THE DRAFT PLAN

The Camenca River Basin Management Plan (CRBMP) was prepared according to the methodology of EU Water Framework Directive (WFD) and Water Law nr. 272 of 23.12.2011. The Management Plan scope is to improve quantitative and qualitative state of water resources within the river basin. The plan is intended for all authorities responsible for water management – district and local public authorities, water users, etc.

This Plan was discussed and approved at the meeting of the Scientific Council of the Institute of Ecology and Geography dated January 21, 2019, Minutes no. 1

The core of this plan is the Programme of measures (PoM), which aims achieving the environmental objectives established for all water bodies (good status). The Programme of Measures is based on analysis of the initial conditions of the basin, significant human pressures and their impact on water resources. One of the key components is Pressure-Impact Analysis, which consists of identification of specific problems and their origin, which can cause failure in achieving the established environmental objectives for water bodies at risk. According to EU WFD and its guidelines four major types of pressure were distinguished: organic pollution, nutrients pollution, hazardous substances pollution, hydromorphological 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 (2019-2024) in accordance with WFD were taken into account. Thus, it was proposed that achieving the environmental objectives of all water bodies to begin from the second cycle which lasts until 2030 (2025-2030).

Within the CRBMP a considerable attention is given to the economic analysis of water use, which have a direct impact on water bodies status.

During CRBMP development, some shortcomings like lack in data and information were identified. The main problems faced during the development of CRBMP were: 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 with local public authorities, etc. Some of these problems have been partially solved within the project, by organizing field trips. The project "Development of Integrated Management Plan of Camenca RB" provides some recommendations for completion of lack in data and information.

THE CAMENCA RIVER BASIN

The Camenca river is one of the biggest tributaries of the Prut river in the limits of the Republic of Moldova territory, with the largest hydrographic basin (Figure 2). The Camenca river basin is located in the middle course of the Prut River, comprising practically the natural unit Middle Prut Plain, situated in the northwest part of the country. The total area of the basin is 1236.9 km^2 (Table 1). The total length of Camenca river is 108.5 km.

The Camenca river begins 3 km north of Borosenii Noi v. and flows into Prut river, on its the left side, at 466 km from its mouth, 1.5 km south of Pruteni v.. River gradient is 136 m, the average slope - l,5 ‰, the coefficient of sinuosity - 1.6 (Resursele acvatice, 2007).

Table 1. General data of Camenca river basin

Characteristics	Camenca river basin	Characteristics	Camenca river basin
Basin area, km^2	1236,9	Number of towns	2
Maximum absolute elevation, m	266,5	Number of water bodies	rivers – 12 lakes – 0 groundwater – 3
Minimum absolute elevation, m	41,8	Average lengths of river water bodies	27,1 km
Number of people, thousand of inhabitants	93,1	Average area of river water bodies basins	103,1 km^2
Number of villages	73	Number of heavily modified water bodies	10

Source: Topographic map, 1 : 50 000 (2013), Population census of 2014

Main left side tributaries are: Șovățul Mic (length 43,8 km), Căldărușa (41,1 km), Glodeanca (30,7 km), Șovățul Mare (26,5 km) and r. Camencuța (20,6 km).

The basin is located within the limits of the Middle Prut Plain. It has an irregular shape, in the lower course it is developed only on the left side, asymmetric, elongated from north to south-east. The altitudes of basin line exceeds, in most cases, the values of 150 m. The highest basin hills are Movila Țighira with 265,1 m (Cajba Forest - watershed line between Căldărușa and Camencuța river basins) and another one of 266,5 m (Derenea Forest - watershed line between Camenca and Ciuhur River basins) (Figure 3). The minimum altitudes, under 50 m, are recorded in the lower course of Camenca, in the lower floodplain, in the perimeter of Hâncești and Pruteni villages.

WATER RESOURCES OF CAMENCA RIVER BASIN

The most important rivers are Camenca, Căldărușa, Glodeanca, Șovățul Mic, Șovățul Mare. Based on the existing monitoring information it was estimated that average annual discharges of the Camenca and Căldărușa rivers are 0.46 m^3/s and 0.15 m^3/s. The average annual runoff is 54 mm for Camenca and 58 mm for Căldărușa. The average annual water volume is 15.3 mil. m^3 and 4.6 mil. m^3 for the two rivers.

In the limits of the Camenca river basin there are about 800 reservoirs. The volume of stored water was estimated to be about 114 mil. m^3. The total reservoirs area is 31.6 km^2 (2.6% of the river basin area). The average reservoirs volume is 0.14 mil. m^3 and their average area is 4 ha. **The Camenca river basin is poorly assured with surface water resources.** During water use planning process, especially for construction of new surface water abstraction systems, it is imperative to take into account the degree of water resource assurance.

CLIMATE CONDITIONS

The average multiannual air temperature in the Camenca river basin is +9.6°C (st. Fălești). The current climatic conditions (1960-2017) in the basin are characterized by a stable trend of warming, fact confirmed by seasonal and annual air temperature evolution. During winter months temperatures are below 0 °C. Maximum temperatures are recorded during the summer months, average being over +20°C (Figures 4 and 5).

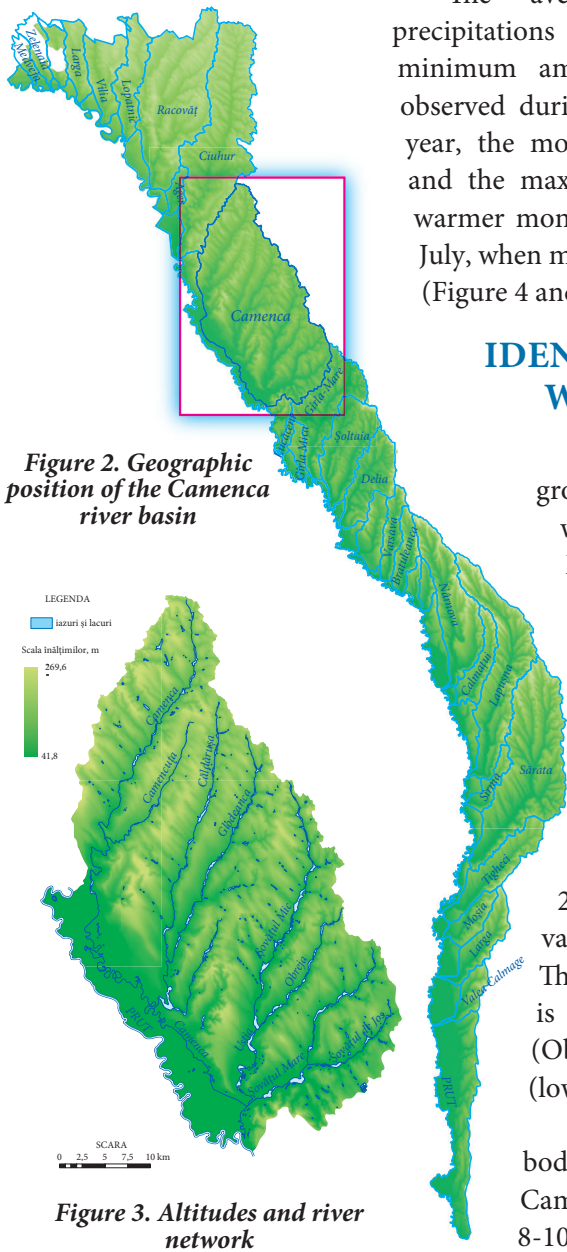

Figure 2. Geographic position of the Camenca river basin

Figure 3. Altitudes and river network

The average annual sum of precipitations is 570 mm. The monthly minimum amount of precipitation is observed during the cold period of the year, the monthly sum being 30 mm, and the maximum is recorded during warmer months, especially in June and July, when monthly sums exceed 80 mm (Figure 4 and 6).

