

The Hashemite Kingdom of Jordan

**Ex-Post Evaluation of Japanese Grant Aid Project
The Project for Improvement of the Water Supply for the Zarqa District (Phase II)**

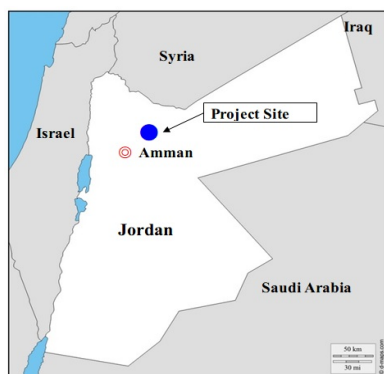
External Evaluator: Kenichi Inazawa, Miyuki Koga, Octavia Japan Co., Ltd.

0. Summary

This project constructed water supply facilities and provided technical assistance for strengthening water distribution management technologies with an aim to reduce the leakage ratio and to increase the number of water supply hours per week and water consumption per head per day in the northern part of Zarqa Municipality, Hashemeyeh Municipality, and Sukhna Municipality, located northeast of the capital city, Amman. At the time of the ex-post evaluation, this project is consistent with the policy, such as the ‘Jordan Water Strategy,’ and with the development needs for improving water supply facilities; thus the relevance is rated high. Through this project, the water supply rate has improved, the number of water supply hours has increased, the water pressure has improved, the water consumption per head per day has increased, and the leakage ratio has reduced mostly as planned. Additionally, the results of the beneficiary survey show positive responses about water pressure and water supply volume, as well as positive impacts of the project, such as reduced time and labor burden in accessing water. Thus, effectiveness and impacts are rated high. The project period and project cost were mostly as planned, therefore the effectiveness is rated high. On the other hand, sustainability is rated fair because financially the Implementing Agency has recorded deficits for many years, although no major problems are observed in the institutional and technical aspects of the operation and maintenance carried out by the Implementing Agency.

In light of the above, this project is evaluated to be highly satisfactory.

1. Project Description



Project Location



Batrawi Reservoir

1.1 Background

In the Hashemite Kingdom of Jordan (hereinafter referred to as “Jordan”) deserts and waste land comprise 80% of the national land, and the rainfall is also low. The per capita water resource potential¹ is extremely low at 160m³ as compared to the world average of 7,700m³². In addition, because the country accepted refugees from neighboring countries as a result of the Gulf War and other regional conflicts, water demands rapidly increased before the commencement of this project, adding stress on the water resources. Both in the urban and rural areas people relied on public water supply with the national service ratio exceeding 95% on average. However, water supply could not keep up with the demand, as a result of which planned water restrictions were implemented a few days a week. Water shortage was particularly serious in Zarqa Governance located northeast of the capital, Amman. Per capita water consumption in the project target area (northern part of Zarqa Municipality, Hashemeyeh Municipality and Sukhna Municipality) was particularly low at 84 L per day, which was far short of the national goal at that time, 150 L per day. In some areas residents only had water supply 12-72 hours per week. Therefore, it was essential to increase the amount of supplied water in the project area, thereby supplying water in a stable manner.

1.2 Project Outline

This project aims to reduce the leakage ratio, to increase the number of water supply hours per week, and to increase water consumption per head per day by improving water supply facilities (i.e., construction of service reservoir, laying of transmission mains, and renewing pumping facilities, etc) and providing technical assistance for the enhancement of water distribution management technology, thereby contributing to the improvement in the living environment for the residents in the northern part of Zarqa Municipality, Hashemeyeh Municipality and Sukhna Municipality located northeast of the capital, Amman.

Grant Limit / Actual Grant Amount	【Grant Limit】2,371 million yen in total (the first term: 511 million yen, the second term: 668 million yen, the third term: 1,192 million yen) 【Actual Grant Amount】2,261 million yen in total (the first
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¹ In general, the term, resource potential, refers to a total amount of some resource based on theoretical calculation.

² 2002 data

	term: 489 million yen, the second term: 666 million yen, the third term: 1,105 million yen)
Exchange of Notes Date (/Grant Agreement Date)	The first term: July 2006 The second term: July 2007 The third term: August 2008
Implementing Agency	Water Authority of Jordan (WAJ)
Project Completion Date	March 2010 (the first term: February 2008, the second term: February 2009, the third term: March 2010)
Main Contractor(s)	Dai Nippon Construction
Main Consultant(s)	Tokyo Engineering Consultants Co., Ltd.
Basic Design	October 2005 – May 2006
Detailed Design	(The first term) July 2006 – March 2008 (The second term) August 2007 – March 2009 (The third term) November 2008 – March 2010
Related Projects (if any)	[Technical Cooperation] ■ “The Study on the Improvement of the Water Supply System for the Zarqa District in the Hashemite Kingdom of Jordan” (1994-1996), JICA ■ “Capacity Development Project for Non-Revenue Water Reduction in Jordan (Phase 1)” (2005-2008) ■ “Capacity Development Project for Non-Revenue Water Reduction in Jordan (Phase 2)” (2009-2011) ■ Dispatching of Experts (Non-Revenue Water Reduction Experts and Water Supply Improvement Experts, 4 persons, 1999-2006) ■ Training of counterparts in Japan (Water supply and non-revenue water management, 1 person, 2001) [Grant Aid] ■ “The Project for Improvement of the Water Supply for the Zarqa District³” (2002-2005, 1,721 million yen)

³ It improved the water conveyance and distribution facilities in Ruseifa Municipality and Awajan area in Zarqa Municipality.

2. Outline of the Evaluation Study

2.1 External Evaluator

Kenichi Inazawa & Miyuki Koga, Octavia Japan Co., Ltd.

2.2 Duration of Evaluation Study

Evaluation Study: January 2013 – December 2013

Field Study: 24 May – 6 June 2013 & 2 – 8 September, 2013

3. Results of the Evaluation (Overall Rating: A⁴)

3.1 Relevance (Rating: ③⁵)

3.1.1 Relevance to the Development Plan of Jordan

Before the commencement of this project, the government of Jordan showed its direction toward pursuing optimum utilization of limited water resources by managing and conserving water resources and improving institutional systems concerning water supply operations, based on the National Water Strategy, which had been in effect since 1977. In addition, the government was developing the National Three-Year Socioeconomic Plan (2004-2006) at that time, in which water-sector objectives were laid out, including the development of new water sources, reduction in non-revenue water tariff rates, and financial improvement concerning water and sewerage facilities.

At the time of the ex-post evaluation, the government has developed a new national development plan, the “National Agenda (2006-2015).” Among the water-sector issues stipulated in this national plan are shortage of renewable water resources, depletion of underground water, inefficient water tariff rate structure, and limited market opportunities for the private sector. In addition, the government has developed the “Jordan's Water Strategy” (2008-2022), which lists objectives for the time being, such as supply of safe drinking water, promotion of non-revenue water reduction, effective utilization of the existing water resources, and increasing water supply capacity with the introduction of new technologies.

