PROJECT APPRAISAL DOCUMENT

Construction of water supply system in the municipality Shuto Orizari

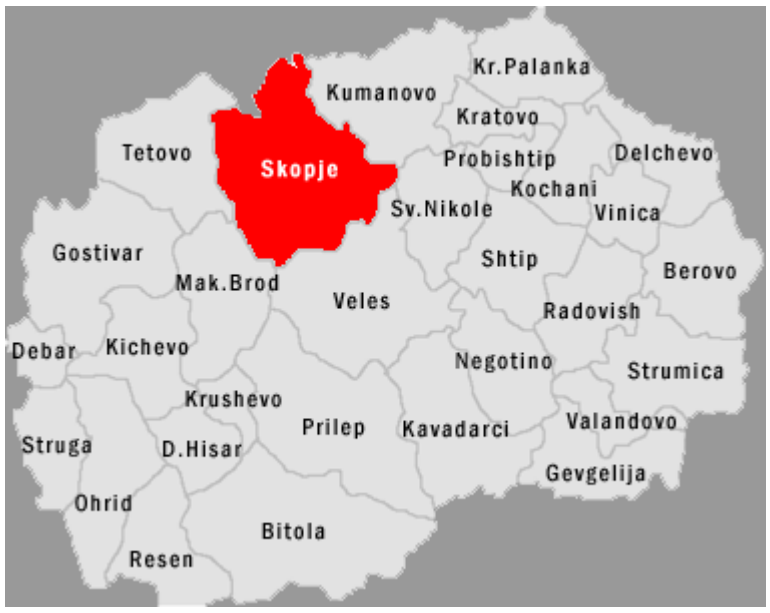
October 2014

MUNICIPALITIES: CITY OF SKOPJE AND SHUTO ORIZARI and CSE VODOVOD SKOPJE

I. PROJECT DESCRIPTION

A. GENERAL INFORMATION ON THE MUNICIPALITY CITY OF SKOPJE

1. Location map



2. General information

Area: 1,818 km^2 / 23 km length and 9 km width
Latitude: 42°00’ north
Longitude: 21°26’ east
Elevation: 245 meters
Average temperature: 13.5°C / 56°F

B. DEMOGRAPHIC AND ECONOMIC PROFILE

1. Demography of the City of Skopje

Table 1: Inhabitants, households, apartments in Skopje

Municipality	Inhabitants	Households	Apartments
Aerodrom	72,009	21,495	23,754
Butel	36,154	10,056	11,077
Gazi Baba	72,617	20,336	22,815
Gjorche Petrov	41,634	11,886	13,938
Karposh	59,666	19,680	22,849
Kisela Voda	57,236	17,577	20,237
Saraj	35,408	7,972	7,837
Centar	45,412	15,355	18,848
Chair	64,773	17,107	17,127
Shuto Orizari	22,017	5,102	5,263
City of Skopje	506,926	146,566	163,745

Source: 2002 Census, according to the administrative-territorial organization from 2004

Table 2: Total inhabitants in Skopje according to five years groups

Municipality	Total	0-4	5-9	10-14	15-19	20-24	25-29	30-34	35-39	40-44
Skopje	506926	30097	32788	35942	38117	40111	39973	38700	36900	35361
Aerodrom	72009	3393	3458	4198	5668	6704	6091	5131	4705	5017
Butel	36514	2239	2557	2639	2740	3029	2844	2759	2659	2563
G.Baba	72617	4582	4913	5141	5280	5742	6090	5560	5240	4989
G.Petrov	41634	2248	2484	2869	3189	3109	3213	3075	2956	3192
Karposh	59666	2837	3142	3550	3760	3657	4030	4741	4671	4228
K.Voda	57236	2843	3361	3794	3886	4008	3933	4294	4440	4264
Saraj	35408	3317	3453	3737	3291	3269	3241	3023	2729	2216
Centar	45412	1677	1890	2476	3196	3463	3188	2810	2774	2997
Chair	64773	4812	5334	5320	5065	5072	5487	5644	5099	4322
S.Orizari	22017	2149	2169	2218	2042	2058	1856	1663	1591	1573
Municipality	45-49	50-54	55-59	60-64	65-69	70-74	75-79	80-84	85+	Unknown age
Skopje	37152	37044	27497	24283	21500	14906	9906	4484	1916	249
Aerodrom	6462	7452	4586	3256	2489	1553	1115	485	190	29
Butel	2654	2576	1825	1669	1499	961	565	227	98	15
G.Baba	5226	5300	4077	3707	3190	1788	1071	443	239	39
G.Petrov	3410	3207	2389	2096	1724	1194	738	357	165	19
Karposh	4406	4328	3595	3674	3632	2672	1713	741	269	20
K.Voda	4324	4114	3288	3319	3000	2083	1379	636	253	17
Saraj	1768	1365	1045	945	818	577	296	163	133	22
Centar	3684	4256	2865	2211	2337	2215	2026	993	326	28

Chair	3863	3450	3104	2793	2338	1555	886	376	211	42
Sh.Orizari	1355	996	723	613	473	308	117	63	32	18

Source: 2002 Census

Table 3: Ethnic structure of the City of Skopje

Nationality	Population	Share (%)
Macedonians	338358	66.7
Albanians	103891	20.5
Turks	8595	1.7
Roma	23475	4.6
Vlachs	2557	0.5
Serbs	14298	2.8
Bosniacs	7585	1.5
Other	8167	1.6
TOTAL:	**506926**	**100**

Source: 2002 Census

Table 4: Ethnic structure of Shuto Orizari municipality

Nationality	Population	Share (%)
Macedonians	1438	6.5
Albanians	6675	30.3
Turks	56	0.3
Roma	13342	60.6
Vlachs	--	--
Serbs	67	0.3
Bosniacs	177	0.8
Other	262	1.2
TOTAL:	**22017**	**100**

Source: 2002 Census

Table 5: Education of the population over 10 years old by gender

Municipality	TOTAL		MALE		FEMALE	
	Educated	Non-educated	Educated	Non-educated	Educated	Non-educated
Skopje	433139	10902	215256	2143	217883	8759
Aerodrom	64656	475	31688	86	32968	389
Butel	30672	686	15477	129	15195	557
G.Baba	61156	1966	31137	385	30019	1581
G.Petrov	36308	594	18175	103	18133	491
Karposh	53002	685	25222	181	27780	504
K.Voda	50326	706	24730	146	25596	560
Saraj	27394	1244	14216	291	13178	953
Centar	41494	351	19423	65	22071	286
Chair	52241	2386	26692	396	25549	1990
Sh.Orizari	15890	1809	8496	361	7394	1448

Source: 2002 Census

a) Employment of the total inhabitants over 15 years old

Table 6: Employment of the total inhabitants over 15 years old

Municipality	TOTAL	Economically active			Economically not active
		All	Employed	Unemployed	
Skopje	406392	200937	143745	57192	205455
Aerodrom	60743	35448	28310	7174	25259
Butel	28632	13821	9824	3997	14811
G.Baba	57716	29326	19766	9560	28390
G.Petrov	33936	18584	13586	4998	15352
Karposh	49996	26212	21784	4428	23784
K.Voda	47104	25068	18582	6486	22036
Saraj	24487	7661	2891	4770	16826
Centar	39209	19967	16662	3305	19242
Chair	49099	19179	10433	8746	2990
Sh.Orizari	15470	5635	1907	3728	9835

Source: 2002 Census

According to the last Census data of 2002 there were 57,192 unemployed persons in Skopje. For the last 12 years this number was falling and in the end of April 2014 it was 17,034 only (Employment Agency data).

2. Density and housing

The population density varies in different urban areas of the City. The average density is 146 inhabitants/ha, but in the central city area it is up to 455 inhabitants/ha.

35% of the City is covered with housing. Significant areas of residential zones and complexes (built according to urban settings and standards) have a satisfactory level of infrastructure equipment, system of public functions and recreational areas. But there are also neighborhoods where there is neither appropriate infrastructure nor public functions in the housing area (characteristic of Topaana, Yaya Pasha, Shuto Orizari, etc.). A special problem of the City are the illegally built structures with buildings built on plots having different shapes and sizes, often unorganized, with uncompleted or poorly organized communal infrastructure.

3. Commercial facilities

Commercial facilities in Skopje engage a total area of 1,373.17ha. Participation of the industry is dominant. There are four industrial zones set up in the City: Northeast part (zone of non-ferrous metallurgy), Eastern part (zone of mechanical, automobile, pharmaceutical, leather industry, the industry for the production of beer), Southeast part (zone of electrical engineering, tobacco and chemical industry) and Western part (zone of chemical, lumber, construction metal industry and ferrous metallurgy). The total area of industrial buildings in the City covers 54.4% or 748.26ha.

4. Transport and energy

Skopje is a major traffic junction where road, railway and air traffic intersect. The length of the planned road network in the City is 267.92 km (according to the GUPs of 2002). Public passenger transport is organized as distant, suburban and urban, and taxi passenger transport. Primary transport mean is the bus. The network includes 29 City and 26 suburban lines.

Energy infrastructure in Skopje includes electricity, heat and gas line infrastructure. Skopje is supplied with electricity from the power system of the Republic of Macedonia, connected through four primary substations. Thermal energy is obtained from the City central heating system (three thermal plants, three boiler room facilities, adequate central heating network with total length of 170km and more than 2350 reduction stations). Gas pipeline system consists of the main pipeline with total length of 98km and city gas pipeline network of 19.71km. To the natural gas system that is not completely built 13 customers are connected.

5. Green areas

The green and the other open areas are planned and implemented as a system of parks, squares, housing and linear greenery. The achieved standard in Skopje is by 16m^2/capita. The total green area is 667.9ha or 8.7% of the total area of the city and it is distributed as a public greenery (housing greenery - 276.7ha; area parks - 3.38ha; city parks - 54.82ha; children's playgrounds - 0.75ha; central amusement park - 2.97ha and sports fields - 17.47ha); foliage with limited use - 144.98ha and protected greenery - 166.83ha. The suburb green forest park (4573ha) consists of the forest park Zajchev Rid (7ha) the Monument to Nature, the Canyon Matka (5.442ha) and greenery in the suburban recreation centres.

C. GENERAL DESCRIPTION OF THE PROJECT

1. General description

The vision for sustainable development implies a high quality environment defined by the availability of clean water, clean air, and clean soil. All these natural resources are under the threat of production processes, consumption, mobility and aspiration for economic growth, i.e. under the threat of the driving forces which provoke the production of waste. The City of Skopje makes efforts to implement its vision of sustainable development set up in the strategic documents: The Local Environmental Action Plan and the Strategy for Local Economic Development of the City and most of its municipalities.

The proposed project refers to the water supply system in the smallest municipality in the City of Skopje: Shuto Orizari (one of ten municipalities in the City of Skopje). This municipality is densely populated and the inhabitants are mostly Roma. The fertility rate in this municipality is high. For last ten years the population has been facing problems with the water supply because of lack of water quantity and low system pressure. Therefore the City of Skopje municipality, CSE Vodovod Skopje and Shuto Orizari municipality decided to invest jointly in construction of a new water supply system for high zone which will consist of:

1. Pump station;
2. Water supply pipeline;
3. Water tank with capacity of 4350m^3.

Ultimately, this water supply system will provide water to about 35,451 inhabitants for Shuto Orizari municipality and additionally to 19,755 inhabitants of part of the Skopje Sever area (Butel municipality) at the same time with this construction capacity.

