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EUWI+ EU WATER INITIATIVE FOR EASTERN PARTNERSHIP

MASTER PLAN ON WATER SUPPLY AND SANITATION FOR THE NIRNOVA RIVER BASIN

Republic of Moldova

Implementation strategy

UNECE

OECD BETTER POLICIES FOR BETTER LIVES

umweltbundesamt ENVIRONMENT AGENCY AUSTRIA

International Office for Water

Chisinau, 2023

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1.1. Summary

This document describes the objectives to be met at national, regional and local levels in order to comply with the requirements of national legislation for the water and sanitation sectors. It presents a summary of the objectives and targets assumed by the Republic of Moldova through policy and planning documents. These are in fact the Republic of Moldova's national targets for the water sector, which it intends to achieve by developing the appropriate water and wastewater infrastructure.

The Association Agreement between the European Union and the Republic of Moldova is a binding legal document and was ratified by the European Parliament on 13 November 2014. The Republic of Moldova is harmonising its legislation with that of the European Union in the field of water quality and resource management. To this end, harmonisation with the Directive 98/83/EC *on the quality of water intended for human consumption* was achieved by Law No. 182 of 19 December 2019 *on drinking water quality*, and harmonisation of the Directive 91/271/EEC of 21 May 1991 *on urban wastewater treatment* was achieved by the GD No. 950 of 25 November 2013 for the approval of the *Regulation on the requirements for collection, treatment and discharge of wastewater in the sewerage system and/or in water bodies for urban and rural localities*.

1.2. National water supply and sanitation targets

The Association Agreement between the European Union and the Republic of Moldova is a binding legal document and was ratified by the European Parliament on 13 November 2014. The Republic of Moldova is harmonising its legislation with that of the European Union in the field of water quality and sanitation.

The base scenario of the National Development Strategy "Moldova 2030" approved by the GD No. 377 of 10 June 2020 assumes that the percentage of people with access to water from safe sources should rise to 91.8% and the percentage of people with access to improved sanitation services should reach 81.4%.

The general objective of the Water Supply and Sanitation Strategy 2014-2028 approved by the GD No. 199/2014, subsequently amended by the GD No. 442 of 01/07/2020, is the gradual provision of access to drinking water and adequate sanitation for all localities and inhabitants of the Republic of Moldova, thus contributing to improving health, dignity and quality of life and to the economic development of the country. More specifically, meeting the requirements of the country's population for improved, efficient and cost-effective water supply and sanitation services will be achieved through:

a) implementation of water safety plans and compliance with the quality requirements of the Directive 98/83/EC on water intended for human consumption;
b) reduction by 50% of water-related epidemics and possibly water-borne diseases;
c) achievement of the Millennium Development Goal target to supply safe drinking water to at least 65% of the population by 2020 (instead of 2015);
d) achievement of the Millennium Development Goal target to connect 65% of the population to sewerage systems by 2025 at the latest (instead of 2015);
e) progress in the implementation of urban waste water treatment in accordance with the requirements of Directive 91/271/EEC.

The above-mentioned objectives show that the government of the Republic of Moldova has made a firm commitment to developing the WSS sector in order to eliminate existing problems, as well as to reduce the qualitative gap with other countries, especially European ones. At the same time, it should be noted that, in general, the structures currently involved in the WSS sector have failed to follow a clear strategy to develop the sector and establish a benchmark, due to both management problems and insufficient funds. These issues are also identified in the strategy, which provides for a set of specific measures to address them.

With regard to the necessary institutional changes, the strategy requires a different approach from the current one, which would eliminate the monopoly character of service provision and the negative consequences for captive consumers. The provision of water and sanitation will be based on the promotion of market economy principles and attraction of private capital, in order to ensure competition.

The stakeholders/ interested parties will ensure the initiation of the following measures:

a) Central and district authorities:

- planning and programming in a coherent and phased manner of the development of an improved water supply and sanitation infrastructure for all communities, based on well-defined, transparent selection criteria, including the involvement of beneficiary communities;
- mobilising adequate national and international financing resources for investments in water supply and sanitation infrastructure, good coordination between the government institutions and subordinate structures and local public authorities;
- coordinating the monitoring of progress generated by the infrastructure investments in order to verify whether they correspond to the objectives of the strategy and other general socio-economic development objectives;
- strengthening the capacity of water operators, by consolidating those that are efficient, to provide drinking water supply and sanitation services with the appropriate quality parameters and at acceptable prices that ensure both cost recovery and the continuation of the activity.

b) Local public authorities:

- organising compulsory auctioning of services in all cases where the operator records financial losses or is unlikely to ensure appropriate quality for the water and sanitation services it provides;
- reorganising municipal enterprises subordinated to the public authorities;
- ensuring transparency in the process of delegating the management of public water supply and sanitation services;
- associating to form inter-community structures in order to produce common decision to jointly develop water supply and sanitation services. These agreements should include long-term planning documents, investment programmes, service performance indicators, and liability and asset registers.

c) National Agency for Energy Regulation (NAER):

- issuing and withdrawing operating licences.

d) Water operators/enterprises:

- extending the area of water supply and sanitation services provision to other administrative-territorial units, with economic viability;
- achieving minimum managerial standards (annual business plan and performance verification) and operational performance (quality of services and statement of positive profit-loss ratio);
- seeking mergers with other water operators.

At the same time, the strategy requires that district and local authorities stimulate community management, represented by rural water consumer associations, in areas where the water quality allows the development of local solutions and no complex water treatment solutions are needed/required.

For the purposes of the above, the strategy provides an intermediate target of creating regional companies to provide water supply and sewerage services for at least 100,000 inhabitants, excluding communities with fewer than 5,000 inhabitants in the case of sewerage, and 500 inhabitants in the case of connection to the drinking water supply.

The final regionalisation goal is the creation of 3-5 regional companies to provide water supply and sanitation services for the entire population of the Republic of Moldova, except for small villages.

Given the figures mentioned in the strategies, such a large increase in the connection rate to water and sanitation services in just a few years is unrealistic.

Both in the Directive No. 91/271/ECC (article 2.4) regarding urban wastewater treatment, and in Annex 8 – Methodology regarding the delimitation of agglomerations of the GD No. 950 of 25 November 2013 for the approval of the Regulation on the requirements for collection, treatment and discharge of wastewater in the sewerage system and/ or in water bodies for urban and rural localities, updated on 19 February 2020, the term "agglomeration" is defined as an *area where the population and/ or economic activities are* ***sufficiently concentrated*** *in terms of urban waste water to be collected and directed to a sewage treatment plant or to a final discharge point"*. An investment in such a system may only be supported if it generates sufficient revenue to cover all system costs. The income generated by an investment depends on the concentration of the inhabitants and/ or on the economic activities in the respective area. Therefore, the maximum geographical extent of an agglomeration should not be greater than the area in which the investment could be met by the income of those in the area likely to pay for the service. The settlements that comply with this constraint are "agglomerations" in terms of the implementation of the Directive.

In conclusion, the Republic of Moldova, aware of the difficulties in the water supply and sewerage sector, has made commitments to increase the degree of access to water supply and sanitation in order to ensure a path of economic development.

The responsibilities for achieving these national targets have been shared with all relevant actors, in particular with local public authorities and operators. However, local authorities will need to consider the complexity of the whole system and understand that their efforts will be more visible and feasible if coordinated at district level. In this regard,

local authorities will have to work under the coordination of the district councils. From this perspective, "middle management" (the district represented by the council) will play an essential role to facilitate the transition from policies adopted in the field to clear actions implemented by direct legal officials (local public authorities).

1.3. Districts development strategies

Starting from the national objectives, during the elaboration/ development of this Master Plan, the objectives for the water supply and sanitation system and service were identified and approved by the Nisporeni and Hincesti district council, in order to ensure both the needs of the district and attempt to achieve national targets. The district targets are understood to be as ambitious as possible in relation to the degree of affordability identified for the district to provide a sustainable service.

Neither the Sustainable Development Strategy of Nisporeni district (2013-2020) nor the Socio-economic Development Strategy of Hincesti district (2013-2020) set clear objectives and targets for the development of the water and sanitation sector. At the time of writing this document, both districts are working on updating their development strategies (2021-2030). In the absence of other information, the closest document that may be assimilated to these strategies is the present MPWSS. The MPWSS of the Nirnova river basin is in accordance with the Development Strategy of Nisporeni and Hincesti Districts. However, during the development of this plan, the targets for achieving 100% connection to the water supply and sanitation system for the whole region were identified as potentially achievable by 2027/2033.

The targets estimated to be achieved during the implementation of this Master Plan are the following:

Connection rate	2021	2027	2033
Drinking water	43%	71%	100%
Sewerage	9%	41%	86.7%

The drinking water supply connection rate estimated by the consultant takes into account an infrastructure that provides adequate water in terms of quantity and quality. The sewerage connection rate takes into account the connection to a centralised, grouped or individual sewerage infrastructure that collects and treats wastewater up to the parameters established by the legal and normative framework.

In order to achieve these objectives and targets, an institutional reform is needed to establish clear responsibilities for all stakeholders/involved parties.

1.4. Target tasks of water supply and sanitation

The district targets must follow the nationally established objectives and targets for the development of the water supply and sanitation sector.

The main difficulties in achieving the national targets are:

- Lack of strategic planning for the development of the water supply and sewerage systems, based on the real financial possibilities of the country;
- Lack of financial coverage of the need for investments in the water supply and wastewater sector;
- Circulation of technical regulations of the Soviet Union for the design of the water supply and sewerage infrastructure. These are outdated and inadequate and promote insufficient investment.

The target tasks regarding the water supply at the level of the Nirnova basin are drawn up based on the national objectives. Such targets will be transposed at the district level and then at community level depending on their size and their contribution to achieving the basin level targets.

The Nirnova River Basin takes into account the following objectives, agreed by the district councils during the working sessions during the period of elaboration/ development of this MPWSS:

- Providing access to drinking water in accordance with legal quality standards to consumers in the Nirnova basin;
- Providing sewage and high-standard wastewater treatment facilities for the entire region of the Nirnova basin;
- Developing a sustainable and efficient water infrastructure that will allow the authorities and operator/ operators to provide the service at acceptable rates, while ensuring the protection of groundwater and surface water resources;
- Developing, maintaining and improving an institutional system that will allow the operation of water infrastructure through the use of delegation contracts and water supply service regulations, including long-term investment planning.

In the implementation process, all water supply systems developed in the last 5-10 years in rural areas and in Nisporeni town will be considered, as long as they are technically compatible with legal standards and allow interconnection with the regional infrastructure.

Currently, the connection rate to a public drinking water system is 34%. However, the existing infrastructure faces several difficulties that result in the supply of poor quality water and water leaks, making it technically unsustainable. The connection rate estimated by the consultant concerns a new infrastructure that will ensure adequate water from a qualitative and quantitative point of view.

2. DEVELOPMENT STRATEGY – WATER SUPPLY

All localities in the Nirnova basin must reach a level of total compliance with the water supply system by 2033. The top priority will be to ensure an adequate source in terms of quality[1] and quantity.

For the development of water supply systems the following main aspects were considered in terms of efficiency:

- Use of available water sources in each locality/ area (selection of the best sources);
- Surface water sources preferred over groundwater sources, in terms of quality and quantity;
- Comparison of local sources (wells/ catchments) with regional sources, in terms of efficiency;
- Use of pipes and other materials with similar qualities to those already used on the market;
- Use of related facilities that are easy to maintain and sufficiently durable.

Taking into account the objectives of the districts, the main priority is to ensure an appropriate source in terms of water quality and quantity. The process of implementing the MPWSS at the level of the Nirnova Basin, in order to achieve the previously defined goals, will be ensured by a strategy, which will provide the necessary measures, responsible factors and a calendar. The development strategy shall take into account the short- and long-term action programme set out in Chapter 10 of the MPWSS, as well as the national targets set out in the previous chapter.

1 In accordance with national legislation.

The water supply options studied in the Master Plan were presented at the working sessions held on 26 March and 1 April 2021 based on the document "Master Plan for Water Supply and Sanitation of the Nirnova River Basin". These working sessions were attended by local mayors, Nisporeni and Hincesti District Councils, district presidents, representatives of the Ministry of Agriculture, Regional Development and Environment, representatives of the Ministry of Economy and Infrastructure, and representatives of the Agency "Apele Moldovei". Following the consultant's presentation of the selected and studied optimal scenarios, it was proposed to implement the most appropriate solution, Regionalised Scenario AA1, which provides for the regionalisation of water services in three large areas, see figure below:

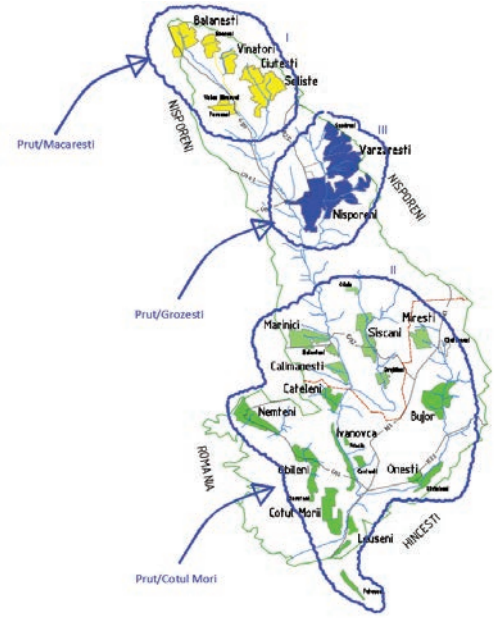


Figure 2.1. Regionalised water supply scenario (WS1)

- **Area I** the localities in the northern part of Nisporeni river (7,700 inhabitants) – water supply from the Prut/Macaresti aqueduct (Romania);
- **Area II** the communities of Hincesti district and the communities in the southern part of Nisporeni district (17,700 inhabitants) – raw water supply from Prut/Cotul Morii;
- **Area III** Nisporeni town and Varzaresti commune, Nisporeni district (20,000 inhabitants) – raw water supply from the river Prut/Grozesti.

The main implementation activities for each project are given below and detailed in Chapter 10.3.5.

Activity 1: Cooperation between district and local public authorities for the provision of water and sewerage services;

Activity 2: Local and regional planning and programming activities;

Activity 3: Infrastructure for water services provision;

Activity 4: Development of institutional infrastructure and capacities;

Activity 5: Information activities.

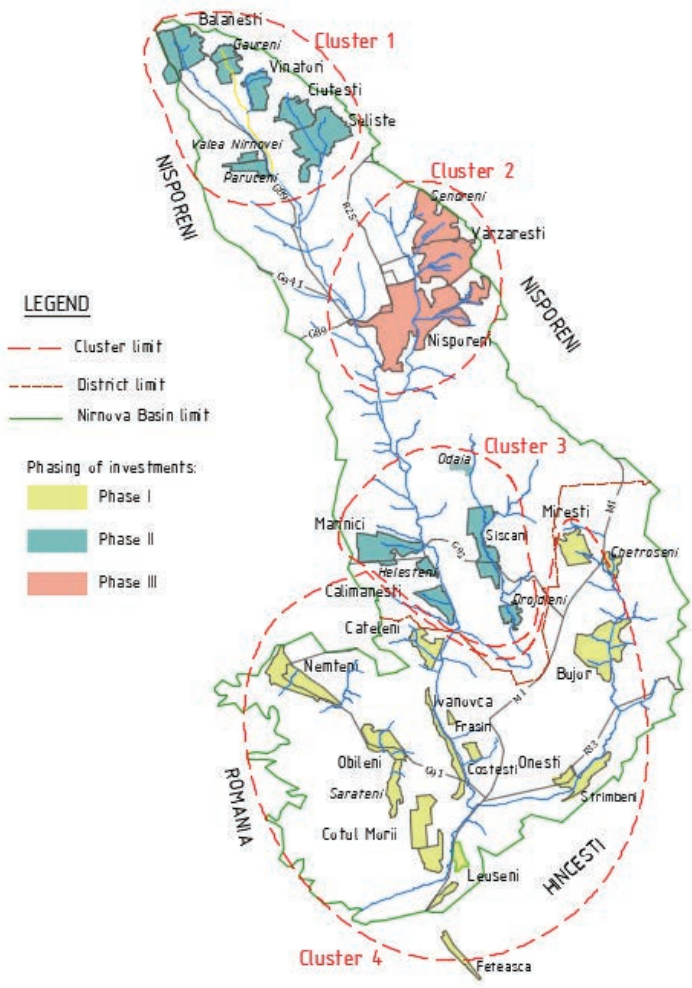


Figure 2.2. Phasing of investments in water infrastructure

Phase 1 is planned for 2022-2027. Phase 2 is divided into two parts: extension of the "Lunca Prutului" aqueduct in Cluster 3, which is planned for 2022-2027; and investments in the water infrastructure in Cluster 1, which are planned for 2028-2033. Phase 3, which provides for the expansion of the infrastructure in Cluster 2, is planned for 2028-2033. The following table shows the general development strategy for the Nirnova basin, which includes the investment and institutional measures, implementation periods and general costs.