In view of the above, this project is consistent with the policy concerning the water sector in Jordan, such as the national and sectoral plans, both at the times of before project commencement and the ex-post evaluation.

⁴ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

⁵ ③: High, ② Fair, ① Low

3.1.2 Relevance to the Development Needs of Jordan

The Zarqa Governorate, located northeast of the capital, Amman, was one of the regions in Jordan that faced serious water shortage before the commencement of this project. The volume of supplied water was insufficient, and the leakage ratio in the distribution network was high. In the project area (northern part of Zarqa Municipality, Hashemeyeh Municipality and Sukhna Municipality) water consumption per head was 84 L per day, which was far below the national goal of 150 L per day. Additionally, as the project area has hilly topography, water was mainly conveyed using pump pressure. No planned measures were in place to control the water leakage. It was difficult to say that supplied water was safe because water pressure in the pipes could drop to zero or negative due to intermittent water supply with chlorination being insufficient. Although water service ratio was as high as 98% in the target area at that time, water supply hours were restricted. Some areas only received 12-72 hours of water supply weekly, which had major impacts on daily lives of the residents. Considering these circumstances, there was a great demand to improve water supply facilities, which would enable stable and safe water supply in the project area.

At the time of the ex-post evaluation, per capita water consumption has reached 116 L per day⁶ in the target area through the implementation of this project. However, it still falls short of 150 L per day, the national goal before the commencement of this project. Also, there still remain old water distribution pipes in the downtown area of Zarqa Municipality, and the Implementing Agency of this project (hereinafter referred to as “WAJ”) is planning to stabilize water supply by replacing the existing distribution pipes, by improving water distribution network systems, and by reducing non-revenue water tariff rate⁷.

In view of the above, there continues to be a plan and needs to improve water distribution network systems in the project area at the time of the ex-post evaluation. Therefore, it can be judged that this project is consistent with the development needs both at the times of the ex-ante and ex-post evaluations.

3.1.3 Relevance to Japan's ODA Policy

In Japan's Country Assistance Policy for Jordan (formulated in 1996), water supply was

⁶ It will be explained in the Quantitative Effects section under Effectiveness.

⁷ New projects planned for the next few years include the Millennium Challenge Water Supply Project supported by the government of the United States, which will begin in October 2013. It will renew the existing water distribution networks mainly in downtown Zarqa Municipality with the project budget of 275 million USD according to WAJ. In addition, there is a plan to improve and renew the pumping facilities and equipment in Awajan, Abu Al Zaigan and Sarrouh areas.

identified as one of the priority issues concerning the improvement of basic living conditions. In particular, it highlighted the securing of water for domestic use and irrigation. In addition, the Jordan Country Assistance Plan (FY2005) developed by JICA aims to improve water supply capacity while paying attention to effective and efficient water utilization under a priority sector: “improvement in basic living conditions.” Specifically, the plan lays out JICA’s direction to assist the improvement of water supply facilities and measures to reduce non-revenue water. This project supports Jordan’s water sector with a view to supplying safe water to the people; therefore, it can be said that the project is consistent with the development assistance policy of Japan.

This project has been highly relevant with the Jordan’s development plan, development needs, as well as Japan’s ODA policy, therefore its relevance is high.

3.2 Effectiveness⁸ (Rating: ③)

3.2.1 Quantitative Effects

Before the commencement of this project, population growth was prominent in the project areas⁹, causing serious water shortage. In addition to the shortage of water supply volume, leakage ratio was also high. As a result, water consumption per head was as little as 84 L, which could not reach the national goal of 150 L per day. In addition, not enough measures were in place to address the leakage problem. Table 1 shows data on various indicators (actual before commencement and target after completion) of the project area (northern part of Zarqa Municipality, Hashemeyeh Municipality and Sukhna Municipality) before project commencement as well as actuals for the three years after the completion of the project.

Table 1: Effectiveness and Quantitative Data of This Project
(Actual Before Project Commencement and Target After Project Completion)

Indicator	Actual Before Commencement (2005)	Target Before Commencement (2010)	Actual After Completion		
			2010	2011	2012
(1) Water service ratio	98%	100%	100%	100%	100%
(2) Estimated	329,540	373,711	382,000	390,000	400,000

⁸ Sub-rating for Effectiveness is to be put with consideration of Impact

⁹ The population growth rate is 2.2% per annum (source: World Bank’s 2011 data). Particularly, many people, such as workers, are migrating from rural areas to downtown Zarqa these days.

population served with clean water	people	people	people	people	people
(3) Estimated population un-served with clean water	6,725 people	0	0	0	0
(4) Weekly water supply hours	12-72 hours/week	72 or more hours/week	72 hours/week	72 hours/week	72 hours/week
(5) Leakage ratio	31%	25%	23.5%	25.0%	24.5%
(6) Water consumption per head per day (daily average)	84 L /head/day	113 ¹⁰ L /head/day	126 L /head /day	128 L /head/day	116 L /head/day ¹¹
(7) Water pressure	0-10 bar	1-7 bar	1.5-5.5 bar	1.5-5.5 bar	1.5-5.5 bar

Source: JICA document (actual and target before project commencement), answers on questionnaire (actual after project completion)

With regard to (1) water service ratio, it has reached 100% in the project area as the water supply rate improved through mainly the implementation of this project. This means that all residents in the project area have become able to receive WAJ's water supply service. The (2) estimated population served with clean water has increased as compared to 2005, which is attributed to the high population growth rate mentioned earlier. Regarding (3) estimated population un-served with clean water, while there were a few areas in which residents did not have access to water supply service and had to purchase domestic water from private sellers, the number of such residents became zero after the completion of this project¹². Concerning (4) weekly water supply hours, while WAJ Zarqa targeted to supply water 72 or more hours per week after the completion of this project, they have achieved 72 hours since 2010. It is mainly because the reservoirs and water distribution network systems developed by this project enabled the water distribution to switch from the pumping system to a gravity system (which will be elaborated in the "Qualitative Effects" section), realizing efficient water distribution¹³. With respect to 5) leakage ratio, it has become 25% or less after the completion of the project as certain improvement was made to the distribution networks through this project. However, there still remain old distribution pipes particularly in the northern part of Zarqa Municipality at the time of the ex-post evaluation, and leakage continues to be a problem in some areas. Therefore,

¹⁰ On the other hand, it was projected to be 104 L/head/day if the project was not to be implemented.

¹¹ It decreased from 2011. According to WAJ Zarqa, water supply situation temporarily worsened in Ruseifa area next to Zarqa Municipality (outside the project area), which forced them to temporarily allocate some of the water meant for the project areas to Ruseifa. Besides, because WAJ Zarqa does not keep track of daily water consumption, daily consumption was calculated by dividing the weekly consumption by seven days.

¹² As a result, service ratio has reached 100% as seen in (1).