The water supply system is calculated and designed based on the following parameters:

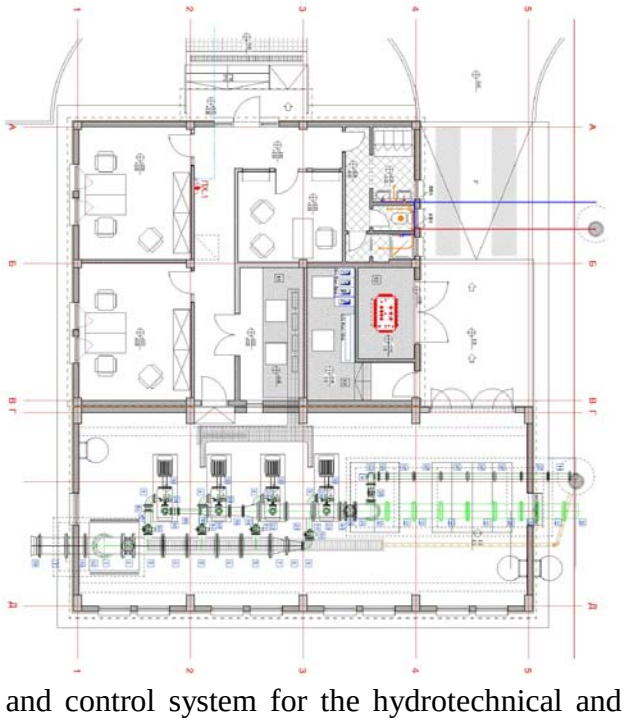
- 25 years projection period;
- water supply norm of 250 l/sec./capita;
- daily coefficient of inequality a_1=1.3;
- hourly coefficient of inequality a_2=1.3.

a) Pump station

The pump station will be connected with ductile iron pipe ND=600mm and length L=135.2m to the second main water supply pipe called “Zelezarski vodovod” for the City of Skopje, which is a steel pipe with diameter D=1600mm.

At the outlet from the new pump station, a branch manhole is located where the pipe is divided into the pressure return pipe to the water tank and Shuto Orizari and the branch pipe to part of the settlement “Skopje sever” (which is not subject of this project).

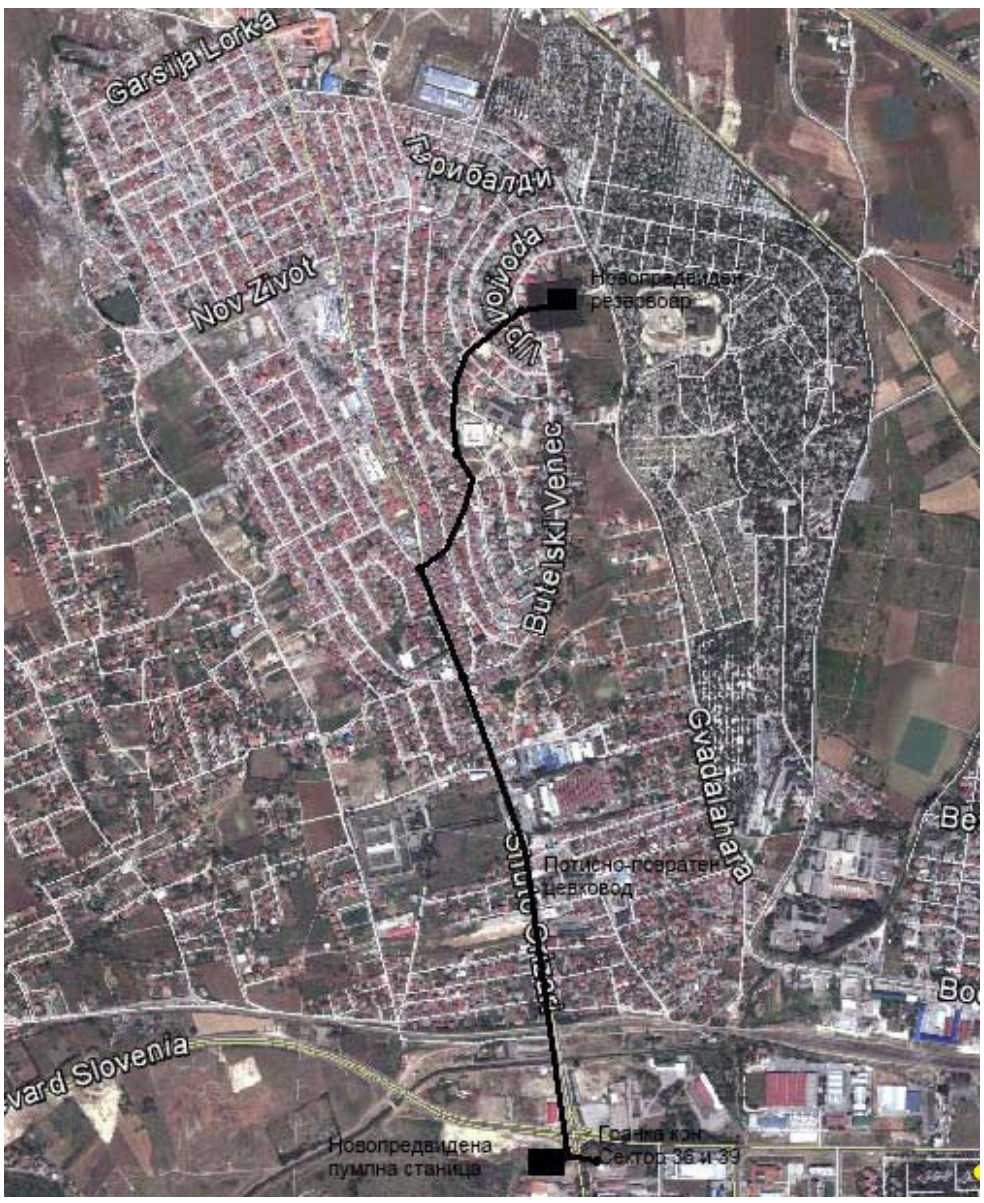
The total water quantity needed for the entire area is 320 l/sec. which has to be transported to the new water tank with three horizontal centrifugal pumps (+ one spare envisaged). The pump pressure is H=75m, the power of each pump is P=135kW. The total installed power of the pump plant is 445kW (3x135kW) + 40kW for other electrical needs.



A modern supervision and control system for the hydrotechnical and electrical equipment (SCADA) is planned in the pump station.

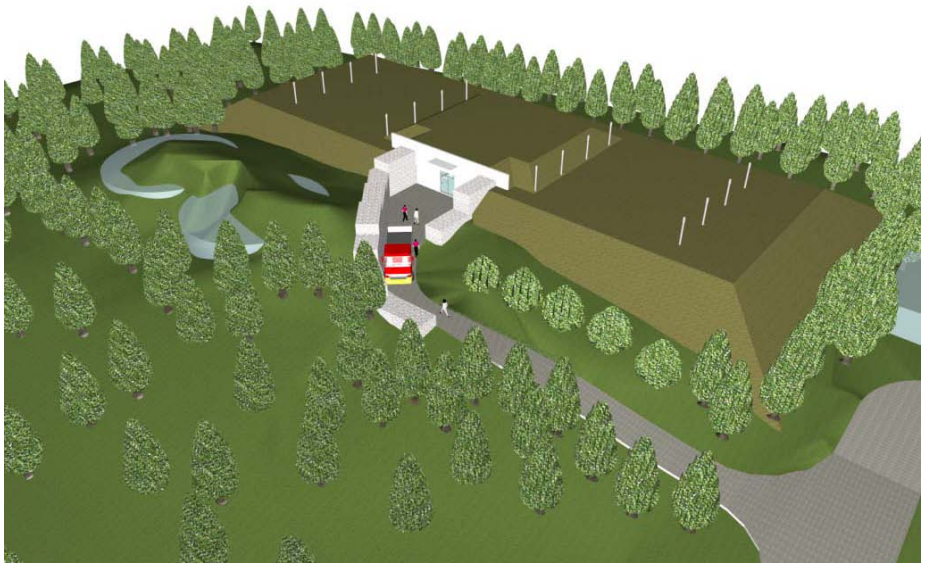
b) Water supply pipeline

The water supply pipeline, which is actually a pressure-return pipeline, has diameter ND=500mm and length L=2285.29m. This pipeline is transited at one part from the pump station to the junction of street Shuto Orizari and Butelski Venec, while at the other part is connected to the existing street water network in several connection points. Along the pressure-return pipeline, manholes for connections are placed, as well as branch manholes, manholes for air valves, discharge valves, manholes for measurement equipment, control meter and crossing through the river Serava as well. At horizontal and vertical changes of the route direction anchor blocks will be placed.



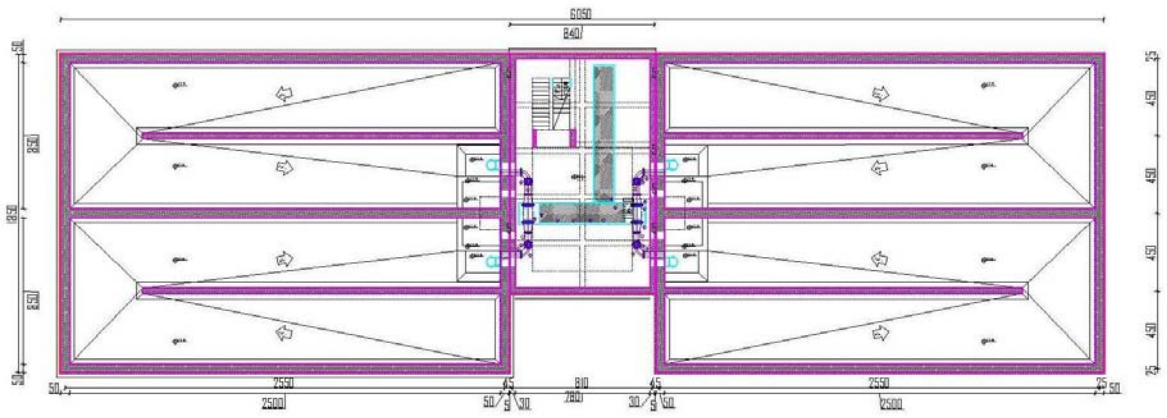
c) Water tank

The new water thank with capacity of 4350m^3 is planned to be constructed very close to the existing one of 1200m^3, because it does not satisfy the real water needs. The new and the old water tank will operate together and will be connected.



The water tank is rectangular with four water chambers, symmetrically placed on both sides of the joint dry chamber. Each of the water chamber is able to work independently and it is partitioned with a wall which provides mixing of the water and support for the roof slab. The length of one water chamber is L=25m and the width is 8.5m. The dry chamber dimensions in layout are 13.3m length and 7.8m width.

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



2. Strategic goals

Selection of the project scope (settlement Shuto Orizari and part of settlement Skopje Sever) is based on existing development documents on water supply in the City of Skopje. The main is a new **General Urban Plan of the City of Skopje 2012-2022**. According to the GUP, implementation of the "System Upper Zone" in Shuto Orizari settlement (pressure-return pipe, reservoir and pump station) and connection to the main water pipe Ø1600mm supplying the city (one of two) should create conditions for improvement in the water supply in part of settlement Skopje Sever (located at the territory of Butel municipality) to consider improvement in the water supply to the existing buildings and future planned facilities in Skopje Sever, that should be connected to the mentioned "system upper zone".

Settlement Shuto Orizari and part of Skopje Sever are part of water supply system that operates together, as one system. Therefore, any project related to one of them should consider needs of the other.