Tabel 2.1. General development strategy

Period	Action	Estimated costs, EUR
2021 (short term)	➢ **Investment measures** • Consolidation of knowledge about water sources by conducting hydrogeological studies (Balanesti, Gaureni, Vinatori, Calimanesti, Marinici, Miresti and Cateleni); • Completion of the construction of water supply systems (Gaureni, Valea Nirnovei, Seliste, Drojdieni, Siscani and Marinici); • Improvement of water quality from the source of existing centralised systems (bactericidal installations for the catchments from Valea Nirnovei and Miresti). Arrangement of sanitary protection areas of water sources (Balanesti, Gaureni, Cateleni, Onesti, Strimbeni); • Guarantee of water distribution through Active Loss Control; • Implementation of participatory governance; • Training/ instructions for technical services; • Action to inform and mobilise the population; • Commissioning of the "Lunca Prutului" aqueduct, which will provide drinking water to over 14,000 inhabitants from 15 rural communities in Hincesti district.	**156,000.00**

Period	Action	Estimated costs, EUR
	➢ **Institutional measures** • The institutional measures described in Chapter 12 must be initiated in the first period before the implementation of the investment measures, and continued in the following periods. The assistance, monitoring and quality assurance capacities need to be established (more or less) at the central level.	
2022 – 2027	➢ **Investment measures** (2022 – 2027) • Construction of a water infrastructure inside rural communities in Hincesti district included in the project "Lunca Prutului" (Cluster 4); • Extension of the "Lunca Prutului" aqueduct up to Marinici commune, Calimanesti village and Siscani commune (Cluster 3); • Construction of a water infrastructure within Marinici commune, Calimanesti village and Siscani commune (Cluster 3); • Extension of the distribution networks of the localities in Cluster 1 with the supply from the existing sources.	**3,910,000.00**
2028 – 2033	➢ **Investment measures** (2028 – 2033) • Extension of the raw water treatment plant from Prut River/Grozesti for Nisporeni town and Varzaresti commune from a capacity of 32 l/s to 64 l/s; • Construction of water tanks in Varzaresi commune and extension of distribution networks in Nisporeni town and Varzaresti commune of 58.4 km; • Construction of an aqueduct from the Prut/Macaresti source for Balanesti commune, Vinatori village, Seliste commune and Ciutesti commune.	**3,314,000.00**

2.1. Short-term investment actions

The priority investments for each locality are needed to improve the level of accessibility for all residents to safe, high-quality water. The detailed actions and costs for each locality may be found in Table 10.5 of the MPWSS.

Tabel 2.2. Short-term priority investments

#	Locality	Short-term investments, EUR
1	Balanesti	5,780.00
	Gaureni	2,780.00
2	Vinatori	8,900.00
3	Ciutesti	3,700.00
	Valea Nirnovei	280.00
4	Seliste	30,820.00
	Paruceni	3,000.00
5	Siscani/ Drojdieni/ Odaia	41,450.00
6	Marinici	52,600.00
	Helesteni	3,000.00
7	Calimanesti	580.00
8/9	Nisporeni/ Varzaresti/ Sendreni	1,150.00

#	Locality	Short-term investments, EUR
10	Miresti/ Chetroseni	705.00
11	Cateleni	3,430.00
12	Bujor	6,250.00
13	Nemteni	2,500.00
14	Obileni	2,300.00
15	Ivanovca/ *Costesti/ Frasin*	250.00
16	Onesti	2,780.00
	Strimbeni	3,980.00
17	Cotul Morii/ Sarateni	650.00
18	Leuseni/ Feteasca	980.00

The largest investments to increase the rate of connection to water services are required in the following localities:

- **Marinici village** – construction of a new sonde/ well according to the existing project (approx. EUR 40,700);
- **Siscani commune** – completion of construction works to put the water systems into operation in Siscani village and Drojdieni village (respectively approx. EUR 25,500.00 and EUR 10,500.00);
- **Seliste village** – completion of construction works to put the water system into operation (approx. EUR 27,500.00).

The implementation of short-term actions is largely the responsibility of LPAs with the support of the existing operators, District Councils and other relevant institutions.

2.2. Long-term investment actions

In the long-term investment plan, the costs were broken down by water supply area (cluster), depending on the proposed implementation phases. This long-term investment plan was prepared based on the Scenario WS1 – Regionalised.

2.2.1. Cluster 4

The project "Drinking water supply complex of villages in Hincesti district, Phase I – localities in the Prut river meadow (Lunca Prutului Project)" is devised to ensure the drinking water supply for 12 localities in 9 ATUs in Hincesti district, **Cluster 4** (Nemteni, Obileni, Cateleni, Cotul Morii (new village), Sarateni, Leuseni, Onesti, Strimbeni, Costesti, Miresti and Bujor). Once it is completed and put into operation in the near future, it is essential that the localities included in this project be provided with the necessary local water infrastructure. The total population of Cluster 4 estimated for 2033 is 14,440 inhabitants.

Thus, in order to be able to use this regional aqueduct at maximum capacity, according to the estimates, total investments amounting to EUR 2,710,000.00 are required, see details in the table below.

Tabel 2.3. Investments in water infrastructure for Cluster 4 (Phase I)

No.	Water supply system	Population, 2033	Infrastructure	Investments, EUR	Cost of investment per capita, EUR/cap.	Annual O&M costs, EUR
1	com. Miresti	1,110	Miresti water tank-25m^3	27,500.00		
			Chetroseni water tank - 50m^3	31,900.00		
			Distribution networks – 5,0 km	114,750.00		
			Total amount	**174,150.00**	**157.00**	**13,587.00**
2	s. Cateleni	1,150	Distribution networks – 11,7 km	263,250.00		
			Total amount	**263,250.00**	**229.00**	**9,162.00**
3	s. Bujor	3,260	Distribution networks – 25,0 km	603,750.00		
			Total amount	**603,750.00**	**185.00**	**17.001.00**
4	s. Nemteni	1,540	Distribution networks – 24.4 km	558,760.00		
			Total amount	**558,760.00**	**363.00**	**14,170.00**
5	s. Obileni	1,530	Distribution networks – 17.1 km	392,445.00		
			Total amount	**392,445.00**	**257.00**	**10,480.00**
6	com. Ivanovca	930	Water tank - 50m^3	31,900.00		
			Distribution networks – 14.0 km	315,000.00		
			Total amount	**346,900.00**	**373.00**	**7,888.00**
7	com. Onesti	1,460	Distribution networks – 0,7 km	14,910.00		
			Total amount	**14,910.00**	**10.00**	**11,143.00**
8	com. Cotul Morii	1,640	Distribution networks – 10,5 km	240,450.00		
			Total amount	**240,450.00**	**147.00**	**8,795.00**
9	com. Leuseni	1,820	Distribution networks – 5,5 km	114,750.00		
			Total amount	**114,750.00**	**63.00**	**8,149.00**
TOTAL INVESTMENTS - CLUSTER 4				**2,710,000.00**	**188.00**	**100,376.00**

2.2.2. Cluster 3

According to the technical data of the "Lunca Prutului" Project, the water capture and treatment installations are provided at a capacity of 2,470 m³/day, which can also supply water to the localities in Cluster 3 – Marinici, Helesteni, Calimanesti, Siscani, Drojdieni and Odaia, which have a cumulative average flow of 480 m³/day. The total population for 2033 for the average growth scenario is estimated at 5,540 inhabitants. The group of localities Marinici, Helesteni and Calimanesti will be connected to the aqueduct that connects SP-4 to the reservoirs from Cateleni village, and Siscani commune will be connected to the aqueduct that connects SP-6 to the reservoirs from Miresti commune.

Tabel 2.4. Investments in water infrastructure for Cluster 3 (Phase II)

No.	Water supply system	Population, 2033	Infrastructure	Investments, EUR	Cost of investment per capita, EUR/cap.	Annual O&M costs, EUR
1	com. Marinici	2.357 Inclusiv: Helesteni – 277	Pumping station 20.2 m³/h	20,000.00		
			Adduction – 2.2 km	43,000.00		
			Water tank – 100 m³	41,800.00		
			Distribution networks Marinici – 19.5 km	447,500.00		
			Distribution networks Helesteni– 4.0 km	90,000.00		
			Total amount	**642,300.00**	**273.00**	**16,191.00**
2	s. Calimanesti	743	Adduction – 3.2 km	63,000.00		
			Water tank – 75 m³	31,900.00		
			Distribution networks – 13.0 km	292,500.00		
			Total amount	**387,400.00**	**521.00**	**8,764.00**

No.	Water supply system	Population, 2033	Infrastructure	Investments, EUR	Cost of investment per capita, EUR/cap.	Annual O&M costs, EUR
3	com. Siscani	2,445 Including: Drojdieni – 336 Odaia - 138	Pumping station Odaia – 1.8 m^3/h	10,000.00		
			Adduction Siscani – 5.4 km	107,800.00		
			Adduction Drojdieni – 2.7 km	54,600.00		
			Adduction Odaia – 1.3 km	25,200.00		
			Water tank Odaia – 15 m^3	26,400.00		
			Distribution networks Odaia – 1.8 km	32,200.00		
			Total amount	**256,200.00**	**105.00**	**23,690.00**
TOTAL INVESTMENTS - CLUSTER 3				**1,285,900.00**	**232.00**	**48,645.00**

2.2.3. Cluster 1

For the water supply to localities in **Cluster 1,** it is proposed to use water resources from Romania. The drinking and industrial water supply company "Apavital SA" Iasi. currently has sufficient water reserves to supply four districts of the Republic of Moldova with drinking water: Ungheni, Nisporeni, Falesti and Glodeni. In this regard, an agreement was concluded between Romania and the Republic of Moldova in which it was agreed to build a centralised water supply system of Moldovan localities from Gorban source and additionally from Prisacani – Moreni source by crossing the Prut River in the area of Macaresti locality. The total number of inhabitants in Cluster 1 estimated for 2033 in the average scenario is 7,760.

Although several technical projects are being carried out in this regard, this project is currently more at discussion level, which may lead to an excessively long implementation period. Therefore, the technical proposal for this area is to continue investing in the water infrastructure in localities that have their own water sources and do not require major investments (e.g. arrangement of water catchments, use of existing sondes/ wells, expansion of distribution networks etc.), while taking into account at the time of design/ construction the perspective of connection to the Prut/Macaresti line in order to minimise further additional investments. The list of recommended local water sources for use for each locality is detailed in Table 9.4 of the MP on WSS.

Balanesti locality has sufficient water resources from the existing sonde/ well but the water quality is not drinkable since it exceeds several parameters such as ammonia (70 times more than the norm), hydrogen sulphide (31 times more than the norm), fluorine (6 times more than the norm) and soluble dry residue (2.5 times more than the norm). In order to treat the water up to the quality allowed for human consumption, several technological steps are required:

- Pre-filtration of raw water, with storage of raw water in the reaction tank:
  - Sedimentary filtration;
  - Oxidation of ammonia and hydrogen sulphide by oxidant dosage (sodium hypochlorite);
  - Pressure aeration to increase the quality and oxidation time.
- Final filtration of pre-filtered water, with storage of treated water in the drinking water tank:
  - Sedimentary filtration (turbidity, colour);
  - Organic filtration (odour, taste, chlorine oxidation);
  - Filtration/ purification/ desalination of water using semi-permeable membranes (fluorine etc.);
  - Conditioning of treated water;
  - Final disinfection/ sterilisation of UV-treated water.

The water treatment equipment for a flow of 5 m^3/h is estimated at EUR 200,000. But this requires other investments such as the construction of a technical unit comprising sandwich panels with autonomous heating and ventilation, a container house for the operator, and fencing, road access etc. The total investment is estimated at EUR 380,000.

Moreover, according to the economic analyses performed within the four water supply scenarios (see the Master Plan), the operation and maintenance costs for the water treatment are significantly higher for Scenario WS0 with a water treatment facility from the sonde/ well for Balanesti locality only. In addition, the scenarios featuring supply from the (regionalised) main aqueduct require less specialised operating personnel than scenario WS0 (separate local water supply).

Based on the above, for the locality of Balanesti it is proposed to make investments in arranging existing water springs (preceded by a detailed hydro-geological study), to build an adduction leading to the locality, and to extend the adduction networks for the N, NE and E areas. The NW region includes a higher area, home to around 10 households, that from a hydraulic point of view would be unlikely to satisfy free pressure in the network of a water column of at least 10 m. Thus, the households in this area will be fed individually, or a common tap/drinking fountain will be installed.

In order to establish the emplacement of a new water tower, it is necessary to identify a location near the existing water tower in the northern part of the locality. Given the fact that there are no other available locations in the jurisdiction of Balanesti commune, it is proposed to consult Milesti Village Hall in this regard.

Considering that the locality of **Gaureni in Balanesti** commune has already built a water supply system serving more than half of its inhabitants, and that the area in the north without a centralised water system is less concentrated and has a more complex topographic structure, it is proposed to connect it to the Macaresti aqueduct. If investments move faster, the construction and arrangement of water springs in the NE area, pumping station, adduction (1.3 km), tanks and distribution networks

(3.7 km) represent investment costs of over 170,000 EUR for fewer than 270 inhabitants. In addition, the O&M costs for scenario WS0 are double that of scenario WS1.

For **Vinatori** locality, it is proposed to initiate the design/construction works in order to supply water from the existing springs with the perspective of a subsequent connection to the Prut/Macaresti source. The investments in water catchments are not so high (approx. EUR 15,000) and may serve as a source of reserve water in the future. Priority investment is also needed in water tanks and distribution networks that would provide drinking water to public institutions and part of the population (approx. 5.0 km).

The localities of **Ciutesti** and **Seliste** are currently provided with water from springs and water sondes/ wells. While the water from **Ciutesti** springs corresponds to "drinking water" parameters, the water quality of the sondes/ wells in Seliste village does not satisfy the parameters for sulphate, sodium, ammonium, fluorine and iron. Thus, the connection to the Prut/Macaresti aqueduct will serve as a safe source of water for these localities, without large investments in water storage and distribution infrastructure.

For the shorter-term water supply of **Paruceni village, Seliste commune**, it is proposed to evaluate the real capacity of the water flows of the catchments that supply water to Valea Nirnovei village, Ciutesti commune. If these catchments are quantitatively sufficient, the water system could also be extended to Paruceni village 4 km away, or as a priority to supply drinking water to the kindergarten and some inhabitants located 2 km away.

For this area (Cluster 1), given the fact that the regional aqueduct with the connection from Prut/Macaresti is not yet viable and that the delivery date is not known, it is proposed to build the infrastructure in existing or new water sources that do not require additional major investments. This should partially solve the problem of drinking water, especially for public institutions such as schools and kindergartens. These works will be carried out for a period of 2-5 years depending on the budget and sources of funding.

