Project appraisal document

NEGOTINO MUNICIPALITY
Reconstruction of water supply system

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1.1.1. Location map

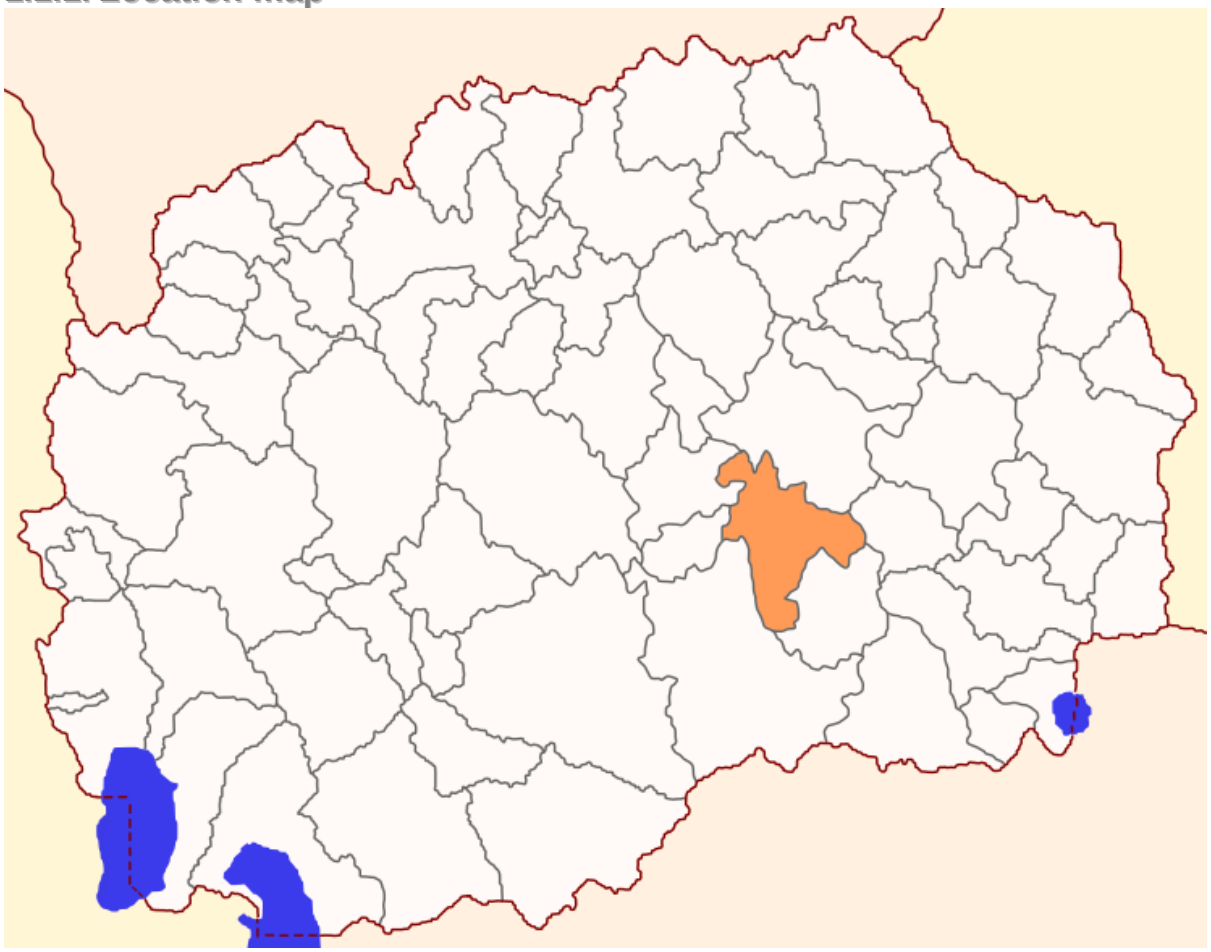


Figure 1. Map of Negotino and the Republic of Macedonia

1.1.2. Information[1]

Municipality of Negotino is located in the central part of the Republic of Macedonia in the middle of the Povardarie area. It belongs to Vardar Region and as a separate natural area it belongs to Tikves–Raecki micro region. It covers the eastern part of Tikves valley, spreading out onto the two banks of Vardar River. The Municipality of Negotino is bordering with the Municipality of Stip to the North, Konce to the East, Demir Kapija to the Southeast, Kavadarci to the South, Rosoman to the West and Gradsko to the Northwest. Municipality of Negotino covers an area of 426 km^2 populated by 19,212 inhabitants living in the town of Negotino and in the other settlements.

[1] For more information please, see at the municipality web site: and the "*Strategy for local development of the municipality of Negotino*" prepared by Local Leadership Group from the Municipality of Negotino from October 2007.

Municipality of Negotino is located about 150 meters above sea level. Being part of Tikves and Povardarie area, the territory of the Municipality of Negotino is under the impact of the mediterranean climate penetrating from the South through Demir Kapija ravine and under impact of the continental climate penetrating from North through Veles valley. Negotino comprises 426 km^2 with 19,212 citizens in 5,898 households and 13 settlements as per the latest census from 2002.

1.2. DEMOGRAPHIC AND ECONOMIC PROFILE

1.2.1. Demographic table

In the next table we present basic demographic and economic data about Negotino.

Table 1: Basic demographic and economic data about Negotino

Demography			Quality of life	
Number of settlements	13		Infant mortality Negotino 2012	0
Area in km^2	426		Number of births Negotino 2012	180
Population census 2002	19,212		Age dependency Negotino 2002	0.42
Population density Negotino	45		Infant mortality Macedonia 2012	230
Population density Macedonia	82		Number of births Macedonia 2012	23,138
Number of dwellings	7,369		Age dependency Macedonia 2002	0.46
Number of households	5,898		Economy	
Average number per household	3.26		GDP per capita in US $ Negotino 2002	5,591
Infrastructure			Unemployment rate Negotino 2002	44.4
Total length of roads (of which asphalt) in km for 2012 Negotino	79 (20)		GDP PPP growth Negotino 2002/1998	0.9
Total length of roads (of which asphalt) in km for 2012 Macedonia	9,355 (4,439)		GDP per capita in US $ Macedonia 2002	6,850
			Unemployment rate Macedonia 2002	38.1
			GDP PPP growth Macedonia 2002/1998	5.2

Source: State statistical office-SSO and expert estimation for the GDP

What we can see from the table above is that the infant mortality number in Negotino for 2012 is zero while the Macedonian average for 2012 is 230 and that the population density is almost twice lower than the average population density for Macedonia for 2002 when the last census was conducted. Negotino have had lower GDP per capita compared to Macedonia in 2002 as well as higher unemployment rate in the same year. GDP growth in 2002/1998 is also much lower in Negotino (only 0.9%) than the proper GDP growth for Macedonia (5.2%).

1.2.2. Gender and age repartition

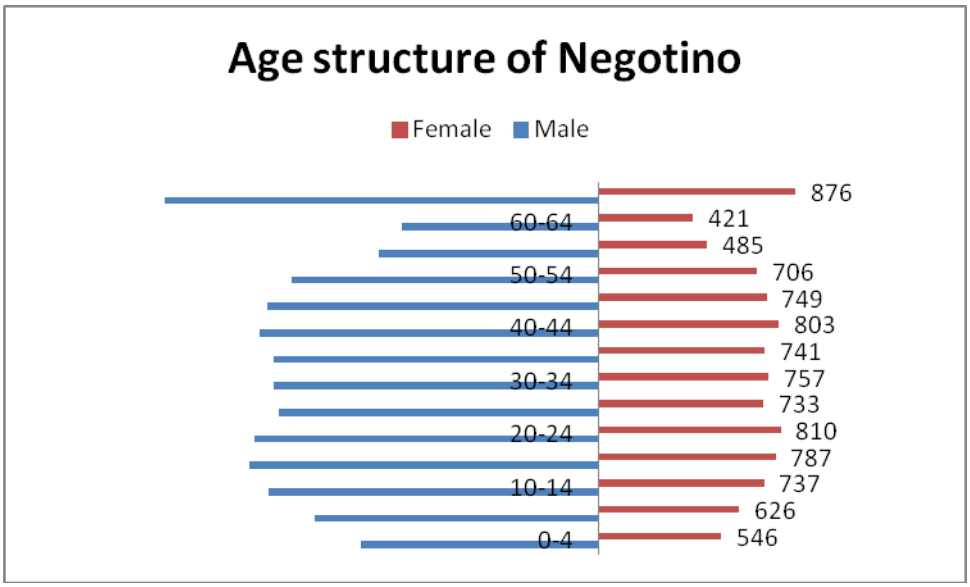


Figure 2. Age structure of Negotino population; Source SSO census

From the figure above we can conclude that 9.99% of the population in Negotino is older than 65. This is less than 10.63%, which is the average for Macedonia. On average the population in Negotino is younger than the average for Macedonia. The age distribution by gender in Negotino is presented in table below.