¹³ WAJ Zarqa divides the project area into three groups and assign scheduled water supply hours to each group. On the other hand, residents who receive water supply service have water tanks at home to store water.

WAJ Zarqa is continuing its effort to reduce leakage ratio through new projects, including the new project such as “Millennium Challenge Water Supply Project” mentioned earlier. Regarding 6) water consumption per head per day (daily average), owing to the development of water distribution networks and the improvement in leakage ratio, it has exceeded the initial target (113 L/head/day). As for 7) water pressure¹⁴, it was unstable (0-10bar) before the commencement of this project. In some areas residents complained about low water pressure (e.g., 1 bar or less) whereas in others water was distributed at pressures as high as 10 bar. In some cases distribution pipes were seriously damaged. At the time of the ex-post evaluation, WAJ Zarqa is keeping the water pressures within the range of 1.5-5.5 bar, realizing more stable water distribution as compared to before the commencement of the project. According to WAJ Zarqa, the main reason is that the reservoirs and distribution network systems developed by this project have made the management of water distribution more efficient. It has also suggested that stable water pressures indirectly contribute to increasing water supply hours and reducing water leakage.

In view of the above, it can be judged that this project has improved water pressure, reduced leakage ratio, increased weekly water supply hours and water consumption per head per day, and thus mostly achieved the initial targets.



Photo 1: Sukhna Reservoir



Photo 2: Northern Zarqa Reservoir

¹⁴ The unit used to measure water pressure, 1 bar, represents a water pressure level which can directly supply water to a place 10 meter upward from the ground.

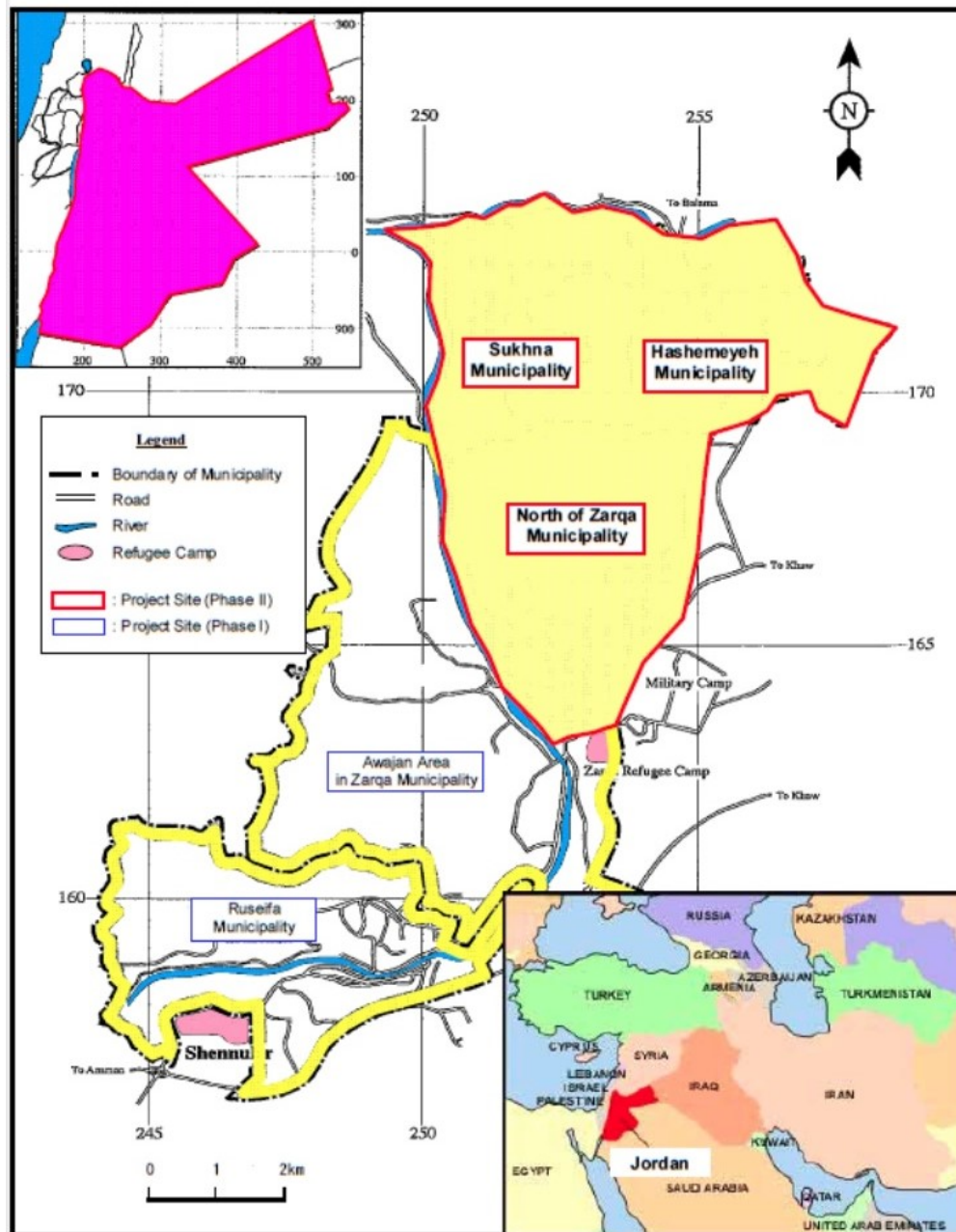


Figure 1: Locations of the Project Sites



Source: JICA document

Figure 2: Locations of the Project Sites

3.2.2 Qualitative Effects (Realizing Efficient Water Distribution with Gravity System and Strengthening Chlorination System)

With the construction of water reservoirs and distribution networks by this project, the pumping water system which was used before the commencement of this project switched to a gravity system in the project area. This shift to the gravity-based water distribution has equalized water pressure, making water distribution efficient. In addition, it has become possible to distribute sufficient volume of water to farther places inside the project area as compared to before the commencement of the project.

With the aim of strengthening the chlorination system, chlorination equipment was procured and installed inside the Khaw Pumping Station located in the eastern part of Zarqa Municipality (see Photo 6). Combined with the chlorination equipment installed at the Azraq wells and pumping station¹⁵, which is the intake source of the project area, it has reinforced the chlorination systems for the water conveyance to the area. More specifically, through this project, a system has been established whereby the chlorination equipment of the Khaw Pumping Station is operative even when the chlorination equipment of the Azraq well and

¹⁵ It is located in the desert area about 100km east of the capital city, Amman.

pumping station stops operating due to power outages and accidents; thus there is no problem with the chlorination system in the project area.

3.3 Impact

3.3.1 Intended Impacts

3.3.1.1 Contribution to Improvement in Living Conditions of Residents

Targeting residents of the project areas (the northern part of Zarqa Municipality, Hashemeyeh Municipality, and Sukhna Municipality), a beneficiary survey was conducted concerning the level of satisfaction with this project and improvement of the living conditions. A random sampling method¹⁶ was used, and it was carried out in the form of a questionnaire. Below are the review and analysis of the survey results.