Tabel 2.5. Investments in water infrastructure for cluster I (Phase II)

No.	Water supply system	Population, 2033	Infrastructure	Investments, EUR	Cost of investment per capita, EUR/cap.	Annual O&M costs, EUR
1	Com. Balanesti	2,110 Including: Gaureni - 495	Main pumping station – 50.0 m³/h	23,000.00		
			Adduction (towards Balanesti) – 10.4 km	208,600.00		
			Adduction (towards Gaureni) – 0.9 km	18,000.00		
			Water tank – 25 m³	27,500.00		
			Distribution networks (Balanesti) – 15.0 km	344,250.00		
			Distribution networks (Gaureni) – 3.7 km	83,250.00		
			Total amount	**704,600.00**	**334.00**	**23,611.00**
2	s. Vînatori	920	Adduction – 1.3 km	25,900.00		
			Water tank – 50 m³	31,900.00		
			Distribution networks – 10.0 km	225,000.00		
			Total amount	**282,800.00**	**307.00**	**6,109.00**
3	com. Ciutesti	1,780 Including: Valea Nîrnovei - 360	Adduction (Ciutesti) – 2.2 km	44,700.00		
			Total amount	**44,700.00**	**25.00**	**8,748.00**
4	com. Seliste	2,950 Including: Paruceni - 395	Adduction (towards Seliste) – 1.3 km	25,300.00		
			Adduction (towards Paruceni and V.N.) – 1.2 km	24,400.00		
			Water tank (Paruceni)– 25 m³	27,500.00		
			Distribution networks (Paruceni) – 4.0 km	91,800.00		
			Total amount	**169,000.00**	**57.00**	**11,678.00**
TOTAL INVESTMENTS- CLUSTER 1				**1,201,000.00**	**155.00**	**50,146.00**

Table 2.6. Priority investments in water infrastructure for Cluster I

No.	Water supply system	Population, 2033 (average scenario)	Infrastructure	Investments, EUR
1	Com. Balanesti	2.110 Including: Gaureni - 495	Water catchments (Balanesti)	15,000.00
			Pumping station	15,000.00
			*Water tank (Balanesti) – 25 m^3	27,500.00
			*Distribution networks (Balanesti) – 7.0 km	160,650.00
			Total amount	**218,150.00**
2	s. Vinatori	920	Water catchments	30,000,000
			*Water tank – 50 m^3	31,900.00
			*Distribution networks – 5.0 km	114,750.00
			Total amount	**170,650.00**
3	com. Ciutesti	1.780 Including: Valea Nirnovei - 360	-	-
			Total amount	**-**
4	com. Seliste	2.950 Including: Paruceni - 395	*Water tank (Paruceni)– 25 m^3	27,500.00
			*Distribution networks (Paruceni) – 2.0 km	45,900.00
			Total amount	**73,400.00**
			TOTAL INVESTMENTS- CLUSTER 1	**462,200.00**

* *Investments in water infrastructure that may be used when implementing the regionalised aqueduct provided it has been designed and built according to the norms/ rules and this perspective.*

2.2.4. Cluster 2

The supply area for **Cluster 2** is equivalent to the current and planned future coverage of the Prut/Grozesti system which currently serves part of Nisporeni and Varzaresti. There are plans to expand the raw water treatment plant on the Prut/Grozesti River from a capacity of 32 l/s to 64 l/s to provide drinking water to the entire area.

Table 2.7. Investments in water infrastructure for Cluster 2 (Phase III)

No.	Water supply system	Population, 2033	Infrastructure	Investments, EUR	Cost of investment per capita, EUR/cap.	Annual O&M costs, EUR
1	Or. Nisporeni	11,550	Extension of treatment plant – 32-64 l/s	350,000.00		
			Pumping station – 100 m^3/h	22,000.00		
			Distribution networks – 29.4 km	715,900.00		
			Total amount	**1,087,900.00**	**94.00**	**167,812.00**
2	com. Varzaresti	6,100 Including: Sendreni – 1,030	Adduction – 5.7 km	114,000.00		
			Water tanks – 600 m^3	121,000.00		
			Distribution networks – 29.0 km	706,200.00		
			Total amount	**941,200.00**	**154.00**	**1,369.00**
TOTAL INVESTMENTS - CLUSTER 2				**2,029,000.00**	**115.00**	**169,181.00**

O&M Costs

The operating, maintenance and administration costs considered in this MPWSS were based on the consultant's estimates, in correlation with similar work in the country. It should be emphasised that an exact calculation of these costs may be made on the basis of the detailed design, at least at the level of the feasibility study. For the master plan level of this document, the following costs were taken into account for the components of the water supply systems, including those for large objects consuming electricity (wells, pumping stations and water treatment plants):

- Material / chemical costs (related to the proposed measures)
- Electricity costs (related to the proposed measures)

- Staff costs
- Maintenance / repair costs (related to the proposed measures)
- Depreciation
- General administration costs.

The O&M costs were assessed on a percentage basis, starting from the above premises for all investments analysed in Chapter 9.

The O&M cost for the existing infrastructure is not included due to lack of data and this obviously leads to an incorrect global NPV (Net Present Value). An exception is the existing infrastructure in villages (storage and distribution); however, this does not take into account the fact that, due to the age of the existing infrastructure, the O&M costs may be higher. The detailed costs for each type of infrastructure are set out in Table 7 of Annex 7 of the MPWSS.

3. DEVELOPMENT STRATEGY – SANITATION

The development strategy for sanitation is based on district and national objectives. When developing the strategy, the requirements regarding the collection and treatment of wastewater in rural localities were taken into account. Where the installation of a wastewater collection and treatment system is not justified, either because it does not bring environmental benefits or because it generates high costs, individual systems or other appropriate systems shall be used to ensure the same level of environmental protection.

There are two possible approaches for complying with requirements to provide individual wastewater treatment systems suitable for agglomerations with more than 2,000 EI (equivalent inhabitant) where, in addition to centralised systems, individual wastewater treatment systems are also accepted, and where the technical, economic and geographical conditions do not allow the centralised collection of wastewater.

Individual wastewater collection systems may only be used after assessing each case by comparing the absence of environmental benefits to a centralised collection system, or in situations where a collection system would generate excessive costs. The individual wastewater collection systems recommended by the European Commission guidelines are mainly collection basins or other types of waterproof containers from which the wastewater is collected and transported regularly to a treatment plant. In addition, with regard to individual wastewater treatment systems, the only acceptable treatment processes are those that ensure effluents whose quality does not have adverse effects on the environment.

For this reason, the general strategy (for the transport of sludge and septic waste that is produced in significant quantities of wastewater and/ or

sludge) is to provide services that meet the anticipated demand for each settlement in a technically appropriate way. If a settlement currently has a large number of households with latrines, investing in a sewerage system covering the entire settlement is not considered rational in the short term. Therefore, the approach should be to invest in sanitation infrastructure.

3.1. Short-term actions

As most LPAs currently have the primary purpose of providing residents with drinking water, short-term sanitation actions are more about organisation than investment. As some new sanitation infrastructure projects are unlikely to be implemented in such a short time, it is proposed that the short-term programme focus on the following priorities:

- Strengthening knowledge about sanitation at LPA level;
- Strengthening inhabitants' knowledge about sanitation;
- Initiating the technical design regarding the sewerage system for each locality taking into account the possibility of connection to the main collectors proposed in this master plan;
- Completing works and putting into operation/ commissioning the treatment plant in Drojdieni village;
- Monitoring water quality at the entrance and exit of existing treatment plants (Nisporeni and Drojdieni);
- Carrying out a technical study of the construction solution of a main collector in Siscani village with water transportation to Drojdieni WWTP;
- Providing technical training of an operator for the treatment plant in Drojdieni village;
- Monitoring the quality of soil and groundwater near the discharge of untreated water into the soil in Nemteni. Carrying out concrete actions for the construction of a treatment plant;
- Elaborating/ developing/ updating the chapter "Water and sanitation" in the strategic plans for socio-economic development of the town/ village halls, harmonised with the National strategy for water supply and sanitation (2014 -2028) and the present Master Plan.

Strengthening knowledge about sanitation at LPA level

In order to develop the sanitation infrastructure at LPA level, it is necessary to carry out several actions such as:

- Integrating planning and programming at local level;
- Constantly communicating with target beneficiaries and strategic partners;
- Mobilising financial resources from all potential partners (local funds, NFRD (National Fund for Regional Development), National Ecological Fund (NEF), European funds);
- Providing and disseminating information necessary for the implementation of projects and ensuring their sustainability;
- Permanently monitoring activities, results, processes, project impacts;
- Ensuring continuous learning, based on implementation processes and adopting good practices;
- Improving cooperation between LPAs;
- Investing in the creation of an infrastructure for the provision of the public sanitation service;
- Strengthening the capacities of the LPA and the service provider;
- Informing and mobilising the population.

Strengthening inhabitants' knowledge about sanitation

Inhabitants need to know the negative effects on soil and groundwater of discharging domestic wastewater directly onto the surface of the soil or into cesspools/ cesspits that are not sufficiently waterproofed. The population should be informed of where to locate such cesspools/ cesspits and the minimum location distances from the wells, houses, rivers, streams.

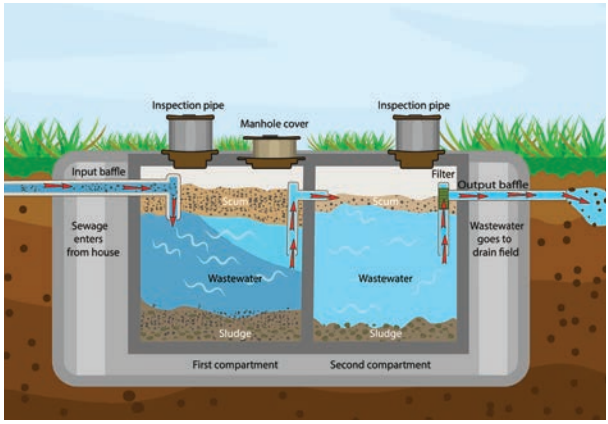
Example of construction of cesspool/ cesspit with reinforced concrete rings

Example of drainable basin made of fiberglass-reinforced polyesters

Other actions necessary to be implemented in the short term for rural localities that will not benefit the construction of a centralised sewerage system in the near future include the organisation of information campaigns targeting the population on the use of ecological methods for collection/ treatment/ discharge of domestic wastewater, such as:

- construction of sealed cesspools/ cesspits;
- installation of watertight drainable basins;
- use of ecological septic tanks;
- use of small-capacity treatment plants for a household or a group of households;
- construction of small-scale built-up wetlands (SCW) – a filter layer planted for secondary or tertiary wastewater treatment. The preliminarily treated wastewater (e.g. from a septic tank) is distributed over the entire surface of the filter and flows vertically through the filter. The water is treated through a combination of biological and physical processes. The SCWs are simple to operate and maintain and achieve high purification performance.

Example of a small capacity treatment plant



Example of an ecological septic tank

People who have sanitary facilities inside their homes and produce a sufficiently large volume of water should be informed about the specific features of such machines and the differences in technology/cost. The population should also be informed about the possibility of using Ecosan-type dry toilets instead of the usual latrines, which may be built in the home and make a great contribution to the protection of groundwater.

Organising information and awareness campaigns for the population on the activities of various projects and the importance of citizen participation in their implementation is paramount. These awareness and information campaigns may be conducted through the "door-to-door discussions" method and may be accompanied by community newsletters. Citizens should also be informed about the benefits of sanitation systems, and their responsibility to use the equipment correctly.

The initiation of the technical design regarding the sewerage system for each locality takes into account the possibility of connection to the main collectors proposed in this master plan.

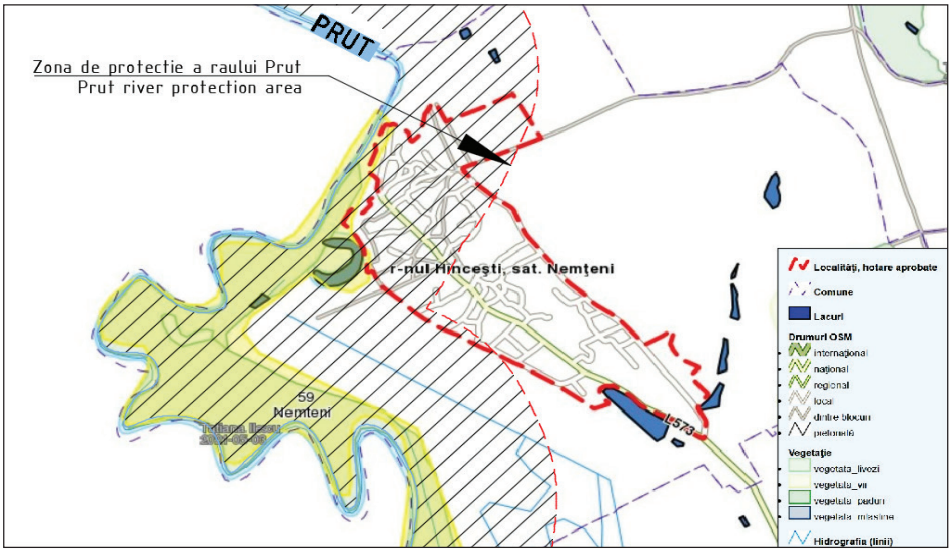
Initiation of technical design for sewerage systems

For localities that have a public water supply system, it is essential that LPAs should plan solutions for wastewater collection and treatment. To do so, the LPAs should initiate the technical design procedures or, if there are several collection and treatment solutions, a feasibility study should be carried out in order to establish the optimal solution for the locality or group of localities.

Concrete actions for the construction of a treatment plant in Nemteni village, Hincesti district

From an environmental point of view, in Nemteni locality there is a major need to invest in a wastewater treatment infrastructure, since wastewater is currently collected and discharged into a pit without being treated (see image below).

Procedures have been initiated to obtain funding for the construction of a CW-type (constructed wetlands) treatment plant, but due to the fact that the selected area is at increased risk of flooding, this project has been abandoned. The urgent solution for this area is the construction of a compact treatment plant of type MBBR (Moving Bed Biofilm Reactor – biological with mobile biofilter) or SBR (Sequencing Batch Reactor – biological with sequential supply).



According to the law[2] of the Republic of Moldova, the width of the protection zone for the water of the Prut River should be at least 1,000 meters. In this area, the construction of sewer collectors and wastewater treatment plants is prohibited without written approval from both the central authority responsible for the management of natural resources and environmental protection, and the central authority for health. Sewage collectors may be exceptionally constructed in cases where their location outside water protection areas is impossible (due to construction conditions, land conFiguretion or other reasons), provided that measures are taken to prevent pollution of rivers and water basins.

Thus, given the fact that all possible locations for a WWTP for Nemteni locality are located in the protection area of the Prut River (see figure above), the project for the construction of a possible WWTP will contain pollution prevention measures and will be coordinated with the competent authorities according to the legislation.

The average calculation capacity of the WWTP for the area with the existing sewer collector is 30.00 m^3/day (280 EI), which means an investment of approximately EUR 60,000.00.

2 Law No. 440 of 27/04/1995 with subsequent amendments of 15/06/2018 regarding the areas and strips for the protection of rivers and water basins.

3.2. Long-term investment actions

The sanitation options studied in the Master Plan were presented at the working sessions held on 26 March and 1 April 2021 based on the document "Master Plan for Water Supply and Sanitation of the Nirnova River Basin". These working sessions were attended by local mayors, Nisporeni and Hincesti District Councils, district presidents, representatives of the Ministry of Agriculture, Regional Development and Environment, representatives of the Ministry of Economy and Infrastructure, representatives of the "Apele Moldovei" Agency. Following the consultant's presentation of the selected and studied optimal scenarios, it was proposed to implement the most appropriate solution – Regionalised scenario S1 which involves 7 clusters based on the assumption of neighbourhood settlements. Table 3.1 summarises the regionalised solution S1.