Table 2: Age distribution by gender in Negotino

	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	60-64	65-
Total	19212	1051	1255	1461	1548	1521	1416	1440	1440	1501	1464	1357	972	867	1919
Male	9777	546	626	737	787	810	733	757	741	803	749	706	485	421	876
Female	9435	505	629	724	761	711	683	683	699	698	715	651	487	446	1043

Source: SSO census in 2002

1.2.3. Urban-rural repartition

Urban population dominates the municipality of Negotino.

Table 3: Population structure and area depending on the urban/rural character

	Urban	**Rural**
Population	68%	32%

Source: Strategy for local development of the municipality of Negotino

1.2.4. Ethnic structure

Demographic structure of Negotino by ethnicity is: Macedonians 92.5%, Serbs 3.3%, Roma 2.4%, Turks 1.3%, Albanians 1.6%, and other 4.7%. Average population age is 35.7 years, up to 20 years are 27.7% of total population of Negotino, up to 40 years are 57.9% of total population of Negotino, more than 60 years are 14.5% of total population of Negotino.

Table 4: Ethnic structure in Negotino

	Macedonians	Albanians	Turks	Roma	Serbs	Other
%	92.5	0.1	1.3	2.4	3.3	0.4

Source: Strategy for local development of the municipality of Negotino

1.2.5. Employment repartition

In Negotino 15,195 or 79.1% from the population is at age 15-79[2]. In 2002 total unemployment in Macedonia was 38% while in Negotino it was 44.4%. The age dependency rate (population over 65 over population of 15-64) in Negotino is 14% and in Macedonia it is 16%.

Table 5: Unemployment by age and by gender in Negotino and in Macedonia on 30th of April 2014

Negotino	Total	15-19	20-24	25-29	30-34	35-39	40-44	45-49	50-54	55-59	More than 60
Total	1272	25	118	134	118	98	102	127	122	159	269
Female	603	12	75	85	69	57	61	68	53	65	58
Macedonia	**Total**	**15-19**	**20-24**	**25-29**	**30-34**	**35-39**	**40-44**	**45-49**	**50-54**	**55-59**	**More than 60**
Total	103250	2140	11628	14188	10442	9086	8650	8958	9940	13401	14817
Female	43117	757	5204	7132	5207	4402	3908	3776	3841	5103	3787

Source: Employment agency of Macedonia:

In accordance with the Employment agency's of Macedonia data presented in the table above we can see that on the territory of Negotino compared to Macedonia there is less youth unemployment for age class 15-24 as a share of the total unemployed (13.3% in Macedonia and 11.2% in Negotino). Also, we can see across age classes that the female unemployment, as a share of total unemployment, is higher in Negotino than in Macedonia.

In the next table the employment in Negotino is illustrated by economic sectors from the census 2002 data. We can see that the services were underdeveloped in Negotino compared to Macedonian average.

Table 6: Employment by economic sectors in Negotino and Macedonia

	Employed	Agriculture (as % from work force)	Industry (as % from total)	Services (as % from total)	Unknown (as % from total)
Negotino	19,626	12%	49%	39%	0%
Macedonia	174,974	11%	36%	51%	2%

Source: SSO census 2002

[2] *Working age population is between 15 and 79 as per the State statistical office-SSO. See the SSO's publication: http://www.stat.gov.mk/Publikacii/2.4.11.09.pdf*

1.2.6. Economy

According to the data received from the Central Register, in 2010 in the municipality of Negotino 1,206 business entities have been registered, out of which 42.8% are enterprises, 32.0% trade companies and 13.0% sole proprietors.

The structure of business entities in the municipality by industry shows that 260 subjects or 65% are registered in the sector of services with wholesale and retail trade, while in the area of shipping – 53 subjects or 13.2%. 39 subjects (9.57%) are registered in the area of tourism and catering industry, while the rest is in the area of financial services and other types of services. The structure of the subjects in the industrial production shows that the food industry has a dominant role with 32 registered subjects or 50% of the industrial production. 11 subjects (17.18%) are registered in the construction industry and 8 subjects (12.5%) are registered in the textile industry. The remaining subjects are part of the wood, metal processing, machine and graphics business. Main feature in the economy in the municipality of Negotino is the production of grapes and wine.

As described in the municipality's LEAP, Negotino is known for the vineyards and production of quality wines for the European market as well. Large amounts of high quality varieties of grapes and wine are produced in this territory. The main producer is the Winery "Povardarie", along with several private producers, which have gained high reputation such as for example wineries: Bovin, Pivka, Vardarska dolina, Fonko, Gjorcev, Dudin, Disan Hills, Venec-Dolni Disan, Mantev, Shato Royal and others. In the economic structure of the municipality of Negotino the livestock production is present as well. Besides the individual households that breed cattle for their own needs, several farms have been registered such as: Dubrovo – cow farm in Vojshanci that is a part of the cattle plant ZPTP Dubrovo, in Dolni Disan there is a cow farm.

From the next table we can see that in Negotino there are 785 active business legal entities which are 1.1% of the total active business legal entities in Macedonia. Domination of the micro businesses is obvious in Negotino (73%) as well as in Macedonia (71%). Micro and small business legal entities in Macedonia and in Negotino are 99% of the total active business legal entities.

Table 7: Active business legal entities in Negotino and Macedonia

2012	Total	Micro	Small	Medium	Large
Macedonia	74,424	53,117	20,341	631	335
Negotino	785	570	204	10	1

Source: SSO

In the next table we can see that most of the business legal entities in Negotino (as well as in Macedonia) are in the sector of trade wholesale and retail and repairing of motor vehicles and motorbikes (around 35%). Next sector is the manufacturing (11% in Macedonia and 13.8% in Negotino). Transport and warehousing share is 5.5% in Negotino and 8.7% in Macedonia. Construction share is 4.2% in Negotino and 6.1% in Macedonia.

Table 8: Structure of active business legal entities in Negotino and Macedonia by sectors

	Macedonia	Negotino
Total	100	100
Agriculture, forestry and fishery	4.1	6.5
Mining and quarrying	0.2	0.0
Manufacturing	11.1	13.8
Electricity, gas and steam supply	0.2	0.3
Water supply; sewage, waste management, environment rehabilitation	0.4	0.6
Construction	6.1	4.2
Wholesale, retail, motor vehicles and motorbikes repair	36.7	34.8
Transport and warehousing	8.7	17.1
Accommodation and beverages services	6.2	5.5
ICT	2.0	0.6
Finance and insurance	0.6	0.3
Immovable property	0.7	0.0
Consulting, scientific and technical services	7.7	5.4
Administrative and support services	1.9	0.5
Public sector and defense; mandatory social insurance	0.4	0.3
Education	1.4	1.1
Health and social protection	4.4	4.7
Art, entertainment and recreation	1.6	1.7
Other services	5.7	2.8

Source: SSO

1.2.7. Relevant extracts from the municipality's documents about the project

The needs for this project are identified in the Strategy for local development of the municipality of Negotino from 2007. In that document it is stated on page 34 as Strategic goal No 1: „*Solving the problem as regards water supply to Municipality of Negotino by 2012 through reconstruction of the Municipality's water supply and sewage system network* ". **Furthermore, the Strategy identifies the following strategic and operational goals:**

Table 9: Strategic and operational goals of the Strategy for local development of the municipality of Negotino

Strategic priority 1	Strategic priority 2	Strategic priority 3	Strategic priority 4
Solving problems in the infrastructure	**Socio-economic development**	**Education and culture**	**Inclusion of socially excluded people**
Strategic goals	Operational goals	Operational goals	
1. Solving the problem as regards water	**1. Decrease the unemployment rate**	**1. Improved general education** **2. Professional**	**1. Initiative and support of the accessibility to**

supply to Municipality of Negotino by 2012 through reconstruction of the Municipality's water supply and sewage system network **2. Construction of new roads and reconstruction of the existing ones** **3. Construction, repair and maintenance of the sewage system network in rural areas**	**2. To promote support of planned and organized crop production, organized yields purchase and production of quality products compliant with European standards.** **3. Alternative tourism development**	**orientation in education and establishment of centres for vocational training** **3. Advancement of the conditions for cultural development**	**all institutions and roads of transportation for the physically disadvantaged persons.** **2. Support to public institutions, social protection services and extra–institutional forms of social protection** **3. Active inclusion of the disabled in the economic and social life of the municipality.**

Source: Strategy for local development of the municipality of Negotino

This project assumes reconstruction of the water supply system and construction of new reservoir that addresses the strategic goal "Solving the problem as regards water supply to Municipality of Negotino by 2012 through reconstruction of the Municipality's water supply and sewage system network", **as per the Strategy for local development of the municipality of Negotino from 2007.**

The indicators as per that strategy for this strategic goal are:

- Concluded reconstruction/construction of the water supply system;
- Reduction of water loss;
- End the water supply restrictions;
- Continuous 24/7 water supply for the citizens;
- Improved environmental quality.