The project is assumed in **investment program 2014** of CSE "Vodovod i kanalizacja" in the area of water supply. The project will be financed in two years, therefore it will be included in 2015 program, but probably also in 2016 program.

The project will contribute to achievement of the following goals:

- Improvement in the water supply;
- Complete separation from the existing water supply system for Shuto Orizari called "high zone Butel Radishani" by which presently water is delivered to the existing reservoir in Shuto Orizari;
- Improvement in the water supply in Skopje Sever settlement that will be transferred to the "high zone Shuto Orizari".

This project will substantially increase the water supply services in the Shuto Orizari municipality. This crucial step will complete actions undertaken presently. CSE undertook many activities to improve collection of water supply fee in the municipality Shuto Orizari. However, many misuses were identified including illegal connections to the network without watermeters (according to the information on collection service of CSE, there are 380 connections without watermaters), using the drinking water to clean the streets, and intentional defects to the network. Addressing these problems CSE continuously undertakes the following actions:

- Setting watermeters to control water consumption on all consuming points;
- Registration of new users;
- Identification of illegal connection;
- Regular reading of watermeters;
- Introduction of flexible payments' schedules;
- Use of all available legal forms to collect liabilities.

These actions started slowly to bring some results.

3. Water production in Skopje

a) General description of the current system

Main facilities of the system for water production and distribution for the City of Skopje are: spring Rashche, pump areas Nerezi and Lepenec, water chlorination stations, pre-pumping stations, hydrophores, water tanks and the water supply network. The system is managed by the CSE "Vodovod i kanalizacja" Skopje.

The water demand for the City of Skopje is almost fully satisfied with Rashche springs consisting of Rashche 1 and Rashche 2, with a total installed capacity of 6m^3/sec or 6000l/sec. Due to the enormous consumption of water in the summer and despite the abundant capacity of Rashche spring, sometimes emerges the need for activating the wellspring areas Nerezi and Lepenec. Nerezi well area consists of 4 wells with capacity of 0.76m^3/sec, whereas Lepenec well area consists of 3 wells with capacity of 0.69m^3/sec.

Water from Rashche to the consumers is delivered through two steel pipelines profiled φ1600mm, which right after the overpass to Novo Selo split towards the City and towards the industrial complex Zelezara-Skopje. The origin and quality of spring water merged into Rashche is constantly analysed by use of sophisticated hydrological, meteorological and isotopic laboratory tests. It confirms that this invaluable natural source is physically, chemically and bacteriologically clean therefore it does not require any additional treatment except preventive chlorination. Preventive chlorination is performed with chlorine gas and thus provides permanent protection from pollution. The water disinfection is carried out through chlorination in the chlorination stations set in different locations over the city of Skopje, as follows: Kondovo chlorination station with a capacity of 15l/h of chlorine is built on the west at the main supply input φ1600mm. Another chlorination plant with a capacity of 4l/h of chlorine is built in the well area Lepenec and the chlorination station built in the well area Nerezi holds a capacity of 4l/h of chlorine. The chlorination station built in Rashche village has a capacity of 1 l/h of chlorine.

The actual field conditions in the city of Skopje require vertical zoning of the water supply systems. The water supply for higher zones is carried out with the help of 25 pre-pump stations with a total capacity of 3350l/sec.

Water supply system retains 6 hydrophores with total installed capacity of 144l/sec and the same are used for some suburban neighbourhoods in the City of Skopje. Additionally, 36 tanks are built with a total capacity of 36,735m^3.

The total water supply network has 1085km (end 2013). The size of the pipe diameter ranges from ϕ2″(ϕ50mm) to ϕ1600mm and are mainly produced of ductile cast iron, with a minor percentage of other materials (galvanized, steel, plastic, and asbestos-cement). Asbestos-cement pipes are being gradually replaced due to age and the introduction of new technologies for the production of pipes, and not because they are harmful. All previous studies in this area carried out by the World Health Organization (WHO) show that asbestos-cement pipes are not harmful to human health for the tube is coated with cement slurry providing the necessary protection. CSE stopped using asbestos-cement pipes for building its infrastructure since 1989.

The main and only reason for the replacement of asbestos-cement pipes are savings and reduction of water losses, and in no case the water quality. CSE is continually replacing the asbestos-cement pipes with new quality materials that are resistant to impacts of the soil and traffic and each year sets aside a substantial amount of funds. So far, about 700 million denars have been invested in water supply network reconstruction (100 million in 2008 and 120 million each year from 2009). In 2013, 14 km of water supply network was reconstructed and in 2008-2013 all together 84km. According to the Investment Program for 2014, 120 million denars were assumed for the reconstruction of 15km of the existing water supply network.

The project on improvement of the water supply system in the municipality Shuto Orizari is assumed in the CSE investment program for 2014 and will be included in 2015 and 2016 programs. The water supply network in Shuto Orizari was designed for 10,000 people, whereas even in 2002 (last Census data) the number of inhabitants was more than twice this figure. Implementation of this project will solve the water supply problems of about 40,000 people.

Basic characteristics of the water supply system are presented in the following table.

Table 8: Water supply system components (end 2013)

No.	Description	Unit	Quantity
1	Water supply network of ϕ2" to ϕ1600mm	Meters	1,085,431
2	All valve profiles	Pieces	21,053
3	Fire Hydrants	Pieces	43,433
5	connections	Pieces	62,804

b) General description of the water supply system in the municipality Shuto Orizari

The settlement Shuto Orizari is located in the northern part of the City of Skopje. At this moment, the water supply for this settlement is from the "System high zone Butel" including the pump station Butel and the existing reservoir in the settlement of Shuto Orizari, while additional amounts of water are entering into the system from the existing pump station Akvadukt, which is in the area of Ilinden army barracks, with a pipe Ø250mm. The CSE "Vodovod i kanalizacija" has built a hydrophore unit for two streets, which are immediately below the reservoir in the settlement high area in order to provide the required network pressure for the region, which is in close proximity to the existing reservoir.

According to the cadastre data on CSE "Vodovod i kanalizacija" i.e. GIS, which has been updated, the water supply network in the settlement Shuto Orizari is 35,120m long. The condition of the installed pipes in the urban area is good (percentage of installed pipes according to diameter: Ø80mm - 62%, Ø100mm - 5.7%, Ø125mm - 10%, Ø150mm - 11%, Ø250mm - 1.50%, Ø300mm - 2.80% and the remaining 7% are galvanized pipes smaller than Ø80mm). Regarding the pipe material, the situation is as follows: almost 68% are asbestos-cement pipes, cast iron and ductile iron comprise 23%, polyethylene pipes – 1.7% and the remaining 7.3% are galvanized pipes.

The water shortages are mostly observed in the summer that creates the need of construction the new pump station, pressure-return pipe and reservoir.

In the low part of the settlement Shuto Orizari, close to the prison and south-west to the settlement Vizbegovo, there is water misuse for irrigation and a lot of network defects and in addition, there is no record of the illegally built water supply network by users which includes hoses and galvanized pipes.

There are no layouts or urban plans for this low section of the settlement Shuto Orizari and the CSE cannot plan the water supply network for an area for which there is no urban plan, including public areas i.e. streets.

In 2013, the CSE constructed a water supply network along the street behind the prison i.e. Shuto Orizari street with Ø110mm and L= 650m. Reconstruction of this section is not planned due to the fact that there is no urban plan, which should be prepared by the municipality Shuto Orizari, and the design for rehabilitation of the water supply network will be prepared in the future in cooperation with the municipality.

In the municipality Shuto Orizari, flow meters and pressure regulators have not been installed and as a result of this water losses cannot be analyzed. The National examinations centre is preparing a program on reduction of water losses and with the construction of the new pump station, the pressure-return pipeline and the reservoir, flow meters will be installed, thus providing the possibility to analyze water losses and reduce them within the required period of time.

c) Water production and consumption

Total population living in the water supply service area is systematically growing at the rate of 0.6% (average of 2008-2013). The CSE is setting new connections even with higher rate, following the growth in distribution network. Continuous investments result in improvement of the service that is well illustrated with the remarkable fall in reported pipe breaks.

Table 9: Water supply in the City of Skopje

	Code	2008	2009	2010	2011	2012	2013
Total population living in the water supply service area	30	560,144	566,254	572,254	578,144	578,500	578,500
Population served with water supply	40	487,326	492,641	497,861	503,876	503,876	503,876
Water connections (end year)	41	59,575	60,079	60,602	61,219	61,784	62,804
Water connections (end year) to individual houses and appartments	41a	49,519	49,938	50,372	50,885	51,355	52,207
Length of water distribution network	54	990	1,000	1,012	1,030	1,064	1,085
Number of pipe breaks	60	11,090	10,272	10,358	9,926	7,878	8,167
Water produced (m3)	55	95,618,935	94,419,410	102,812,615	101,280,847	103,343,937	102,700,170
Water sold (billed, in m3)	59	38,172,729	37,834,586	37,893,888	37,543,232	37,063,433	36,168,910
Total services billed (water and sewerage), MKD	90	1,219,615,389	1,178,560,262	1,160,427,377	1,125,070,750	1,126,149,965	1,073,436,390
Total water operating billings, MKD	90c	824,001,836	792,167,059	785,528,388	762,489,400	773,619,981	724,569,563
Total revenue collected (water and sewerage), MKD	91	951,062,506	881,267,009	867,912,381	878,110,842	887,922,913	884,462,723
Total water operational expenses, MKD	94a	787,802,406	755,436,892	733,444,458	684,426,914	723,784,905	722,781,392
Indicators							
Collection rate on water and sewerage (%)		78	75	75	78	79	82
Water losses (%)		60	60	63	63	64	65

Source: CSE, IBNET database

In general water consumption measured with the amount billed by CSE was falling for last few years. During the year, water consumption is the highest in the summer months: July and August.

Table 10: Physical volume of water consumed (m^3)

Consumer category	2011	2012	2013
Economy			
Institutions with sewage	2,010,022	1,875,538	1,900,872
Institutions without sewage	447,189	421,550	380,987
Legal entities with sewage	6,358,518	6,496,558	5,908,683
Legal entities with no sewage	797,848	724,459	760,473
Services with sewage	74,278	69,691	66,401
Total Economy	9,687,855	9,587,796	9,017,416
Households			
Households with sewage	21,313,806	21,326,533	21,186,900
Households with no sewage	5,403,527	5,040,834	4,843,512
Sewage	6,217	5,860	6,280
Business users with sewage	1,015,793	999,824	982,413
Business users with no sewage	116,034	102,586	132,389
Total households	27,855,377	27,475,637	27,151,494
TOTAL	**37,543,232**	**37,063,433**	**36,168,910**
Approval claims	-142,436	-175,894	-147,892
GRAND TOTAL	**37,400,796**	**36,887,539**	**36,021,018**

Source: CSE

d) Water losses

Non-revenue water calculated as a share of water produced was equal to 64% in 2013 and was stable for last two years. However, CSE claims that this figure could not be identified with water losses (technical), which are estimated at about 40% (see table below). Detailed analysis of water losses indicates that quality of network and its defects contribute mostly to the generation of losses.