Tabel 3.1. Technical characteristics – Sanitation scenario S1 (Regionalised)

Cluster	Area served	Regional			Local	
		WWTP, EL	Collector, km	WWPS, EL	SP, pc.	WWTP, EL
1	Balanesti, Gaureni, Vînatori, Ciutesti Seliste, Valea Nîrnovei and Paruceni	8,150	15.4	Vînatori – 1,482	5	68.9
2	Nisporeni, Varzaresti, Sendreni	14,450	-	-	1	71.9
3	Siscani, Drojdieni and Odaia	2,570	2.5	Odaia – 145; Siscani – 2,215	10	26.0
4	Marinici, Helesteni, Calamanesti, Cateleni, Nemteni, Ivanovca, Costesti, Frasin, Obileni, Sarateni, Cotul Morii, Leuseni and Feteasca	12,290	21.1	Nemteni – 1,614; Sarateni – 3,815; Caliman.– 4,459; Ivanovca – 5,434	12	135.2
5	Miresti and Chetroseni	1,170	1.0	-	-	19.7
6	Bujor	3,430	0.6	-	1	22.0
7	Onesti and Strîmbeni	1,530	0.2	-	-	9.3

WWTP – wastewater treatment plant
WWPS – wastewater pumping station
EL – equivalent inhabitants

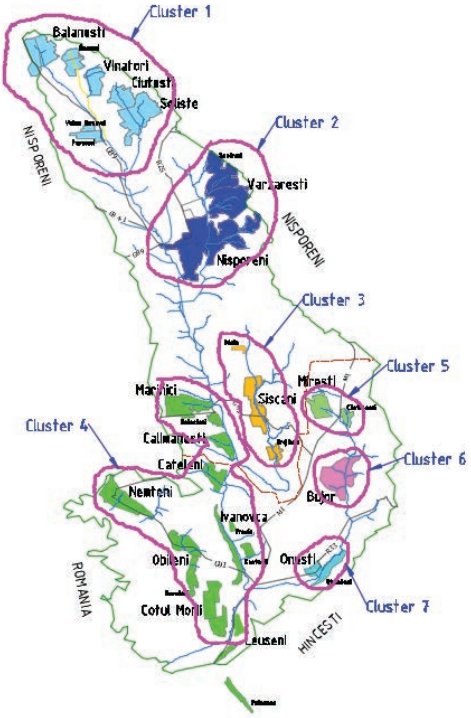
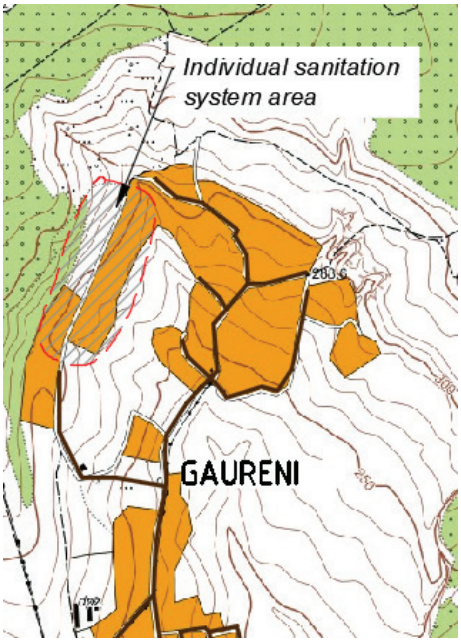


Figure 3.1. **Scenario S1 selected for sanitation**

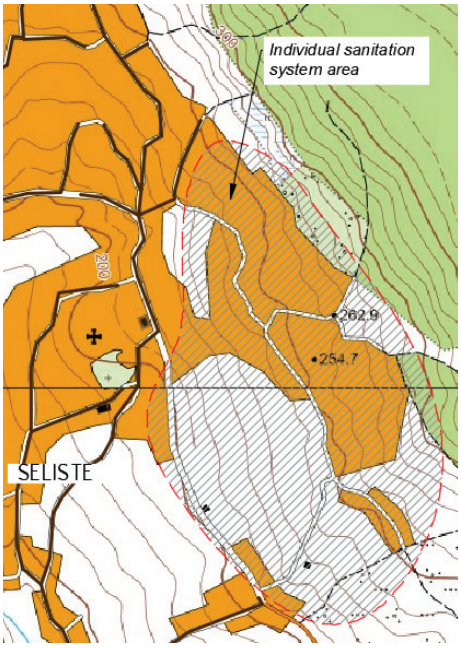
3.2.1. Cluster 1

Cluster 1 consists of rural localities in the north of Nisporeni district. The sewer collector consists of 13.0 km of pipes with diameters between 150-300 mm. The map featuring the location of the pumping stations, WWTP and the planned sewerage networks can be found in Annex 6. Due to the topography of the land, the collector is mostly gravitational except for the area in Vinatori locality, where it is necessary to build a wastewater pumping station.

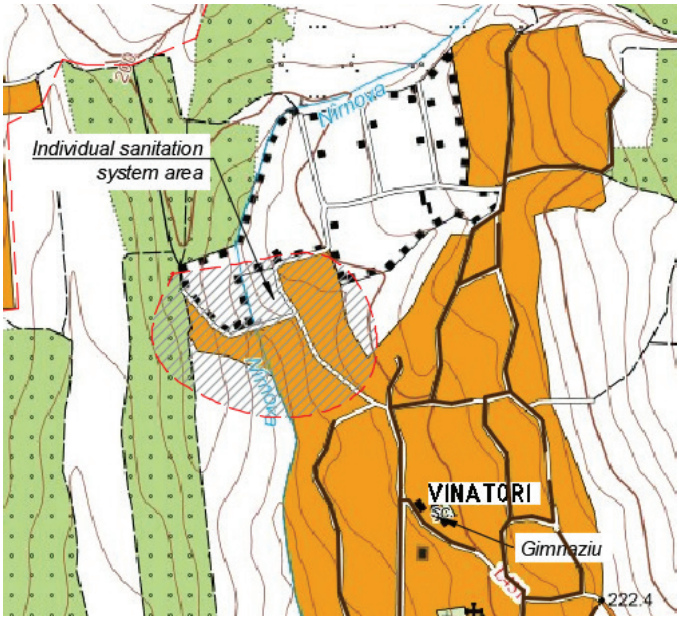
In order to estimate the necessary infrastructure, it was assumed that at least 90% of the population would be provided with sewerage networks. For some areas, due to the topographic conditions of the land or the location at greater distances from the locality, it is assumed that inhabitants will rely on an individual sewerage system, consisting either of the construction of watertight cesspools/ cesspits, septic tanks, or involving pumping wastewater to the centralised sewerage system. Local pumping stations have been provided for Balanesti and Ciutesti localities. The images below show the discovered areas that require an individual sewer system.



Gaureni village, Balanesti commune – Northwest



Seliste village – Northeast



Vinatori village – Northwest

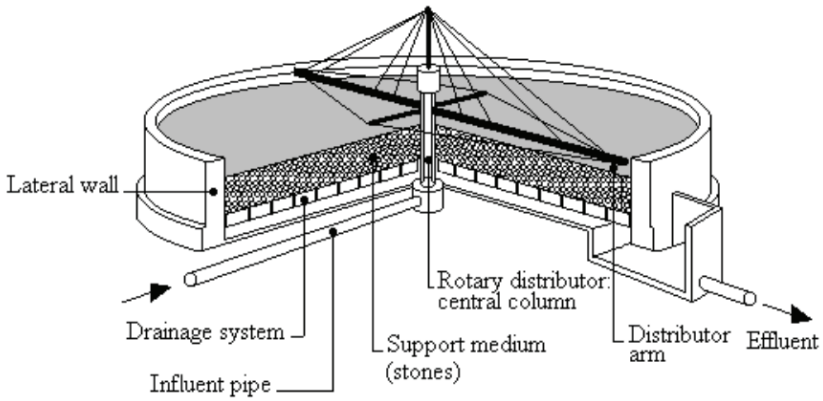
Figure 3.2. Areas with individual sanitation system – Cluster 1

The regional treatment plant is planned to be located in the suburbs of Seliste commune near the regional road G89 (R1 – Pirlita – Nisporeni - G91) at an altitude of 80-85 m. The average capacity of the treatment plant is estimated at 750 m^3/day (8,150 EI).

Depending on the type and technology of treatment, several types of secondary stage wastewater treatment plants may be used, with different costs and treatment performance. In order to comply with the evacuation conditions imposed by the legislation of the Republic of Moldova, several alternatives were analysed for the construction of the treatment plant for Cluster 1:

- Low load percolating filters (biofilters) with primary decantation/ settling;
- Activated sludge process with low load without primary decantation/ settling;
- Aerated pond system with primary decantation/ settling;
- Constructed Wetlands (CW) with primary sedimentation.

Percolating filters (also called biofilters, biological filters and/ or percolating biological filters) are aerobic systems with a fixed membrane. The biomass – responsible for the decomposition of organic pollutants – forms a biological film, which is fixed by a kind of filtration medium with a high surface of rocks, pebbles, plastic modules, etc. The percolation filters are usually applied to settlements with between 1,000 and 50,000 inhabitants. The great advantage thereof, compared to alternative options, is the relatively low energy consumption.



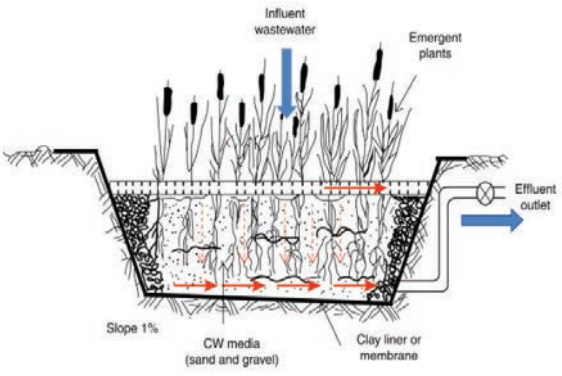
Source: Jordão and Pessoa (2009)

Source:
WWTP Chisinau municipality

The activated sludge process (ASP) is a standard process applied in most densely inhabited towns in EU countries. The advantages of this type of plant is that it requires little land, it is possible to remove the phosphorus and nitrogen, and no primary decantation/ settling is required with the fermentation of the primary sludge. However, the construction and maintenance costs are very high. This type of process requires permanent professional operation, very high energy consumption and expensive mechanical parts.

The aerated pond system is a nature based solution that employs an activated sludge process, but uses simpler electromechanical equipment and a pond instead of concrete tanks. Such systems require large plots of land and are potentially less effective in winter.

Constructed wetlands use a natural process to ensure the simple and effective wastewater treatment. They comprise constructed, planted bodies of soil that are subject to horizontal or vertical flow after the primary treatment of wastewater. The advantage of CWs is their relatively simple maintenance and operation with low costs and few mechanical parts.



Several treatment plants of this type were built for isolated objects in the villages of Bratuleni, Iurceni, Cristesti, Negrea, Sarata Galbena, Draguseni Noi, and Rusca (400 EI). As an example, the Rusca treatment plant involves a septic tank (as a first phase of treatment), built in 2007; the second phase is a CW with 4 horizontal beds of 300 m^2 each, filled with gravel, the surface of which is cultivated with reeds. The treatment capacity is 40 m^3/day.

Among the disadvantages of CWs are:

- High requirement for land – approx. 3-5 m^2/capita for CW with horizontal flow and 2-2.5 m^2/capita for CW with vertical flow;
- The material for high quality filters is not always available and can be expensive;
- They do not tolerate cold weather.

In the city of Orhei, a CW-type wastewater treatment plant was put into operation. This station is one of the largest of its kind in Europe, and its cost (funded by the EBRD, WB, Moldova Ecological Foundation) is about EUR 4.8 million. Designed with a capacity of 10,000 m^3/day, the main treatment plant in Orhei is composed of the following treatment units: sand chamber; primary decanters; biological filtration (filtered with gravel material); secondary sedimentation; handling of sludge in sludge drying beds; effluent stabilisation (chemical additives are not used); sludge pumping stations; and a chlorination station.

From the experience of existing CWs in the Republic of Moldova, the application of such technology is advantageous in terms of natural emissions and investment and O&M costs, provided there is sufficient land for its construction and quality filter material is available.

To illustrate the differences between the treatment technologies specified above and described in detail in Chapter 8.2.3. of the MPWSS, the investment and operational costs were also compared to other physical aspects of location.

There is a difference between the cost of investment in such treatment technologies and the size of the facilities, see Figure 3.3. The dominant factor in relation to the investment costs for the percolating filter and the activated sludge process (ASP) is the aeration installations; these include the percolating filter itself, and the aeration tanks contain electromechanical equipment.

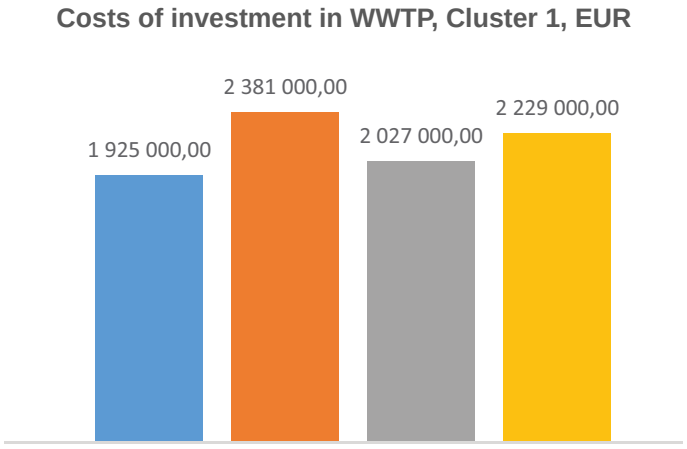


Figure 3.3. Cost of the investment in the WWTP Cluster 1
(Biofilter, Activated sludge process, Aerated pond system, Constructed wetlands)

In addition to the investment costs, the operating and maintenance costs are also very relevant factors in the process of approving the decision on treatment technologies. Operation and maintenance affect wastewater management costs on a permanent basis, as opposed to one-time investment costs. Figure 3.4 shows the significant difference between the various technologies. The main difference between the activated sludge process (ASP) and constructed wetlands, for example, is the energy consumption, which is high for ASP and very low for CW.

According to the legislation, the protection area of the water of the Nirnova River is established as at least 500 m wide from the edge of the riparian slope of the riverbed on the shore, and the riparian water protection strip is 20 m. In accordance with NCM G.03.02:2015 “External sewerage networks and installations”, the sanitary protection area of the wastewater treatment plants constitutes 200 m.

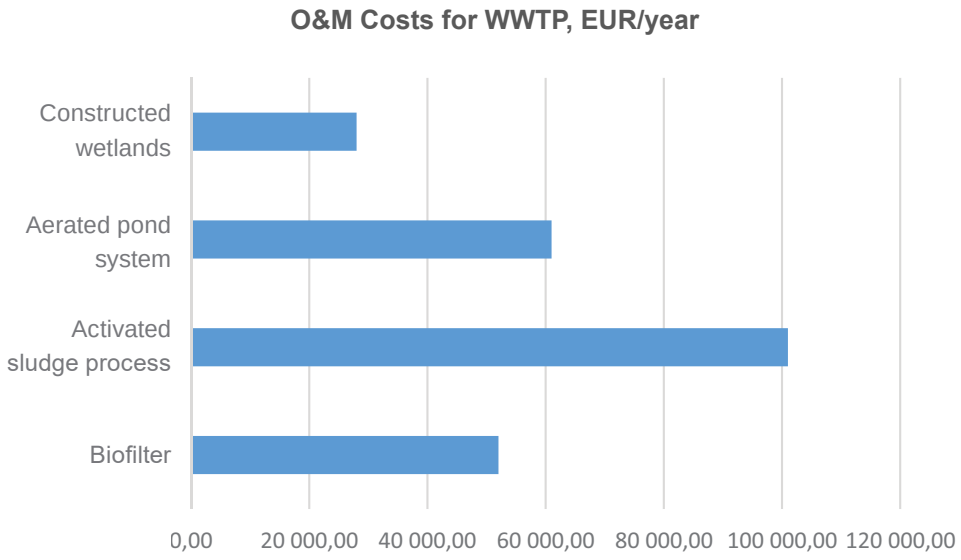


Figure 3.4. Annual O&M costs for WWTP with different technologies

For the construction of a CW-type WWTP, an area between 1.7 ha and 3.4 ha is required, depending on the type of CW (horizontal or vertical flow). A protection zone at least 10 m from the installations/ technology must also be included. The cadastral map of potential plots for the construction of CW shows that most of such land is privately owned, which implies a long and expensive process for obtaining land use rights. At the same time, the distance between the WWTP location/ site and the Nirnova River is less than 10 m, which constitutes an increased risk of river pollution, see Figure 3.5.