IDENTIFICATION OF WATER BODIES

Delineation of bodies of groundwater as well as surface water was performed within EPIRB project (2013-2014), these were taken over without any modifications and used in present research.

Within the Camenca river basin 12 river water bodies were delineated (figure 7). Table 2 shows flow characteristics values of river water bodies. Thus, the average discharge is within the range of 0.11 (Obreja) - 1.29 m^3/s (Camenca (lower course)).

Three groundwater bodies were delineated in the Camenca river basin (Figures 8-10):

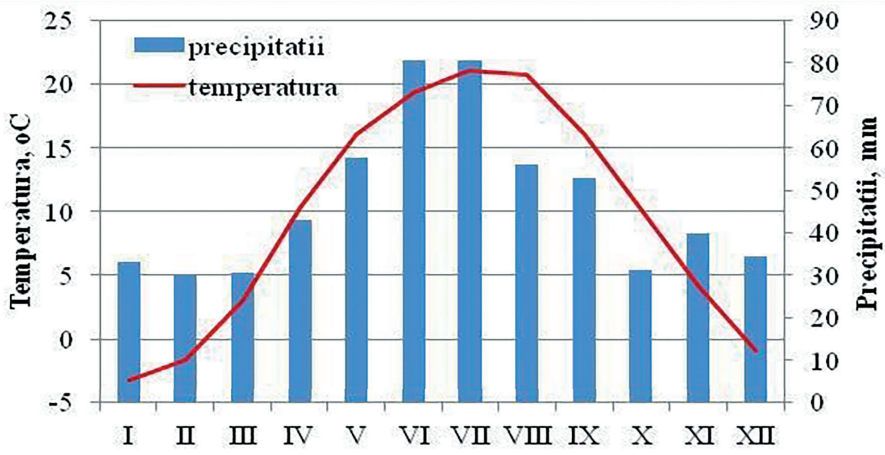

Figure 4. Monthly values of temperature and precipitations, st. Fălești

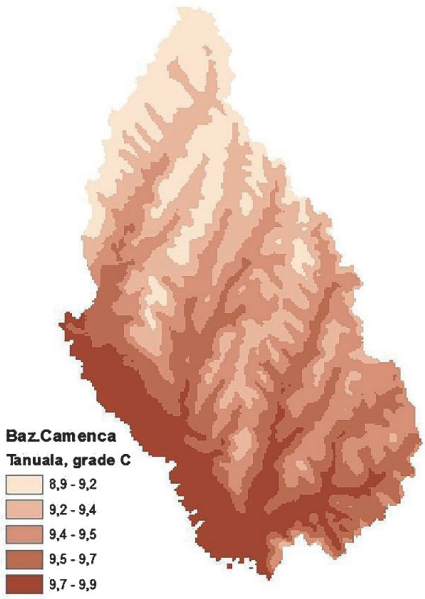

Figure 5. Annual average temperature, °C (1986-2005)

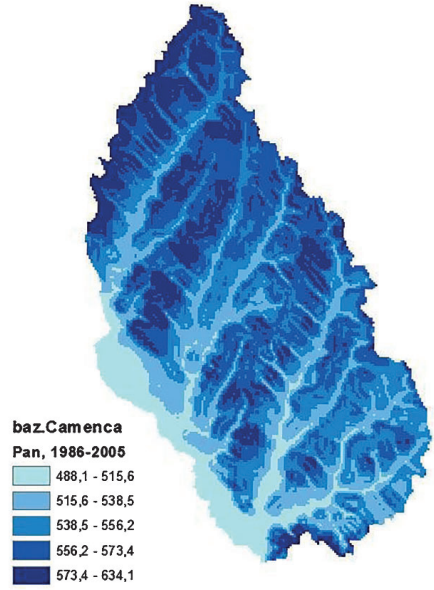

Figure 6. Annual average sum of precipitations, mm (1986-2005)

Table 2. Hydrological characteristics of river water bodies

Name of river water bodies	Length, km	Basin area, km^2	Average discharge, m^3/s	Specific discharge, l/s km^2	River runoff, mm	Volume, mil. m^3
Camenca (upper course)	13.8	87.3	0.21	2.42	43.8	6.7
Camenca (middle course)	35.8	169.5	0.55	1.73	40.6	17.5
Camenca (lower course)	59.6	134.4	1.29	1.04	35.0	40.6
Camencuța	20.7	62.7	0.15	2.41	41.4	4.8
Căldărușa	41.2	174.2	0.51	1.56	36.7	15.9
Glodeanca (upper course)	11.9	50.1	0.12	2.45	40.5	3.9
Glodeanca (lower course)	18.8	98.8	0.27	1.82	36.5	8.6
Șovățul Mic	43.8	200.5	0.60	1.30	33.2	19.0
Obreja	18.2	56.4	0.11	2.03	34.2	3.6
Șovățul Mare (upper course)	18.5	57.1	0.15	1.87	33.2	4.6
Șovățul Mare (lower course)	8.1	78.4	0.31	1.49	31.7	9.7
Șovățul de Jos	14.4	71.0	0.13	1.85	32.3	4.1

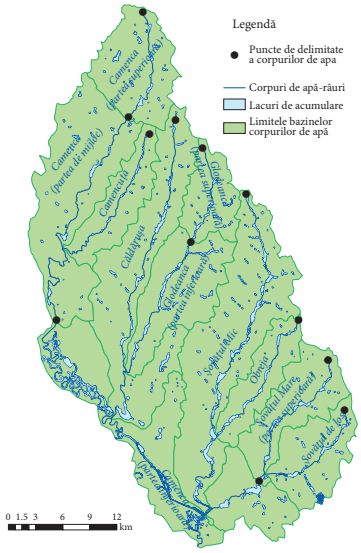

Figure 7. Surface water body

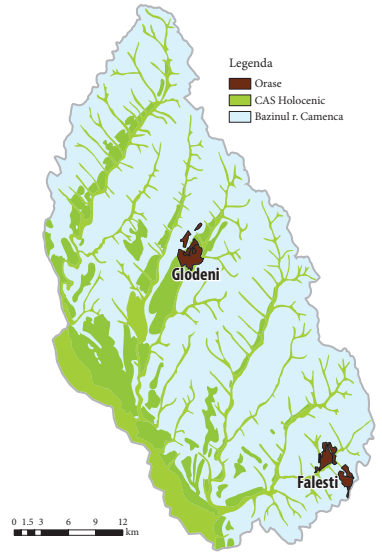

Figure 8. Holocene groundwater body

1. Holocene aquifer horizon (aA_3);
2. Badenian-Sarmatian aquifer complex (N_1b-s);
3. Cretaceous-Silurian aquifer complex (K_2-S).