With regard to Figure 3, which is the level of satisfaction with this project, approximately 50% of the respondents answered they were either “very satisfied” or “satisfied.” On the other hand, “normal” and “dissatisfied” also account for approximately 50% of the responses. The main reason for this seems to be that residents are discontent with the water supply situations, such as leakage and water pressure, as there still remain many old existing water pipes in the northern part of Zarqa Municipality where residential houses are concentrated compared to Hashemeyeh and Sukhna Municipalities¹⁷. This also explains why the same percentages of the respondents answered “good” and “deteriorated” to a question about water pressures in Figure 4. On the other hand, regarding a question about supplied water volume in Figure 5, more than 75% of the respondents answered “yes” (increased).” This is presumably because the water distribution switched from the pumping system to the gravity system. In addition, as shown in Figure 6, 70% of the respondents said that water had no odor. This could be owing to the reinforcement of the chlorination system through the procurement and installation of chlorination equipment by this project as explained above. Figure 7 is a question about physical and time burden involved in drawing and transporting water; a high percentage of the respondents answered “yes (reduced)”. Many of those who answered “yes” are residents of Hashemeyeh and Sukhna Municipalities where water supply service was worse relative to the northern part of Zarqa Municipality. Figure 8 is a question about the level of confidence in water; more than 70% of the residents answered “yes (water has become safe and secure),”

¹⁶ The total sample size for all three areas was 102. (35 samples from the northern part of Zarqa Municipality, 34 samples from Hashemeyeh Municipality, and 33 samples from Sukhna Municipality.)

¹⁷ It was confirmed during the resident interviews conducted in the beneficiary survey.

indicating that the level of confidence is generally high. Additionally, Figure 9 and 10 are questions about illness, such as diarrhea, and improvement in sanitary conditions. Although it is difficult to prove that these results have direct linkages to this project, it seems that the project is making a certain contribution to the improvement in health and sanitation of the residents in the target area as the responses were generally positive.

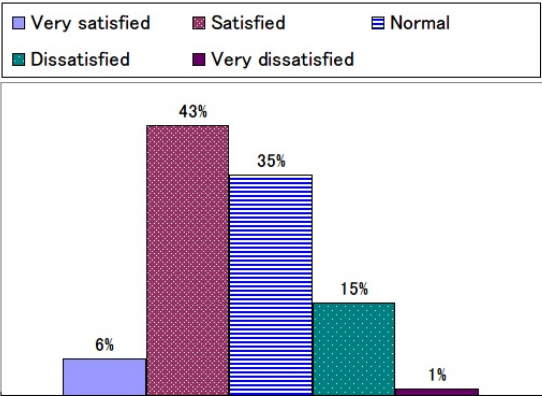


Figure 3: Are you satisfied with this project?

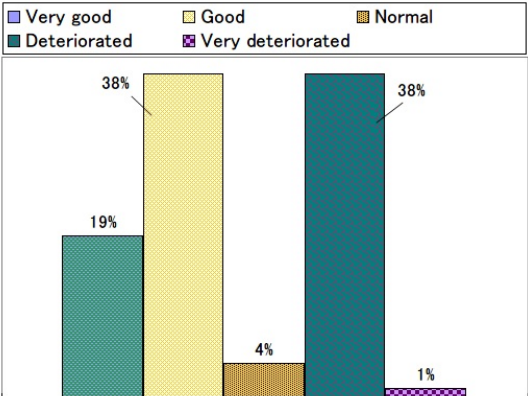


Figure 4: What do you think of the current water pressure?

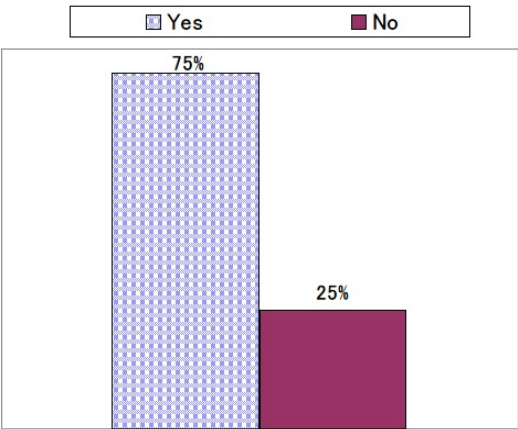


Figure 5: Do you think the volume of supplied water has increased?

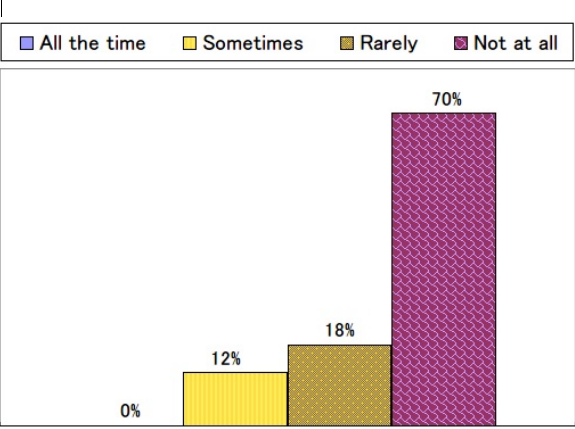


Figure 6: Do you feel that the supplied water has any unpleasant odor?

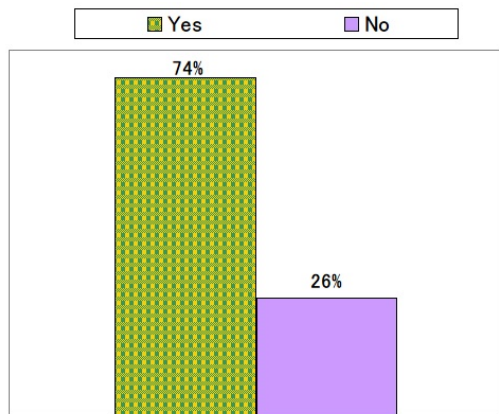


Figure 7: Do you think the physical and time burden involved in drawing and carrying water reduced after the completion of this project as compared to before the project?