The WWTP location for Cluster 1 is located on marshy alluvial soil, which means that from a structural point of view the plant requires special construction solutions depending on the concrete geological conditions that will be developed during the feasibility study or technical design phases. Also, the location of the plant needs to be coordinated with the authorised structures, given the fact that it is located in the sanitary protection area of the Nirnova River.

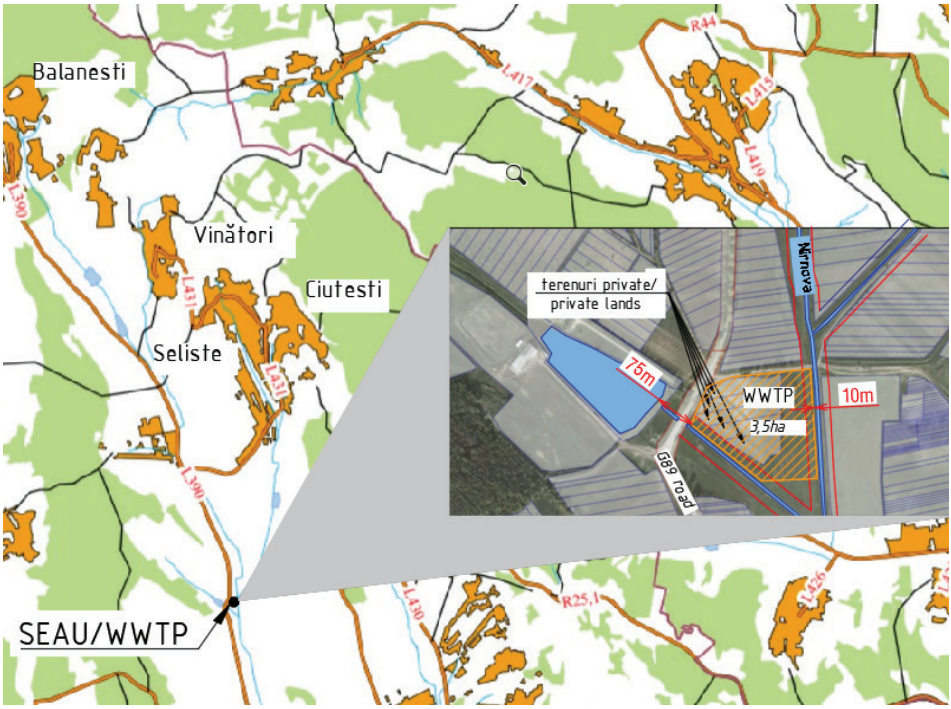


Figure 3.5. Framing the WWTP of CW type for Cluster 1

These facts lead to the conclusion that aerated ponds and constructed wetlands are more suitable for smaller agglomerations and/ or areas where land is available and cheap.

In conclusion, despite the fact that biological CWs and ponds require approximately 45% less maintenance than biological filters, the former require much more land to accommodate the technology, which represents 50% of the investment costs for larger installations (assuming EUR 20 per 1 m^2).

For the alternative of WWTP with biological filters, a smaller land area is needed, around 0.5 ha, depending on the technology employed for the primary and secondary stages and sludge treatment. WWTPs can be constructed without expropriating land and respecting the limits of the riparian strip of the Nirnova River and stream, see Figure 3.6.

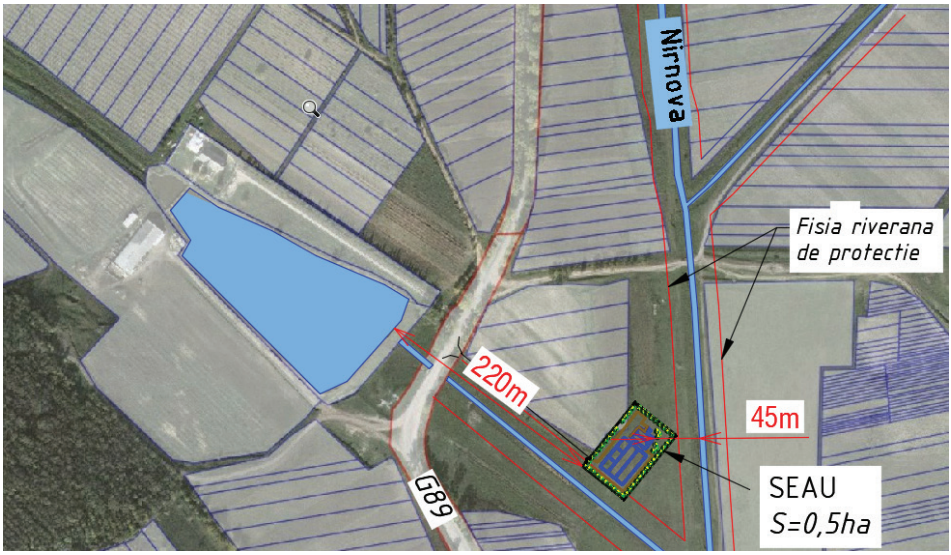


Figure 3.6. Framing of WWTP with biological filters for Cluster 1

In the following, the option of adopting a treatment plant with percolating filters also called biofilters will be considered for the investment estimate. The exact costs of the construction of the WWTP will be established in the estimate of expenses executed on the basis of the technical project.

Table 32 summarises the infrastructure needed to implement the project for each locality separately and their investment costs. Investments for septic tanks (pits) are not included. The septic tanks are accepted as a temporary solution and play an important role in any medium-term scenario, but are not a solution that can be actively promoted due to the current legal situation in Moldova.

Tabel 3.2. Investments in sanitation infrastructure for Cluster 1

Locality	Infrastructure	Investments, EUR
Balanesti	Sewer collector – 3.3 km	90,200.00
	Gravitational networks – 17.0 km	459,000.00
	Sewer manholes – 570 pc.	329,000.00
	Pressure networks – 1.2 km	22,000.00
	Local pumping stations, m^3/h – 1.3, 3.0, 5.5	42,600.00

Gaureni	Sewer collector – 2.2 km	59,900.00
	Gravitational networks – 6.8 km	184,000.00
	Sewer manholes – 230 pc.	132,000.00
	TOTAL INVESTMENTS com. Balanesti , EUR	**1,318,700.00**
Vinatori	Sewer collector – 4.3 km	115,700.00
	WWPS – 1,480 LE	20,000.00
	Gravitational networks – 7.6 km	205,000.00
	Sewer manholes – 260 pc.	148,000.00
	TOTAL INVESTMENTS s. Vînatori, EUR	**488,700.00**
Ciutesti	Gravitational networks – 9.5 km	257,000.00
	Sewer manholes – 320 pc.	184,000.00
	Pressure networks – 0.1 km	2,000.00
	Local pumping stations, m^3/h – 4.4, 10.8	34,800.00
Valea Nîrnovei	Gravitational networks – 2.1 km	57,000.00
	Sewer manholes – 71 pc.	41,000.00
	Total investments com. Ciutesti, EUR	**575,800.00**
Seliste	Sewer collector -2.9 km	118,500.00
	Gravitational networks – 21.3 km	575,000.00
	Sewer manholes – 711 pc.	412,000.00
Paruceni	Sewer collector -2.7 km	109,900.00
	Gravitational networks – 4.6 km	124,000.00
	Sewer manholes – 155 pc.	90,000.00
	Total investments Seliste, EUR	**1,429,400.00**
	Regional wastewater treatment plant – 8,150 LE	1,925,000.00
	TOTAL CLUSTER 1	**5,737,600.00**
Investment cost per capita , EUR/loc.		**755 EUR/loc.**
Annual O&M costs, EUR		**106,000.00 EUR**

As shown in the table above, it is estimated that a total investment of EUR 5,700,000.00 is required to operate this sanitation system. Most investments concern local infrastructure, namely gravitational networks, pressure networks, manholes, connection of consumers and for regional treatment plants, see Figure 3.7.

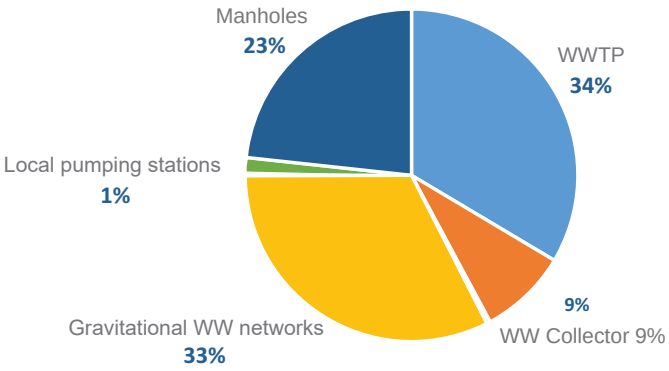


Figure 3.7. Structure of investments for Cluster 1

The operating costs of the whole system amount to EUR 106,000.00 per year. The maintenance, operation and maintenance costs include O&M for WWTP (85%), maintenance of WW collectors (1%), O&M regional and local pumping stations (10%) and maintenance of gravitational sewer networks (5%). The O&M costs for each locality are shown in Table 11.5 of the MPWSS.

Prioritisation of investments

As the investment costs are quite high compared to the budgets of localities in the Republic of Moldova, it is further proposed to prioritise investments according to several factors listed in Chapter 11.3.1. of the MPWSS, in particular Table 11.2.

The investment costs for each locality depending on the proposed phase are shown in Table 3.3. The investments are proposed to be distributed as follows:

Phase I

- Sewer collector for the localities of Balanesti village and Ciutesti and Seliste communes;
- Local sewerage networks for the localities of Balanesti (20%), Ciutesti (60%) and Seliste (60%);
- WWTP at a capacity of 35% of the population with the prospect of expanding to 100% of the population of the Cluster.

Phase II

- Sewer collector for Vinatori locality;
- Pumping station for Vinatori locality;
- Local sewerage networks for the localities of Balanesti (50%), Vinatori (70%), Ciutesti (40%) and Seliste (40%);
- Local pumping stations in the villages of Balanesti and Ciutesti;
- Expansion of WWTP to a capacity of 75% of the Cluster population.

Phase III

- Sewer collector for Gaureni locality;
- Local sewerage networks for the localities of Balanesti (30%), Gaureni (100%), Vinatori (30%), Valea Nirnovei (100%) and Paruceni (100%);
- Expansion of WWTP to a capacity of 100% of the Cluster population.

Tabel 3.3. Phasing of investments in sanitation – Cluster 1

Locality	Infrastructure	Investments, EUR		
		Stage I	Stage II	Stage III
Balanesti Stage I – 340 per. Stage II - 850 per. Stage III - 510 per.	Sewer collector	90,200.00		
	Gravitational networks	91,800.00	229,500.00	137,700.00
	Sewer manholes	65,800.00	164,500.00	98,700.00
	Pressure networks		8,800.00	13,200.00
	Local pumping stations		17,040.00	25,600.00
Gaureni Stage III - 520 per.	Sewer collector			59,900.00
	Gravitational networks			184,000.00
	Sewer manholes			132,000.00
Total investments com. Balanesti , EUR		**247,800.00**	**419,840.00**	**651,100.00**
Vinatori Stage II - 672 per. Stage III - 288 per.	Sewer collector		115,700.00	
	WWPS		20,000.00	
	Gravitational networks		143,500.00	61,500.00
	Sewer manholes		103,600.00	44,400.00
Total investments s. Vînatori, EUR		**0.00**	**382,800.00**	**105,900.00**

Locality	Infrastructure	Investments, EUR		
		Stage I	Stage II	Stage III
Ciutesti Stage I – 894 per. Stage II – 596 per.	Gravitational networks	154,200.00	102,800.00	
	Sewer manholes	110,400.00	73,600.00	
	Pressure networks		2,000.00	
	Local pumping stations		34,800.00	
Valea Nîrnovei Stage III – 380 per.	Gravitational networks			57,000.00
	Sewer manholes			41,000.00
Total investments com. Ciutesti, EUR		**264,600.00**	**213,200.00**	**98,000.00**
Seliste Stage I – 614 per. Stage II – 076 per.	Sewer collector	118,500.00		
	Gravitational networks	345,000.00	230,000.00	
	Sewer manholes	247,200.00	164,800.00	
Paruceni Stage III – 410 per.	Sewer collector	109,900.00		
	Gravitational networks			124,000.00
	Sewer manholes			90,000.00
Total investments Seliste, EUR		**820,600.00**	**394,800.00**	**214,000.00**
Regional wastewater treatment plant – 8,150 LE		1,155,000.00	481,250.00	288,800.00
TOTAL CLUSTER 1		**2,488,000.00**	**1,891,890.00**	**1,357,800.00**

3.2.2. Cluster 2

Cluster 2 comprises a small land area (148.7 km^2) but is also the most densely inhabited, with a current population of 17,420. Cluster 2 is made up of the town of Nisporeni and the commune of Varzaresti. At the moment, the coverage rate of the sanitation system for Nisporeni is 24% and 15% for Varzaresti village. The sewerage network of Nisporeni town includes three wastewater pumping stations, a gravitational sewerage network comprising 22.0 km of cast iron, PVC and asbestos pipes, and a treatment plant. Only approximately 10.0 km of the sewerage networks built in 2018 are in good condition, the rest are damaged and need to be changed. The pumping station near the hospital was decommissioned/ went out of service following the sewerage extension works in 2018. A map featuring the location of the pumping stations and the existing WWTP can be found in Figure 3.8.

The method of wastewater treatment includes mechanical and biological steps. The plant treating 1,500 m³/day, which is type SDR (Sequential Dosing Reactors) Flexidiblok, was renovated with the support of the local authorities and the Czech Government in 2014. The estimated average capacity for the WWTP in the entire region is 2,400 m³/day, meaning that the WWTP needs to be expanded by 900 m³/day. The treated wastewater is discharged into the Nirnova River. The existing WWTP is located on public land in the southern part of the built-up area outside Nisporeni town with a total area of 5.84 ha, see Figure 3.8. There is enough land available for extension.

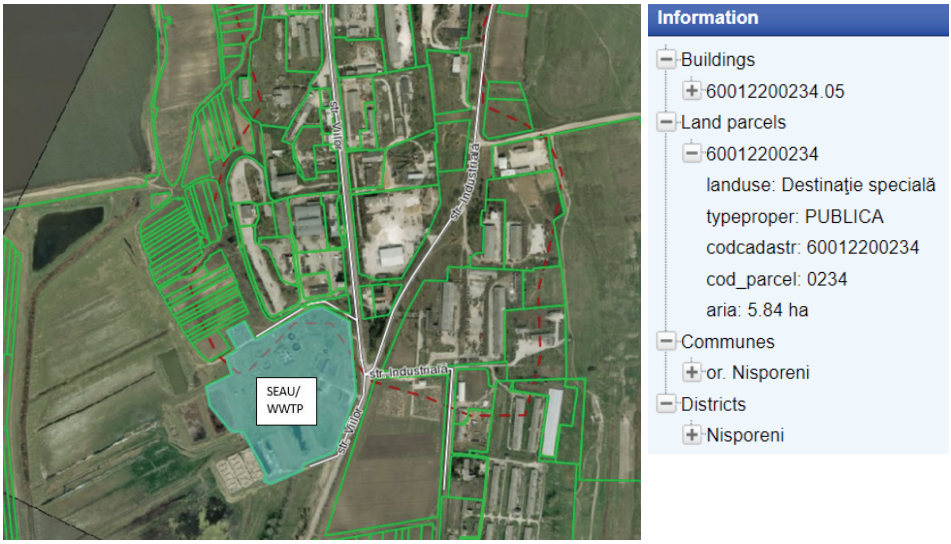


Figure 3.8. Location of the existing WWTP – Cluster 2

In some areas of Varzaresti commune, due to the topographic conditions of the land, it is recommended to use individual sewerage systems which either consist of constructed watertight cesspools/ cesspits or septic tanks, or involve pumping wastewater to the centralised sewerage system, see images in Figure 3.9.