Within the Camenca river basin, groundwater reserves constitute 22.4 ths. m3/day, which are used for various purposes (Table 3).

Holocene groundwater body (aA3) is extended in river beds and is characterized by the presence of sands, often with gravel inclusions, located between sandy clay and clay soils (Figure 8). The thickness of aquifers rocks is 20-30 m. Mineralization ranges from smaller values of 1 g/l up to 5-7 g/l.

Badenian-Sarmatian groundwater body (N_1b-s) includes the entire Camenca basin (Figure 9). Its chemical composition generation is influenced by lithological composition of aquifer rocks. The waters are slightly salinized, transparent, colorless and odorless. The chemical composition is of the hydrocarbonate-sodium type with the dry residue value of 1.2-2.5 mg/l. Water has a weak alkaline reaction (pH 6.92 - 9.0). The content of hydrocarbons (in mg/l) ranges from

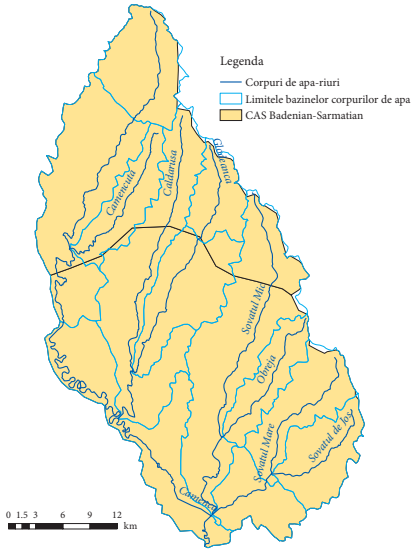

Figure 9. Badenian-Sarmatian groundwater body

Table 3. The exploitable reserves of groundwater in CHB

Nr. d/o	Aquifer	Exploitable reserves (ths. m^3/day)						
		Total	APM			AAT		
			A	B	C_1	A	B	C_1
1	Aquifer horizon Holocene (aA_3)	9,4	5	2,7	1,7			
2	Aquifer complex Badenian-Sarmatian (N_1b-s)	6	1,9	2,2		0,9	1	
3	Aquifer complex Cretaceous-Silurian (K_2-S)	7	4	3				
	Total	22,4	10,9	7,9	1,7	0,9	1	

Source: processed according to the data AGRM

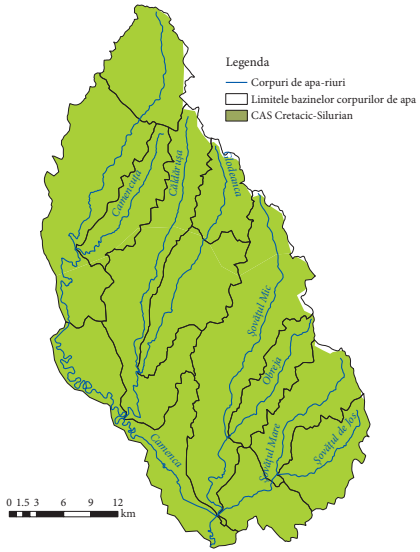

Figure 10. Cretaceous-Silurian groundwater body

826.5 to 2540, sulphates - from 116 to 290, chlorides - from 19 to 98. In cations composition, predominant are: Na - from 183 to 1055 mg/l, calcium and magnesium content - from 0.55 to 141 mg/l. Fluorine content - from 0.45 to 9.53 mg/l, ammonia - 0.18-5.68 mg/l.

Cretacic - Silurian groundwater body (K_2-S) includes the aquifer sediments of the Silurian and Lower Cenomanian and is extended throughout the basin. The aquifer rocks of the upper part (Lower Cenomanian) are represented by limestones, sandstone, and an increase in the sandstone content is observed in the west. According to chemical composition the waters are of hydrocarbonate type, little sulphate, the dry residue value is 1.2-3.0 mg/l. The ammonium content is found in exploitable wells from 0.05 to 5.07mg/l. The waters of the given complex were studied in the districts where the centralized water supply is used. F content exceeds the admissible concentrations from 2.32 mg/l to 15.52 mg/l. Mineralization is from 1.2 g/l to 3.0 g/l. According to the predominant anion content the waters are of hydrocarbonate-sulphate type, and by cation content - these are of sodium-calcium type. The pH is from 8.1 to 9.0.

The hydrocarbon content is 830 to 1840, sulfates from 15 to 290, chlorides from 28 to 86. In the cation composition, predominant are: Na from 262 to 836 mg/l, the calcium and magnesium content from 1.0 up to 6 mg/l.

Assessing the groundwater bodies quality, it can be concluded that **waters are not favorable for drinking water supply** due to the amount of dry residual value, sodium and fluoride content. They can only be used for water supply after a pretreatment. Water bodies „at risk" are mainly found in alluvial-delluvial, Holocene aquifer.

ECONOMIC ACTIVITY

Agriculture

Based on land use type, the Camenca river basin is a typical agrarian region. Agricultural lands occupy approximately 77% (Figure 11). More than half of the basin area is occupied by arable area (55%). The share of arable land is higher on the slopes of middle and upper parts of the tributaries, with a mean value of 61%, it decreases significantly in the lower part of the Camenca river and practically disappears in its floodplain where the pastures and forests of „Pădurea Domnească" reserve predomonate. Pastures cover 19% of the total area of the basin, and mainly are represented as riparian strips in rivers floodplains. The predominance of agricultural land, on the one hand, influences the high demand for irrigation water and, on the other hand, it causes intense pollution with nitrates and other nutrients.

In the structure of sown areas, cereals (wheat, corn), technical plants (sugar beet, sunflower), etc. have the largest share. In the structure of livestock, there are predominant the sheep (about 60 ths. heads) - due to extensive natural pastures; pigs (about 20 ths. heads) - due to rich feed base; cattle (over 17 ths. heads). Total milk production exceeds 3 ths. tons.

Within the Camenca river basin, in 2017, 3.7 ths. tons of mineral fertilizers were applied on agricultural land. The largest quantity is applied within Fălești district (66 kg/ha). In Glodeni district this index was 49 kg/ha, and in Râșcani district - 39 kg/ha. The highest rate of nutrient pollution (N, P, K) is recorded within the basins of Șovățul Mare și de Jos. The application of organic fertilizers to agricultural land within the Camenca basin is insignificant.

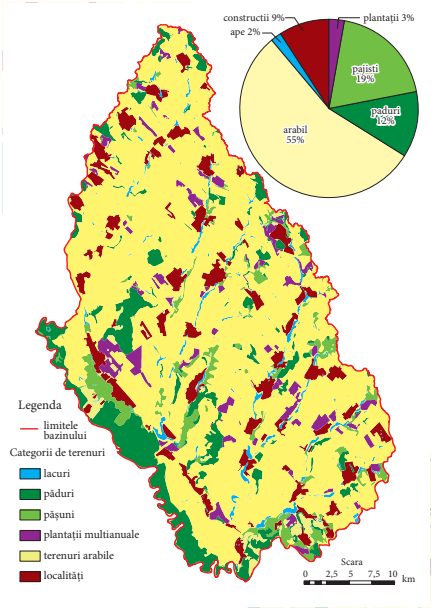

Figure 11. Land use

Industry

The largest water users are towns with big factories. The sugar factories in the Glodeni (currently not active) and Fălești, the bakery and dairy industry, etc. are highlighted. 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.