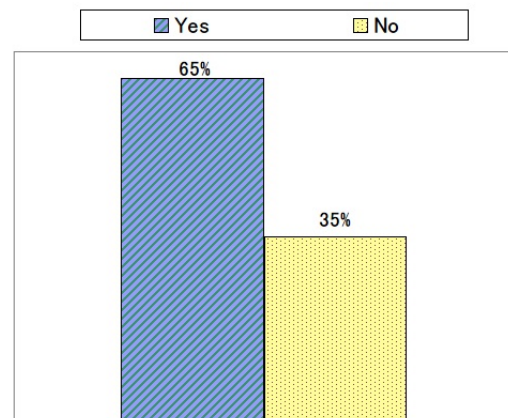


Figure 8: Do you think the supplied water has become safe and secure after the completion of this project? (a question related to levels of confidence in water)

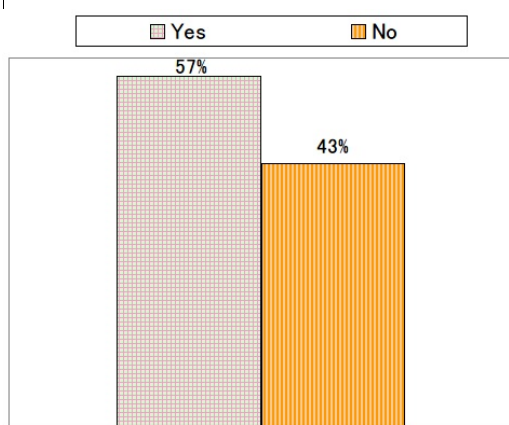


Figure 9: Do you think diarrhea and typhoid cases reduced around you after the completion of this project?

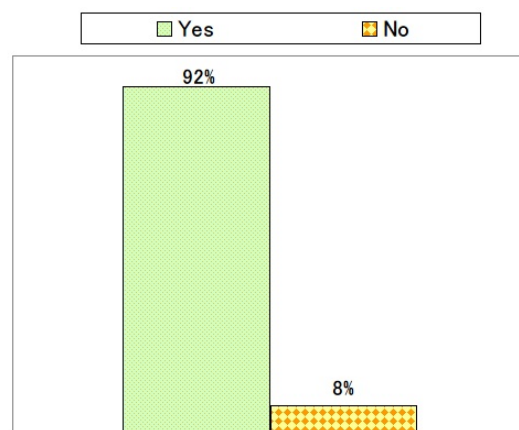


Figure 10: Do you think sanitary conditions improved around you after the completion of this project?

3.3.2 Other Impacts

3.3.2.1 Impacts on the Natural Environment

Initially, the Ministry of Environment of Jordan deemed that an Environmental Impact Assessment (EIA) was necessary for this project because it was an infrastructure development project. Before the commencement of this project (February 2006), however, the Ministry decided that the EIA was not necessary because the main focus of this project was to rehabilitate and improve the existing facilities and also because the impacts of this project on natural environment were expected to be minimum.

With regard to the environmental issues (air pollution, noise, odor, and so on) inside the

project sites at the time of the ex-post evaluation, it was confirmed through the interviews with WAJ Zarqa staff and others that there were no major problems in this regard¹⁸. Additionally, during the site inspections, no major problems were observed in and around each project site in terms of the impacts on natural environment.

3.3.2.2 Land Acquisition and Resettlement

This project did not require any resettlement. On the other hand, land was acquired for the construction of the reservoirs: 7,638m² for Sukhna Reservoir; 11,661m² for Hashemeyeh Reservoir; 13,600m² for Batrawi Reservoir; and 4,273 m² for Zarqa North Reservoir. There was no monetary compensation involved because all the acquired lands were owned by the government of Jordan (national land) before the commencement of the project. In addition, WAJ already completed all the necessary procedures before the commencement of the project.



Photo 3: Northern Part of Zarqa Municipality (photo was taken from the developed reservoir)



Photo 4: Sukhna Municipality

Conclusion on Effectiveness and Impacts

Through this project, the water supply rate has improved, the number of water supply hours has increased, the water pressure has improved, the water consumption per head per day has increased, and the leakage ratio has reduced mostly as planned. Additionally, the results of the beneficiary survey show positive responses about water pressure and water supply volume, as well as positive impacts of the project, such as reduced time and labor burden in accessing water.

This project has largely achieved its objectives, therefore its effectiveness is high.

¹⁸ It is the “Environment and Reuse Department” that is responsible for environmental monitoring of WAJ. The main tasks of this department are to conduct environmental studies concerning water supply projects and to carry out periodical environmental monitoring. The department is mandated to address any issue concerning negative impacts on natural environment as soon as it arises.

3.4 Efficiency (Rating: ③)

3.4.1 Project Outputs

Table 2 shows the planned and actual outputs of this project.

Table 2: Planned and Actual Outputs of the Project

Plan (Before Project Commencement)	Actual (At the Time of Ex-Post Evaluation)
【Planned Inputs from Japanese Side】 ■ Construction of Service Reservoirs: • Zarqa North Reservoir (2,500m³) • Hashemeyeh Reservoir (1,500m³) • Sukhna Reservoir (1,000 m³) • Batrawi Reservoir (Expansion (14,000m³) of the existing part, which is 4,000 m³) ■ Laying of Transmission Mains: • Batrawi Pumping Station – Zarqa North Reservoir (300mm x 2,072m) • Khaw Junction – Hashemeyeh Reservoir (300mm x 6,141m) • Hashemeyeh Reservoir – Sukhna Reservoir (300mm x 7,798m) ■ Laying of Distribution Connection Mains: • Zarqa North Reservoir to the existing distribution mains (300mm x 1,572m) • Hashemeyeh Reservoir to the existing distribution mains (300mm x 1,338m) • Sukhna Reservoir to existing distribution mains (200mm x 722m) • Batrawi Reservoir to the existing distribution mains (600mm x 3,080m, 400 mm x 480m) ■ Renewing Pumping Facilities (Batrawi Pumping Station) • Pump capacity: 5m³/min x 90m head x 132 kW x 2 units (1 unit as a spare) • Electricity equipment and metering units ■ Chlorination Facility: • Dosing equipment (16kg/h x 2 units) • Concrete building (L 12m x W 10m x H 6.3m) ■ Separating Distribution Zones and Changing the Existing Distribution Pipes to Transmission Pipes: • Sluice valves: 6 places (materials to be	【Actual Inputs from Japanese Side】 The outputs shown in the left column were implemented mostly as planned.

procured by the Jordanian side) ■ Transfer of Water Distribution Management Technologies to Enable Smooth Operation And Maintenance of the Above (soft component) (*For more details, refer to “Technical Aspects of Operation and Maintenance” under the Sustainability section.) <u>【Planned Inputs from Jordanian side】</u> ① Allocation of required water resources amount for the project area ② Procurement of sluice valves and other required materials for installing sluice valves ③ Provision of the construction sites for water distribution reservoir ④ Development of the reservoir site by construction of access road, fence, green area, light and overflow pipe ⑤ Appropriate operation and maintenance of the constructed water supply system and provision of equipment and facility to implement the soft component	<u>【Actual Inputs from Jordanian side】</u> The outputs shown in the left column were implemented mostly as planned.
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Source: JICA document (before project commencement), Answers on questionnaire (at time of ex-post evaluation)

As shown in Table 2, the outputs, which were planned before the project implementation to be contributed by the Japanese and the Jordanian sides, were implemented mostly as planned. It has also been confirmed through the questionnaire and interviews that the project did not have any additional output.