Table 11: Analysis of water consumption in 2013

		Quantity (m^3)	**% of water produced**

	I. COMMUNAL CONSUMPTION		
I.1	Water consumed for regular water tank rinsing	142,940	0.1
I.2	Water consumed for mechanical washing, chlorination and commission of newly designed network	35,325	0.03
I.3	Water consumed for public taps, fountains and restrooms	1,019,280	1.0
I.4	Water consumed for regular flushing of the sewerage network	288,254	0.3
I.5	Water consumed for regular flushing of the water supply network	108,543	0.1
I.6	Water consumed during removal of defects	4,233,733	4.1
I.7	Water consumed for watering of green areas, alleys, nursery and greenhouse production	8,905,523	8.7
I.8	Water consumed for washing of public traffic areas, sidewalks, tracks, squares etc.	4,651,620	4.5
I.9	Water consumed during drills and fire protection	513,501	0.5
I.10	Water consumed for public utility services	93,282	0.1
	Total communal consumption (non-billed)	19,992,001	19.5
	II. COMMERCIAL CONSUMPTION		
II.1	Water consumed as difference in reading the main - control water meter	1,129,702	1.1
II.2	Water consumed by lump sum users	828,960	0.8
II.3	Water consumed by non- registered (illegal) users	1,920,000	1.9
II.4	Water consumed from illegal usage of hydrants	601,385	0.6
II.5	Water consumed within written-off bills	184,422	0.2
II.6	Water consumed with no compensation fee (social cases)	5,510	0.01
	Total commercial consumption (non-billed)	4,669,979	4.5
	WATER PRODUCTION	**102,700,170**	**100**
	Communal consumption	19,992,001	19.5
	Commercial losses	4,669,979	4.5
	Invoiced water (households and legal entities)	36,168,910	35.2
	Real losses	**41,869,280**	**40.8**

Source: CSE Vodovod Skopje

Addressing the problem of high water losses the CSE in 2007 has prepared “Strategy on reduction of the water losses in water supply system in the City of Skopje for 2007-2014”. This is detailed and quality document comprising definitions of different water losses, optimal level of water losses (20%) and methodology on losses reduction. Specific measures were identified and since then the CSE is systematically implementing those measures. Moreover, CSE is also preparing medium term (20 years) strategy on reduction of water losses.

So far, the following activities have been taken with regard to users’ education and increase of their awareness of water conservation and payment of bills:

- with each bill, CSE provides an additional leaflet with: calls for regular payment of bills in order to avoid lawsuits or disconnections, calls for water conservation, notifications regarding new services and payment methods and other similar marketing contents;
- video materials regarding water conservation and regular payment of bills, which have been presented through local and national media;
- participation of the director and other relevant CSE employees in various informational debates and other shows in local and national media; providing frequent interviews with the director of the CSE Vodovod-Skopje on the local TV station Shutel, explaining the importance of the project for improvement of the water supply in the municipality of Shuto Orizari, as well as regular payment of bills.

Implementing the strategy on reduction of the water losses the CSE undertook the following measures:

- Installation of flow and pressure meters at all production plants and pump stations;
- Implementation of a SCADA system;

These two measures are adopted and flow and pressure meters have been procured in the last years. This is implemented in correlation with the project for automatic management of pump stations that has been implemented in the last 4 years. Pump stations are fitted with equipment for automatic management of the operation of pumps and other plant equipment is also acquired in order to enable the implementation of the SCADA system.

- Reconstruction and repair of old pipelines

This measure is adopted and the implementation of the reconstruction of the water supply network has lasted for 6 years now. The annual investments amount to approximately MKD 120 million and around 60km of asbestos cement and galvanized pipes have been reconstructed.

- Timely repair of reported and detected defects
- Free telephone line

The free telephone line (0800 22555) is implemented within the Information center of the CSE. In addition to this, users have other available channels and means to report defects and other problems. The next phase is the registration system for reported defects, which should be implemented soon.

- Systematic testing of the water supply network

This measure comprises: staffing and improvement of the organization of the Department for water supply network defects testing; modernization of the measuring equipment and defect detection equipment; permanent improvement of the personnel that performs the measuring and detection of defects; update of the technical documentation and introduction of GIS in the work of the defect detection team in order to provide faster interventions; introduction of a mathematical model in the work of the Department for reduction of water losses.

- Projects that analyze water losses in consumption zones (special attention shall be paid to the settlement of Shuto Orizari)

The company has a Defect detection department. This department has 9 employees who perform interventional and systematic testing of the network and detect defects. The abovementioned measures refer to this department. We believe that there is need to increase the number of employees in this department and provide their constant education.

- Reduction of water losses by providing constant system pressure at minimal allowed level

This measure has been adopted and implemented. The project for installation of zone flow meters and pressure reducers has been implemented in the last 4 years. This enables flow and pressure measurement and analysis and their reduction depending on the needs of the consumers, especially during nights, in order to reduce water losses in periods of low consumption. This project is considered important and will continue to implement in the future.

- Placement of air valves in the water supply system
- Establishment of defects data and planning of repairs and reconstruction of network parts indentified

This measure is considered important as well, but its application will be fully utilized with the implementation of a defect recording system. This will provide analysis of defects frequency, location and nature which may indicate the need for installation of air valves.

- Analysis of water consumption, record of daily diagrams and remote reading with significant customers
- Consumer control with respect to illegal connections and networks
- Regular control of water meter accuracy, repairs and calibration and their frequent reading
- Implementation of Automatic (remote) water meters reading - AMR
- Proper sizing of water meters with consumers
- Installation of water meters in manholes outside residential buildings

All 6 abovementioned measures are included in the project for procurement and replacement of water meters with ones with high accuracy and remote reading. 5,000 such meters have been purchased and installed, which is a significantly small number compared to the 200,000 existing water meters in the system. This project requires large investments, but we believe that the CSE will provide the means to continue the provision of water meters in the future.

- Division of the distribution system into several consumption zones fed from a limited number of main lines with installed flow meters
- Improvement of pipe protection with appropriate coatings and cathodic protection, thus reducing the number of defects

The project for designing and construction of a new system for cathodic protection of the main steel pipes Rashche – Skopje has been implemented during the last 2 years. Cathodic protection is planned for the remaining steel pipes in the system and the design should be prepared this year.

- Permanent visual inspection of water supply and sewage network
- Prevention of hydrants abuse
- Campaign on water conservation
- Reduction of water losses from utility services
- Installation of UFR devices next to meters

To improve implementation of those measures CSE procured 4WD vehicle fully equipped to identify defects and trained employees on its use.

Besides those measures, City of Skopje in 2012 ordered “Feasibility study on using the underground water on watering the green areas and washing the public traffic areas”. The conclusions of this study will be implemented in future. Presently these two categories comprise 13.2% of produced water (I.7+I.8 in Table 11 above). If implemented it would contribute to fall in water consumption from the water supply system managed by CSE.

Source: CSE Vodovod Skopje

e) Price of Water

CSE is financed exclusively from fees for its services. Water supply and sewerage are billed at the same invoice (if both services are delivered to the household). The price is determined by the Law on drinking water supply and disposal of urban waste water (Official Gazette no.68/04) and the methodology developed by the Ministry of Transport and Communications. The applicable service rates are presented in table below.

The last decision on prices was adopted by the CSE management and approved by the City of Skopje Council in 2007 (decision no.07-425/1 as of 20.02.2007). This decision assumed remarkable increase in prices for water and sewerage services: by 98%.

Previous decision on service fee was made on June 1999 (applied on July 1, 1999) and was in force for next eight years. This decision replaced Council Decision of 1995.

Table 13: Service fees for water and sewerage (MKD/m^3, without VAT)

	1999 decision	2007 decision
Households:		
Water with sewerage	14.83	29.39
Water without sewerage	8.71	17.25
Sewerage only	6.12	
Companies and craftsmen:		
Water with sewerage	33.23	65.80
Water without sewerage	23.55	46.63
Sewerage only	9.68	

Source: City of Skopje Council decisions

Presently, no further changes are assumed.

The bill from Vodovod comprises a few positions: water and sewerage, communal hygiene fee (Vodovod passes this fee to CSE Komunalna hygiene) and maintenance of public greenery fee (this fee is passed to the CSE Parks and greenery).

f) Return on billing

Vodovod differentiates its clients into three groups: households, companies, and public institutions. Return on billing could be evaluated for each of those groups and in total. The highest collection rate is on institutions (92%), the lowest on companies (80%). The average collection rate for all groups of clients is relatively high (83%) and was growing for the last three years. These figures refer to all clients served by Vodovod Skopje, whereas the situation in Shuto Orizari is different. Collection rate on billing on households in Shuto Orizari municipality was equal to 16% in 2013, on companies 67% and on average 22%. Companies paid its bills regularly, and only in 2013 the collection rate decreased substantially. Collection rate on households was growing.

The situation in Shuto Orizari differs from the City of Skopje. In the last few years, due to situation with the water supply, lack of pressure and inadequate water supply network, the consumers refuse to pay their water bill. They claim that the service is inadequate.

Shuto Orizari is populated mostly by Roma (60.6%), whose social status is substandard. The unemployment rate is much higher than in the City of Skopje, and very few families have regular income. Additionally, they spend the water unreasonably. As a result, during the summer in some parts of the municipality weak water pressure is observed to part of consumers, who for this reason refuse to pay. Furthermore, the municipality Shuto Orizari has not organized yet its legal property administration, which is precondition to proper collection of taxes and fees. The situation is improving, but there is long way to go.

CSE is continuously addressing this problem and some improvements are already observed. Since the beginning of 2014 additional measures were taken to improve collection and as a result the rate has reached 31.5% as of 30.04.2014. This process will continue. The most significant measures that were already taken to improve the collection rate and shall continue and intensify in the future are:

- distribution of 100% of the bills for water consumption and waste and 80% increase in the reading of water meters;
- strengthening of all control activities related to: suspicious water meter conditions, misreading of meters, false reporting and other conditions;
- providing a warning note prior to final disconnection with a deadline for debt settling or signing an agreement for payment in installments;
- disconnection from the water supply network of CSE;
- after the third consecutive unpaid bill, CSE sends a written notification to the users along with their first consecutive bill informing them that they have a debt; six months after the unpaid bill, they send a written warning prior to suing the user along with the consecutive bill; nine months after the unpaid bill, they send the last warning prior to suing the user along with the first consecutive bill; and finally they issue a lawsuit against the users who have unpaid bills for water supply and waste collection prior to the legal deadline for debt prescription;
- registration of users and determination of the actual condition of water meters by the CSE;
- detection and removal of all illegally connected users to the water supply network;
- procurement of 54,000 water meters seals, which will be placed in pre-determined users, thus preventing water meter manipulation and water thefts;
- procurement of 40 cameras for the workers in the Collection department, who will photograph the water meters on site, documenting all suspicious and questionable cases;
- efficient and effective replacement of water meters that are not operational or are over 5 years old;
- staff reinforcement of the Collection department;
- installation of a system for counter services improvement by issuing numbers, thus providing faster and more efficient payment of bills and eliminating crowds;
- activities for payment facilitation by promoting the possibility of electronic billing directly to the email address of the users, reporting water meter conditions to CSE website, promoting the possibility of electronic payment of bills etc.