The largest and most important industries are in Floresti town, including 6 heavy industry companies (potential sources of heavy metal pollution), 7 light industry companies (potential sources of pollution with vegetable oils, detergents, enzymes, acids, etc.) and a wine factory (from which emissions of sulphites (SO_3^{2-}), acids, alkaline substances, colloids, Fe_2O_3, etc. are recorded periodically).

Water abstraction

During the period 2007-2017, 2.8 mil. m^3 of water (Table 4) were abstracted in the Camenca river basin, or 12% of the total water volume in the Prut river basin. In the perimeter of Fălești and Glodeni districts about 1.2 mil. m^3 of water were abstracted by each district, and in Râșcani district - 0.3 mil. m^3.

The maximum water volume was used by communal companies in Fălești (452 ths. m3) and Glodeni (165 ths. m3) towns, by rural settlements with larger aqueducts, by sugar factories from Glodeni (303 ths. m3) and Fălești (234 ths. m3), as well as by large agricultural companies (Figure 12).

Table 4. Volume and share of abstracted water by sources of origin

	Average					2017				
	total	surface waters		groundwater		total	surface waters		groundwater	
		ths. m^3	%	ths. m^3	%		ths. m^3	%	ths. m^3	%
Râșcani	307	93	30	214	70	416	248	60	168	40
Glodeni	1235	486	39	750	61	1061	240	23	800	77
Fălești	1270	721	57	549	43	1220	638	52	582	48
BH Camenca	2814	1300	46	1513	54	2697	1126	42	1571	58

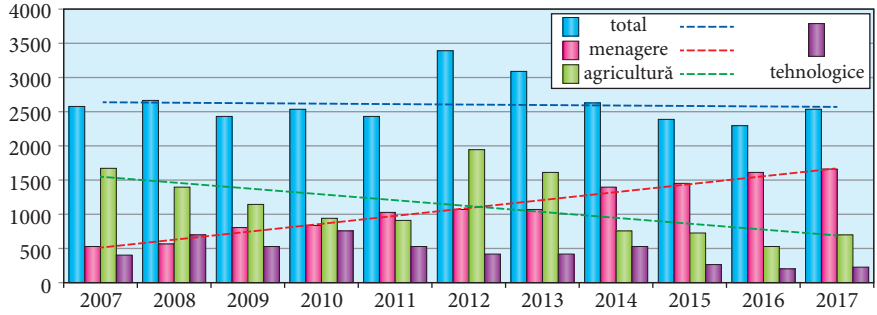

Figure 12. Structure of the of water resources use, mil. m3

IDENTIFICATION OF SIGNIFICANT PRESSURES AND ESTIMATION OF IMPACT

The appreciation of human pressures and impacts on water bodies was performed in order to assess the status of water bodies and to identify those that are at risk of not achieving the WFD objectives and included the following basic steps: identification of water use and associated pressures and the assessment of the risk of a possible failure to achieve the environmental objectives (Table 5).

Point pollution sources

The assessment of point source pollution impact on the status of river water bodies was performed using the ratio of population number within the water body and the minimum water discharge. Taking into account the fact that the number of population related to basin area is considerable and the water resources are small, we can conclude that all water bodies are significantly influenced by anthropogenic activity. This method application results show that an average impact is specific only for Camencuța (Figure 13).

Diffuse pollution sources

The assessment of diffuse pollution sources impact on the status of river water bodies has been made by estimation of agricultural activities and livestock impact. Agricultural activities impact is determined by the share of arable land relative to the basin area. Considering that the arable land occupies fairly large areas within the water bodies basins, this factor influences

Table 5. The main pressures types within the Camenca river basin

Pressures type	Basin/ Water body	Comments
Wastewater discharge	Glodeanca, Șovăț	Discharges of untreated or insufficiently treated waters
Agricultural activities	All the water bodies	The agricultural lands occupy 77%. Over 55% of the basin is occupied by arable lands. Riparian protection strips are absent in most water bodies.
Unauthorized dumps	All the water bodies	The lack of authorized dumps in most settlements.
Interruption of longitudinal continuity of rivers	Camenca	The construction of reservoirs and ponds on rivers.

significantly the rivers quality state. The average impact is estimated for one water body, Camenca (the lower course), mainly due to the fact that the "Pădurea Domnească" scientific reserve is located here.

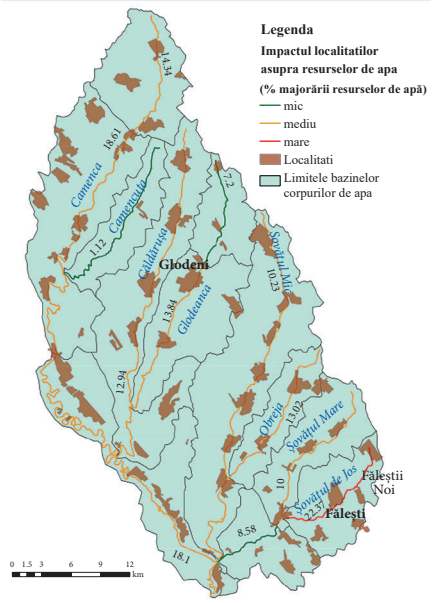

Figure 13. Impact of total amount of untreated wastewater discharge

The impact of livestock was estimated as ratio of the conventional livestock to the water bodies basin area. It was determined that this type of pressure is lower for 3 water bodies: Camenca (middle and lower course), Glodeanca (upper course) and medium for 9 water bodies. It should be noted that birds have not been taken into account in the calculations, thus this indicator may be higher.

Finally, by aggregating the pressures from identified diffuse sources, we mention that 11 of 12 water bodies are under high pressure and only 1 (Camenca (lower course)) - under medium (average) pressure (Figure 14).

Hydrologic and hydromorphologic alterations

Assessment of the human impact on hydromorphological status of water bodies was performed on the basis of analysis of reservoirs build in cascade on water bodies, protection embankments and irrigation/drainage channels located near riverbeds.

Construction of reservoirs in cascade resulted in water bodies length reduction. Within the pilot basin, all water bodies are subject to this type of pressure. Protection embankments are built in Camenca RWB (lower course) basin and do not significantly affect the water body status. On the other hand, the large number of drainage/irrigation channels within the same water body determines us to classify their impact as high. Channels built near other water bodies do not significantly affect their status.

As a result, it should be mentioned thatthewaterbodieshydromorphological status is significantly influenced by anthropogenic activity, in general, by construction of reservoirs (Figure 15), but also, especially, of channels in lower part of Camenca.