Photo 5: Renewed Pumping Facility
(Batrawi Pumping Station)



Photo 6: Procured and Installed Chlorination
Equipment (Khaw Pumping Station)

3.4.2 Project Inputs

3.4.2.1 Project Cost

The total project cost was planned to be 2,485 million yen (grant limit of 2,371 million yen,

roughly 114 million yen to be borne by the Jordanian side). The actual total cost was around 2,416 million yen (2,261 million yen was contributed by the Japanese side, and roughly 155 million yen was contributed by the Jordanian side), which was mostly as planned (97% of the plan).

3.4.2.2 Project Period

The planned project period was 3 years and 9 months (45 months) from July 2006 to March 2010. While the procurement and installation work by the Japanese side was implemented as planned from July 2006 to March 2010, the construction work by the Jordanian side was executed from March 2007 to May 2010, which was a delay of about two months. More specifically, out of the outputs to be contributed by the Jordanian side, the construction of fences and gates and the site paving were delayed (by about two months) because the Cabinet was reshuffled in October 2009, which caused a delay in the approval of the FY2010 budget, affecting the budget allocation for this project as well as for others. However, considering that the fence construction by the Jordanian side is not something that severely affects the attainment of the project effects, it is appropriate to consider that the project outputs were achieved when the procurement and installation work by the Japanese side was completed. (Therefore, the project period is considered 100% of the plan.)

In view of the above, both project cost and project period were mostly as planned; therefore, efficiency of the project is high.

3.5 Sustainability (Rating:②)

3.5.1 Institutional Aspects of Operation and Maintenance

The Implementing Agency of this project is Water Authority of Jordan (WAJ). WAJ is mandated to operate water supply and sewerage services in Jordan under the supervision of the Ministry of Water and Irrigation (MWI). Regarding the organizational structure of WAJ, it has 8 divisions (Water Supply Division, Sewerage Division, Laboratory and Water Quality Division, Northern Region Division, Central Region Division, Southern Region Division, Finance Division, and Administration Division). There were totally about 7,000 employees working for WAJ before the commencement of the project, which is down to around 4,000 employees at the time of the ex-post evaluation. The reasons, as explained by WAJ, are: (1) WAJ reduced the

number of staff with the aim of improving its finance; and (2) With the introduction of IT and other new technologies, some positions became unnecessary and were cut¹⁹.

It is WAJ Zarqa that is responsible for the operation and maintenance of this project. It consists of Administration Department, Technical Department, Water Supply Department, Sewer Department, Client Relation Department, Non-Revenue Water Department and Russeifa Water Department. There are totally 649 employees: 18 engineers; 347 technically skilled workers; and 284 other staff. Before the commencement of the project, on the other hand, the total number of employees was 615. According to WAJ Zarqa, as the number of staff slightly increased because with the expansion of the area covered by water distribution networks, there was a need to increase the number of staff engaged in water supply and guards who would be stationed at the reservoirs. The Water Department (273 employees), which is the largest in WAJ Zarqa, manages pumping stations and wells inside Zarqa Municipality. For the operation and maintenance of the facilities developed by this project (e.g., opening and shutting of water distribution valves, patrol and inspection of the water distribution networks, responding to the breakage and fixing/repairing, opening and shutting of reservoir valves, and cleaning of the facilities), 21 staff members are assigned to Zarqa area and 5 staff members each to Hashemeyeh and Sukhna areas. When interviewed about the number of operation and maintenance staff, WAJ Zarqa commented, "We consider that each department is fully staffed, handling just the right amount of work." As stated above, it can be judged that the staffing level is sufficient at WAJ Zarqa. Taking account also of the comment of the staff member, it can be considered that there are no major problems in the institutional aspects of the operation and maintenance of this project.

3.5.2 Technical Aspects of Operation and Maintenance

As a soft component training, training covering water distribution network mapping program and water distribution data management program was given to WAJ Zarqa staff (totally 11 participants); GIS training was given to WAJ Headquarters staff (totally 6 participants); training on water distribution network analysis program was given to WAJ Zarqa staff (totally 13 participants); and training on EPANET (network analysis software) was given to WAJ Headquarters staff (totally 7 participants) during the implementation of this project. In addition, a seminar was held on a water distribution network analysis model for many of the WAJ Zarqa

¹⁹ The introduction of PCs and other terminals enabled WAJ to work more efficiently while improving the performance of maintenance equipment, such as leakage detectors. Therefore, WAJ was able to reduce the number of staff from what was previously required in some parts.

staff (totally 50 participants). Through such soft-component training, staff members have become able to capture a status of a water distribution network more easily and utilize water distribution data properly. Furthermore, a water distribution network analysis model has been established, enabling staff members to run water distribution network simulations and also to understand hydraulic situations of the network. Staff members who took part in the above mentioned training commented when being interviewed, “We are utilizing what we learned in the training for our day-to-day tasks as needed.”

The examples of training held after the completion of this project include technical training for staff (e.g., practical training on service pipe connection for household connections), which is organized regularly at a training facility owned by WAJ²⁰. In addition, WAJ Zarqa holds its own training for staff members. The examples include technical and practical training on how to use equipment to detect leakage in distribution pipes. Additionally, On-the-Job Training (OJT) is provided to newly recruited staff as needed.

The operation and maintenance staff assigned to Zarqa North, Hashemeyeh and Sukhna areas are generally well-experienced. (On average they have more than 8 years of experience. The oldest person has 20 years of experience.) According to the interviews with the management of WAJ Headquarters and WAJ Zarqa, they commented, “The levels of staff’s experience are sufficient to carry out the day-to-day operation and maintenance work.”

Based on the above, WAJ Zarqa staff members not only have sufficient training experiences but also have rich working experience, demonstrating sufficient technical capacities to carry out the periodic and day-to-day operation and maintenance. Therefore, it can be said that no major problems are found in the technical aspects of the operation and maintenance.

3.5.3 Financial Aspects of Operation and Maintenance

WAJ group’s profit and loss statements for the past three years²¹ are shown in Table 3, WAJ group’s balance sheets are shown in Table 4, and WAJ Zarqa’s profit and loss statements are shown in Table 5. With regard to WAJ group’s profit and loss statements, current term net profit or loss has been in the red for the past three years. Total operation revenue exceeds total operation expense, leaving some surplus and enabling cost recovery. However, once the other expenses, such as depreciation, bad loans and financial charges (interests paid), are taken into account, current term net balance shows large deficits, demonstrating how these expenses weigh

²⁰ It is located in the capital city, Amman.

²¹ Although the evaluation team attempted to obtain the most recent FY2012 data, it was not made publicly available because WAJ was going through an external audit.

on WAJ. In fact, WAJ has been creating new borrowings to repay its debt since before the commencement of this project²². At the time of the ex-post evaluation, WAJ is exploring an organizational strategy, including profitability, income structures and restructuring. However, they have not explicitly indicated the policy of moving toward an independent accounting system. It is deemed necessary that WAJ make further efforts to improve its finances while considering to revise the water tariff rates²³.