Estimates of the investments required to extend the sanitation system for Cluster 2 did not consider replacing the existing WWTP with another technology, but rather extending it to achieve the necessary capacity. The exact costs of the investments will be set out in the estimate of expenditure performed on the basis of the detailed technical design.

Sendreni village, Varzaresti commune, North

Varzaresti village, Northeast

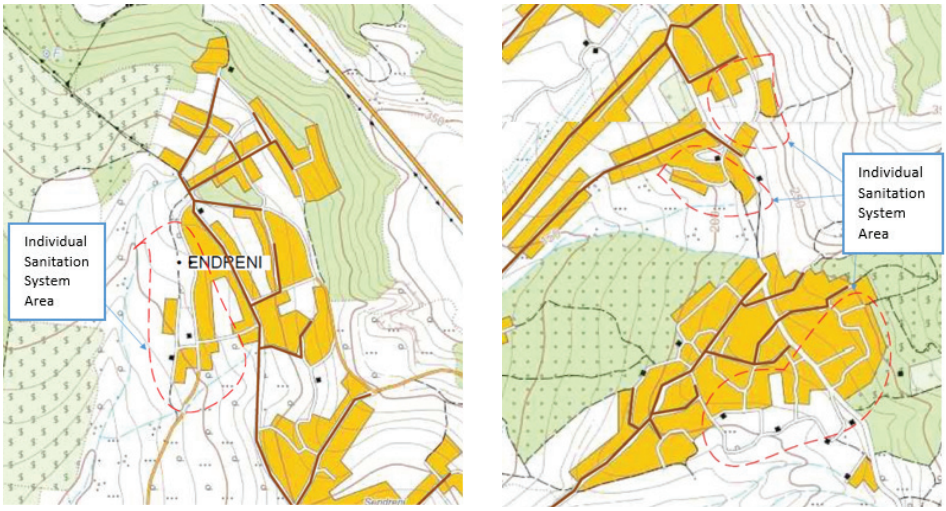


Figure 3.9. Areas with individual sanitation systems – Cluster 2

Table 3.4 summarises the infrastructure needed to implement the project for each locality separately and their investment costs. Investments for septic tanks (pits) are not included. The septic tanks are accepted as a temporary solution and play an important role in any medium-term scenario, but are not a solution that can be actively promoted due to the current legal situation in Moldova.

Tabel 3.4. Investments necessary in sanitation infrastructure for cluster 2

Locality	Infrastructure	Investments, EUR
Or. Nisporeni	WWTP extension to 2,400 m³/day	1,810,100.00
	WWPS – 6.6 m³/h	9,900.00
	Pressure networks – 1.0 km	18,000.00
	Gravitational networks – 75.0 km	1,984,000.00
	Sewer manholes – 2,400 pc.	1,391,000.00
TOTAL CLUSTER 2		**5,213,000.00**
The investment cost per capita , EUR/loc.		**281 EUR/loc.**
Annual O&M costs, EUR/an		**177,300.00 EUR**

According to the estimates in the table above, the construction of the sanitation system requires total investments amounting to EUR 5,213,000.00. Most of the investments concern gravitational networks, including manholes, see Figure 3.10.

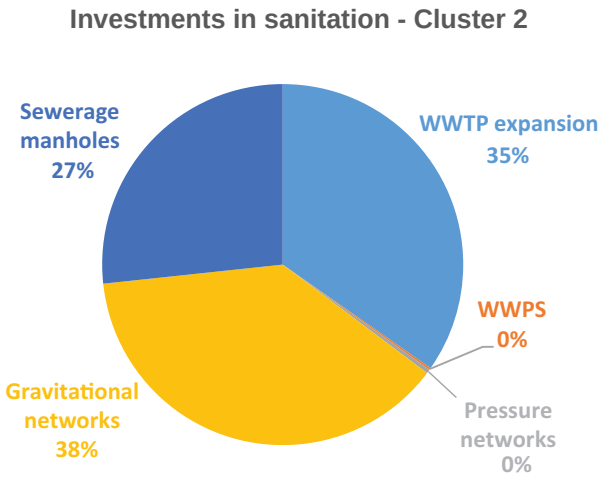


Figure 3.10. Structure of investments for Cluster 2

The operating costs of the whole system exceed EUR 177,000.00 per year. The maintenance and operation costs include O&M for WWTP (156,000.00 EUR/year), maintenance of gravitational sewerage networks (9,600.00 EUR/year), and O&M of pumping stations (5,300.00 EUR/year). The O&M costs are shown in Table 11.5 of the MPWSS.

Prioritisation of investments

Chapter 11.3.1. of the MPWSS describes in detail the functions of prioritising investments in sanitation. Once 37% of the population connected to a centralised water supply system has the opportunity to connect to the centralised sanitation system, this Cluster will be ranked as a medium priority. The investment costs for the three proposed implementation stages are shown in Table 3.6. The investments are proposed to be distributed in correlation with the existing water infrastructure and according to the phasing of investments in the water supply system:

Phase I (connection to the sewerage systems of the population that has a centralised water system)

- Extension of local sewerage networks for Nisporeni and Varzaresti localities up to 60%;
- Construction of the pumping system for the South-East area of Nisporeni town.

Phase II

- Expansion of the WWTP to a capacity of 100% of the population of Cluster 2.

Phase III

- Extension of the sewerage networks for the entire Cluster 2.

Tabel 3.5. Phasing of investments in sanitation – Cluster 2

Connected population	Infrastructure	Investments, EUR		
		Stage I	Stage II	Stage III
Stage I – 11,000 per. Stage II – 11,000 per. Stage III – 18,500 per.	WWTP extension	-	1,810,100.00	-
	WWPS	9,900.00	-	-
	Pressure networks	18,000.00	-	-
	Gravitational networks	793,600.00	-	793,600.00
	Sewer manholes	556,400.00	-	556,400.00
TOTAL CLUSTER 2		**1,377,900.00**	**1,810,100.00**	**1,350,000.00**

3.2.3. Cluster 3

Cluster 3 includes Siscani commune, which features three villages: Siscani, Drojdieni and Odaia. Only Drojdieni locality has a sewerage system that is not yet in operation and consists of 11.5 km of gravitational networks, a pumping station and a wastewater treatment plant. This scenario foresees the extension of the sewerage networks in the villages of Siscani and Odaia and the transport of wastewater to Drojdieni WWTP. Due to the relief of Siscani locality, several local pumping stations are required.

A map featuring the location of all pumping stations, the existing WWTP, and existing and planned sewerage networks can be found in Annex 6. The capacity of the treatment plant is not known, but taking into account the fact that the entire locality of Drojdieni has been included, the average existing capacity of 40 m^3/day will be considered for estimates.

The method of secondary wastewater treatment in Drojdieni locality is MBBR (Moving Bed Biofilm Reactor biological/ Biological Reactor with Mobile Biofilter). For the extension of Drojdieni WWTP, the proposal is to construct other MBBR modules to operate in parallel with the existing ones. For the primary treatment stage, a more detailed analysis should be made based on the existing situation in order to establish an optimal technical solution. The location of Drojdieni WWTP is shown in the map in Figure 3.11.

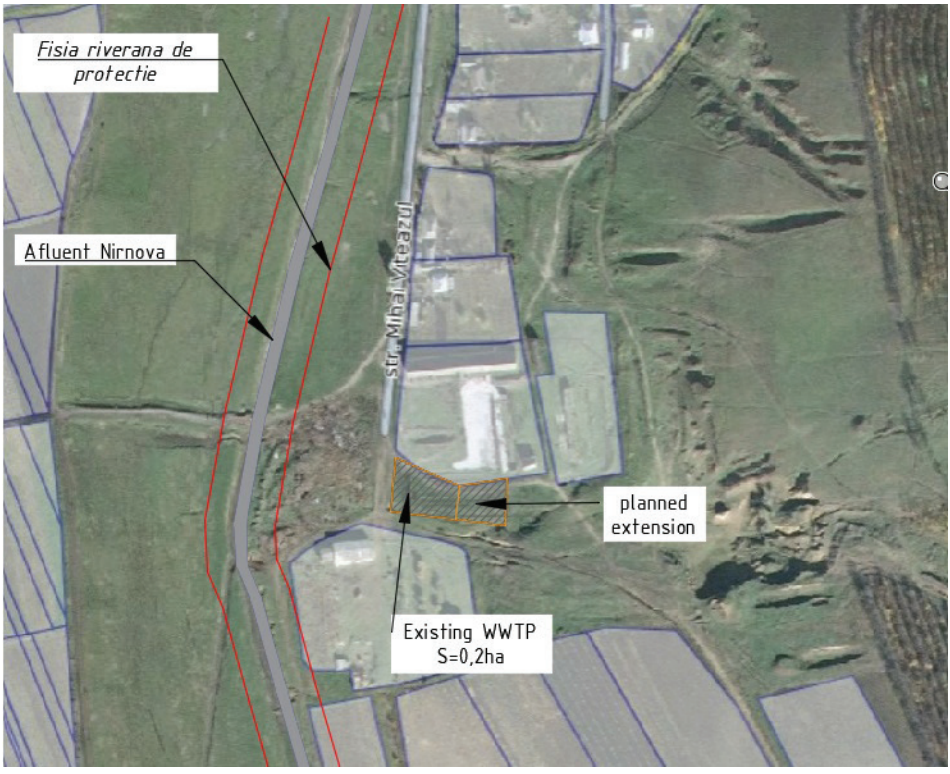


Figure 3.11. Location of the existing WWTP – Cluster 3

The following table summarises the infrastructure needed to implement the project for each locality separately and the investment costs. The costs of septic tanks (pits) are not taken into account. Septic tanks are accepted as a temporary solution and play an important role in any medium-term scenario, but are not a solution that can be actively promoted due to the current legal situation in Moldova. The exact costs of the investments will be set out in the estimate of expenditure performed on the basis of the detailed technical design.

Tabel 3.6. Investments necessary in sanitation infrastructure for cluster 3

Locality	Infrastructure	Investments, EUR
s. Siscani	Sewer collector – 0.7 km	20,000.00
	Regional Wastewater Pumping Station	24,000.00
	Gravitational networks – 23.4 km	632,000.00
	Sewer manholes – 780 pc.	453,000.00
	Local pumping stations, 2.3/4.0/1.3/5.9/6.5/1.1/0.6/0.5 m³/h	110,000.00
	Pressure networks – 1.0 km	18,000.00
Total investments v. Siscani, EUR		**1,257,000.00**
s. Odaia	Sewer collector – 1.8 km	48,000.00
	Regional Wastewater Pumping Station	13,000.00
	Gravitational networks – 2.6 km	70,000.00
	Local pumping stations, 0.7 m³/h	8,000.00
	Sewer manholes – 90 pc.	51,000.00
Total investments v. Odaia, EUR		**190,000.00**
WWTP extension from 40 to 220 m³/day		70,700.00
TOTAL CLUSTER 3		**1,304,000.00**
Investment cost per capita, EUR/loc.		**564.63**
Annual O&M costs, EUR		**177,292.00**

According to the estimates in the table above, the construction of the sanitation system in Cluster 3 requires total investments amounting to EUR 1,304,000.00. Most of the investments concern gravitational networks, including manholes, see Figure 3.12.

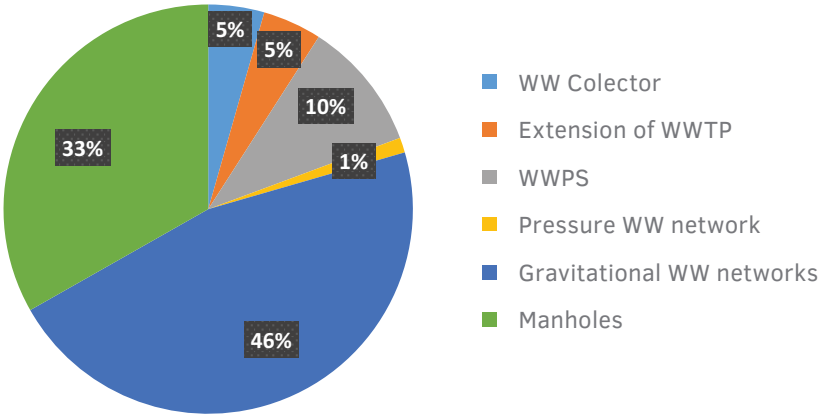


Figure 3.12. Structure of investments for Cluster 3

The operating costs of the entire system are almost EUR 45,000.00 per year. The operation and maintenance costs include O&M for WWTP (EUR 32,000.00 per year), maintenance of the gravitational sewerage networks (EUR 10,000.00 per year), and O&M of pumping stations (EUR 2,300.00 per year). The O&M costs are shown in Table 11.5 of the MPWSS.

Prioritisation of investments

Chapter 11.3.1. of the MPWSS describes in detail the functions of prioritising investments in sanitation. Siscani locality was established as a high priority for investments in sanitation, while Odaia locality was a low priority, see Table 11.2 of MPWSS. The investment costs for the three proposed implementation phases are shown in Table 3.7. The investments are proposed to be distributed in correlation with the existing water infrastructure and according to the phasing of investments in the water supply system:

Phase I

- Construction of the sewer collector from Siscani to Drojdieni WWTP;
- Construction of Siscani WWPS;
- Construction of local pumping stations PS1, PS2, PS3 and PS4;
- Construction of local sewerage networks, including manholes for 50% of the population;
- Extension of the WWTP to a capacity of 1,500 EI.

Phase II

- Construction of local pumping stations in Siscani village – PS5, PS6;
- Construction of local sewerage networks, including manholes for 50% of the population in Siscani village;
- Expansion of Drojdieni WWTP to a capacity of 2,570 EL.

Phase III

- Sewer collector, pumping station and internal sewerage networks, including manholes in Odaia village.