Assessment of anthropogenic activity impact on water bodies water resources was carried out based on analysis of agricultural activities, urbanization processes and reservoirs. Reservoirs determine reduction of water resources due to increased evaporation

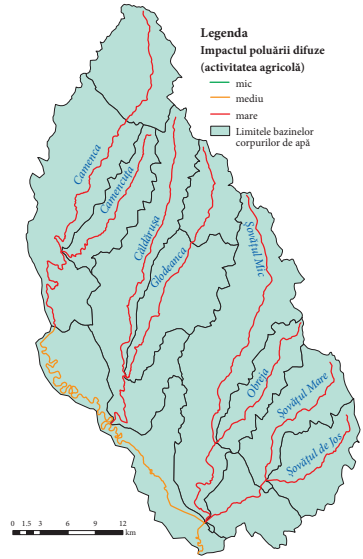

Figure 14. Diffuse pollution impact

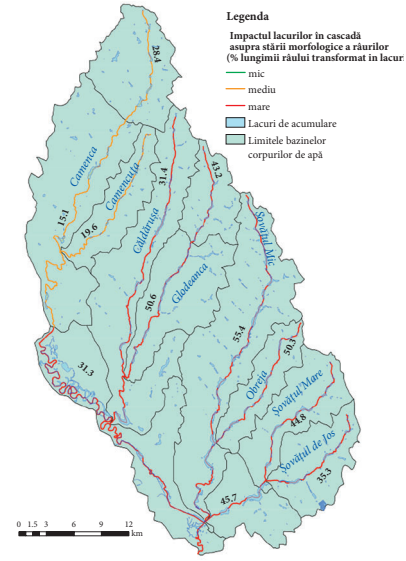

Figure 15. Impact of reservoirs on hydromorphological state of water bodies

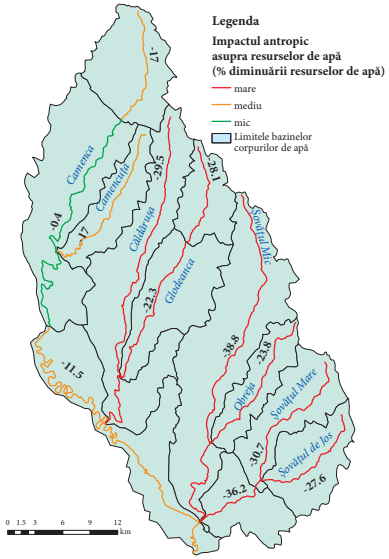

Figure 16. Cumulative human impact on water resources of water bodies

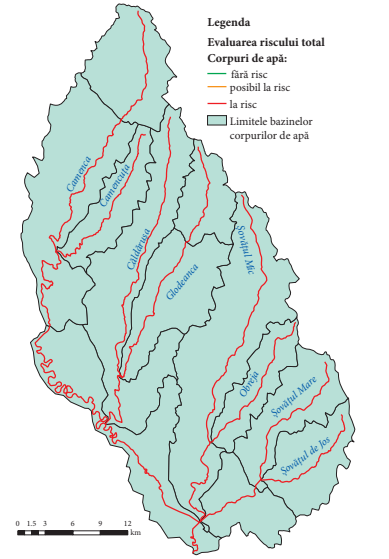

Figure 17. River water bodies at risk

processes. These caused decreasing of water resources by about 12-44%. At the end of assessment of the cumulative human impact on water resources, we conclude that only for one water body within the Camenca river basin the water resources remain practically unchanged, for 3 bodies they decrease up to 20% and for the other 8, decreasing of river runoff is considerable, even being approx. 40% (Figure 16).

Identification of water bodies at risk

As a result of assessment of human impact on the water bodies of Camenca RB, the procedure for identifying the water bodies at risk of failing the environmental objectives was performed. The basic methodology consisted of application of "One-Out-All-Out" approach, according to which all 12 river water bodies are at risk of failing the environmental objectives (Figure 17).

Monitoring program and network

At national level, the State Hydrometeorological Service is the responsible institution for the hydrobiological, hydrochemical and hydrological monitoring of the rivers and lakes of the republic. During the years 2014-2016, according to the quarterly surveillance program the following sections were monitored in the Camenca RB: Camenca - Camenca v., Glodeanca - Dușmani v. and Șovățul Mare - Ilenuța v..

For the mentioned period, hydrobiological parameters investigated in the Camenca RB have attributed the water quality of all water bodies to the third class, ie moderately polluted. A different picture, however, is presented by the hydrochemical parameters according to which only the water quality of Camenca - Camenca v. corresponded to the fourth class (polluted water), while the other sections proved to be very polluted (class V) (Figure 18).

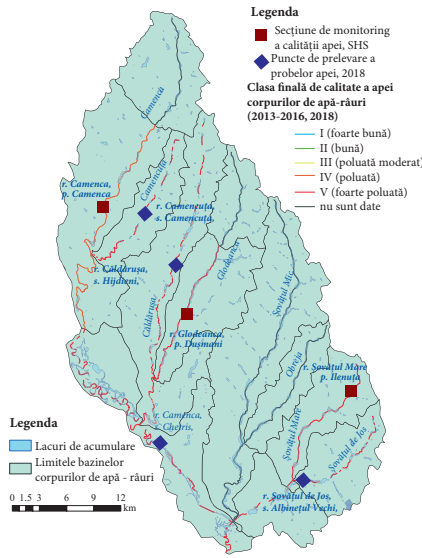

Figure 18. Water quality class

As a result of the expedition carried out in August 2018, unique data were obtained for 4 water bodies (Șovățul de Jos - Albineț v., Camenca - Chetriș v., Căldărușă - Hâjdieni v., Camencuța - Camencuța v.) about which either nothing was known or the monitoring data were insufficient. Of the four investigated sections, the least polluted was Camencuța, downstream of Camencuța v.

Existing monitoring network of groundwater

The monitoring network consists of 2 monitoring wells located in Călinești village, Fălești district (Table 6).

Table 6. Groundwater bodies monitoring wells

№ d/o	Well location	Nr. of well	Measurement depth, m	Number of monthly measurement	Regime conditions
Aquifer complex Cretaceous-Silurian (K-S)					
25	v. Călinești	13-458	0-25	10	2
Aquifer complex Badenian-Sarmatian (N_1b-s_1)					
30	v. Călinești	13-459	0-25	10	2

ENVIRONMENTAL OBJECTIVES

Environmental objectives of water bodies that should be achieved till 2024 should be:

- "good ecological potential" for heavily modified and artificial water bodies (it is applied for upper courses of Camenca, Camencuța and Glodeanca rivers);
- "good quantitative and chemical status" for groundwater bodies;
- "no deterioration of water bodies status" (it is applied for the other surface water bodies);
- achievement of objectives for protection areas (it is applied for all identified protection areas).

For water bodies where environmental objectives cannot be achieved by 2024 and 2030 due to technical feasibility, disproportionate costs or natural conditions, exceptions from achievement of environmental objectives will be proposed (Șovățul Mare și Mic, Glodeanca), which are justified by disproportionate costs related to the necessary technical arrangements (construction of wastewater treatment plants for Glodeni and Fălești towns) or by existing ecological status.

Achieving the environmental objectives for surface water bodies depends directly on the value and the type of identified pressures. Some types of pressures, such as diffuse pollution from agriculture can be relatively easier solved by planting riparian protection strips, reduction of arable lands and greening of agricultural activities. It is much more expensive to decrease the pressures exercised by untreated wastewater discharge.

Thus, for the first cycle (2019-2024) 3 surface water bodies (the upper courses of Camenca, Camencuța and Glodeanca) with a total length of 15.2 km will achieve the objective of good potential. For the other surface water bodies, the "no deterioration of status" is fixed due to significant recorded pressures (Figure 19).