Table 3: WAJ Group's Profit and Loss Statement (Consolidated)

(Unit: Jordanian Dinar: JD)

	FY2009	FY2010	FY2011
①Water supply revenues	92,485,791	99,316,792	112,618,189
②Sewerage revenues	32,821,043	33,344,713	39,133,884
③Subscription and connection fees	14,832,486	16,289,186	17,669,668
④Stations and meters maintenance income	1,464,801	472,812	334,919
⑤Other operating income	797,137	817,063	313,254
Total Operating Revenue (A)	142,401,258	150,240,566	170,069,914
①Water purchase cost	0	1,505,547	3,361,507
②Salaries, wages and employees benefit	42,822,754	43,002,758	49,237,853
③Operating expenses	87,090,497	85,934,465	98,334,438
④Administration expenses	4,285,420	4,748,652	5,170,739
Total Operating Expense (B)	134,198,671	135,191,422	156,104,537
Cost Recovery Ratio (A)/(B)	106%	111%	109%
①Total Operating Revenue (A) – Total Operating Expense (B)	8,202,587	15,049,144	13,965,377
②Other revenue	6,241,988	3,955,134	8,440,362
③Amortization of deferred revenue	0	1,198,224	1,197,984
④Contribution to a waster water treatment project (Al-Sarma Wastewater Treatment Project)	-22,543,533	-13,398,752	-3,621,213
⑤Depreciation	-74,183,432	-77,163,901	-78,663,326
⑥Doubtful debts allowance	-3,017,189	-1,000,000	-5,598,805
Sum of ①–⑦	-85,299,579	-71,360,151	-64,279,621
Gains (losses) on foreign loan revaluation	-9,335,762	15,818,037	4,880,714

²² Regarding the financial data for FY2004 which is before the commencement of this project, total operating revenue was roughly 107 million JD while total operating expense was roughly 81 million JD; thus the difference (surplus) was around 26 million JD. However, after taking account of depreciation, interests paid and other expenses, which are about 76 million JD, the balance shows a deficit of around 50 million JD.

²³ According to a study by USAID, water charge accounts for 1-1.5% of the household's budget, which is relatively small. In addition, results from a socioeconomic survey indicate that costs of purchasing water to make up for the water shortage place more financial burden on households than the water charges. At the time of the ex-post evaluation, WAJ does not have a well-established system of collecting water charges according to the user's ability to pay. It is therefore considered necessary to revise the price setting system and rate levels.

Finance cost	-21,637,189	-24,117,242	-30,479,265
Deficit before tax	-116,272,530	-79,659,356	-89,878,172
Income tax	-410,432	-372,462	-317,759
Current term net profit or loss	-116,682,962	-80,031,818	-90,195,931

Source: WAJ Headquarters

Remark: 1 Jordanian Dinar = around 143 Japanese yen (at the exchange rate of June 2013)

With respect to WAJ group's balance sheets shown in Table 4, total asset is on the increase from FY2009 to FY2011. However, accumulated deficit is also on the increase (FY2009: -1,121,746,589JD → FY2010: -1,202,845,559JD → FY2011: -1,293,814,184JD). Additionally, capital-to-asset ratio (net assets divided by total assets) is on the decrease from FY2009 to FY2011 (FY2009: 0.54 → FY2010: 0.49 → FY2011: 0.43). This is not a favorable trend because low capital-to-asset ratios generally indicate that interests paid are putting pressure on profit, representing higher risks of not being able to repay debts. Furthermore, comparing non-current assets and capital, the former is larger than the latter for FY2009 through FY2011, and the difference between the two is expanding year by year. Ideally, capital should be large enough to cover the fixed assets (land and buildings); thus it is not a favorable trend, either. In addition, comparing current assets to current liabilities, while current assets exceed current liabilities in FY2009, current liabilities exceed current assets in FY2010 and FY2011. Also, the difference between the two has been increasing ((current assets – current liabilities), FY2009: 26,882,383 JD → FY2010: -6,534,811 JD → FY2011: -130,553,294 JD). This means that it is increasing difficulty for current assets to cover liabilities that are due within one year, depicting WAJ's serious cash-flow problem. Another concern is that the investment in the development of new water sources (e.g., DISI Conveyance Project) keeps increasing even though WAJ continues to end in the red.

Table 4: WAJ Group's Balance Sheet (Recent 3 Years)

(Unit: Jordanian Dinar: JD)

Assets	2009	2010	2011	Liabilities	2009	2010	2011
Current Assets	201,422,657	173,822,510	160,284,751	Current Liabilities	174,540,274	180,357,321	290,838,045
Current account and deposits at banks	11,821,113	22,724,213	17,556,935	Payables and other credit balance	10,323,960	8,448,740	26,971,632
Receivables and other debit balances	55,981,663	65,236,199	74,872,206	Electric companies payable	7,877,461	3,924,612	11,877,588
Warehouses	27,219,911	25,547,160	28,691,789	Disi Water Conveyance Deposit	35,500,000	60,314,938	39,163,821
Restricted escrow account	106,399,970	60,314,938	39,163,821	Due to others	14,625,550	9,899,232	10,545,321
Non-Current Assets	1,234,114,360	1,438,119,201	1,507,085,613	Due to banks	27,644,784	31,006,431	41,356,394
Property, plant and equipment	1,234,114,360	1,365,789,201	1,429,672,047	Foreign loans payable current portion	14,782,485	15,792,421	19,934,439
Disi Water Conveyance Project	0	72,330,000	77,413,566	Public treasury bonds -current portion	62,000,000	48,500,000	138,500,000
Total Assets	1,435,537,017	1,611,941,711	1,667,370,364	Unearned revenue current portion	1,347,262	1,852,315	1,745,238
				Current liabilities provision for income tax	438,772	618,632	743,612
				Non-Current Liabilities	489,564,295	648,277,360	654,401,691
				Foreign loan payable	216,235,638	212,580,798	213,717,590
				Public bond	234,500,000	387,480,000	392,980,000
				Long term deposit payable	19,352,644	20,811,610	21,384,438
				Unearned revenues	19,476,013	27,404,952	26,319,663
				Total Liabilities	664,104,569	828,634,681	945,239,736
				Equity	2009	2010	2011
				Capital	1,883,336,470	1,975,677,595	2,004,697,124
				Statutory Reserve	1,341,212	1,501,905	1,687,066
				Voluntary Reserve	3,142,159	3,437,616	3,807,938
				Accumulated deficit	-1,121,746,589	-1,202,845,559	-1,293,814,184
				Non-controlling interest right	5,359,196	5,535,473	5,752,684
				Total Equity	771,432,448	783,307,030	722,130,628
				Total Liabilities and Equity	1,435,537,017	1,611,941,711	1,667,370,364

On the other hand, WAJ Zarqa has also been ending in the red for the past three years as shown in Table 5, WAJ Zarqa's profit and loss statements²⁴. Given that it does not show a trend toward improvement, it can be said that there are concerns about the financial aspects of the

²⁴ In fact, WAJ Zarqa's operation and maintenance budget is centrally managed by WAJ Headquarters who compensates for the deficit.

operation and maintenance of this project.