Further, in the LEAP for Negotino from 2011 it is stated in the section for the water supply that Negotino municipality in the period of 2003-2010 executed the following activities:

1. Preparation of study for underground cadastre;
2. Landscaping around existing wells for additional water-supply;
3. Realization of the project for improvement of water-supply in the city of Negotino and villages in the municipality;
4. Construction of two wells with pressure pipeline for improvement of water-supply in villages D. Disan and Kurija; and
5. Establishment of local environmental information center.

The Action plan for the water supply section from the LEAP from 2011 states: “For solving the problem of the citizens with water-supply in Negotino municipality, following actions are recommended”:

I. Improving the water-supply system of the city of Negotino
Action 1. Realization of project "Dosnica"
Action 2. Improvement of the city water system and reduction of losses
Action 3 Providing data for detection of water losses in the water system (purchase or renting equipment)
Action 4. Increasing the capacity of the filter station on the spring Lukar

II. Construction of system for water-supply in the rural areas of the municipality
Action 5. Providing protection of the wells and reservoirs from different types of pollution in the village Pepeliste
Action 6 Monitoring of the water quality in rural areas

III. Supply with technological water of the city of Negotino and water for irrigation
Action 7. Cleaning the filter and replacement of the dimensions of the lattice near the Tikveski channel
Action 8. Application of „drop by drop” system on public green areas
Action 9. Construction of system for technology water in the village Crveni bregovi
Action 10. Construction of reservoir in the village of Pepeliste

IV. Education of public
Action 11. Preparation and realization of educational project (clean water and water savings).

More, administration of Negotino municipality organized a public hearing about this project on 26th of July 2014. Mr Vanco Apostolov, Mayor of Negotino, presented the project and later Mr Pere Samandov presented the details of the project during the public hearing. Later in the hearing a survey was distributed to the citizens and they all supported the project and expressed their highest expectations given the status at the moment with the water supply in Negotino. Citizens also suggested that the water supply in the Veljko Vlahovik Street should also be part of this project[3].

1.3. PROJECT DESCRIPTION

1.3.1. General project description

This project assumes reconstruction of the water supply system in 10 water supply lines in Negotino and construction of new water reservoir. The water supply lines are in the city of Negotino and the water reservoir is in the settlement Timjanik. The total length of the reconstructed lines is 3,903.8m.

1.3.2. Location of the project

Since this project will comprise substantial component of digging earth work, it is important to have information about the location of the project and the geo-mechanical characteristics of the location.

[3] For more about the public hearing please contact Mr. Pere Samandov from the communal and traffic sector administration in the municipality of Negotino: samandovpere@gmail.com

As per the detailed design prepared by the GEOS-M, on the basis of the field review on behalf of an experienced geologist and a geo-mechanical engineer, from a geo-mechanical aspect it has been found that the terrain is composed mostly from sand and gravel formations which at points are very clayish. Diverse locations have layers from dusty sand and clay dust. From a geological aspect the same belong in the group of Pliocene.

It is also stated that in general, it is not expected the occurrence of underground water or a level of underground water at the construction stage. Therefore, we can say that the excavation conditions are estimated satisfactory however accentuating the terrain categorization. According to the GN classification, the excavation can be classified into category III and IV. At places, the occurrence of diagenetic formations and blocks of compact rock material is possible for which the use of a hydraulic hammer would be necessary.

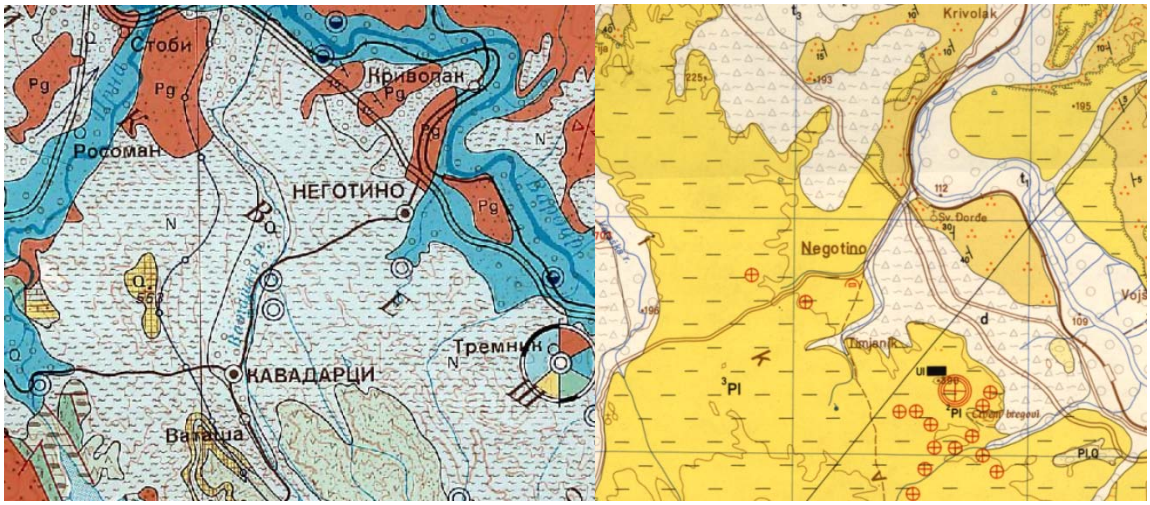


Figure 3. Hydro-geological map of the wider region

1.3.3. Current situation: general information

The Action plan for the water supply section from the LEAP from 2011 states: “For solving the problem of the citizens with water-supply in Negotino municipality, following actions are recommended”:

I. Improving the water-supply system of the city of Negotino
Action 1. Realization of project "Dosnica"
Action 2. Improvement of the city water system and reduction of losses
Action 3 Providing data for detection of water losses in the water system (purchase or renting equipment)
Action 4. Increasing the capacity of the filter station on the spring Lukar

The supply of sanitary water to the population and other consumers that use water in the area of the municipality of Negotino is done mostly through the city water supply system "Lukar" from the municipality of Kavadarci, built and operational from 1974. This system is connected to the city Negotino. The maximum water flow in the system is 105 l/ sec and in dry years - 60 l/sec and that is the reason for not meeting the needs in the summer time. The

settlement Krivolak, that has 1,021 inhabitants, is supplied partly from the water supply system "Lukar" – Negotino and partly from the well system Pepelishte through the water supply network. The water supply in the settlement Timjanik with 1,155 inhabitants is done from the system "Lukar" via built water supply network that meets the needs of the population. The settlement Dubrovo, that has 49 residents, is also supplied with water from the system "Lukar. The rest of the settlements supplied with water from local water supply systems.

The settlement Tremnik has two intakes. One involves spring water, which is then taken to the properly constructed tank and the other intake is from a concrete well, 18m deep, located near the thermal power plant (TPP) “Negotino”. This water supply system, according to the sanitary-hygienic conditions, does not fully meet the criteria, since a regular chlorination of the water is not performed. The settlement of Kurija is supplied from its own water supply system built in 1987. The sanitary hygiene requirements are not fully met because of the improperly regulated water catchments at source. Water disinfection is not performed.

The settlement of Pepelishte is supplied with water from wells around which there are no safety zones. Because of this, there is a great possibility for contamination caused by nearby fields planted with vegetables. According to the performed analysis, the quality of the water is bacteriologicaly proper.

The settlement Dolni Disan uses water from the jointly built local water supply system that is being used by the villages Veshje and Gorni Disan. Sanitary hygiene requirements are not fully satisfied because of the improperly regulated water catchments at source. Water disinfection is not performed. A pressure pipeline was built by digging a well for an additional supply of drinking water for the local population of Dolni Disan. From 2009, a new well is in function. The well is 3 km away from the main reservoir of the settlement Dolni Disan, 68m deep and has flow of 5 l/s. The water is regularly chlorinated and it is chemically and bacteriologicaly proper.

The settlement Vojshanci is supplied with water from natural sources and wells are located near the river Vardar. The water from springs is chlorinated and is sanitary proper. The settlement Crveni Bregovi is supplied with drinking water from the wells on the poultry farm. The well is properly constructed and secured, providing the entire settlement with proper sanitary water. The study of regional water supply of Negotino and the municipality of Negotino, prepared in 1991, proposes construction of a regional HMS “Doshnica” as a means for addressing the problem of water supply. HMS “Doshnica” would have multiple purposes: water supply of the city of Negotino and several settlements in the municipality, irrigation of certain agricultural areas not covered by HMS “Tikvesh”. This system would ensure water supply of the city of Negotino and the settlements Tremnik, Veshje and Dolni Disan along with the settlements of the municipality of Demir Kapija. Water from the existing urban water supply system "LUKAR" is assessed as hygienic proper according to the sanitary hygienic norms and legislation in force.