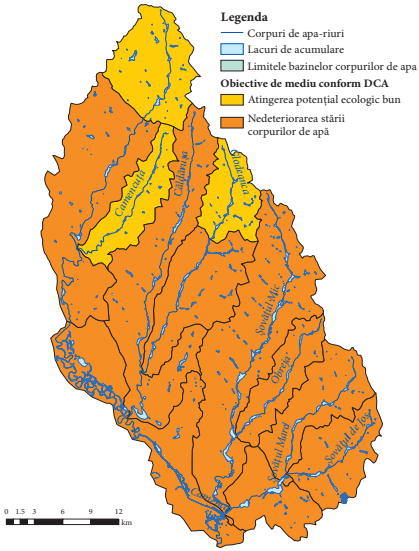

Figure 19. Environmental objectives for river water bodies

ECONOMIC ANALYSIS

The volumes of water used for domestic and agricultural purposes are almost identical, being about 1.1 mil. m^3 or 42% each of the total volume of water used in Camenca RB. For technological needs, an average of 16% of the total volume was used. The total volume of water used in Camenca RB shows an oscillating evolution on the background of a generally low expressed negative trend. Negative dynamics can also be noticed in the Glodeni district, where the volume of utilized water decreased by ≈1/4 and is almost exclusively due to the reduction of about 6 times of volume of water used by sugar factory of Glodeni town, which no longer works. The maximum volume of abstracted and used water is also recorded in 2012, more dry, but is due exclusively to the waters used in Fălești district, especially for agricultural needs. Subsequently, there is attested a tendency of slow reduction, interrupted in 2017, especially due to the finalization of several projects for aqueducts construction and extension in rural areas, as well as to the maximum volumes of water used this year for the agricultural companies nominated in Râșcani district.

Centralized water supply systems are present in 43 (57%) of the 75 settlements located in the Camenca river basin. The highest level of aqueduct assurance is attested in Râșcani district, to which all 15 settlements within the basin are connected. In the Glodeni district there are 16 settlements or ≈1/2 (48%), including 13 of 15 resident villages, connected to aqueduct. In Fălești district only 12 settlements (44%), including 8 resident villages, have access to aqueducts. In the Glodeni and Fălești districts, the absolute majority of small villages do not have centralized water supply systems.

The total length of communal aqueducts in the Camenca river basin is ≈ 500 km, including 186 km (38%) in Glodeni district, 161 km in Fălești district (32%) and 149 km in Râșcani district (30%). The most extensive aqueducts are located in Fălești (45 km) and Glodeni (35 km) towns, as well as in Râșcani district villages. From this point of view, villages Danu (29,2 km), Iabloana (27 km) and Petrunea (19 km) of Glodeni district, and Călinești (23 km), Pânzăreni (20 km) and Pruteni of Fălești district can be emphasized. As a result of the recent aqueducts expansion, a medium level (53%) of population access to aqueduct was reached.

During the analyzed period (2007-2017), the number of centralized water supply systems in the Camenca RB increased from 100 to 160 (+ 60%) and their length - by approx. 2 times (from 1055 km to 2133 km). Despite the

rapid expansion of water supply system, the per capita water consumption is 2 times lower than the average for the republic, which is due to the lower degree of urbanization in this river basin.

Irrevocable water losses exceed 70% of abstracted water volume due to significant wear of the supply infrastructure and the technological specificity of the water supply in agriculture, which predominates in the branch structure of this basin.

Centralized sewerage systems operate only in Glodeni and Fălești towns, as well as in 5 rural settlements. The total length of the sewerage network in Camenca RB is ≈70 km, including 32 km (46%) in Fălești town, 18.2 km (26%) in Glodeni town, 12 km in the residential district of the Fălești sugar factory. Unfortunately, we identified that the rapid expansion of aqueducts is not accompanied by the similar extension of sewerage networks and sewerage systems, which significantly increases the impact on aquatic ecosystems and the population.

The total volume of discharged wastewater through the public sewerage systems of the Camenca river basin is 510 ths. m^3, including that from the municipal network of Fălești and Glodeni towns - 183 ths. m^3 (36%) and correspondingly 86,3 ths. m^3 (16%). Also, large quantities of water are discharged from Fălești (183 ths. m^3) and Glodeni (23.5 ths. m^3) sugar factories, the Danulschi agro-food company in Glodeni and from the sewerage networks of Limbenii Vechi and the residential district of Fălești sugar factory.

The current mechanism of water consumption taxes is focused only on obtaining of local tax effects, and economic and environmental effects are insignificant. These taxes do not offer a recovery of public expenditure for the restoration and protection of water resources and do not stimulate water saving according to the requirements of national and European legislation. It is necessary to adjust the rates of this tax to the inflation rate, to the costs of maintaining and restoring of water supplies, to the complex value of water resources and objectives.

Tariffs for public water supply (Table 7), sewerage and wastewater treatment (Table 8) services are applied for 3 main categories of consumers for which separate tariff rates are set: 1) the population; 2) budget organizations; 3) economic agents.

The amount and the procedure for the application of tariffs for public water supply, sewerage and treatment services are stipulated in the *Decision*

no. 741 of the National Agency for Energy Regulation (ANRE) of 18.12.2014 regarding "Methodology for determination, approval and application of tariffs for the public service of water supply, sewerage and wastewater treatment"

Table 7. Prices and costs for water delivered in Camenca RB (2018)

Districts	Tariff quota, in lei/m3				Mean cost	difference
	mean	Population	Budget organization	Economic agents		
Râșcani	12,3	12,1	13,6	13,6	15,8	-3,5
Glodeni	16,4	14,9	24,8	27,3	17,4	-1,0
Fălești	14,9	14,0	22,0	22,0	16,5	-1,6
BH Camenca	**14,7**	**13,8**	**20,5**	**21,5**	**16,6**	**-1,9**

Table 8. Prices and costs for water delivered to cities (2017)

Towns	Tariff quota, in lei/m3				Mean cost	difference
	Mean billed	Population	Budget organization	Economic agents		
Fălești	14,5	10,7	26,6	26,6		-3,5
Glodeni	22,6	13,7	53	53	28,6	-6,1

Despite the increase in tariffs, the cost of water supply services exceeds the tariffs for these services with about 1 leu for 1 m^3, and the negative differences are recorded in the most of the Camenca RB settlements.

Current tariffs allow costs recovery from municipal companies of settlements that have new aqueducts and do not require additional maintenance costs, even if tariff quota are relatively low. At the same time, in the settlements with an high degree of aqueduct wear (eg in Glodeni town, in Fundurii Vechi, Pârjota, Danu, Petrunea villages of Glodeni district), the operational costs significantly exceed the tariffs. For hydro-technical structures rehabilitation, local budgets are constantly being appealed to, which have very modest capacities.

The current tariffs applied for provision of sewerage and wastewater treatment services in Fălești and Glodeni towns do not allow to recover the costs of those services, and even more, to perform measures for water resources and bodies improvement.