Table 14: Collection rate in the City of Skopje and Shuto Orizari by category

	IBNET Code	2008	2009	2010	2011	2012	2013
ALL CLIENTS							
Total services billed (water and sewerage), MKD	90	1,219,615,389	1,178,560,262	1,160,427,377	1,125,070,750	1,126,149,965	1,073,436,390
Total revenue collected (water and sewerage), MKD	91	951,062,506	881,267,009	867,912,381	878,110,842	887,922,913	894,553,146
Collection rate (%)		78	75	75	78	79	83
Total services billed (water and sewerage), MKD, Households	90a	853,316,428	820,133,766	821,155,887	799,347,326	801,593,545	764,072,023
Total revenue collected (water and sewerage), MKD, Households		676,966,291	627,285,857	617,780,033	625,039,297	632,023,529	636742929
Collection rate (%)		79	76	75	78	79	83
Total services billed (water and sewerage), MKD, Companies	90b	300,700,956	291,268,146	268,418,113	254,273,742	250,793,597	239,054,284
Total revenue collected (water and sewerage), MKD, Companies		211,801,620	196,258,163	193,284,087	195,555,285	194,585,891	192558450
Collection rate (%)		70	67	72	77	78	80
Total services billed (water and sewerage), MKD, Institutions	90b1	65,598,005	67,158,350	70,853,377	71,449,682	73,762,823	70,310,083
Total revenue collected (water and sewerage), MKD, Institutions		62,294,595	57,722,989	56,848,261	57,516,260	61,313,492	65251767
Collection rate (%)		95	86	80	80	83	92
SHUTO ORIZARI							
Total services billed (water and sewerage), MKD		64,439,843	54,046,773	54,151,276	63,928,485	55,644,753	52,595,447
Total revenue collected (water and sewerage), MKD		18,496,209	15,095,839	14,158,215	14,187,786	13,315,451	11,489,484
Collection rate (%)		29	28	26	22	24	22
Total services billed (water and sewerage), MKD, Households		51,697,734	43,895,070	44,500,163	54,971,403	48,312,870	46,310,724
Total revenue collected (water and sewerage), MKD, Households		6,137,100	5,248,687	4,893,147	5,489,164	6,136,192	7,259,711
Collection rate (%)		12	12	11	10	13	16
Total services billed (water and sewerage), MKD, Companies		12,742,109	10,151,703	9,651,113	8,957,082	7,331,883	6,284,723
Total revenue collected (water and sewerage), MKD, Companies		12,359,109	9,847,152	9,265,068	8,698,622	7,179,259	4,229,773
Collection rate (%)		97	97	96	97	98	67

Source: CSE

According to the last Census data of 2002 in Shuto Orizari municipality there were 22,017 inhabitants and 5,102 households (4.3 persons per households). In 2013 CSE Vodovod registered 5,255 households in this municipality that means growth by 3% in the number of clients in 11 years period. This growth is lower than estimated population growth, which means that there is a room for increase in the number of clients.

Table 15: Number of clients from Shuto Orizari on water supply service

	Households	New clients
2009	5211	11
2010	5235	24
2011	5248	13
2012	5252	4
2013	5255	3

Source : CSE Vodovod Skopje

II. SOCIAL IMPACT

A. SOCIOLOGICAL STUDY

1. Methodology

The social assessment anticipated field research in order to get available information on interests and attitudes of the population and stakeholders. The weakness of this approach lies in its indirectness as only the sample is questioned. More precisely, the indirect way of getting information on this issue, plus possibility of subjective approach decreases the level of accuracy of the public opinion in this respect.

2. Social diversity and gender

In the City of Skopje people are organized into various social groups based on status ascribed to them at birth, according to their ethnicity, gender, locality, language, etc. In this research we shall present statistical data that are of special importance for this particular social assessment. From the information presented in chapter I one can conclude:

- The age groups are almost regularly distributed: it means in the City of Skopje there are almost equal portion of age group represented in the total population;
- There is equal representation of male and female in the total population of about 50%;
- In relation to their ethnic affiliation, the prevailing population in the City of Skopje is Macedonian; whereas in the municipality Shuto Orizari is Roma (60%) and Albanian (30%);
- Each of the above ethnicities speaks its own languages in the informal communication. The officially used languages in Skopje are the Macedonian and Albanian.

3. Institutions, rules and behaviour

The project is the first step to address the efficiency problems and it will contribute to the improvement in the CSE operations. Once the proper water supply is provided the CSE will be able to address the current misuses and malpractices of the part of populations. It will be necessary to improve this behaviour in the future combined with the continued improvements in the CSE commercial attitude. It is believed that elimination of the water supply problems will enable CSE to focus on efficiency measures in terms of water losses and collection rate.

The following regulations apply to this project:

- Law on the City of Skopje;
- Law of local self-government;
- Water Law;
- City of Skopje Council decisions on water tariff.

4. Stakeholders

There are several important stakeholders in this project.

The most influential participants in the process of decision making at the municipal level are the mayor and political parties. The influential stakeholder in this municipality is the business sector, more precisely some of the businessmen. The nongovernmental organizations (NGOs) are influential to some extent, but not as much as the former. Citizens, as an organized group of stakeholders, do not articulate their opinion directly to the council and mayor, but through the political parties representatives and they are not very influential stakeholder in the municipal decision making.

The project was supported by all political parties in the municipal councils (City of Skopje and Shuto Orizari) because political consensus was achieved on this issue. In respect to citizens, the opinion of most interviewees is that all citizens support or will support the project because it is in the general interest. It is believed that most of the citizens will support the project and that the Roma population and the category of poorly educated population will be indifferent to the project. It has also been stated that no opposition to the project is expected. Public meetings were organized with the mayor of Skopje and mayor of Shuto Orizari on July 12, 2013 and November 28, 2013 with inhabitants of Shuto Orizari who indicated water supply as the priority project to be financed. The public express their concern on current quality of water supply services and requested solution to be provided as soon as possible. Based on those consultations both mayors initiated the project financed with MSIP funds.

Probably the most important stakeholder is the mayor. The success of this project for the general interest will improve his reputation and prestige among the future voters. The political parties are the second influential stakeholder because their members are represented in the council. But the political parties are not unanimous and have different and sometime opposing interests, which weakens their positions. Moreover, being councillors, they cannot have so active role in the whole political process at the local level: they can control the issues by taking decisions, but the initiative and execution of projects are not in their hands.

The non-governmental organizations have some influence, and since this project should promote municipal economy and the health of population, they should be in favour of the projects.

The citizens or the population as a whole can be an influential factor. Most of the citizens will be beneficiaries of the project. Therefore they should support it.

5. Participation

It is decided that the loan will be covered or repaid on the municipal budgets in the ensuing years. There is no need for any kind of voluntary participation or financial contribution of the citizens. The project does not require it, and should not require additional financial contribution of the citizens.

6. Social risks

High socials risks for carrying out of these projects cannot be perceived. Special obstacles and difficulties cannot be anticipated or expected.

B. EXPROPRIATION AND LAND OWNERSHIP

The project will not have adverse effects on the population and the business operating on the current and the newly traced section. For the needs of construction of water supply system in the municipality Shuto Orizari, the City of Skopje and municipality Shuto Orizari were working intensively on resolving any issues regarding the ownership of the land the right to use thereof, within the current legislative framework.

1. Purchase of land and moving

The project anticipates the purchase of land, but not moving of residents. The total area of the land that is subject of expropriation by the City of Skopje is 19,887m^2, out of which 18,017m^2 is state owned (belongs to the Republic of Macedonia), and the rest is private: 565m^2 is registered in the Cadastre and 1305m^2 is not registered in the Cadastre.

Taking into account the functional importance of water supply system, as well as the lack of alternate routes, when defining the route of the water supply system, the attention was paid to minimize the area that would have to be expropriated and needs for moving.

2. Expropriation Action Plan

The City of Skopje is responsible for solving the land property issues. For this purpose action plan was prepared by the municipality. The purpose of this document was to define and implement steps that would mitigate the effect on land purchase and the moving on a stretch of water supply system construction, both for the residents as well as the firms. For that purpose, the following steps were assumed:

- An expropriation procedure will be conducted in accordance with the Law on Expropriation;
- Consultations will be conducted with all stakeholders;
- Implementation of the right to compensation and taking comprehensive measures for compensation;
- Complaints related with the compensation of damages;
- Implementation schedule;
- Monitoring, evaluation and reporting.

3. Legal framework

The legal framework for the implementation of the project includes the laws that directly apply to expropriation, ownership rights and rights to use land, as well as on planning and construction on land, such as:

- Constitution of the Republic of Macedonia;
- Law on proprietary and ownership rights;
- Law on Real Estate Cadastre;
- Law on Construction;
- Law on Expropriation;
- Law on Spatial and Urban Planning, and
- Law on Construction Land.

4. Procedure for settlement of property- legal disputes

The process of resolving property-legal issues is run by the Office on expropriation, property-legal affairs and real estate within the Spatial Planning and Management Department in the City of Skopje municipality. The Office consists of a preparatory working group that includes 1 architect, 1 geodetic technician, 1 civil engineer, 1 administrative worker and the property seizure working group that includes 4 lawyers.

The preparatory office accepts the project from the Urban planning department and based on that project orders an expropriation analysis. After obtaining the analysis, the office staff visits the location to identify the parcels that are subject of the expropriation and the proprietors (owners or holders). In addition, they contact all parties affected by the expropriation analysis as well as other persons seeking information in relation with the construction of the facilities. The preparatory office then makes estimates of the pieces of property that would be affected by the project and based upon those estimates that also cover dislocations of fences, payments for crops and plantations, dislocations of prefabricated facilities and such, while also preparing offers for payments to the stakeholders.

The offers are taken over by the property seizure office that prepares proposals for expropriation and proposals for taking away a holder's right, and they are then submitted to the Ministry of Finance. The contacts with the parties begin with the very visit of the route and it then continues in the form of meeting, specifically with the parties whose property is being expropriated. About half of these meetings were held in the Mayor's cabinet, half with the Head of the Spatial Planning and Management Department. In the meantime, dozens of telephone calls were conducted with these persons, for the purpose of reaching a solution to the property-legal problems that would be as painless as possible. The parties were provided with continuous reviews of the official documentation. Constant contact was maintained with the officials from the Cadastre and the Ministry of Finance for the purpose of providing the explanations that the parties needed. The meetings were held on mayor level and in Shuto Orizari – the Municipality in which the facilities are located. When necessary, the parties were also contacted individually, a working process that is common when resolving property-legal issues of any character, not only for expropriation.

The rights of the parties are guaranteed by the Constitution and the applicable legal regulations in the Republic of Macedonia.

5. Ownership of land and real estate

There are different aspects of the Macedonian legislation that regulate the rights to ownership that are important for the ongoing expropriation.

a) Definition of "real estate", rights "owners" and "proprietors"

Article 13 of the Macedonian Law on proprietary and other ownership rights specifies the definition of real estate (static property), and it includes land under various regulatory regimes, as well as buildings and constructions, either constructed or permanently affixed to the land, with certain exceptions that have been specified by separate laws. This definition excludes the majority of temporary facilities (kiosks) that operate under a temporary license for the facility.

The Macedonian property rights include the right to ownership (including the right to co-ownership and joint ownership), as well as other actual rights – right to official use, right to collateral-mortgage, right to actual official use, right to actual-legal long-term lease of land, right to leasing, right to creditor mortgages, and other rights. Of special importance in the case of the project it is the defined right to "long term lease of construction land" that includes the Macedonian legal equivalent of utilization.

According to the Macedonian Law on Construction Land (Article 11), the owners of construction land have the right to use and build on the land, as well as to transfer such rights to other entities. Article 14 stipulates the conditions for giving state-owned land for long-term lease or utilization, to private users, in case of joint ownership (between the Republic of Macedonia and private owners), or in cases where the buildings have been constructed legally and properly registered by their owners in the database of the public register (maintained by the Cadastre Agency). Section 2.1 of the Law specifically applies to the utilization, as a sub-element of long-term lease, and it specifies the requirements for leasing, transferring and revoking the rights to utilization. Section 5 of the Law refers to short-term lease contracts (up to 5 years) of state-owned construction land granted to owners of temporary facilities, and transfers the planning and the regulatory focus on short-term lease contracts for the purposes of placement of temporary facilities and equipment to the municipalities.