Quality control of drinking water is done regularly by the Institute for Public Health Care Veles - Organizational Unit Negotino. According to the information on water supply and drinking water quality in the municipality of Negotino, received in March 2011[4], the state of

[4] Note though, that the water quality is controlled twice a month at six measurement points.

quality of the drinking water coming from local water supply systems is not safe in hygiene terms and this percentage ranges from 65 to 100% in the following settlements: Tremnik (over 60%), Kurija (75%), Dolni Disan, Gorni Disan and Veshje (80%), Vojshanci (90%) and Crveni Bregovi (65%). Only in the settlement Pepelishte, according to the checks carried out, the water is quite clean and proper for use.

The maintenance of the water supply facilities is the responsibility of the CSE Komunalec Negotino. The total consumption of water from the city water supply system amounts to 6,000m^3. During the year, particularly in summer months when water consumption is increased and there is a shortage of about 30 l/s. Exclusions and restrictions of water increase the risk of bacteriological contamination.

The loss of water in the system reaches up to 50% and is due to the old city water supply network built over 20 years ago and the illegal connections to the system. On certain parts of the water supply network there is reduction - loss of pressure because of which there is a need for reconstruction or expansion of the network.

1.3.4. Current situation: specific information

City water supply is done by impoundment of the spring Lukar. The towns Kavadarci and Negotino receive water from this spring. There is a separating structure, near the village Vatasa, where the water is proportionally distributed to both towns. Of this water, 25% flows towards Negotino, and 75% flows towards Kavadarci. According to the project documentation, expected is a water flow of 80 liter per second towards Negotino. From the separating structure with steel pipeline, the water is distributed to two water tanks. One of them is for the low zone W=2500m^3 and the other is for the high zone W=150m^3 from the distribution network.

From the separating structure near village Vatasa, with steel pipeline with external diameter of 323.9/4 mm and length of 10,750m the water is distributed to two water tanks located approximately one kilometer from the town's entrance near the village Timjanik. The water tanks are located at a mutual distance of approximately 600m at different peak elevations above sea level. The smaller water tank with capacity of W=150m^3 is at a height of 235 meters above sea level and is for the higher zone of the distribution network of the town and the village Dubrovo, in whose vicinity is the cable factory and TPP Negotino. The reservoir for the low zone with W=2,500m^3 capacity is placed at elevation of 201 meters above sea level. The water tanks are designed as reinforced concrete with one dry and two wet chambers. From the water tanks, the water is gravitationally distributed to the consumers.

In the past, there were efforts to find means to improve the water supply in the wider Negotino municipality region and the surrounding villages by providing additional sources of water supply. One of the means for providing additional water quantity was supplying water from new wells with capacity of 60 to 80 liters per second that are near village Pepeliste. From there, the water by the method of re-pumping was distributed to a water tank with W=200m^3. This technical solution was performed in 2005 and now that water tank of W=200m^3 is supplying Krivolak settlement. The next phase is this technical solution with new water tank space of 500m^3.

1.3.5. New technical solution

This project consist technical solution for reconstruction of water supply lines at 10 streets in

Negotino with total length of 3,903.8m and construction of new water reservoir in the settlement Timjanik. **The basic information, as per the construction project company GEOS-M that prepared the detailed design is illustrated in the next table.**

- Reconstruction of water supply lines

Table 10: Water supply line with description

No.	Water supply line (name of the street)	Description
1	12 Vataski drugari	Reconstruction of existing water supply line with a length of 421.02m. It is planned replacement of the old depreciated asbestos cement pipes with new HDPE 100 (polyethylene pipes) with pressure of 10 bar and ND 160mm. The pipes will go through the line of the main street. The connection manhole is CM3, CM19 until CM4.
2	29-ti Noemvri	Reconstruction of existing water supply line with a length of 409.28m. It is planned replacement of the old depreciated asbestos cement pipes with new HDPE 100 (polyethylene pipes) with pressure of 10 bar and ND 110mm. The pipes will go through the line of the main street. The connection manhole is CM117 until CM120.
3	Aco Adzi Ilov	Reconstruction of existing water supply line with a length of 273.20m. It is planned replacement of the old depreciated asbestos cement pipes with new HDPE 100 (polyethylene pipes) with pressure of 10 bar and ND 110mm HDPE 100 (polyethylene pipes) with pressure of 10 bar. The pipes will go through the line of the main street. The connection manhole is CM66 until CM76.
4	Dusan Jurukov	Reconstruction of existing water supply line with a length of 255.71m. It is planned replacement of the old depreciated asbestos cement pipes with new ND 110mm HDPE 100 (polyethylene pipes) with pressure of 10 bar. The pipes will go through the line of the main street. The connection manhole is CM103 until CM106.
5	Engelsova	Reconstruction of existing water supply line with a length of 199.61m. It is planned replacement of the old depreciated asbestos cement pipes with new ND 110mm HDPE 100 (polyethylene pipes) with pressure of 10 bar. The pipes will go through the line of the main street. The connection manhole is CM30 until CM34.
6	Ilo Valarov	Reconstruction of existing water supply line with a length of 475.73m. It is planned replacement of the old depreciated asbestos cement pipes with new ND 110mm HDPE 100 (polyethylene pipes) with pressure of 10 bar. The pipes will go through the line of the main street. The connection manhole is CM40 until CM54.
7	Kiro Krstev	Reconstruction of existing water supply line with a length of 919.88m. It is planned replacement of the old depreciated asbestos cement pipes with new ND 160mm HDPE 100 (polyethylene pipes) with pressure of 10 bar. The pipes will go through the line of the main street. The connection manhole is CM1 until CM14.
8	Leninova	Reconstruction of existing water supply line with a length of 375.823m. It is planned replacement of the old depreciated asbestos cement pipes with new ND 110mm HDPE 100 (polyethylene pipes) with pressure of 10 bar.

		The pipes will go through the line of the main street. The connection manhole is CM35 until CM43.
9	Nikola Petrov	Reconstruction of existing water supply line with a length of 260.62m. It is planned replacement of the old depreciated asbestos cement pipes with new ND 110mm HDPE 100 (polyethylene pipes) with pressure of 10 bar. The pipes will go through the line of the main street. The connection manhole is CM113 until CM116.
10	Stavre Stavrov	Reconstruction of existing water supply line with a length of 312.98m. It is planned replacement of the old depreciated asbestos cement pipes with new ND 110mm HDPE 100 (polyethylene pipes) with pressure of 10 bar. The pipes will go through the line of the main street. The connection manhole is CM61, CM60 until CM66.
11	Water reservoir	Water reservoir comprises two independent water chambers connected with each other by a dry chamber which houses the entire hydro-mechanical equipment for handling. The shape of the water tank is rectangular with a total volume of around V=2x250=500m and dimensions 1080/ 2160/ 440cm.

- Construction of new water tank with 500m^3 capacity

The water tank design is done respecting the actual situation of the terrain, architectural solution, preserving the starting geometry of the structure and its use, as well as the technical solution derived from the calculations for its structural and hydro-technical part.

According the above mentioned, the water tank represents a whole of two independent water chambers connected with each other by a dry chamber which houses the entire hydro-mechanical equipment for handling. The shape of the water tank is rectangular with a total volume of around V=2x250=500m^3 and dimensions 1080/ 2160/ 440cm.

The water tank is composed of 2x250m^3 wet chambers connected to each other by a dry chamber. The dry chamber is designed for accommodation of the entire hydro-mechanical and electrical equipment necessary for functional continual work of the water tank.

1.3.6. Quantity of water produced and invoiced[5]

CSE Komunalec from Negotino

CSE Komunalec is established in 1957 as part of the Water community public organization at that time and as a sole CSE started to operate in 1983. It employs 103 workers at the moment with competencies in water supply, sewage, solid waste management, green market management, cemetery and public green areas.

The water supply network is 72km long and the sewage system network is 65km, of which 15km is storm water system. The CSE “Komunalec” has 4,770 users of the water supply system with 3,881 water flow meters (IBNET data 2013).

[5] Information are from Mr Pere Samandov from the communal and traffic sector administration in the municipality of Negotino: samandovpere@gmail.com.

The situation of water supply is at risk in the winter period with restrictions from 23h-05h and restrictions in summer from 12h-15h. Thus, on average (without taking into account the day/night amplitudes) the water supply is restricted 25% of the time in winter and 12.5% of the time in summer or this is on average 19% of the time during one year restriction from water supply to the citizens. **These 19% of time average restrictions that will be abandoned with this project will be assumed as additional water supply/demand for revenue collection (as an incremental benefit from this project in our calculations).**

Price of Water

The changes of water price in Negotino municipality are illustrated in the next table.
Table 11: Water prices in Negotino (per m^3)

Since December 2011	
Households	18.5 MKD + 5% VAT
Industry	36 MKD + 5% VAT
2010-2011	
Households	10.5 MKD + 5% VAT
Industry	18.5 MKD + 5% VAT

The 2011 prices will be taken into account in our calculations.