PROGRAMME OF MEASURES

For measures identification, the results of pressure analyzes and impact assessment, the set of environmental objectives and the performed economic analysis were taken into account with reference to the WFD and national legislation. In the process of identification of important water management problems, three general objectives were formulated, each of them having several specific objectives and actions set:

General objective 1. Improving the monitoring program

General objective 1.1. Improving the monitoring program for surface water bodies. Present monitoring programme of surface water includes 3 stations for assessment of water quality but there are no any stations for hydrological measurements. According to the WFD requirements, each surface water body must have at least one monitoring station. Thus, 12 stations (for both water quality and quantity monitoring) are needed within Camenca RB. It is also necessary to improve the quality of samples taken (extension of the number of parameters, regularity of sampling).

General objective 1.2. Improving the monitoring program for groundwater bodies. There are 2 monitoring wells (for Badenian-Sarmatian and Cretaceous-Silurian complexes) for the most important complexes. The first disadvantage is their location, both wells being located in Călinești village. This does not allow us to obtain qualitative information for the whole basin. It is proposed to introduce 2 new monitoring wells in the two towns (Glodeni and Fălești), which abstract large quantities of groundwater. Another problem is the insufficient number of chemical analyzes performed. This objective involves taking samples regularly (field trips, etc.) and performing qualitative analyzes (reagents, personnel, etc.).

General objective 1.3. Introduction of hydromorphological monitoring for surface water bodies. At present, this type of monitoring is not performed, and within the basin there have been identified the biggest hydromorphological alterations at the level of entire Danube-Prut and Black Sea district. The hydromorphological status of the water bodies is significantly influenced by anthropogenic activity, in general, by reservoirs construction, but, especially, by channels in the case of Camenca lower course. Many of these constructions are illegal, and the presence of such monitoring would

allow their early identification and prevention. In this context, it is proposed to create a working group (at the level of bazinal committee) in order to identify, prevent and not admit construction of illegal water accumulations and channels, which modify rivers courses.

General objective 2. Progressive reduction of pollution.

General objective 2.1. Progressive reduction of pollution from point sources. Wastewater treatment plant of Glodeni town does not work, and the one of Făleşti town works at minimum capacity. Thus, discharged wastewater is insufficiently treated (Făleşti) or untreated (Glodeni). The priority for the next 6 years will be the construction of a new station (in Glodeni) and the rehabilitation of the one of Făleşti. It is also a priority to build sewerage treatment plants in large villages, with over 3,000 inhabitants, within the basin.

General objective 2.2. Progressive reduction of pollution from diffuse sources. The objective involves the delimitation of riparian water protection strips (in accordance with Law nr. 440 of 27.04.1995) and the afforestation of certain floodplain sectors identified as priority (along Camenca river). Also, the objective requires a more rigorous evidence of mineral fertilizers, pesticides use, a proper management of waste from zootechnical complexes, etc. Compliance of modern soil processing technologies on the slopes of riparian areas.

General objective 2.3. Extending and restoration of natural habitats. Within the limits of the Camenca river basin, a potential wetland of international importance was identified - the "Pădurea Domnească" Scientific Reserve. The objective is focused on the extension of the "Pădurea Domnească" Scientific Reserve. Priority represents also the Camenca lower course renaturation, which implies, in a first stage, elaboration of the Feasibility Project on rehabilitation and restoration of the river in the historic bed. Also here the following are included: creation of an ecological corridor that would join the basins of Şovăţ with Camenca and Prut rivers, identification and mapping of springs within the basin, arrangement of springs with considerable flows.

General objective 3: **Sustainable use of water resources.**

General objective 3.1. Application of economic mechanism to recover the costs of waters use and protection. The current tariffs applied for water

supply, sewerage and wastewater treatment services do not allow the costs of those services to be recovered, and even more, to perform measures for water resources and bodies restoration. This finding tells us the very low profitability of these services and serious problems in the communal household in the district. It is strictly necessary to adjust the tariffs to the actual costs. The tariffs quota should be set according to water consumption in households and the daily reserves available at the abstraction sources. Assuring profitability, improving the quality of provided services and protection measures of water resources by the main users.

General objective 3.2. Improvement of the population access to water and sanitation. The measure is fully covered by the Water Supply and Sanitation Strategy. There are several projects, funded by the NEF and the NFRD, on improving assurance with drinking water and sanitation system. In the years 2010-2017, in the Camenca RB perimeter, with NEF financial support, 30 projects were implemented with total amount of 108 mil. lei. It is very important that all the financed projects to be successfully completed and that the services created to be economically and environmentally cost-effective (construction of treatment plant in Glodeni, for which there is a feasibility study and a financing decision from the NFRD budget, modernization of the wastewater treatment plant in Făleşti, rapid expansion of aqueducts is not accompanied by the similar extension of sewerage networks and sanitation systems).

General objective 3.3. Monitoring the management and rational use of surface water resources. Adjustment of water consumption tariffs to fully recover the costs. All consumers counting. Respecting the priorities set out in the Water Law, regarding the consumption of water resources.

General objective 3.4. Drought and flood risk mitigation. With the SDC-ADA financial support from July 2018 to April 2019, Drought and Flood Management Plans will be developed. From these plans, the maps with the respective risks for the Camenca river basin and corresponding measures will be extracted.

The Programme of measures was approved by the Camenca sub-basin Committee as a result of public consultations with main beneficiaries.

beneficiari.

PUBLIC INFORMATION, CONSULTATION AND PARTICIPATION

During the Management Plan development, a particular importance has been given to public information, consultation and participation. Each stage of the Management Plan development was finalized with public debates and meetings with the main stakeholders in 2018.

The first public consultation meeting took place on October 27, 2018 in Fălești town with the beneficiaries from the Camenca, Șovățul Mare, Șovățul Mic and Șovățul de Jos river basins. Another public consultations meeting took place on December 11, 2018 in Glodeni town with the beneficiaries from the Camenca, Căldărușa, Glodeanca river basins.

The interim management plan was placed at the end of November on the webpage: http://www.mediu.md; http://www.glodeni.md; http://www.cr-Fălești.md.

Figure 20. Meeting with stakeholders

PILOT PROJECT

In order to have real results and a continuity of activities, the project intended to implement a pilot project in Danu commune with economic agents involvement, LPA, etc. On the shore of a lake, situated on the Glodeanca river, a tourist halt was arranged.

Figure 21. Tourist halt

Also, two springs, which supply Glodeanca River, were unclogged and arranged.

Figure 22. Unclogging and arrangement of springs

4 ha of forest (riparian zone and adjacent terrains where the owner intends to develop a tourist pension) were planted. In total, about 14,000 seedlings of acacia, linden, field maple, black walnut, honey locust, white willow, poplar were planted.

Figure 23. Seedlings planting

REFERENCES

1. Anuarul privind starea calității apelor de suprafață conform elementelor hidrobiologice pe teritoriul Republicii Moldova, SHS. 2011-2017.

2. Anuarul privind starea calității apelor de suprafață conform parametrilor hidrochimici pe teritoriul Republicii Moldova, SHS. 2011-2017.

3. Anuarul Inspectoratului Ecologic de Stat. 2007-2017.

4. Anuarul Statistic al Republicii Moldova, Chișinău, 2017.

5. Directiva 2000/60/EC a Parlamentului și a Consiliului European din 23 octombrie 2000 cu privire la stabilirea unui cadru de politică comunitară în domeniul apei.