The expropriation procedure is based on the recognition of the property rights of the holders of the rights stated in this report as the "owners" - registered private owners of construction land and/or buildings and "proprietors" – users /holders of long-term (utilization or other type of long-term lease) or short-term rights to leases of construction land, owned by the state of Republic of Macedonia. There may be exceptions where the registered "proprietors" of land parcels can be "owners" of buildings constructed with the right to the land under lease; however the distinction between the definitions of buildings and temporary facilities applies. Both the "owners" and the "proprietors" need to have their requests registered in the public register of real estate that is maintained by the Macedonian Cadastre Agency, for the purpose of taking into consideration the compensation of damages for expropriated property.

b) Registration in the Cadastre for validation of the request for rights to ownership

Articles 148-155 of the Macedonian Law on proprietary and other ownership rights require that all real estate acquired must enter the official public register of real estate. Article 256 of the Law stipulates that the registration and verification of the ownership of the real estate has been regulated with the Law on geodesy, cadastre and registration of real estate, later replaced by the Law on Real Estate Cadastre adopted in 2008.

The Law on Real Estate Cadastre (Section VII – Real Estate Cadastre) establishes the Real Estate Cadastre (as a segment of the Cadastre Information System of the Republic of Macedonia – GKIS), as the aforementioned public register, and it stipulates that the right to ownership is acquired with the registration in the Real Estate Cadastre (Article 105). The registration of ownership of real estate in the Cadastre is mandatory for the owners or holders of other property rights to construction land or buildings. The bodies of local self-government (such as City of Skopje) are obliged to use the data from the Real Estate Cadastre when making decisions and verifying the rights from the claims (Article 111). The rights to ownership and other actual rights to real estate are acquired with the formal registration in the Real Estate Cadastre, and it can also be cancelled with the deletion from the registration (Article 112). Based on the above, the City of Skopje uses the document entitled "property list", acquired from the Cadastre Agency at the request of City of Skopje, in order to confirm and prove the rights to real estate such as land and buildings – the rights as an "owner" and as a "proprietor" for the purposes of the expropriation.

6. Expropriation procedure

Article 8 of the Macedonian Law on Construction Land confirms the right of the state to perform expropriation and purchase of construction land from private owners, in cases of verified public interest. The Macedonian process of expropriation itself is regulated with a special law – Law on Expropriation.

The Law on Expropriation specifies the conditions and the procedures observed by the state and local authorities when conducting prerogatives of a very important domain (seizure of land for a fee). Article 2 of this Law regulates the construction, development of infrastructure, and other projects that are considered of "public interest", in accordance with Article 30 of the Constitution of the Republic of Macedonia Article 3 of the Law specifically authorizes the City of Skopje to undertake the expropriation on behalf of its integral municipalities – in this specific case the Municipality of Shuto Orizari.

The overall expropriation procedure, as defined in the Macedonian Law on Expropriation, includes the following steps:

i) Preparation of a Proposal on expropriation by the user of the expropriation or an entity legally authorized by the user (in this case the City of Skopje) - the proposal must include identification of the expropriated property and the respective ownership and the holders of the rights, as well as a description of the project that needs to be implemented. As annex to the proposal for expropriation, the user must also include a formal geodetic report with numerical and spatial data for the expropriated property, as well as the estimated evaluation of the property for the purposes of proving the assets required for the expropriation, based upon this estimation.

ii) The proposal for expropriation is submitted to the body of the state expropriation authority that is the Office for property-legal affairs within the Ministry of Finance (Office). The office needs to send the proposal together with all the annexes to all owners of property and the holders of the rights to the procedure (within 8 days from the day of receiving the proposal), as well as to the Cadastre Agency that is responsible for running the register of real estate.

iii) The office then convenes a meeting with the user of the expropriation at the official premises of the Office. The date of the meeting shall not be scheduled within less than 8 days following the reception of the Proposal for expropriation and the documentation by the owner of the property or the holder of the rights. The purpose of the meeting is to check the bases for the public interest, on one side, as well as the ownership or the rights to claims, and then the funds and the amounts of the compensations. This initial meeting could end with an agreement on compensation of damages, which agreement has the effect of

a resolution on expropriation and formally rounds up the expropriation procedure, enabling the user to claim ownership of the property 15 days after the signing of the agreement.

iv) In cases when an agreement cannot be reached at the first meeting, the expropriation body (Office) needs to issue a Decision for an expropriation proposal in accordance with the facts established in the case. The decision of the Office could be either positive or negative, meaning that it could assert the expropriation based on the public interest, or deny the request for expropriation. The affirmative decision could be disputed by the owner of the property or the holder of the rights within the Administrative Court. In case of an affirmative decision, the Office then convenes a second meeting between the user of the expropriation and the owner or the holder of the rights, for the purposes of agreeing on the amount of the compensation. If an agreement on the compensation cannot be reached at this meeting, the Office then brings the case before the competent court.

a) Eligibility for compensation for land and property and business

The Macedonian Law on Expropriation stipulates the following provisions in relation with the eligibility for compensation of the holders of the rights to different properties and classes and circumstances of expropriated property:

• **Owners versus proprietors –** there is a distinction between owners of real estate and proprietors (usually the holders of the rights to utilization of state-owned construction land, based on a long-term or short-term lease, as provided in section 7.1) in relation with the fee that they have the right to receive from the user of the expropriation. While the owners who have registered their land and buildings in the Cadastre Agency and have acquired precise lists of property have the right to full compensation according to the market vale, the holders of rights to use state-owned land may only get a compensation for their investments (i.e. for improvements and additional constructions of buildings and land), that they would lose in the expropriation procedure (Article 43). In addition, Article 43-a of the Law establishes that not all holders of rights to use are entitled to hits compensation, but only those users whose user rights have been determined based on prior requests for ownership (related with the privatization procedures), or the users who have obtained their usage rights based on compensation in agreement with the state. The user of expropriation carries the burden of proof when establishing the circumstances of the holders of usage rights, regarding their eligibility for compensation.

• **Amortization of real estate** – in accordance with the Law on Expropriation (Article 25), the investments of the owners and the holders of rights are compensated only up to the time of amortized value of such investments. According to the evaluation methodology used by the City of Skopje, the annual amount of amortization for construction works equals 0.5%, deducted from the calculated material costs.

• **Compensation for cultures** – the owners of crops and forests on expropriated land (meters of construction land, as well as the indicated fields, forests and fruit gardens) are entitled to additional compensation for the market value of their cultures, as established by a specialist for estimating cultures engaged by the City of Skopje.

• **Loss of business** – Article 31 of the Law on expropriation stipulates that the owners of businesses and shops that operate on the given property and who will have suffered damages due to the closing and losing businesses as well as any losses incurred due to the change of the location should “be taken into consideration”. However, despite this, the Article does not specify their right to compensation or the request for an estimate, but it only asserts that the amount of such damages are to be determined on “case by case” basis.

• **Illegal constructions** – Article 45 of the Law on Expropriation stipulates that buildings and other facilities built without the appropriate permits after February 15th 1968 (following the census conducted with aerial images of the property) are to be demolished without the right to compensation, at the expense of their owners, in the event of expropriation.

• **Unregistered land and buildings** – the Law on Expropriation does not include provisions for cases of persons who have claims to ownership or proprietary rights to ownership but who have not registered their claims in the Cadastre Agency, in the appropriate manner. The administration of the City of Skopje cannot recognize or compensate such claims, in accordance with Article 111 of the Law on Real Estate Cadastre (See Section 7.1), however there is an option for the owners to register their property in the Cadastre Agency in the course of the expropriation procedure, and the current practice of the City of Skopje is to encourage owners to do so through written communication in the course of preparation of the Proposal for expropriation. The unregistered claims could potentially postpone the completion of the procedure for expropriation and the issuing of construction permits and work licenses (see Section 7.4). However, this mostly applies to cases of holders of rights to usage who are legal owners of buildings since the actual land indicated with the adopted plan for territorial development cannot be registered later as private construction land to be built upon, in accordance with the laws on urban planning (see Section 7.3). Article 9 of the Law on Expropriation stipulates a provision for a single post factum compensation of owners and holders of user rights in cases where the expropriation body (Office of property-legal affairs) was unaware of their ownership and rights, after the expropriation has been completed, but the unregistered requests that are usually presented before the Office during the review of the Proposal for expropriation, thus rendering this provision as inapplicable.

• **Date of legal exclusion of the fee** – The Law on Expropriation (Article 37) specifies that the investments in land and improvements of buildings made after the reception of the Proposal for expropriation by the owner or the holder of rights do not qualify for compensation.

b) Temporary right to access private land as a special form of expropriation

Articles 24 and 25 of the Law on proprietary and other ownership rights prescribes a temporary right to access private land, upon a proposal raised by the competent state authority, however this temporary usage of property must be compensated in an amount not lower than the given amount, in accordance with the partial state expropriation, as determined in the Law on Expropriation (see Section 7.2 below). The right to access (typically for construction of linear infrastructure such as water supply network, sewage system, gas lines and telecommunication trunks) can also be established by a state body, without the consent of the owner of the property, in cases when the public interest is determined by law. The right to access for temporary performance of construction work has also been regulated with Articles 7-8 of the Law on Expropriation.

7. Overview of the expropriation conducted

From January 5, 2014, when the Spatial Planning and Management Department began the process of reviewing the planned area in order to preserve the social element in the course of construction of water supplying system, a project solution and a geodetic expropriation analysis have been prepared, that would avoid physical moving and demolition of buildings.

The table below presents the effects that correspond with the legal status of the owners and users of the land, in accordance with Macedonian laws. In addition, a short summary has been given of the effects on each construction.

Table 16: Land being the subject of expropriation (m^2)

Description of the effects	Construction of water tank	Construction of pump station	Construction of pipeline
Total land that is subject of expropriation by the City of Skopje	12,288	1,584	6,015
- State owned	12,004	377	5,636
- Private users	/	1,207	98
- Private property	284	/	281

The expropriation procedure in the City of Skopje and the municipality of Shuto Orizari is completed.

C. CONCLUSION ON THE PROJECT SOCIAL IMPACT

The project should be socially successful for the following reasons:

- The project is useful for the health of the citizens;
- The project is a part of the municipal priorities and the majority of the citizens in Municipality Shuto Orizari and settlement Skopje Sever;
- Most of the stakeholders are motivated by this project;
- Considering the ethnicities, the Roma population in the municipality is the biggest beneficiary of the project. This is very important when social status of this ethnic group is taken into consideration: the unemployment and poverty are higher than among other ethnicities. The project will bring benefit to all ethnic groups, therefore no resistance due to feeling of inequality is expected;
- The project does not bear so high financial burden in comparison to the budget, and the population is not put into a position to contribute financially. The costs are distributed among City of Skopje, CSE and municipality Shuto Orizari in the optimal way;
- There are no social risks due to ownership of land as the expropriation process has been completed and all the procedures assumed in the law were obeyed.

III. ENVIRONMENTAL IMPACT

This project includes activities for construction of new water supply system in the settlement Shuto Orizari and part of settlement Skopje Sever, in Municipality Shuto Orizari and Municipality Butel in the City of Skopje. This project will contribute to improvement in the water supply in both settlements ensuring minimization of health risks and water borne diseases.