Water produced and invoiced

By comparing the water amount at the Vatasa shaft and the invoiced amount of water the total water losses are around 58-59%. The proper numbers of produced and invoiced amounts of water together with losses are illustrated in the next table. We expect the water losses to decline with the implementation of this project

Table 12: The produced and invoiced amounts of water for 2012 and 2013 in Negotino

	2012	2013
Produced (m^3)	2,426,650	2,433,168
Invoiced (m^3)	1,015,459	986,285
Losses (m^3)	1,411,191	1,446,883
Losses (%)	58	59

Source: CSE Komunalec

Return on billing

In Negotino, the return on billing rate is around 65-67% as illustrated in the next table.

Table 13: The return on billing of water for 2012 and 2013 in Negotino

	2012	2013
Return on billing (%)	65	67

Source: CSE Komunalec

We expect the return on billing to improve after the implementation of this project.

Incremental analysis from this project

This project will have incremental impact as it is about reconstruction of already existing water supply network. The project consists of technical solution for reconstruction of water supply lines at 10 streets in Negotino with total length of 3,903.8m and construction of new water reservoir in the settlement Timjanik. The number of household connections is 551 and the number of industry connections is 16 as presented in the next table.

Table 14: Water line length and number of connections

No.	Water supply line (name of the street)	Length in m	Number of connections households	Number of connections industry
1	12 Vataski drugari	421.02	36	1
2	29-ti Noemvri	409.28	84	0
3	Aco Adzi Ilov	273.20	81	12
4	Dusan Jurukov	255.71	44	0
5	Engelsova	199.61	20	0
6	Ilo Valarov	475.73	27	0
7	Kiro Krstev	919.88	131	2
8	Leninova	375.823	55	1
9	Nikola Petrov	260.62	46	0
10	Stavre Stavrov	312.98	27	0
	Total:	3,903.853	551	16

Source: GEOS-M and CSE Komunalec

On the other side the total number of water supply network in Negotino is 72km, as per the staff from CSE Komunalec. The project's length of 3.9km is actually 5% from the total network. The total number of household's connections in Negotino municipality in 2013, as per the IBNET toolkit of the World Bank, was 4,329 with 15,400 of population under supply of water and total number of industry's connections in Negotino in 2013 was 431. **Thus, this project will reconstruct water supply network for 13% of the total household' water connections and 3.6% of the industries water connections.**

If in 2013 number of households in Negotino municipality under water supply was 4,329 for population of 15,400 thus, the average number per households is almost 4. The 551 households will thus, contain around 2,200 citizens.

The incremental benefits for this population will come at least from no water loss, higher water revenues collection. More detailed analyses will follow.

1.3.7. Projected population

As per the Project program for preparation of the detailed design for construction of the new reservoir provided by the municipal staff, the total population that will benefit economically from the reconstruction of water supply system and construction of the new reservoir is 15,400 citizens (80.16% of the total population of Negotino municipality which is 19,212).

On the other side, the incremental benefit from less water loss and higher efficiency can come from the 2,200 citizens that live on the 10 streets where the reconstruction as per this project will occur. This is 2,200/15,400=14% of the total population in Negotino covered with water supply network.

As per the LEAP, the population dynamics in Negotino from 1948 till 2002 is illustrated in the next table.

Table 15: Population of Negotino from the Macedonian censuses

Year	1948	1953	1961	1971	1981	1991	1994	2002
Population	8,552	10,400	10,223	12,804	15,994	18,351	18,341	19,212

Source: LEAP of Negotino

Thus, the average annual population growth for the period 1948-2002 was 1.5%. We will use this annual growth rate to estimate the population of Negotino for the purpose of this project.

In the next table we estimate the population growth for the period of next 30 years[6]. Population that receives invoices for water supply in Negotino municipality is 15,400 in 2013.

Table 16: Projection of population for Negotino municipality for the 30 years horizon of the project that receive invoices for water supply

Year	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024
Negotino	15865	16103	16345	16590	16839	17092	17348	17608	17872	18140
Year	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Negotino	18413	18689	18969	19254	19542	19836	20133	20435	20742	21053
Year	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044
Negotino	21368	21689	22014	22345	22680	23020	23365	23716	24071	24433

We consider one year for reconstruction/construction in 2015 and start of exploitation in 2016.

1.3.8. Goals of the project

The project has the following goals:

- Reconstruction of the water supply system and construction of new reservoir;
- Reduction of water loss;
- End the water supply restrictions;
- Continuous 24/7 water supply for the citizens;
- Improved quality of life;
- Improved environmental quality.

[6] Reference time horizon for water projects as per the EU's *Guide to cost benefit analysis of investment projects*. See more in http://ec.europa.eu/regional_policy/sources/docgener/guides/cost/guide2008_en.pdf page 37 in the document.

2. SOCIAL IMPACT OF THE PROJECT

2.1. SOCIOLOGICAL STUDY

2.1.6. Methodology

The Sociological study follows the methodology concept of the World Bank that focuses on the five components:

- Social diversity and gender
- Institutions, rules and behavior
- Stakeholders
- Participation
- Social risk

2.1.7. Socio diversity and gender

Here we will present the main findings from the statistical information we illustrated above. From the demography we can see that:

- Population density is almost twice lower in Negotino than population density in Macedonia
- The urban population in Negotino is twice higher than the rural one (68%:32%)
- Infant mortality is much lower in Negotino than in Macedonia
- The age class share of population over 65 is 9.99% in the total population of Negotino and is lower than the proper share in Macedonia (10.63%)
- The male and female shares are almost equal in Negotino but female unemployment, as a share of total unemployment, is higher in Negotino than in Macedonia.
- From ethnic structure point of view Macedonians are dominating with 92.5% from the total population
- Unemployment is higher in Negotino compared with the Macedonian unemployment rate but on the territory of Negotino compared to Macedonia there is less youth unemployment of total unemployed for age class 15-24
- The age dependency rate (population over 65 over population of 15-64) in Negotino is 14% and in Macedonia it is 16%

Direct beneficiaries from this project are the citizens of Negotino for being able with this project to finally receive quality and regular water supply.

2.1.8. Institutions, rules and behavior

By discussing with the Mayor of Negotino it was confirmed that sentiment and actions about this project is already reflected in the Strategy for local development of the municipality of Negotino and the LEAP's action plan when this project is clearly prioritized with clear description of the problems and a clear goal.

The Strategy and the LEAP itself and the proper projects are visible for the Negotino's population and the citizens are fully informed about it. Namely, on 26th July 2014 at **a public hearing in Negotino**, Mr. Vanco Apostolov, Mayor of Negotino, presented the project and

later Mr. Pere Samandov presented the details of the project. Citizens supported the project and expressed their highest expectations given the current status of the water supply in Negotino. Citizens also suggested that the water supply in the Veljko Vlahovik street should also be part of this project.

By discussing with Mr. Samandov related to the project and the public hearing he answered that he is not surprised from the consensus in supporting this project not only because of its nature but because citizens were expecting for years. No feeling of inequality will be caused with this project for the Negotino citizens.

By discussing with Mr. Zoran Janev, the technical director, from the CSE Komunalec, he said that he is very enthusiastic about this project and sees the benefit of no water restrictions and full access to water for the citizens in Negotino. He also mentioned that next step for the municipality and CSE Komunalec is to implement the water supply SCADA system.

We should note also that citizens suggested during the public hearing about this project that the water supply in the Veljko Vlahovik Street should also be part of this project.

2.1.9. Stakeholders

Stakeholders comprise citizens of Negotino, Mayor, Negotino's Council CSE Komunalec and political parties within the Council. Detractors are not expected for this project more because this project is clear enough about improving water supply quality.

2.1.10. Participation

MSIP will cover all the finances for this project and the Negotino will pay off the loan. This project does not cause any additional financial burden or claims to the Negotino citizens.

2.1.11. Social risk

High socials risks for carrying out of this project cannot be perceived and is highly unlike. This project is about replacing old pipes of water supply network with new ones and construction of new water reservoir that will improve the water supply for the Negotino's citizens. The project does not bear high financial burden in comparison to the budget, and the population is not put into a position to contribute financially, so there is no cause for conflict on this point.

2.2. RESETTLEMENT ISSUES

This project is not subject to resettlement issues and/or population migration in Negotino. The new reservoir will be constructed on state land where there are no inhabitants and will cause now resettlement issues.