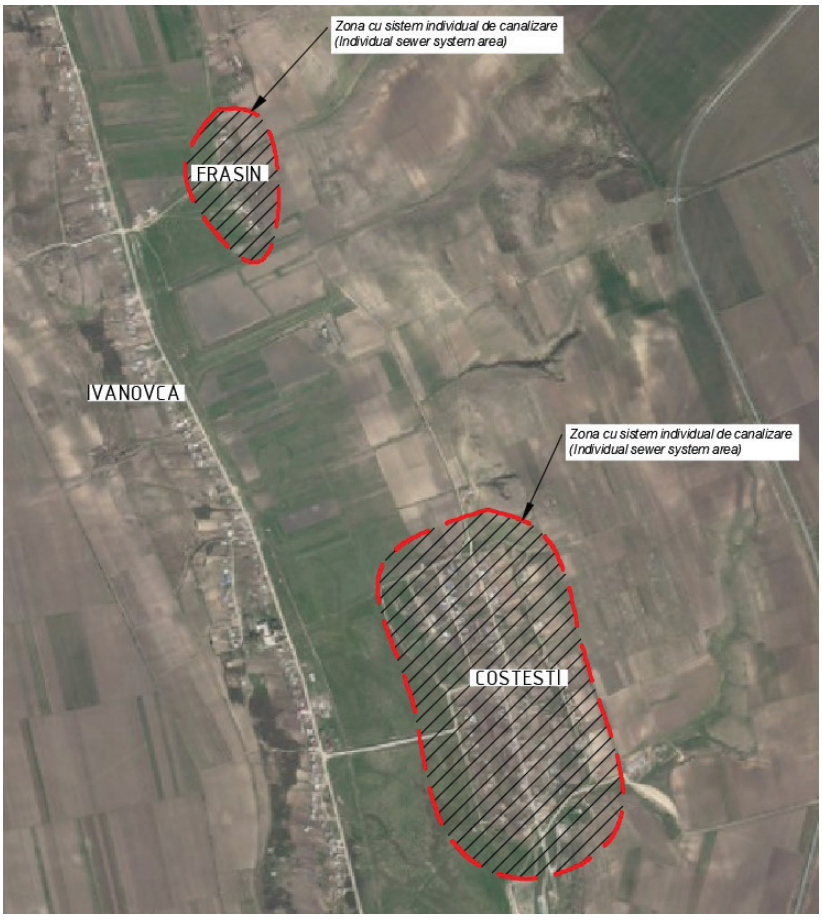
Tabel 3.7. Phasing of investments in sanitation – Cluster 3

Connected population	Infrastructure	Investments, EUR		
		Stage I	Stage II	Stage III
Com. Siscani Stage I – 1,420 per. Stage II – 2,310 per. Stage III – 2,570 per.	Sewer collector	-	19,700.00	-
	Regional WWPS Siscani	24,000.00	-	-
	Gravitational networks	347,600.00	284,400.00	-
	Sewer manholes	249,150.00	203,850.00	-
	Local pumping stations	77,070.00	33,030.00	-
	Pressure networks	12,600.00	5,400.00	-
	Sewer collector	-	-	47,500.00
	Regional WWPS Odaia	-	-	13,000.00
	Gravitational networks	-	-	70,000.00
	Local pumping stations	-	-	8,400.00
	Sewer manholes	-	-	51,000.00
	WWTP extension	49,490.00	21,210.00	-
TOTAL CLUSTER 3		**759,910.00**	**567,590.00**	**189,900.00**

3.2.4. Cluster 4

Cluster 4 consists of the localities: Marinici commune, Calamanesti village, Cateleni village, Nemteni village, Ivanovca commune, Obileni village, Cotul Morii commune and Leuseni commune. The sewer collector consists of 21.1 km of pipes with diameters between 150-300 mm. The pumping stations are located in the villages of Nemteni, Sarateni, Calimanesti and Ivanovca. A map featuring the location of the pumping stations, the WWTP and planned sewerage networks can be found in Annex 6.

In order to estimate the necessary infrastructure, it was assumed that at least 90% of the population will be provided with sewerage networks. For some areas in the locality, due to the topographic conditions of the land or the location at greater distances from the locality, it is assumed that some areas will have individual sewerage systems, consisting of constructed watertight cesspools/ cesspits and septic tanks. In the north-western part of Marinici village the population density is quite low and the houses are located at great distances from each other. Thus, in these areas, the proposal is to establish individual WW collection systems with periodic transportation to the centralised sanitation system. The same approach is proposed for small localities such as Costesti, Frasin, Ivanovca and Feteasca communes, and Leuseni commune.



Costesti village and Frasin village, Ivanovca commune, Hincesti district

Marinici village, Hincesti district, Northwest

Feteasca village, Leuseni commune, Hincesti district

Figure 3.13. Areas with individual sanitation systems – Cluster 4

The optimal technology for secondary wastewater treatment for Cluster 4 (12,727 inhabitants) will be selected following the analogous technical-economic analysis made for Cluster 1.

In terms of wastewater treatment efficiency, activated sludge technology is capable of removing maximum nutrients, while treatment plants with biological filters have a treatment efficiency of about 80% which ensures efficient treatment of discharge into surface water bodies. For the option of constructing CW, some technical characteristics will be taken into account that are not favourable for construction, such as: groundwater level, floodability of the area, possibility of infiltration of wastewater into the soil. The topography and available areas will also be taken into account. The slope of the proposed land is practically zero/ nil. For the two-stage treatment plants with gravitationally fed vertical flow phytofilters, a dif-

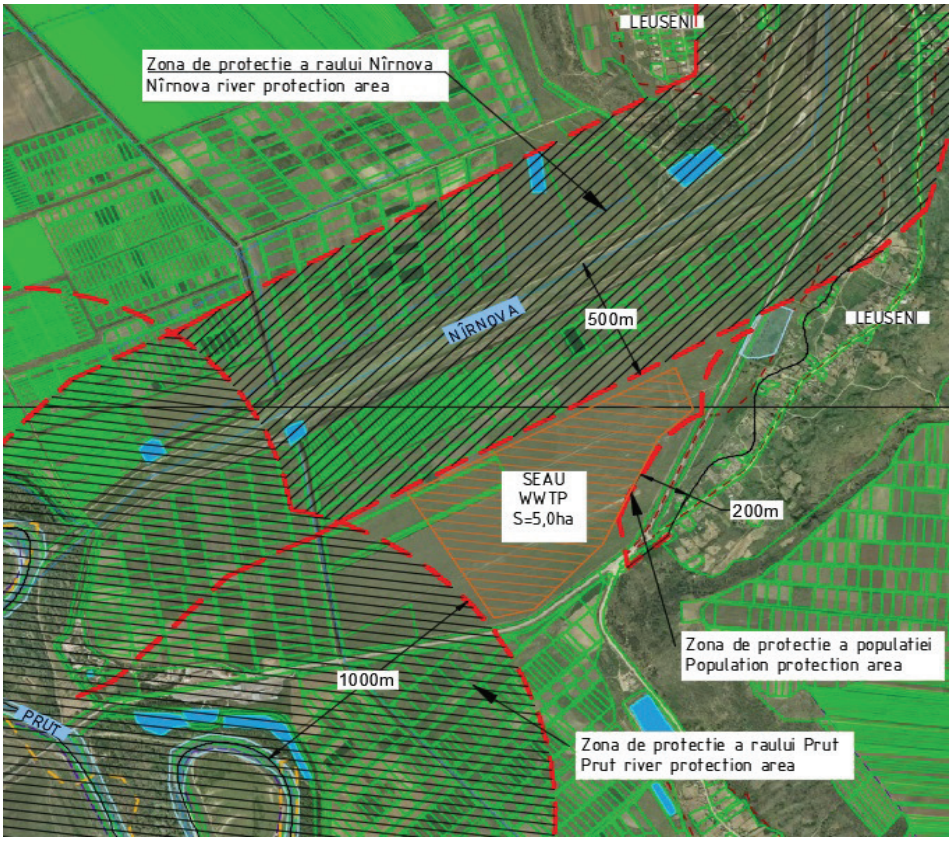


Figure 3.14. Model of location of WWTP of CW-type – Cluster 4

ference in elevation of at least 4 m is required between the point of entry into the station and the point of discharge into the emissary. This unevenness/ dislevelment may even reach 6 m for larger stations like these.

For the WWTP alternative with biological filters, a smaller land area is required, around 1.0-1.5 ha depending on the technologies for the primary and secondary stages and sludge treatment. The WWTPs can be constructed without expropriating land and respecting the limits of the sanitary protection area of the Prut and Nirnova rivers.

From an economic point of view, the activated sludge process requires the largest investments (approx. EUR 3,800,000) and the least investments are required for treatment with biological filters (approx. EUR 2,200,000.00). For the construction of a CW-type WWTP from the perspective of the large area of occupied land (3-5 ha) an investment of EUR 2,810,000.00 was estimated.

In addition to investment costs, the operating and maintenance costs are also very relevant factors in the process of approving the decision on treatment technologies. Operation and maintenance affect the wastewater management costs on a permanent basis, as opposed to one-time investment costs. The figure below shows the significant difference be-

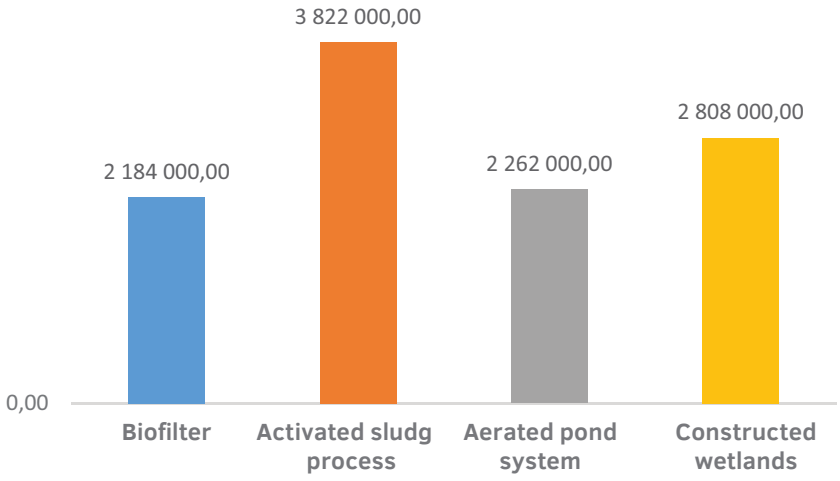


Figure 3.15. Cost of the investment in the WWTP Cluster 4 for different technologies

tween the various technologies. The main difference between the activated sludge process (ASP) and constructed wetlands, for example, is the energy consumption, which is high for ASP and very low for CW.

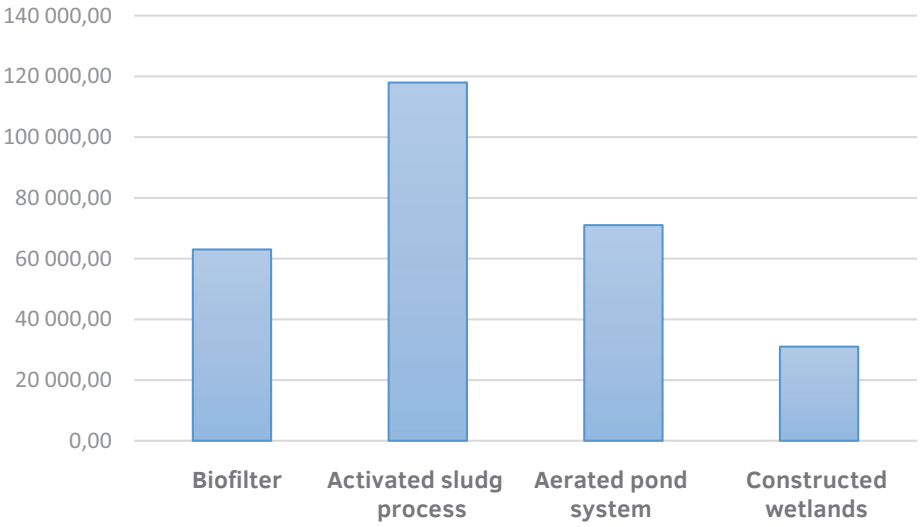


Figure 3.16. Annual O&M costs for WWTP with different technologies, Cluster 4

In conclusion, both CW technology and biological filters may be used to treat wastewater collected from Cluster 4 agglomerations. Since CW technology needs to be studied in more depth, analysing all technological, technical and economic aspects, further investment costs will be considered in WWTPs with biological filters, which is a safe, widely used technology, occupies a smaller area and involves fewer risks. The exact costs of the construction of the WWTP will be established in the estimate of expenses performed on the basis of the technical project.

The table below summarises the infrastructure needed to implement the project for each locality separately and their investment costs. Investments in septic tanks (pits) are not included. Septic tanks are accepted as a temporary solution and play an important role in any medium-term scenario, but are not a solution that can be actively promoted due to the current legal situation in Moldova.

Tabel 3.8. **Investments in sanitation infrastructure for Cluster 4**

Locality	EI	Infrastructure	Investments, EUR
Marinici	2,180.00	Gravitational networks – 21.0 km	567,000.00
		Sewer manholes – 701 pc.	407,000.00
Helesteni	290.00	Gravitational networks – 3.8 km	103,000.00
		Sewer manholes – 128 pc.	74,000.00
		Total investments com. Marinici , EUR	**1,151,000.00**
Calimanesti	780.00	Sewer collector – 1.6 km	36,000.00
		WWPS – 4,460 LE	24,000.00
		Gravitational networks – 10.8 km	292,000.00
		Sewer manholes – 361 pc.	209,000.00
		Local pumping stations - 2 pc.	25,000.00
		Pressure networks – 2.8 km	50,000.00
		Total investments s. Calimanesti, EUR	**636,000.00**
Cateleni	1,200.00	Sewer collector – 1.8 km	50,500.00
		Gravitational networks – 12.4 km	335,000.00
		Sewer manholes – 415 pc.	241,000.00
		Total investments s. Cateleni, EUR	**626,500.00**
Nemteni	1,610.00	Sewer collector – 5.5 km	69,300.00
		WWPS – 1,610 LE	20,000.00
		Gravitational networks – 20.9 km	564,000.00
		Sewer manholes – 698 pc.	405,000.00
		Local pumping stations - 4 pc.	49,700.00
		Pressure networks – 2.7 km	49,000.00
		Total investments s. Nemteni, EUR	**1,157,000.00**
Ivanovca	650.00	Sewer collector – 1.3 km	16,400.00
		WWPS – 5,400 EL	31,000.00
		Gravitational networks – 11.8 km	319,000.00
		Sewer manholes – 395 pc.	229,000.00
		Local pumping stations - 4 pc.	19,000.00
		Pressure networks – 1.7 km	31,000.00
Costesti	300.00	Individual sanitation system	45,000.00
Frasin	30.00	Individual sanitation system	4,500.00
		Total investments com. Ivanovca, EUR	**694,900.00**

Locality	EI	Infrastructure	Investments, EUR
Obileni	1,610.00	Sewer collector – 2.1 km	69,300.00
		Gravitational networks – 12.9 km	348,000.00
		Sewer manholes – 431 pc.	250,000.00
		Local pumping stations - 2 pc.	32,000.00
		Pressure networks – 0.5 km	9,000.00
		Total investments s. Obileni, EUR	**708,300.00**
Cotul Morii	1,230.00	Sewer collector – 2.4 km	122,000.00
		Gravitational networks – 12.6 km	340,000.00
		Sewer manholes – 421 pc.	244,000.00
		Local pumping stations - 1 pc.	16,800.00
		Pressure networks – 1.2 km	22,000.00
Sarateni	600.00	Sewer collector -2.8 km	35,700.00
		WWPS – 3,800 EL	24,000.00
		Gravitational networks – 6.4 km	167,000.00
		Sewer manholes – 208 pc.	121,000.00
		Total investments com. Cotul Morii, EUR	**1,092,500.00**
Leuseni	1,850.00	Sewer collector -3.7 km	187,700.00
		Gravitational networks – 21.4 km	578,000.00
		Sewer manholes – 715 pc.	415,000.00
		Local pumping stations - 2 pc.	28,700.00
		Pressure networks – 0.1 km	2,000.00
Feteasca	60.00	Individual sanitation system	9,000.00
		Total investments com. Leuseni, EUR	**1,220,400.00**
		Regional wastewater treatment plant Cluster 4	**2,184,000.00**
		TOTAL CLUSTER 4	**9,470,600.00**
12,390.00		**The cost of investment per capita, EUR/loc.**	**1,246.13**
		Annual O&M costs, EUR	**163,900.00**

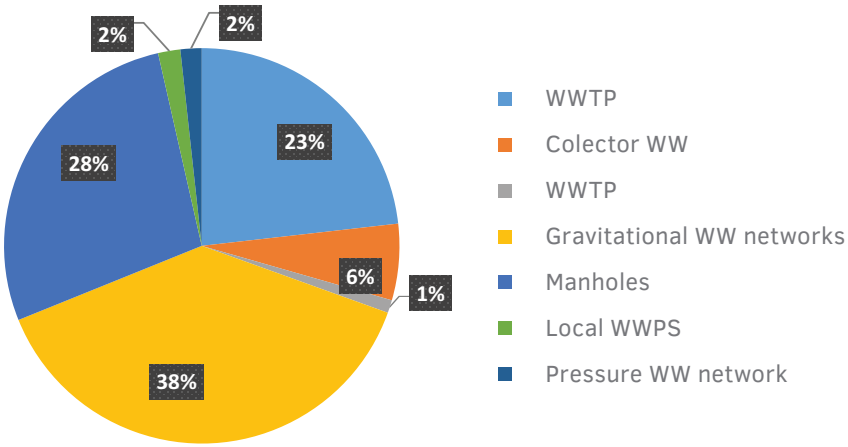


Figure 3.17. Structure of investments for Cluster 4

The operating costs of the entire system amount to EUR 164,000.00 per year. The maintenance, operation and maintenance costs include O&M for WWTP (135,400 EUR/year), maintenance of WW collectors (1,900 EUR/year), O&M of regional and local pumping stations (16,400 EUR/year) and maintenance of gravitational sewerage networks (10,100 EUR/year). The O&M costs for each locality are shown in Table 11.5 of the MPWSS.