The main characteristics of this project are the following:

a) Construction of pump station (243 m^2) built from reinforced concrete construction system and coverage made from steel construction with bolted roof panels. It will be connected to main water supply pipe called "Zelezarski vodovod" for the City of Skopje, which is a steel pipe with diameter D=1600mm;

b) Drinking water supply pipeline – pressure-return pipeline with diameter of 500mm and total length of 2,285.29m. It will connect the pump station and new projected water tank. The predicted pressure-return pipeline starts from pump station, goes to part of the streets "Shuto Orizari", "Vinicka", "Che Guevara", "Plackovica" and "Butelskivenec" to the location of the predicted water tank; and

c) Water tank, reservoir – new designed water tank is provided at a location near the existing tank with volume of 1,200m^3. It is sized to provide the required quantity of water to meet the daily needs of water supply and the firefighting reserve according the national regulation. The predicted volume of the new water tank is 4,350m^3.

A. CURRENT SITUATION WITH WATER SUPPLY IN CITY OF SKOPJE AND BOTH SETTLEMENTS

This project will contribute to the improvement in the water supply in both settlements ensuring minimization of health risks and water borne diseases. For last ten years the population has been facing problems with the water supply because of lack of water quantity and low system pressure.

This water supply system will provide water to about 35,451 inhabitants for Shuto Orizari and additionally to 19,755 inhabitants living in the settlement Skopje Sever area.

These two municipalities are connected to the main water supply network of City of Skopje. Currently the main facilities of the water supply system of the City of Skopje are water spring Rashche, pump areas Nerezi and Lepenec, water chlorination stations, pre-pumping stations, hydrophores, water tanks and the water supply network. The water demand for the City of Skopje (total 600,000 consumers) is fully satisfied with Rashche springs consisting of Rashche 1 and Rashche 2, with a total installed capacity of 6m^3/sec with total length of 1,085km. The system is managed by the CSE "Vodovod i kanalizacja" Skopje and the quality of drinking water is analysed by laboratory of Center for sanitary control within the CSE "Vodovod i kanalizacja" Skopje.The hydrological, meteorological and isotopic laboratory testing of drinking water confirms that the water quality is in compliance with physical- chemical and bacteriological technical specifications. Preventive chlorination is performed only.

The water supply network in the settlement Shuto Orizari is 35,120m long and serves around 22,017 citizens. The water shortages are mainly observed in the summer period when there is an insufficient pressure in a water supply system. This is due to the specific terrain features (hilly area) and an increasing number of illegal users of water. Also, there is a high birth rate within the municipality Suto Orizari and the expansion of water supply system is essential.

The construction of water supply network starts from the plug in of the so-called "zelezarski cevkovod" (pipe line Ø1600mm) by Rasche, and goes to the intersection between street "Makedonska Kosovska brigara" and Blvd. "Slovenia". From here it goes under Blvd. "Slovenia", continues to st. "Shuto Orizari" and separates at st."Vasingtonska", st. "CheGevara" and ends at existing reservoir, water tank "Shuto Orizari".
There is an already constructed collection sewage system (primary and secondary network) in settlement Suto Orizari with main characteristics: diameter 400/600mm and the length 3.2km and additionally 1,202km. The main purposes of this collection sewage system is to collect the urban waste waters from the settlement Suto Orizari and to transfer up to the main collector on the street "Cvetan Dimov" (diameter 700m and length 1,250km). This collection sewage network will be appropriate to collect and discharge the urban waste waters coming from the newly designed water supply pipeline in two settlements (Suto Orizari and Skopje Sever).

B. LOCATION OF THE SUB-PROJECTS

The project activities are located in urban area in settlement Shuto Orizari and part of settlement Skopje Sever, both located in the northern part of the City of Skopje. Legend of Figure 1:

1 - New water tank with a capacity of 4,350m^3;

2 - Water supply pipeline with a length of 2,285.29m;

3 - New pump station.

Along the main project location there are densely populated family houses, education institutions, and commercial facilities, catering facilities, market place and city cemetery.

C. MAIN PROJECT ACTIVITIES WITH ENVIRONMENTAL IMPACT

The project activities include 3 phases: preparatory work, constructive phase and operational phase.
The preparatory phase is a short-term activity consists of clearing the ground and removal of existing vegetation, removal of land area, cutting and removal of asphalt and mechanical excavation of excess soil, marking of construction site, signing the site and ensuring the implementation of OH&S standards (e.g., mobile toilets for workers and adequate containers for waste collection).

The construction phase will include the construction of water supply pipeline, pump station and water tank and the operational phase will include the everyday usage of water supply system and water consumption by the population and companies.

D. MAIN ENVIRONMENTAL IMPACTS AND SENSITIVE RECEPTORS

All three project locations are in urban settlement “Shuto Orizari” and part of “Skopje Sever” settlement. In order to prevent the adverse environmental impacts and to ensure regular transportation of goods and people across both settlements, the preparation of the Traffic Management Plan is essential that needs to be adopted prior the start of the activities (especially when the pipeline is under construction). 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) need to be prepared by the municipality Shuto Orizari and municipality Butel 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 construction site, the Contractor should provide fencing, marking and putting signs on the construction site and should also provide use of personal protective equipment for workers in accordance with the good construction practice.

The construction of water supply pipe line will cross through the River Serava which is 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 Serava 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.

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 very small quantity of hazardous waste (e.g. batteries, paint). 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 should be handled with more attention.

The noise sensitive receptors will be workers and inhabitants living along the construction area. The locations where the pump station and tank are planned to be constructed are far from the residential buildings (the reservoir will be located min. 20m far from the several commercial buildings-storage facilities and the distance between the location for pump station and the first row of houses is min. 400m). Taking this into account and requirements of the national legislation on noise limits, the maximum allowed noise level for these areas should be 55dBA for night and 60dBA for day and evening (third degree of protection against noise).

Referring to the biodiversity, the locations are in urban areas, so no endangered and protected species of animals and plants are there.

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 “Vodovod I Kanalizacija” and the Center for water testing in the same institution.

The proper collection of urban waste waters coming from new water consumers (households and companies in these two settlements) and regular sewer maintenance will ensure minimization of spills and overflows and directly will prevent the risk of disease-causing organisms to human health and harmful chemicals and heavy metals. The municipality Shuto Orizari and City of Skopje (CSE ”Vodovod i kanalizacija”) need to establish routine maintenance program (clean sewer lines on a regular basis to remove grease, grit and other debris that could lead to sewer backups, regular inspection of the condition of water supply and sewer network, pump station failures, sewer lines ruptures and blockages, etc.).

Although all environmental impacts in construction phase are short-term, several prevention and mitigation measures are provided in the following Environmental Mitigation Plan and monitoring parameters are provided in the Monitoring Plan. The main responsibility lay to the Contractor to implement the measures and to the Supervisor to monitor the implementation of measures.

According the national legislation, The Environmental Impact Assessment Report for the project was prepared in 2013 (Company “GEING” from Skopje) and the EIA Report was adopted by the Mayor of the City of Skopje. The Report contains the main project goals, main project activities, photos of the locations where the construction activities will be performed and the environmental mitigation measures.

The Contractor is obliged to implement all proposed measures within the EIA Report-Elaborate.

E. MITIGATION PLAN

Potential impact	Impact scale	Proposed mitigation measures	Responsibility
Project activity: Marking out the location for construction of pump station, water supply pipeline and water tank in municipality Shuto Orizari and municipality Butel			
Possible adverse social and health impacts on the citizens and traffic as well as for the workers due to: - Unsafe start of construction works; - Not compliance with health and safety at work procedures; - Inappropriate public access.	Local/ within the streets ”Makedonska Kosovska brigada", “Bulevar Sloveija” “Shuto Orizari” “Vasingtonska” and “Che Gevara” in municipality Shuto Orizari and municipality Butel Short term/minor	• Application of good practice for marking out the construction site including: ➢ Ensure the marking out the construction site; ➢ Forbidden entrance of unemployed persons within the fence; ➢ Adequate warning tapes and signage need to be provided; ➢ 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 should be kept clean.	• Contractor – Bidder • Supervisor
Project activity: Construction of pump station, water supply pipeline and water tank			
Possible impacts on landscape and visual aspects	Local/ within the streets ” Makedonska Kosovska brigada", “Bulevar Sloveija” “Shuto Orizari” “Vasingtonska” and “CheGevara” in municipality Shuto Orizari and municipality Butel Short term/minor	• Good construction practices have to be implemented – including fencing and protection of construction site according to national legislation; • Minimization of the construction area as much as possible (carefully planning and design of the project activity according the Traffic Management Plan for a certain period of time); • Fully clean-up of the construction site immediately after accomplishment of reconstruction activities section by section; • Collection of the generated waste on daily basis, selection of waste, transportation and final disposal on appropriate places (according the type of waste – more details under Waste management issue).	• Contractor –Bidder • Supervisor
Possible emissions by transportation vehicles and impact on air quality due to: - gases emissions of dust-suspended particulates; - Emissions from the mobile sources (vehicles and construction machinery) of CO_2, NOx, SO_2, PAH.	Local/ within the streets ” Makedonska Kosovska brigada", “Bulevar Sloveija” “Shuto Orizari” “Vasingtonska” and “Che Gevara” in municipality Shuto Orizari and municipality Butel 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; • Vehicles and construction machinery will be required to be properly maintained and to comply with relevant emission standards; • Conduct regular maintenance of the vehicles and construction machinery in order to reduce the leakages of motor oils, emissions and dispersion of pollution; • Vehicle loads likely to emit dust need to be covered; • Usage of protective masks for the workers if the dust seems to be appeared; • Restriction of the vehicle speed within the construction location; • Burning of debris from ground clearance not permitted.	• Contractor –Bidder • Supervisor
Possible noise disturbance as a result of outdoor equipment usage and transportation vehicles driving around the construction site.	Local/ within the streets ” Makedonska Kosovska brigada", “Bulevar Sloveija” “Shuto Orizari” “Vasingtonska” and “CheGevara”	• As it is a mixed area (third degree of noise protection) the level of noise should not exceed 60dB during the day and evening and 55dB during the night; • The construction work should be not permitted during the nights, the operations on site shall be	• Contractor –Bidder • Supervisor

Potential impact	Impact scale	Proposed mitigation measures	Responsibility
	in municipality Shuto Orizari and municipality Butel Short term /major	restricted to the hours 7.00 -19.00; • The workers should be provided with ear protective devices (ear muffs and/or ear plugs).	
Possible adverse environmental impact and health effects could occur as a result of generation of the different waste streams. The inappropriate waste management and not in time collection and transportation of waste streams	Local/ within the streets ” Makedonska Kosovska brigada", “Bulevar Sloveija” “Shuto Orizari” “Vasingtonska” and “CheGevara” in municipality Shuto Orizari and municipality Butel Short term/major	• Identification of the different waste types at the reconstruction site (soil, sand, asphalt, pieces of asphalt, road surfacing, bottles, food, parts of pipes, paper, broken concrete etc.); • 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 01 – Waste from concrete, bricks, 17 05 04 – Excavated soil, 17 09 04 – Mixed waste from construction site, 17 03 - bituminous mixtures; • Small amount of solid municipal waste could be found (food, beverages), as well as packaging waste (paper, bottles, glass, etc.)	• Contractor –Bidder • Supervisor • CSE “Javna Komunalna Higiena”
		• Transportation and final disposal of the inert and communal waste by the CSE “Javna Komunalna Higiena” ; • The contract with the company for waste collection and transportation should be signed for collection and transport of waste to the Landfill-Drisla; • The construction waste should be promptly removed from the site, should be re-used if it is possible; • The materials should be covered during the transportation to avoid waste dispersion; • Burning of construction waste should be prohibited; • 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) should be collected separately and authorized collector and transporter should be sub-contracted to transport and finally dispose the hazardous waste	• Municipality staff (Communal Inspector/ Environmental Inspector) • CSE “Javna Komunalna Higiena”
Soil and water pollution The negligible impacts on soil arising from construction activities are expected. The compaction of soil can be expected due to vehicle movement, ground contamination from the spillage of materials such as vehicle fuel, motor oils, asphalt, inert waste, construction waste. Possible impact water (River Serava) and cause the erosion of the land as a result of loss of upper soil layer due to erosion as a result of construction activities	Local (River Serava) 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 public roads and construction sites; • Proper positioning of the water drainage system on the 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.	• Contractor – Bidder • Supervisor
• **Operational phase**	• **No adverse environmental risks are expected by the water supply system** • **Very positive impact is expected due to supplying the population of settlement “Shuto Orizari” and “Skopje Sever” with clean safety drinking water**		