2.3. CONCLUSIONS ON THE PROJECTS POTENTIAL SUCCESS AND RECOMMENDATIONS

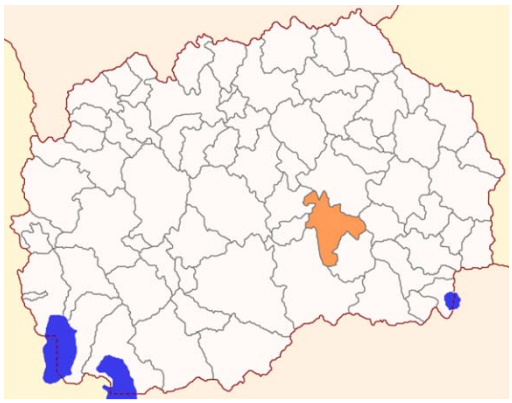
- This project is beneficial because it improves the water supply quality;

- This project is beneficial because it replaces the depreciated pipes of the existing water supply system and because it will build new water reservoir;
- This project have potential to introduce water savings in the water pipe network;
- This project is not subject to resettlement issues and/or population migration in Negotino;
- This project provides better quality of life for the Negotino's citizens;
- This project may contribute to increase in the collection rate;
- This project marginally protects the environment;
- There is stakeholder's consensus within Negotino about this project;
- With this project the cohesion among citizens, administration, Mayor and Council of Negotino is strong.

3. ENVIRONMENTAL IMPACT OF THE PROJECT

3.1. CURRENT WATER SUPPLY

Municipality of Negotino is located in the central part of the Republic of Macedonia in the middle of the Povardarie area. The Municipality of Negotino is bordering with the Municipality of Stip to the North, Konce to the East, Demir Kapija to the Southeast, Kavadarci to the South, Rosoman to the West and Gradsko to the Northwest. The Municipality of Negotino covers an area of 426 km^2 with 19,212 inhabitants (5,898 households) living in the town of Negotino and in the other settlements.



The existing water supply system "Lukar" operational from 1974 provides water to City of Kavadarci (Municipla of Kavadarci), City of Negotino and settlements Timjanik (1,155 inhabitants), Krivolak (1,021 inhabitants) and Dubrovo (49 inhabitants). The maximum water flow in the system is 105l/ sec and in dry years - 60l/sec and that is the reason for not meeting the needs in the summer time. Other settlements within the municipality are supplied with water from local water supply systems.

In settlement Vatasha there is a proportionally distribution of water to City of Negotino (25% of the water flow) and City of Kavadarci (75% of the water flow). From the separating structure with steel pipeline, the water is distributed to two water tanks. The water supply network of City of Negotino is 45km long and consists of following facilities:

- Water reservoir for lower zone with capacity of 2,500$m^3$and water supply network;
- Water reservoir for higher zone with capacity of 150m^3 and water supply network; and
- Underground fire fighting hydrants for securing the facilities from fire.

The current situation of water supply system in the Municipality of Negotino does not fulfill and meet the required standards for quality drinking water for the municipal population. During the year, especially in the summer period the water consumption is increased and there is a shortage of about 30-40l/s. The restrictions of water in the summer time increase the risk of bacteriological contamination of the local population. According to analyses form March 2011 by Institute for Public Health Care Veles - Organizational Unit Negotino (which performed regular quality control of drinking water in the municipality) the drinking water in some of the settlements of the Municipality of Negotino such as Tremnik, Kurija,Dolni Disan, Gorni Disan, Veshje,Vojshanci and Crveni Bregovi was found not safe for drinking and did not meet the proper sanitary standards. The loss of water is one of the main problems that occur during water supply of local populations. It reaches up to 50% and is due to the old city water supply network built over 20 years ago and the illegal connections to the system. On certain parts of the water supply network there is reduction - loss of pressure because of which there is a need for reconstruction or expansion of the network.

The existing sewage system network is 65km (territory of City of Negotino is covered with 45km sewage system network ensuring 100% households' coverage) of which 15km is storm water system.

In order to improve the current situation, Municipality of Negotino has decided to implement a project which will involve reconstruction of water supply lines in City of Negotino with total length of 3,903.8m and construction of new water reservoir with capacity of 500m^3.This

project will contribute to: improvement inwater supply system, reduction of water losses, elimination of the water supply restrictions, continuous water supply for the citizens, providing drinking water with good quality. The project will reconstruct water supply network for 13% of the total household' water connections (551 households of total 4,329 households) and 3.6% of the industries water connections (16 industry capacities).
The main characteristics of the water supply system are presented in Table 17.

Table 17: Short description of technical features of the project

Reconstruction of the water supply network in the Municipality of Negotino				
No	Water supply line (name of the street)	Length of water supply line (m)	ND Ø in mm HDPE 100 (polyethyl ene pipes)	Description of activity
1.	12 Vataskidrugari	421.02	160	Reconstruction of existing water supply line will be performed with replacement of the old asbestos cement pipes with new polyethylene pipes with various lengths and diameter with pressure of 10 bars. The water pipes route is along the 10 streets in City of Negotino, planned for replacement of the asbestos cement pipes. The new PVC pipes will be placed in ditches width 0.8m and depth 2m. On the bottom of every ditch will be placed 10cm of sand. The design envisages construction of the manholes for air valves, discharge valves, connection manholes and fire hydrants.
2.	29-ti Noemvri	409.28	110	
3.	AcoAdziIlov	273.20	110	
4.	DusanJurukov	255.71	110	
5.	Engelsova	199.61	110	
6.	IloValarov	475.73	110	
7.	KiroKrstev	919.88	160	
8.	Leninova	375.823	110	
9.	Nikola Petrov	260.62	110	
10.	StavreStavrov	312.98	110	
	Total	3,903.853		

Construction of new water reservoir in the settlement Timjanik				
		Volume of new water tank	Dimensions of water tank	Description of activity
11.	Water reservoir	500m^3	1080/ 2160/ 440cm	The shape of the water tank is rectangular and it will contain two independent water chambers connected with each other by a dry chamber. In the dry chamber will be placed entire hydro-mechanical equipment for handling such as inlet and outlet pipes, overflow/discharge pipes, valves and all other needed fittings. The water reservoir structure is reinforced concrete construction (class MB30) with additives for water tightness. All exterior concrete surfaces will be hydro insulated.

3.2. LOCATION OF THE SUB-PROJECTS

The project activities which include reconstruction of water supply line are located in the urban area in the City of Negotino whereas the activities for construction of new water reservoir are located in the rural area near the settlement Timjanik, in the Municipality of Negotino. The location of construction activities is shown on Figure 4.

Figure 4: Location of construction activities in the Municipality of Negotino (water supply system in City of Negotino and the water reservoir in settlement Timjanik)

Legend of Figure 4:

1 - Engelsova Str.	5 – Aco Adzilov Str.	9 - Nikola Petrov Str
2 - 12 Vatashki Drgari Str.	6 – Ilo Vilarov Str.	10 - 29th November Str.
3 – Kiro Krstev Str.	7 - Leninova Str.	
4 – Stavre Stavrev Str.	8 – Dushan Jurkov Str.	

The regional road R1103 passes through the project location connecting Municipality of Negotino with Municipality of Kavadarci. In vicinity of the reconstruction of water supply network there are individual family houses as well as educational and cultural buildings, the main City Square, green areas for recreation and Negotinska River. In the wider surrounding of activities for reconstruction of water supply network there is an international road E-75 (500m east from project location) passing by, River Vardar (800m north-east). In settlement Timjanik the family houses are located 500m south from project location and Timjanichka River is passing on 800m south. Far away (more than 5-8km) are Cable Factory FKN, Negotino (4.7km south-west), Thermo Electric Power Plant-Negotino (5.8km south-west) and agricultural areas (west and north from project location).

3.3. MAIN SUB-PROJECT ACTIVITIES WITH ENVIRONMENTAL IMPACT

The preparatory phase is a short-term activity consists of clearing the ground, removal of existing vegetation, cutting and removal of asphalt, mechanical excavation of excess soil, marking of construction site and signing the site and ensuring the implementation of OH&S standards (e.g., mobile toilets and temporary living trailers for the workers and adequate containers for waste collection).

The construction phase will include the reconstruction of water supply line and construction of water reservoir and the operational phase will include the everyday usage of water supply system and water consumption by the municipal population.

3.4. MAIN ENVIRONMENTAL IMPACTS AND SENSITIVE RECEPTORS

Before starting with the activities Traffic Management Plan should be prepared in order to prevent adverse environmental impacts and to ensure regular transportation of goods and people across the City of Negotino and settlement Timjanik. The Plan should include the re-routing directions and works time schedule. The Information note/Press release about the project activities (start, timeframe and re-routes of traffic) needs to be prepared by the Municipality Negotino staff and announced via municipality board, web page or municipality newspaper just in time.

