

Country Name	The Project for Urgent Rehabilitation of Water Supply System in the Capital City Podgorica
Montenegro	

I. Project Outline

Background	The water supply system of Podgorica consisted of intake facilities with transmission pump, disinfection facilities and distribution facilities. Of these pumping facilities, the vital and main part of the system, Mareza 2 pump station had a half of total amount of transmission and distribution, however, water transmission flow of Mareza 2 pump had decreased significantly owing to severe performance deterioration and ex-ordinary vibration resulting from the pumps of aged about 25 years. In addition, the unbalance flow in the pipeline occurred due to decrease of distribution water flow and pressure and thereby resulted water failure at several zones.				
Objectives of the Project	To provide stable water supply services to citizens of Podgorica by replacing four pumps in Mareza 2 pump station and installing facility and distribution monitoring system, thereby contributing to improvement of living condition.				
Contents of the Project	<ol style="list-style-type: none"> 1. Project Site: Podgorica City 2. Japanese side: Replacement of four pumps, pump control system and related equipment at Mareza 2 pump stations, and installation of water distribution monitoring system 3. Montenegro side: (1) Mareza 2 pump station: Dismantling work of existing pumps/motors, and others (2) Monitoring system: Procurement of cables, kiosk and piping materials and equipment for telecommunication system. Installation of Civil and building work for kiosk and concrete pit, piping work for pipe, fitting, valve, etc., installation work for monitoring equipment, wiring work for various kinds of cables and others 				
Ex-Ante Evaluation	2009	E/N Date	May 13, 2010	Completion Date	September 28, 2011
		G/A Date	May 23, 2010		
Project Cost	E/N Grant Limit/ G/N Grant Limit: 596 million yen, Actual Grant Amount 345 million yen				
Implementing Agency	Public Enterprise Podgorica Water Supply and Sewerage (PWS)				
Contracted Agencies	Tokyo Engineering Consultants Co., Ltd., Torishima Pump Mfg. Co., Ltd.				

II. Result of the Evaluation**1 Relevance**

<Consistency with the Development Policy of Montenegro at the time of ex-ante and ex-post evaluation>

This project has been highly consistent with development policy of Montenegro. At the time of ex-ante evaluation, in accordance with the independence of Montenegro in year 2006, the water supply system was decided to be improved under responsibility of each municipality. Podgorica prepared the Long-term Infrastructure Scheme (year 2007-2017) as a part of the urban development plan in year 2007 accordingly. At the time of ex-post evaluation, development plans such as Montenegro Development Directions 2015-2018 cover the water supply issue including the necessity of the rehabilitation and expansion of water supply systems in all municipalities.

<Consistency with the Development Needs of Montenegro at the time of ex-ante and ex-post evaluation>

The project has also been highly relevant with Montenegro's development needs for improving water supply system. At the time of ex-ante evaluation, water transmission from Mareza 2 pump station, which had a half of total amount of transmission and distribution of water supply system of Podgorica had decreased as a result of aging pumps, and it affected the living conditions for habitants. At the time of ex-post evaluation, the population which the target facilities serve has continued to grow because of migration to the capital city and therefore water demands have been continuously increased.

<Consistency with Japan's ODA Policy at the time of ex-ante evaluation>

The project was also consistent with Japan's ODA policy at the time of ex-ante evaluation: Restoration and development of social and economic infrastructure was one of the priority areas of ODA to Montenegro according to the ODA Country Databook 2009.

<Evaluation Result>

In light of the above, the relevance of the project is high.

2 Effectiveness/Impact

<Effectiveness>

The project has achieved its objectives, "to provide stable water supply services to citizens of Podgorica". Indicators of quantitative effects – such as "capacity of water distribution pumps", "population served with stable water supply", "population in water supply suspension" and "energy loss" – achieved the targets that were set at the time of ex-ante evaluation.

All four pumps and pump control system at Mareza 2 pump station as well as water distribution monitoring system procured under the project function well¹. Capacity of Mareza 2 pump station has improved from 544l/s to 960l/s. Whole population in Podgorica is served with stable water supply after the project was completed while the number of population served with stable water would have dropped if the project was not implemented due to the limited capacity. In addition, population increased as the migration to Podgorica is larger than expected. After the project was completed, there is no water suspension for population in areas where suspension occurred frequently

¹ The monitoring system is functioning without difficulties, however, part of the software related to reporting function is malfunctioning. Although PWS has tried to sort it out with the supplier, the issue is still pending. PWS can use data collected through system, but they have to extract it and analyze it manually.

before the project implementation. According to the interviews with several water users from targeted areas, water supply system is functioning without restrictions.

As expected at the time of ex-ante evaluation, the safety of water has improved: The content of residual chlorine has reduced after installing the monitoring system. The content of residual chlorine after the project implementation is between 0.15 -0.3mg/litter whereas the value before the project was 0.4mg/litter (The standard set by the city public office is 0.5 mg/litter). The good example is residential area Tolosi where residents often complained on water quality before the project. Upon installation of chlorine measurement instrument in District Metering Area (DMA) under the project, problem was overcome.

<Impact>
After the project was completed, water leakage rate has improved. The monitoring system facilitates detection of leakage at water pipes network as well as illegal connections to water supply system. PWS took measures such as replacement of pipes accordingly, and informed that Non-Revenue Water rate is currently 48.31%, of which physical loss is 26-27% and commercial e loss is 20-22%. As physical loss of 40.9% was reported at the time of ex-ante evaluation, it can be said that water leakage rate has improved. In addition, PWS started using mechanisms for combating illegal connection, and they expect that with other measures, they will reach 98-99% of paid bills of all invoiced services soon.

According to the interviews with several water users from targeted areas, as water supply system is functioning without restrictions, living conditions of residents have improved.