Potential impact	Impact scale	Proposed mitigation measures	Responsibility
	• **The possible adverse impacts (spills, overflows, sewer blockages and cracked pipes, leaking joints) could occur on the urban waste water sewerage system which collects the urban waste waters of these two settlements. The preventive maintenance program is needed to be established for both water supply and urban waste water sewerage system. The CSE "Vodovod I kanalizacija" has an experience to predict and to solve the spills and overflows and to develop the sanitary sewerage maintenance program**		

F. MITIGATION 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**	
					Construction	Operation	Contraction of pump station, water supply pipeline and water tank for five streets in municipalities Shuto Orizari and Butel	Operations of the water supply system
Project stage: Start-up of the construction of pump station, water supply pipeline and water tank in municipality Shuto Orizari municipality Butel (marking out the construction sites)								
Traffic Management Plan prepared	On the construction site	Visual check and reporting to the Municipality staff	At the beginning of the project activities (before the works start)	To ensure safety and easy re-route of the traffic across around roads/access streets to the construction sites (location for pipeline, water tank and pump station)			Contractor - Bidder /Supervisor Communal inspector at the municipality Shuto Orizari and municipality Butel/Traffic Engineer	
Information prepared and announced about the traffic redirection	At the municipality public relation office	Information/ Press release prepared and announced	At the beginning of the project activities (before the works start)	To inform the citizens of settlements "Shuto Orizari and "Skopje Sever" about planned construction works and re-routes			Municipality staff/ Communal inspector at the municipality Shuto Orizari and municipality Butel /Traffic Engineer	
Safety traffic flow within the local streets: "Makedonska Kosovska brigada", "Bulevar Sloveija" "Shuto Orizari" "Vasingtonska" and "CheGevara" in Municipality of Shuto Orizari and Municipality of Butel	At the spot	Visual monitoring	During the project implementation	To ensure the coordinated traffic flow within settlements "Shuto Orizari and "Skopje Sever"			Municipality staff/ Communal inspector at the municipality Shuto Orizari and municipality Butel /Traffic Engineer	
The safety protection measures applied for the residents of the settlements "Shuto Orizari and "Skopje Sever"	On the reconstruction sites	Visual checks	At the beginning of the reconstruction work (first day) Every working day during the project	To prevent community health and safety risks – mechanical injuries			Contractor - Bidder /Supervisor Communal inspector at the municipality Shuto Orizari and municipality Butel	

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	
					Construction	Operation	Contraction of pump station, water supply pipeline and water tank for five streets in municipalities Shuto Orizari and Butel	Operations of the water supply system
			activities				/Environmental Inspector	
The OH&S 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	
Project stage: Construction of pump station, water supply pipeline and water tank in Municipality of Shuto Orizari and Municipality of Butel								
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 Drisla			Contractor - Bidder /Supervisor Municipal staff (Communal inspector and Environmental Inspector)	
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 on local and national level To be in compliance with national legal requirements			Mayor /Director of Public Utility Enterprise “Javna Komunalna Higena”	
Noise level	On the sites	Monitoring of the noise levels dB (A) with appropriate monitoring devices	On regularly basis during the work, through site visits, in accordance with the national legislation	To monitor if the noise level is above/or below the acceptance noise 60dB (A) during the day and evening and 55dB (A) during the night)			Contractor – Bidder Company authorized to performed noise levels measurements sub-contracted by the Contractor – Bidder	
Drinking water quality	Before the water distribution through the water supply network The water sample should be analysed by the Authorized laboratory (Center for sanitary control	Laboratory equipment for physical-chemical and microbiological water quality	Continuously according the Plan for drinking water quality analysis (short-medium and long water quality analysis) especially	To ensure the distribution of high quality drinking water to the population minimizing the health risks of waterborne diseases				Mayor /Director of CSE “Vodovod i Kanalizacija”

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	
					Construction	Operation	Contraction of pump station, water supply pipeline and water tank for five streets in municipalities Shuto Orizari and Butel	Operations of the water supply system
	within the CSE “Vodovod i kanalizacja”	analysis	the surplus of the residual chlorine					
Regular maintenance of the water supply network and urban waste water sewerage system	Along the water supply network and urban wastewater sewerage system	Review of the Preventive Plan and proposed measures for prevention of spills, overflows and sewer blockages and cracks	On annual basis /6 months after the diagnostic of the “hot spots” along the water supply network and urban waste waters sewerage system	To prevent or minimize the risks to human health as a result of water borne diseases, environmental pollution (chemicals, heavy metals, etc.)				Mayor /Director of CSE “Vodovod i Kanalizacija”

IV. TECHNICAL SOLUTION

A. DESCRIPTION

In order to solve the current water supply problems in the settlements Shuto Orizari (sector 32) and part of Skopje Sever (sector 36), and attaining a definitive solution for water supply to these two sectors, and in compliance with the GUPs of the City of Skopje 2020, the technical solution of this sub-project envisages construction of the following:

- Pump station
- Pressure - return pipeline
- Water tank 4350m^3 capacity

1. Pump station

The project task predicts placement of the pump station to the south side of blvd. Slovenia on the location of the former factory AD TIPO. The pump station is connected to the city's inlet line ϕ1600mm from Rashche spring.

The pump station will be located at 135m from the connection point to the Skopje city main pipeline at terrain elevation 271.42 m.a.s.l. The total water quantity for pumping is 320 l/sec. In the pump station four horizontal centrifugal multistage pumps are planned, out of which one will be spare. The technical characteristics of the pumps are:

- Quantity Q = 110l/sec
- Pressure H=75m
- Power P=135kW

2. Water supply pipeline

The water supply pipeline consists of:

- an inlet pipe from main water supply pipe (Zelezarski vodovod) to the pump station in length of L=135m and diameter ND 600mm;
- a pressure-return pipe from the pump station to the new water tank in a length of L=2285m and diameter ND 500mm. This is the main water supply pipe and the existing street branches of Shuto Orizari will be connected to it. This pipe also provides the connection for the Skopje Sever area.

The pipe material is ductile iron for 10 bars pressure. All fittings and valves are ductile iron as well for 16 bars pressure.

Along the pressure-return pipeline connection manholes are placed, as well as branch manholes, manholes for air valves, discharge valves, measurement equipment, control meter and crossing through the river Serava as well. At horizontal and vertical changes of the route direction anchor blocks will be placed.

3. Water tank 4530m^3 capacity

The new water tank is planned at the location close to the existing water tank of V=1200m^3 capacity. The new water tank is sized to provide the required quantity of water to level the daily needs for water supply and firefighting water upon the Regulations on fire protection.

The existing reservoir and the new one will be connected and operate with the same normal water level of 341 m.a.s.l.

According to the calculations for 16 hours pump operation, the total volume of water, which should be provided to meet the water daily needs for sector 32- Shuto Orizari and sector 36-Skopje Sever is 17,942m^3, thus the needed volume of the water tank is V=4350m^3.

The water thank is a buried reinforced concrete structure, rectangular with four water chambers, symmetrically placed on both sides of the joint dry chamber. Each of the water chambers is able to work independently and it is partitioned with a wall which provides mixing of the water and support for the roof slab. The length of one water chamber is L=25m and the width is 8.5m. The dry chamber dimensions in layout are 13.3m length and 7.8m width.

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

The access road to the new water tank is planned to be constructed (within this project).

B. ANALYSIS AND CALCULATIONS

1. Determining the quantity of water needed

The calculations for needed water quantities are done based on population number, water supply norm of 250 l/sec and coefficients of daily and hourly inequality a_1=1.3 and a_2=1.3.

The projected population number for 25 years period is:

- Shuto Orizari (sector 32) Nk = 35,451 inhabitants;
- Part of Skopje Sever (sector 36) Nk = 19,755 inhabitants.

The total number of residents at the end of the projection period for two sectors covered by the water supply system is Nk = 55,205 residents.

Based on these parameters the calculations are carried out to determine the needed water quantities as follows:

- average daily quantity $Q_{aver.}$/day in l/day;

- maximum daily quantity $Q_{max.}$/day in l/day;
- average hourly quantity $Q_{aver.}$/hour in l/hour;
- maximum hourly quantity $Q_{max.}$/hour in l/hour.

The calculated flow quantities are:

- average daily consumption $q_{aver.}$/day in l/sec;
- maximum daily consumption $q_{max.}$/day in l/sec;
- average hourly consumption $q_{aver.}$/hour in l/sec;
- maximum hourly consumption $q_{max.}$/hour in l/sec.

These quantities are used for the sizing of the pressure-return pipeline D=500mm, the choice of pump characteristics and the needed water tank capacity.

The pumps are chosen with following characteristics:

1. Case with three pumps in parallel operation

Q = 322 l/s; Hman = 79 m; P = 132 kW;
Rotation per minute 1450 rpm;
Coefficient of performance: 79%.

2. Case with two pumps in parallel operation

Q = 220 l/s; Hman = 75 m; P = 132 kW;
Rotation per minute 1450 rpm;
Coefficient of performance: 76%.

3. Case with one pumps in operation

Q = 112 l/s; Hman = 70 m; P = 132 kW;
Rotation per minute 1450 rpm;
Coefficient of performance: 75%.

The energy consumption per one pump will be around P=132kW.

According to these calculations, the total volume of water to be provided in order to meet the water needs of sectors 32 and 36 is:

Settlement (sector)	Max. daily need for water	
	Qmax/day	
	l/day	m^3/day
Shuto Orizari (sector 32)	11,521,575	11,521.58
Skopje Sever sectors 36	6,420,375	6,420.38
	Total	17,941.96

The calculation of the total volume for leveling of the daily inequality of the water consumption is V_1=4808m^3.

The needed volume to provide firefighting water is calculated V_2=504m^3.

The total needed volume for the water tank is:

$V= V_1+V_2= 4808\ m^3 +504\ m^3= 5312\ m^3$

The existing water tank capacity is $V_{exis.}$=1200 m^3.

The new water tank capacity will be:

$V_{new}= 1.05 \div 1.10\ (5312-1200) = 4350m^3$

C. CONCLUSIONS AND RECOMMENDATIONS

The Shuto Orizari settlement is a very densely populated area with inhabitants of Roma nationality and this is an area with high fertility rate.

The existing water supply system in this area does not satisfy the water needs and people have been facing this problem for more than ten years. In order to provide better hygiene conditions and improve the living conditions of the Roma population, the municipality of Shuto Orizari has found this opportunity to solve the problem as its first priority and has the objective to implement this sub-project together with the City of Skopje municipality and CSE Vodovod and Kanalizacija - Skopje.