In order to minimize the negative impacts on the safety of workers and the population living near the reconstruction site, the Contractor should provide fencing, marking and putting signs on the reconstruction site and should also provide use of personal protective equipment for workers in accordance with the good construction practice.

Streets on which will be performed reconstruction of water supply line are in close surrounding with Negotinska River which is right tributary of the River Vardar. According to Regulation on Classification of waterways, lakes, reservoirs and groundwater (“Official Gazette of RM” No. 18/99) the water characterization of river Vardar at that place is III class. This means that this river is hypertrophy with large organic load (low degree of self-purification) and also means that it is polluted, and cannot be used for bathing and recreation, water sports and fish growing. The temporary or final disposal of the inert and other type of waste near the river bank is forbidden to prevent the water pollution.

Waste generated as a result of construction activity will include solid and liquid waste. Solid waste includes waste from combined excavation, removal of asphalt, the cutting of small trees and branches, communal waste (paper, glass, plastic etc.) and possible quantity of hazardous waste (e.g. batteries, paint, asbestos water pipes). Possible liquid waste (oils, fuels and grease) could occur and according to the List of types of waste ("Official Gazette of RM"No.100/05) is hazardous waste. It should be handled with more attention. No asbestos waste is expected as the new pipes will be posted near the existing ones.

Locations of 10 streets where water supply line will be reconstructed are in urban area. Five streets marked at Figure 4 (3, 4, 7, 9 and 10) are in close surrounding of schools. The noise sensitive receptors will be workers, inhabitants living along the reconstructions area and students. Taking this into account and requirements of the national legislation on noise limits, the maximum allowed noise level for these areas should be 45dBA for night and 55 dBA for day and evening (II degree of protection against noise). The location where the reservoir will be constructed is in rural area and the maximum allowed noise level is 60dBA for night and 70dBA for day and evening (IV degree of protection against noise).

On the project locations there are no any recorded endangered and protected species of animals and plants or culture heritage site.

For the operational phase the most important issues is the water quality and quantity that will be distributed to the local population, so the water metering, performing the water testing

analysis on regular basis are the crucial measures. The main responsibility in operational phase will be on the CSE “Komunalec” from Negotino. CSE Komunalec is established in 1957 as part of the Water community public organization at that time and as a sole CSE started to operate in 1983. It employs 103 workers at the moment with competencies in water supply, sewage, solid waste management, green market management, cemetery and public green areas. The water supply network is 72km long and the sewage system network is 65km, of which 15km is storm water system. The CSE “Komunalec” has 4,770 users of the water supply system with 3,881 water flow meters.

According the national legislation, The Environmental Impact Assessment Report for the projects was prepared in period October-November 2014 from the Company “Tehnolab” from Skopje. The EIA Report was adopted by the Mayor of the City of Negotino, Mr. Vanco Apostolov. The Report contains the main project goals, main project activities and very general environmental mitigation measures.

The detailed relevant Environmental Mitigation Plan and Monitoring Plan are presented in following Tables.

3.5. MITIGATION PLAN

Potential impact	Impact scale	Proposed mitigation measures	Responsibility
Project activity: Marking out the location for reconstruction of water supply network and construction of water reservoir in Municipality of Negotino			
Possible social and health impact on workers because: - Unsafely start of construction works; - Non compliance with health and safety at work procedure; - Inappropriate public access	Local/ Municipality of Negotino/ settlement Timjanik Short term/minor	• Providing adequate marking of the construction site; • Ensuring warning tapes and signs (especially important to prevent enter of animals into the construction area); • Not allowed entrance for unemployment in the site where the construction activities are conducted; • Health and Safety measures should be applied: a) Security measures like: perimeter fence, life jackets, use of proper protective clothing and equipment by employees, warning signs for the public around the construction site; b) Maintain a good level of personal hygiene-have on site installations for washing, cleaning; c) Health protection-fist aid kits and medical service on sites d) Apply the emergency and normal first aid procedure for any injury if such occur through construction work; • The roads which are leading to construction site should be kept clean.	• Contractor, • Supervisor • Municipality staff (PM and Environmental inspector)
Project activity: Reconstruction of water supply network and construction of water reservoir in Municipality of Negotino			
Possible impacts on landscape and visual aspects	Local Municipality of Negotino/ settlement Timjanik Short term/minor	• Minimization of the construction area as much as possible (carefully planning and design of the project activity); • Fully clean-up of the construction site immediately after accomplishment of construction activities; • Collection of the generated waste on daily basis, selection of waste, transportation and final disposal on appropriate places.	• Contractor – Bidder • Supervisor
Possible emissions by transportation vehicles and	Local/ Municipality of Negotino/ settlement Timjanik Short term/minor	• Reconstruction site, transportation routes and materials handling sites should be water-sprayed on dry and windy days; • Construction materials should be stored in appropriate places covered to minimize dust;	• Contractor – Bidder • Supervisor

Potential impact	Impact scale	Proposed mitigation measures	Responsibility
impact on air quality		• Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards; • Vehicle loads likely to emit dust need to be covered; • Restriction of the vehicle speed within the construction location; • Burning of debris from ground clearance not permitted.	
Possible noise disturbance as a result of outdoor equipment usage and transportation vehicles driving around the construction site.	Local/ Municipality of Negotino/ settlement Timjanik Short term /minor	• The construction activities are located in urban and rural area with II and IV degree of protection against noise. According to these levels the noise should not exceed more than 60dB during the night and 70dB during the day (IV degree) and 45dB during the night and 55dB during the night (II degree of protection); • The construction work should be not permitted during the nights, the operations on site shall be restricted to the hours 7.00 -19.00; • The workers should be provided with ear protective devices (ear muffs and/or ear plugs); • Use of appropriate and technically functional equipment and mechanization.	• Contractor – Bidder • Supervisor
Possible adverse environmental impact and health effects could be occurred as a result of generation of the different waste streams and its inappropriate management	Local/ Municipality of Negotino/ settlement Timjanik Short term/minor	• Identification of the different waste types at the construction site; • Classification of waste according the national List of Waste (Official Gazette No.100/05) • The main waste would be classified under the Waste Chapter 17 “Construction and demolition wastes (including excavated soil)” with the waste code 17 05 04 – Excavated soil, 17 06 01* - Materials for isolation that contains asbestos, 17 09 04 – Mixed waste from construction site; • Small amount of solid municipal waste could be found (food, beverages), as well as packaging waste (paper, bottles, glass, etc.) • Transportation and final disposal of the inert and communal	• Contractor – Bidder • Supervisor • Communal Services Enterprise (CSE) “Komunalec” from Negotino • Municipality staff (PM,

Potential impact	Impact scale	Proposed mitigation measures	Responsibility
		waste by the Communal Services Enterprise (CSE) "Komunalec" from Negotino; • The contract with the company for waste collection and transportation should be signed for collection and transport of waste to the municipal legal landfill in the Municipality of Negotino; • The materials should be covered during the transportation to avoid waste dispersion; • Fulfilment of the Annual Report for non-hazardous waste management by the Mayor of Municipality and reporting to the Ministry of Environment and Physical Planning; • Possible hazardous waste (motor oils, vehicle fuels, asbestos cement pipes) should be collected separately and authorized collector and transporter should be sub-contracted to transport and finally dispose the hazardous waste; • The temporary or final disposal of waste streams near the rivers along the project sites is forbidden.	Communal Inspector, Environmental Inspector)
Lack of drinking water during the commissioning of the new water reservoir	Local/ Municipality of Negotino/ settlement Timjanik	• Just in time information release about the break in water delivery for certain time period in front of local population; • Announcement of the information through local radio; • Delivery of drinking water with water tanks reservoirs among the local population for the period when the commissioning of the new reservoir is happening.	• Contractor – Bidder • Supervisor Communal Services Enterprise (CSE) "Komunalec" from Negotino
Soil pollution The negligible impacts on soil arising from construction activities are expected.	Local/ Municipality of Negotino/settlement Timjanik Short term /minor	The possible mitigation measures for minimization of the soil pollution could be: • Transportation vehicles should be enclosed to avoid potential leakage; • Promptly clean-up spills of transported material on construction sites; • Proper positioning of the water drainage system on the	• Contractor – Bidder • Supervisor

Potential impact	Impact scale	Proposed mitigation measures	Responsibility
		construction site; • All roads and asphalt surfaces should be maintained clean in order to prevent runoffs from them into the ground water and other water flows; • Not to keep fuel, oil or lubricants along the alignment, especially not in the vicinity of draining structures; • To be set portable toilet that will be cleaned and maintenance on time.	
Operational phase	No adverse environmental risks are expected. In this phase will be achieved positive impact in terms of water supplying of the population of settlements in the Municipality of Negotino with safety drinking water. The CSE “Komunalec” from Negotino should prepare the Plan for preventive and regular maintenance of the whole system for drinking water supply including reconstructed water supply line and newly constructed water reservoir and its components. The possible incidental breakdowns of the water pipeline could cause very limited micro adverse impacts and the Municipality of Negotino should ask the contractor to take care about the proper marking of micro location, proper waste management and the most important to organize the water supply in the breakdown period. After this phase, in order to provide drinking water with proper sanitary conditions it should be continued with regular monitoring by Institute for Public Health Care Veles - organizational unit Negotino.		