Prioritisation of investments

As the investment costs are quite high in terms of the budget of the Republic of Moldova, it is further proposed to prioritise the investments according to several factors listed in Chapter 11.3.1. of the MPWSS, in particular Table 11.2.

The investment costs for each locality according to the proposed phase are shown in Table 3.9. The investments are proposed to be distributed as follows:

Phase I

- Sewer collector for the localities in Cluster 4 except for Marinici commune and Helesteni village;
- Construction of regional pumping stations in Nemteni, Ivanovca and Sarateni;
- Local sewerage networks for the localities of Cateleni (50%), Nemteni (50%), Ivanovca (70%), Obileni (50%), Cotul Morii (50%), Sarateni (50%), and Leuseni (50%);
- Construction of local pumping stations in Nemteni, Ivanovca, Obileni, Cotul Morii and Leuseni;
- WWTP at a capacity of 35% of the Cluster population with the prospect of expanding to 100%.

Phase II

- Sewer collector in Calimanesti;
- Local sewerage networks for the localities of Marinici (40%), Helesteni (40%), Calimanesti (40%), Cateleni (50%), Nemteni (40%), Ivanovca (30%), Obileni (40%), Cotul Morii (40%), Sarateni (50%), and Leuseni (40%);
- Local pumping stations in the villages of Nemteni, Ivanovca, Obileni and Leuseni;
- Expansion of the WWTP to a capacity of 70% of the Cluster population.

Phase III

- Local sewerage networks for the localities of Marinici (60%), Helesteni (60%), Calimanesti (60%), Nemteni (10%), Obileni (10%), Cotul Morii (10%), and Leuseni (10%);
- Implementation of individual sanitation systems for Costesti, Frasin and Feteasca localities;
- Expansion of the WWTP to a capacity of 100% of the Cluster population.

Tabel 3.9. **Phasing of investments in sanitation – Cluster 4**

Locality	LE	Infrastructure	Investments, EUR		
			Phase I	Phase II	Phase III
Marinici	2,180	Gravitational networks	-	226,800.00	340,200.00
		Sewer manholes	-	162,800.00	244,200.00
Helesteni	290	Gravitational networks	-	41,200.00	61,800.00
		Sewer manholes	-	29,600.00	44,400.00
Total investments com, Marinici , EUR			**-**	**460,400.00**	**690,600.00**
Calima-nesti	780	Sewer collector	-	36,000.00	-
		WWPS	-	24,000.00	-
		Gravitational networks	-	116,800.00	175,200.00
		Sewer manholes	-	83,600.00	125,400.00
		Local pumping stations	-	-	25,000.00
		Pressure networks	-	-	50,000.00
Total investments s, Calimanesti, EUR			**-**	**260,400.00**	**375,600.00**
Cateleni	1,200	Sewer collector	50,500.00	-	-
		Gravitational networks	167,500.00	167,500.00	-
		Sewer manholes	120,500.00	120,500.00	-
Total investments s, Cateleni, EUR			**338,500.00**	**288,000.00**	**-**
Nemteni	1,610	Sewer collector	69,300.00	-	-
		WWPS	20,000.00	-	-
		Gravitational networks	282,000.00	225,600.00	56,400.00
		Sewer manholes	202,500.00	162,000.00	40,500.00
		Local pumping stations	24,850.00	24,850.00	-
		Pressure networks	24,500.00	24,500.00	-
Total investments s, Nemteni, EUR			**623,150.00**	**436,950.00**	**96,900.00**
Ivanovca	650	Sewer collector	16,400.00	-	-
		WWPS	31,000.00	-	-
		Gravitational networks	223,300.00	95,700.00	-
		Sewer manholes	160,300.00	68,700.00	-
		Local pumping stations	9,500.00	9,500.00	-
		Pressure networks	15,500.00	15,500.00	-
Costesti	300	Individual sanitation system	-	-	45,000.00
Frasin	30	Individual sanitation system	-	-	4,500.00
Total investments com, Ivanovca, EUR			**456,000.00**	**189,400.00**	**49,500.00**

Locality	LE	Infrastructure	Investments, EUR		
			Phase I	Phase II	Phase III
Obileni	1,610	Sewer collector	69,300.00		
		Gravitational networks	174,000.00	139,200.00	34,800.00
		Sewer manholes	125,000.00	100,000.00	25,000.00
		Local pumping stations	16,000.00	16,000.00	-
		Pressure networks	4,500.00	4,500.00	-
Total investments s, Obileni, EUR			**388,800.00**	**259,700.00**	**59,800.00**
Cotul Morii	1,230	Sewer collector	122,000.00		
		Gravitational networks	170,000.00	136,000.00	34,000.00
		Sewer manholes	122,000.00	97,600.00	24,400.00
		Local pumping stations	16,800.00	-	-
		Pressure networks	22,000.00	-	-
Sarateni	600	Sewer collector	35,700.00	-	-
		WWPS	24,000.00	-	-
		Gravitational networks	83,500.00	83,500.00	-
		Sewer manholes	60,500.00	60,500.00	-
Total investments com, Cotul Morii, EUR			**656,500.00**	**377,600.00**	**58,400.00**
Leuseni	1,850	Sewer collector	187,700.00	-	-
		Gravitational networks	289,000.00	231,200.00	57,800.00
		Sewer manholes	207,500.00	166,000.00	41,500.00
		Local pumping stations	14,350.00	14,350.00	-
		Pressure networks	1,000.00	1,000.00	-
Feteasca	60	Individual sanitation system	-	-	9,000.00
Total investments com, Leuseni, EUR			**699,550.00**	**412,550.00**	**108,300.00**
Regional wastewater treatment plant Cluster 4			**1,528,800.00**	**436,800.00**	**218,400.00**
TOTAL CLUSTER 4			**4,691,300.00**	**3,121,800.00**	**1,657,500.00**

3.2.5. Cluster 5

Miresti commune involves the construction of a centralised sewerage system with connection to the WWTP located in the southern part of Chetroseni village. The table below summarises the infrastructure required to implement the project. Investments in septic tanks (pits) are not included. Septic tanks are accepted as a temporary solution and

play an important role in any medium-term scenario, but are not a solution that can be actively promoted due to the current legal situation in Moldova.

Tabel 3.10. Investments needed in the sanitary infrastructure for cluster 5

Locality	EI	Infrastructure	Investments, EUR
Miresti	880	Sewer collector – 0.8 km	20,250.00
		Gravitational networks – 14.6 km	394,000.00
		Sewer manholes – 488 pc.	283,000.00
Chetroseni	280	Sewer collector – 0.3 km	6,750.00
		Gravitational networks – 5.1 km	138,000.00
		Sewer manholes – 171 pc.	99,000.00
		WWTP 1,160 EI	**186,300.00**
		Total investments Cluster 5, EUR	**1,127,300.00**
	1,160	**Investment cost per capita, EUR/loc,**	**965.15**
		Annual O&, EUR/year	**17,390.00**

A map featuring the location of the sanitation infrastructure proposed at MPWSS level can be found in Annex 6.

3.2.6. Cluster 6

Bujor agglomeration is one of the largest rural localities in the Nirnova basin, after Varzaresti commune. The location of the WWTP is proposed in the southern part of the locality. The treated WW will be discharged into a tributary of the Nirnova river. A map featuring the location of the sanitation infrastructure proposed at MPWSS level can be found in Annex 6.

The table below summarises the infrastructure required to implement the project.

Tabel 3.11. Investments needed in the sanitation infrastructure for Cluster 6

Locality	EI	Infrastructure	Investments, EUR
Bujor	3,430	Sewer collector – 0,6 km	21,120.00
		Gravitational networks – 22,0 km	594,000.00
		Sewer manholes – 735 pc.	426,000.00
		WWPS – 23,9 m^3/h	23,900.00
		Wastewater pressure networks – 1,2 km	22,000.00
		WWTP 3430 EL	496,700.00
		Total investments Cluster 6, EUR	**1,583,720.00**
	3,430	Investment cost per capita, EUR/loc.	461.73
		Annual O&M costs, EUR/year	45,881.00

3.2.7. Cluster 7

The location of the WWTP for Onesti commune is proposed in the South-West part of the locality. The treated WW will be discharged into a tributary of the Nirnova river. A map featuring the location of the sanitation infrastructure proposed at MPWSS level can be found in Annex 6. The table below summarises the infrastructure and investments needed to implement the sanitation project in Cluster 7, Onesti commune.

Tabel 3.12. Investments needed in the sanitation infrastructure for Cluster 7

Locality	EI	Infrastructure	Investments, EUR
Onesti	1,060	Sewer collector – 0.1 km	2,700.00
		Gravitational networks – 3.9 km	105,000.00
		Sewer manholes – 131 pc.	76,000.00
Strimbeni	470	Sewer collector – 0.1 km	2,700.00
		Gravitational networks – 5.4 km	146,000.00
		Sewer manholes – 181 pc.	105,000.00
		WWTP 1530 EL (12.0 m^3/h)	244,500.00
		Total investments Cluster 7, EUR	**681,900.00**
	1,530	Investment cost per capita, EUR/loc.	445.69
		Annual O&M costs, EUR/year	20,968.00

4. INSTITUTIONAL ACTIONS

As described in Chapter 12 of the MP on WSS, the preferred option for managing water systems in the Nirnova Basin region is to empower the Mayors' association so it can be dotted of status allowing decision making and contracting for the converned Local Public Authorities This association would have the responsibility to provide consumers with a public water supply and sewerage service and seek the support from the best combinaison of local operators and staff directly hired by the localities. Considering that the drinking water supply comes first and will generate wastewater, the references to Clusters 1 to 3 from the drinking water scenario 1 will be the core break down of the sub-basin to organise the services.

To ensure water and sewerage systems management, several stages must be carried out by the authorities of the Nirnova basin. The process will include:

(i) Institutionalise further the status of the association in line with the legislation progress in close coordination with the local and rayonal authorities from Hincesti and Nisporeni

(ii) Prepare selection and contract between the concerned authorities and local operators

(iii) Step by step signing of agreement and monitoring of progress by the association in synergy with the operaors.

The institutional mechanism must be implemented in the first phase of work, from 2021. First steps must ensure the reinforcement of the mayors' association or establishment of an IDA if included in the new legislation. It is also important to establish the financial resources of the association from the local budget that will ensure the financing of highly qualify staff to put in place the contractual schemes adapted to implement tha Master Plan and complement the international donors efforts.

By the end of 2021, the association should have a legal letigitimacy and clear functioning rules. Any accessions or functional improvements will be possible through amendments to the statutory acts.

The next step coordinated with all local representatives through the association is to delegate the management of all or part of the clusters to one or several companies. The following priority actions are proposed for the different clusters:

- The **mandate** of the LPAs from the northern area of Nirnova Basin (Balanesti commune, Vinatori village, Ciutesti commune and Seliste commune) to the Nisporeni district council to negotiate together with the association manager with "Apa Vital" Iasi in order to supply drinking water to cluster 1;
- The **mandate** of the LPAs from Siscani commune, Marinici commune and Calimanesti village to the Nisporeni district council to negotiate together with the association manager with the manager of the "Lunca Prutului" aqueduct in order to extend the aqueduct in the respective localities of cluster 3;
- The common **structure (association) of** local public administration authorities will be in charge of dayly work to monitor the implementation of the long-term planning documents, investment programmes, service performance indicators, liability and asset registers etc.;
- The members of the District Councils and LPAs within the inter-community structure shall select through a bid and/or set up a public **company** with the object of activity – provision of all or part of the water supply and sewerage services. The company shall be invited to provide public capital to ensure the viability of the company at the beginning of its activity, until the point when it can collect levies for the provision of the service;
- The selected operators will have to obtain the **licences** required by law, including the operating licence in the WSS sector, issued by the National Agency for Energy Regulation;
- **Delegation contract** between the inter-community structure and operator. The aspects to be included in the delegation contract are provided by art. 13 (7) and (8) of the Law No. 303/2013 of the public water supply and sanitation service.

The advantages of the mayor association are: intervention of high level staff to support the mayors management task with reduced expenses; On top of it it can generate saving by a careful selection of the solutions and help to attract investment; it can increase the attractiveness and credibility of LPAs against donors.

The handicap of the curent association is the: lack of a clear legal framework on the status of such associations; the legislation does not provide for the possibility of delegating powers to such associations, thus in some cases the functions may be duplicated, both at the level of the association and of the founding LPA. This problem could be overcome using the presence of the French cooperation project.

In order to establish the institutional framework of the inter-community associations, and to organise and provide efficient public services, an unapproved 2020 bill has been drafted.

Although the above-mentioned form of association is very poorly regulated by law, in practice more and more LPA associations are registered in the form of unions of legal entities. It should be mentioned: according to the legislation in force, LPAs, like other public authorities, may not be founders of public associations, and therefore the solution was to register LPA associations in the form of unions of legal entities. LPA associations may be founded for various inter-community cooperation projects, such as in order to develop tourism, attract investments and grants, etc. In addition, LPA associations may be created in parallel with service operators with public capital or at the same time with the concession of the services of a common private operator.

If the legislation is not updated and there is no possibility of association in order to set up an inter-community structure, a possible solution is to register the delegation contracts of the regional operator with each public administration authority.

As for the **operation and maintenance of the infrastructure for sanitation** at the household and institution level, this is the responsibility of the respective owners, with direct support from the private sector

(e.g. cesspool/ cesspit disposal services, necessary maintenance services), but also from the public sector (provision of services of disposal of cesspools/ cesspits, of sludge transfer stations). All such public services may be outsourced again to the private sector. In this respect, it is possible for one or more private operators to be contracted in each village to provide the mentioned services, but also or beyond this, single private operators may provide such services for specific clusters or the whole district. Given the current situation, it is a rational option to have a certain number of operators for the provision of decentralised services (e.g. emptying of septic tanks, cesspools/ cesspits etc.) and a single operator for the provision of centralised services (operation of pumping stations, treatment plants, networks).

The operation and maintenance of the sewerage infrastructure – sewerage networks, pumping stations, WW pumping stations, WW treatment plants – shall be the responsibility of the owner, which is the public sector.

There are three main options:

a) directly from each agglomeration for the infrastructure directly serving the agglomeration,
b) by a public entity (society, association, cooperative etc.) for the infrastructure serving the villages and the common infrastructure, or
c) one or more private companies that provide operation and maintenance services on behalf of a public entity.

Based on limited current experience, it is preferable to use a public or private enterprise with sufficient capacity to operate and maintain the sanitation infrastructure. For practical reasons, it is recommended to use the (existing) companies owned by each village for the operation and maintenance of the village goods/ properties, and a separate public or private company owned by the villages for the operation and maintenance of the goods/ properties serving them.