No negative impacts on the natural environment were observed, and no land acquisition occurred under this project.

<Evaluation Result>

In light of the above, the effect of the project has been observed as planned. Therefore, the effectiveness/impact of the project is high.

Quantitative Effects

	Before the project 2009	Target figure at target year (2012)	Actual Figure at target year (2012)	The most recent Actual Figure (2015)
Indicator 1: Capacity of water distribution pumps (6 pump stations) (litter/second)	1,677 (Breakdown) (1) Capacity of Mareza 2: 544 (2) Capacity of Other 5 pump stations: 1,133	2,051 (Breakdown) (1) Mareza 2: 960 (2) Other 5 pump stations: 1,091 ^{*1}	2,051 (Breakdown) (1) Mareza 2: 960 (2) Other 5 pump stations: 1,091	2,150 (Breakdown) (1) Mareza 2: 960 (2) Other 5 pump stations: 1,190 ^{*2}
Indicator 2: Population served with stable water supply	101,382	177,410	187,000	210,000
Indicator 3: Population in water supply suspension	25,370	0	0	0
Indicator 4: Energy loss (MW/Year)	1.64	0	0	0

*1 Capacity of 5 pump stations was assumed to be reduced by performance drop of 1.25% per year.

*2 As a result of spread of water network, PWS closed some wells and opened new ones in boundary areas. Therefore, the capacity has not reduced.

Source: JICA internal documents, questionnaire and interviews with PWS

3 Efficiency

Both the project cost and the project period were within the plan (ratio against the plan: 58%, 75%). Therefore, the efficiency of the project is high.

4 Sustainability

<Institutional Aspect>

Operation and Maintenance (O&M) of the pumps and monitoring system procured under the project is carried out by PWS. PWS operate financially independent under the City Manager of Podgorica. Maintenance service/electro mechanical department under O&M sector is responsible for O&M of electrical and mechanical equipment, O&M sector/pumping station service is responsible for monitoring of water production and IT service/SCADA² department is responsible for monitoring, data analysis and maintenance for monitoring system. Coordination between O&M sector and IT department is functioning well. Total number of staff in PWS has increased and sufficient number of staff is allocated to each department mentioned above.

<Technical Aspect>

The staff members of PWS have sufficient skills to carry out O&M of the pumps and monitoring system procured under the project. O&M of pumps and motors at Mareza 2, basic operation and replacement of hardware components at monitoring system can be easily done with its own capacities. PWS staff commented that the selection of monitoring system without remote operation function was appropriate for enhancing their skills. After acquired knowledge with monitoring function, PWS is now ready for one step further. They are planning to establish the complete SCADA system including remote operation in the near future. However, skills and knowledge on software component of monitoring system and calibration of equipment at measuring points need to be strengthened, according to PWS. PWS does not have training programs to regularly improve and/or update technical skills on maintenance.

<Financial Aspect>

Financial condition of PWS could be recognized as stable. According to the financial information of PWS, maintenance cost has been fully secured and PWS invested in infrastructure improvement. By 2015, Mareza 1 pump station was renovated and 5 new pumps were

² SCADA stands for Supervisory Control and Data Acquisition.

installed. Constant works on pipe network are ongoing. In addition, PWS plans to increase prices of their services since average monthly bill to appropriate level.

<Current Status of Operation and Maintenance>

Inspection and regular maintenance activities have been carried out in right manner. Procurement of spare parts and necessary consumables can be done easily.

<Evaluation Result>

In light of the above, no problem has been observed in terms of the institutional, financial and current status of operation and maintenance aspects of the implementing agency, while some problem has been observed in technical aspect due to relatively weak skills on software component and calibration of equipment, as well as lack of regular training system. Therefore, the sustainability of the project effect is fair.

5 Summary of the Evaluation

The project has achieved its objectives, “to provide stable water supply services to citizens of Podgorica” as indicators of quantitative effects – such as “capacity of water distribution pumps”, and “population served with stable water supply”, “population in water supply suspension” and “energy loss”– achieved the targets. As an impact, water leakage rate has improved and living conditions have improved. As for sustainability, no problem has been observed in terms of the institutional, financial and current status of operation and maintenance aspects of the implementing agency, while some problem has been observed in technical aspect due to relatively weak skills on software component and calibration of equipment, as well as lack of regular training system.

Considering all of the above points, this project is evaluated to be highly satisfactory.

III. Recommendations & Lessons Learned

Recommendations to implementing agency:

- It is recommended to PWS to continue sorting out the problem of reporting function of the monitoring system.
- It is strongly recommended to PWS to establish system of education and training for staff in charge for operation and maintenance. Currently, the weakest point related to the technical capacity is notified at segments software component of monitoring system and calibration of equipment at measuring points. Therefore, PWS should start with training including these issues at earliest possible convenience.

As discussed during the evaluation survey, for implementing training efficiently, PWS is recommended to organize joint training on monitoring system on yearly level with other two cities (Niksic and Danilovgrad) and their Water Supply Companies who also established monitoring system.

Lessons learned for JICA:

- The manner JICA evaluated the capacity of the implementing agency properly and proposed a realistic input is crucial for project implementation and its outcome. The monitoring system under the project aimed at monitoring and accumulating data at the main control center. This was the first step towards the application of SCADA system in the project area. Subsequently, PWS was required to expand it based on the project in future in order to establish the complete SCADA system including remote operation, control operation by using accumulated data. PWS staff commented that they were surprised when JICA informed them that the project would provide them monitoring system without remote operation. But they confirmed that they are aware now that JICA decision was correct. It is necessary to have experience with monitoring system in order to become capable to go one step further on remote function which requires higher responsibility.



Four pumps at Mareza 2 pump station



Monitoring room at Mareza 2 pump station