3.6. MONITORING PLAN

What Parameter is to be monitored?	Where Is the parameter to be monitored?	How Is the parameter to be monitored?	When Is the parameter to be monitored (frequency of measurement)?	Why Is the parameter to be monitored?	Cost		Responsibility	
					Constr.	Oper.	Reconstruction of water supply network and construction of water reservoir in Municipality of Negotino	Operation phase
Project stage: Start-up of the Project activity “Reconstruction of water supply network and construction of water reservoir in Municipality of Negotino” (marking construction site)								
The occupational health and safety measures applied for the workers	On the reconstruction site	Visual check	Before start of the project activities and each of working day	To avoid occupational and safety risks (injuries)			Contractor - Bidder Supervisor Communal /Environmental Inspector at the Municipality of Negotino	
Project stage: Reconstruction of water supply network and construction of water reservoir in Municipality of Negotino								
Separated hazardous and non-hazardous waste	On the construction site	Visual monitoring and reporting	During the project activities	To avoid disposal of hazardous waste on municipal landfill			Contractor - Bidder / Municipal staff (Communal inspector and Environmental Inspector)Director of the CSE "Komunalec" from Negotino	

What Parameter is to be monitored?	Where Is the parameter to be monitored?	How Is the parameter to be monitored?	When Is the parameter to be monitored (frequency of measurement)?	Why Is the parameter to be monitored?	Cost		Responsibility	
					Constr.	Oper.	Reconstruction of water supply network and construction of water reservoir in Municipality of Negotino	Operation phase
Fulfilled Annual Report for transportation and disposal of waste	Local self-government administration	Review of documentation – Identification waste List	After the accomplishment the task of collection, transportation of waste on daily/monthly basis	To improve the waste management and hazardous waste management on local and national level			Mayor of Municipality of Negotino/ Director of the CSE "Komunalec" from Negotino	
Drinking water quality	The water sample should be analysed by the Authorized, accredited laboratory (Institute for Public Health Care Veles - Organizational Unit Negotino) for sampling and examination of water quality	Laboratory equipment for physical-chemical and microbiological water quality analysis	Continuously according to the national regulations Rulebook for safety of drinking water (Official Gazette of RM No.46/08)	To ensure the distribution of high quality drinking water to the population minimizing the health risks			Director of CSE "Komunalec" from Negotino	

What Parameter is to be monitored?	Where Is the parameter to be monitored?	How Is the parameter to be monitored?	When Is the parameter to be monitored (frequency of measurement)?	Why Is the parameter to be monitored?	Cost		Responsibility	
					Constr.	Oper.	Reconstruction of water supply network and construction of water reservoir in Municipality of Negotino	Operation phase
Regular maintenance of the water supply network and water reservoir	Along the water supply network and water reservoir	Review of the Preventive Plan and proposed measures for prevention of spills, water losses and cracks	On annual basis /6 months after the diagnostic of the “hot spots” along the water supply network	To prevent or minimize the risks to human health				Mayor /Director of CSE "Komunalec" from Negotino

4. TECHNICAL SOLUTION

4.1. DESCRIPTION OF THE PROJECT

The technical solution envisages reconstruction of part of the water supply system in Negotino and construction of new water reservoir. The water supply lines are in the Negotino city in the municipality of Negotino and the water reservoir is in the settlement Timjanik.

- Reconstruction of water supply lines

The total length of water lines planned for reconstruction is 3,903.8m. It is planned replacement of the old depreciated asbestos cement pipes with new HDPE 100 (polyethylene pipes) with pressure of 10 bar and different diameters. The water pipes route is along the streets planned for replacement of the asbestos cement pipes. The design envisages construction of the manholes for air valves, discharge valves, connection manholes and fire hydrants.

The construction work for the pipe network will be done in the urban part of the municipality where there is already underground infrastructure. Thus, special care should be taken during the construction work. Technical data and instructions for the diameter of the pipes are provided from the CSE Komunalec in the "Terms of reference". Also, calculations were not done for the reservoir capacity as it was predetermined in the "Terms of reference" to construct a water reservoir for additionally required water quantities with volume of V=2x250=500m^3.

- Construction of new water tank with 500m^3 capacity

Water reservoir comprises two independent water chambers connected with each other by a dry chamber which houses the entire hydro-mechanical equipment for handling. The shape of the water tank is rectangular with a total volume of around V=2x250=500m^3 and dimensions 1080/2160/440cm. The water reservoir structure is reinforced concrete construction with the following sizes:

Water chamber:
- Bottom slab thickness t=50cm
- Walls thickness t=40cm
- Roof slab thickness t=40cm

Dry chamber:
- Bottom slab thickness t=40cm
- Walls thickness t=30cm
- Roof slab thickness t=30cm

The concrete is class MB30 and it is with additives for water tightness. All exterior concrete surfaces are hydro insulated.

Hydromechanical equipment, inlet and outlet pipes, overflow/discharge pipes, valves and all other needed fittings are placed in the dry chamber.

All electrical installations for the water reservoir are planned.

4.2. ANALYSIS AND CALCULATION

City water supply is done by impoundment of the spring Lukar. The towns Kavadarci and Negotino receive water from this spring. There is a separating structure, near the village Vatasa, where the water is proportionally distributed to both towns. Of this water, 25% flows towards Negotino, and 75% flows towards Kavadarci. According to the project documentation, expected is a water flow of 80 liter per second towards Negotino. From the separating structure with steel pipeline, the water is distributed to two water tanks. One of them is for the low zone W=2500m^3 and the other is for the high zone W=150m^3 from the distribution network. From the separating structure near village Vatasa, with steel pipeline with external diameter of 323.9/4 mm and length of 10,750m the water is distributed to two water tanks located approximately one kilometer from the town's entrance near the village Timjanik. The water tanks are located at a mutual distance of approximately 600m at different peak elevations above sea level. The smaller water tank with capacity of W=150m^3 is at a height of 235 meters above sea level and is for the higher zone of the distribution network of the town and the village Dubrovo, in whose vicinity is the cable factory and TPP Negotino. The water tanks are designed as reinforced concrete with one dry and two wet chambers. From the water tanks, the water is gravitationally distributed to the consumers.

During the past period, there were efforts to find means to improve the water- supply for Negotino and the surrounding villages by providing additional sources of water-supply. As one of the opportunities for providing additional amount of water, is supplying water from new wells with capacity of 60 to 80 liters per second that are near village Pepeliste. From here, the water by the method of re-pumping is distributed to a new water tank with W=200m^3. This technical solution was performed in 2005. A next phase is this technical solution with new water tank space of 500m^3.

The designing is done respecting the actual situation of the terrain, architectural solution, preserving the starting geometry of the structure and its use, as well as the technical solution derived from the calculations for its structural and hydrotechnical part.

According the above mentioned, the water tank represents a whole of two independent water chambers connected with each other by a dry chamber which houses the entire hydro-mechanical equipment for handling. The shape of the water tank is rectangular with a total volume of around V=2x250=500m and dimensions 1080/ 2160/ 440 cm.

The water tank is composed of 2x250m^3 wet chambers connected to each other by a dry chamber. The dry chamber is designed for accommodation of the entire hydro-mechanical and electrical equipment necessary for functional continual work of the wet chambers from the first and second phase.

The characteristics of reconstruction of the water supply network are presented in the next table.

Table 17. Characteristics of reconstruction of the water supply network

No.	Water supply line	Line length in m	ND Ø in mm HDPE 100 (polyethylene pipes)	Connection manhole
1	12 Vataski drugari	421.02	160	CM3, P19 until CM 4
2	29-ti Noemvri	409.28	110	CM 117 until CM 120
3	Aco Adzi Ilov	273.20	110	CM 66 until CM 76
4	Dusan Jurukov	255.71	110	CM 103 until CM 106
5	Engelsova	199.61	110	CM 30 until CM 34
6	Ilo Valarov	475.73	110	CM 40 until CM 54
7	Kiro Krstev	919.88	160	CM 1 until CM 14
8	Leninova	375.823	110	CM 35 until CM 43
9	Nikola Petrov	260.62	110	CM 113 until CM 116
10	Stavre Stavrov	312.98	110	CM 61, CM 60 until CM 66
	Total	3,903.853		

4.3. CONCLUSIONS AND RECOMMENDATIONS

The detailed design contains the technical details of this project as well as costs calculation of the technical design.