6. Directiva 2006/118/EC privind protecția apelor subterane împotriva poluării și a deteriorării.

7. Directiva Consiliului privind protecția apelor împotriva poluării cu nitrați proveniți din surse agricole din 12 Decembrie 1991 (91/676/CEE);

8. Directiva UE cadru privind apa: Aspecte statistice ale identificării tendințelor de poluare a apelor subterane și agregarea rezultatelor monitorizării. Raport final. 2001.

9. EPA- Agenția de Protecția Mediului, " Utilizarea și eliminarea nămolurilor apelor uzate municipale". Reglementări și Tehnologii de mediu.-Washington:EPA,1984; DC, 20460.

10. Ghidul Nr. 15. Monitorizarea apelor subterane (2007)

11. Ghidul Nr. 16. Apele subterane în Ariile Protejate a Apei Potabile (2007)

12. Ghidul Nr. 17. Prevenirea sau limitarea intrărilor directe și indirecte (2007)

13. Ghidul Nr. 18. Îndrumări cu privire statutul și tendința de evaluare a apelor subterane. Raport tehnic 2010 - 042

14. Ghidul Nr. 26. Îndrumări cu privire evaluarea riscurilor și utilizarea modelelor conceptuale pentru apele subterane. Raport tehnic - 2009 - 026

15. Ghidul Nr. 7. Monitorizarea în conformitate cu Directiva-cadru privind apa – WG 2.7 Monitoring (2003);

16. Hotărârea Guvernului nr. 1009 din 10.12.2014 cu privire la aprobarea Strategiei Republicii Moldova de adaptare la schimbările climatice pînă în anul 2020 și a Planului de acțiuni pentru implementarea acesteia;

17. Hotărârea Guvernului nr. 779 din 04.10.2013 pentru aprobarea Regulamentului cu privire la planificarea gestionării secetei;

18. Hotărârea Guvernului nr. 887 din 11.11.2013 pentru aprobarea Regulamentului privind gestionarea riscului la inundații.

19. Hotărârea Guvernului nr.199 din 20.03.2014 cu privire la aprobarea „Strategiei de alimentare cu apă și canalizare 2014-2028"

20. http://ec.europa.eu/environment/nature/natura2000/index_en.htm-accessed at 12.19.2014

21. http://www.coe.int/t/dg4/cultureheritage/nature/econetworks/default_en.asp - accesat pe data de 12.19.2014

22. Identificarea, caracterizarea si delimitarea corpurilor de apă subterană din Moldova și Ucraina în bazinele hidrografice Nipru (Ucraina-Belarus) și Prut (Ucraina-Moldova). Disponibil pe http://www.blacksea-riverbasins.net

23. Noua lege a apelor nr.272 din 23.12.2011. (intrată în vigoare la 26.10.2013).

24. Planul de Gestionare a bazinului hidrografic Dunărea 2009-2015. ICPDR. Vienna, Austria.2009

25. Raport referitor la JFS al apelor subterane în țările din cadrul proiectului, Aprilie-Iulie 2013. Disponibil pe http://www.blacksea-riverbasins.net.

26. Raportul 1 de gospodărire a apelor. Agenția „Apele Moldovei". 2017.

27. Towards a guidance on Groundwater Chemical Status and Threshold Values.Versiunea nr.:3.1 27 Iunie 2008. Autor(i): Drafting Group WGC-2 Status Compliance and Trends; Lead J. Grath, R. Ward, Co-lead: H. Legrand, A. Blum, H.P. Broers.

28. Zăvoianu, I., Morfometria bazinelor hidrografice. București, 1978.

COMPETENT AUTHORITIES

Implementation of management Plan, Programme of measures will be performed under the supervisor of Camenca sub-basin Committee as well as district and local public administrations from the basin.

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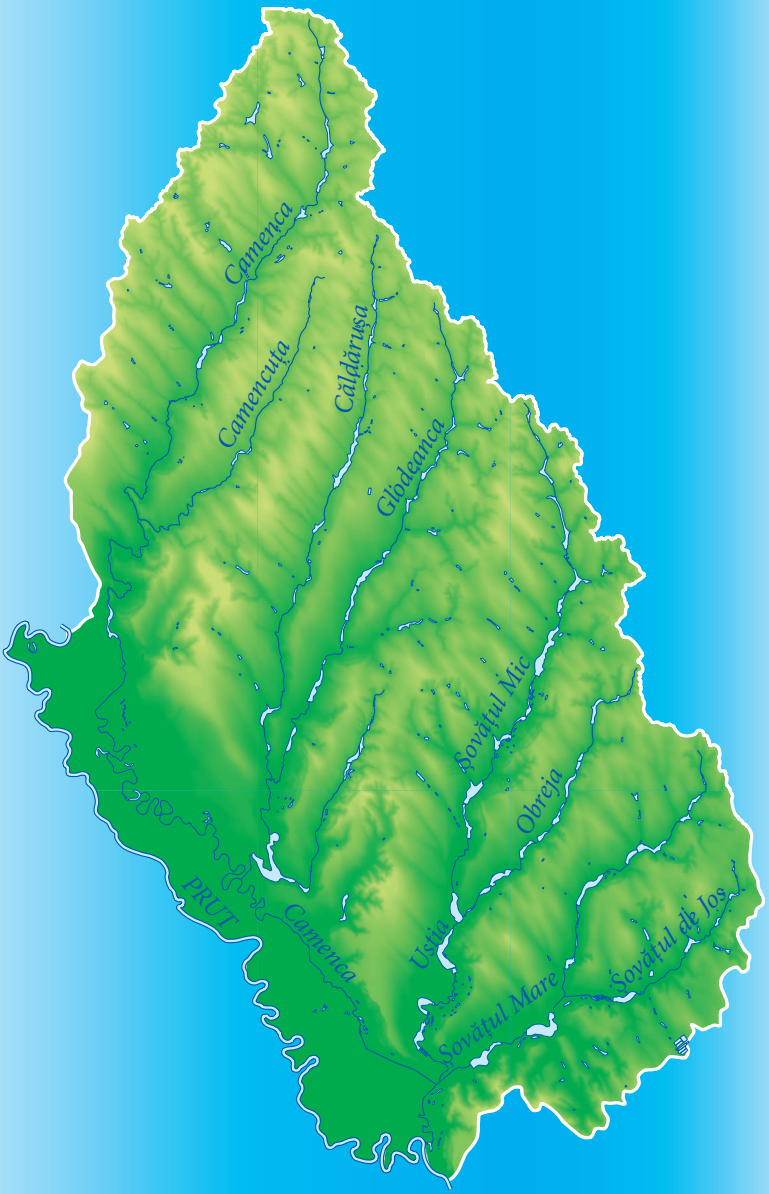

THE CAMENCA RIVER BASIN MANAGEMENT PLAN

CYCLE II (2019-2024)

APELE MOLDOVEI AGENȚIA

Schweizerische Eidgenossenschaft
Confédération suisse
Confederazione Svizzera
Confederaziun svizra

Swiss Agency for Development and Cooperation SDC

AUSTRIAN DEVELOPMENT COOPERATION

AFPMDD