Table 5: WAJ Zarqa's Profit and Loss Statement

(Unit: Jordanian Dinar: JD)

	FY2009	FY2010	FY2011
Water sales	6,047,400	6,036,371	6,487,649
Subscription, application and connection fees	1,185,661	1,152,439	642,557
Sewerage and drainage fees	1,479,504	1,152,301	1,681,181
Sewerage tax	1,142,710	362,553	474,734
Miscellaneous revenues	192,058	137,880	134,517
Water meters maintenance fees	107,152	127,629	137,216
Water exported to other governorates	1,966,983	1,885,776	1,846,388
Water sales by tankers	7,635	17,604	6,710
Total Operational Revenue (A)	12,129,103	10,872,554	11,410,952
Salaries and wages	2,695,309	2,695,404	2,870,305
Vehicles maintenance	168,963	172,332	167,271
Meters maintenance	246,675	168,458	119,524
Maintenance stations	313,684	241,259	493,624
Electricity	5,587,118	5,590,281	5,917,371
Equipment maintenance	136,652	29,160	20,217
Telecommunication	17,430	16,814	14,083
Fuel	212,311	233,648	259,987
New connections	384,412	194,742	356,985
Maintenance of networks	593,860	6,578	34,591
Stationery	62,319	11,041	13,365
Insurance	60,464	32,041	35,000
Building maintenance	35,297	13,920	37,063
Chemicals	52,882	14,102	50,119
Rent expenditure	19,646	19,646	19,646
Other expenditure	11,810	28,736	56,468
Desalination	286,000	226,905	674,547
Water treatment fees	1,778,152	3,617,120	1,154,961
Total Operating Expense (B)	12,662,984	13,312,187	12,295,127
Net Loss Before Tax	-533,881	-2,439,633	-884,175

Source: WAJ Zarqa

3.5.4 Current Status of Operation and Maintenance

There are no major problems in the status of operation and maintenance carried out by WAJ Zarqa staff in charge of the areas targeted by this project. They patrol the areas to check the existing and installed water distribution networks a few times a week. When breakage or leakage is found, they carry out repair work immediately²⁵. Also, they receive phone calls from

²⁵ WAJ Zarqa is focusing on measures against water thefts. Special investigation teams are formed to patrol the areas targeted by this project periodically (5-7 vehicles are going around). The minute somebody is found stealing water, he/she is charged the water fee immediately. For malicious cases, they urge offenders to pay penalty charges on top of

residents regarding leakage, to which they respond by going to the site if needed. For the pumping equipment procured and installed near the Batrawi Reservoir, they change internal oil and carry out inspection and cleaning. Regarding the four reservoirs developed in Batrawi, Zarqa North, Hashemeyeh and Sukhna, they open and shut distribution valves as well as maintain and clean the facilities. WAJ Zarqa has an in-house maintenance workshop at which overhaul and repair works are carried out when there is a problem with the pumping facilities.

There is no problem with spare parts procurement institutionally and financially. According to WAJ Zarqa's staff, if everything goes smoothly, it takes only one day to procure spare parts domestically. WAJ Zarqa submits a request to the headquarters for the cost of purchasing spare parts. Thus far, the headquarters have paid to WAJ Zarqa for the purchasing of spare parts without any problems.

There are guard houses for all the reservoirs developed by this project. Normally, security guards only work in the night for 12 hours from 6pm to 6am the next morning, patrolling the surrounding areas. Among these reservoirs, Zarqa North, being the crowded residential area, has frequent problems such that children from the neighborhood break into the premises passed the protective fence (at times they even break the fence) to scribble and play football during the day²⁶. It is therefore deemed necessary to enforce the protection of the facilities and the premises by assigning daytime guards.

Conclusion on Sustainability

No major problems are observed in the institutional and technical aspects of the operation and maintenance carried out by WAJ Zarqa at the time of the ex-post evaluation. However, considering that both WAJ group and WAJ Zarqa have been recording deficits for many years with little prospect of improving their finances in the near future, there is a concern in terms of financial sustainability. Therefore, sustainability of the project effect is fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

This project constructed water supply facilities and provided technical assistance for strengthening water distribution management technologies with an aim to reduce the leakage ratio and to increase the number of water supply hours per week and water consumption per head per day in the northern part of Zarqa Municipality, Hashemeyeh Municipality, and Sukhna

water fees.

²⁶ The protective fence of this reservoir was broken three times in the first half of 2013 alone.

Municipality, located northeast of the capital city, Amman. At the time of the ex-post evaluation, this project is consistent with the policy, such as the 'Jordan Water Strategy,' and with the development needs for improving water supply facilities; thus the relevance is rated high. Through this project, the water supply rate has improved, the number of water supply hours has increased, the water pressure has improved, the water consumption per head per day has increased, and the leakage ratio has reduced mostly as planned. Additionally, the results of beneficiary survey show positive responses about water pressure and water supply volume, as well as positive impacts of the project, such as reduced time and labor burden in accessing water. Thus, effectiveness and impacts are rated high. The project period and project cost were mostly as planned, therefore the effectiveness is rated high. On the other hand, sustainability is rated fair because financially the Implementing Agency has recorded deficits for many years, although no major problems are observed in the institutional and technical aspects of the operation and maintenance carried out by the Implementing Agency.

In light of the above, this project is evaluated to be highly satisfactory.

4.2 Recommendations

4.2.1 Recommendations to the Implementing Agency

(Enforcing Safety Management in and around the Facilities)

It is preferable that Zarqa North Reservoir is guarded 24 hours a day. As the reservoir is located in a crowded residential area relative to the other sites, it has been reported that children from the neighborhood would enter into the premises by passing the protective fence constructed by this project (by breaking the fence) during the day. Children would then scribble on the facilities and play football inside the premises. Although WAJ Zarqa currently have security guards only in the night, it is deemed necessary to assign security guards also during the day with a view to enforcing the management in and around the facilities.

(Improving and Reinforcing WAJ's Finance)

With respect to WAJ group's finances at the time of the ex-post evaluation, although operation and maintenance cost is recovered by water charges and other revenues, the total cost, including depreciation, bad loans and interest paid, is not recovered. While WAJ group continues to end in the red, investment in the development of new water sources keeps increasing; thus it can be said that WAJ is in a critical financial situation. Additionally, if there is a difficulty to secure sufficient operation and maintenance budget, WAJ may find itself trapped

in a vicious circle in the future such as undermining the efficiency of water supply system, increasing non-revenue water tariff rate and worsening the cost recovery ratio even further. In order to avoid such situation, it is recommended that (1) WAJ pursue a fine balance to the extent possible between the costs of new investment and operation and maintenance and the revenues, such as water charges; and (2) WAJ prepare and execute a business strategy, which includes measures to increase revenues, such as increasing water tariff rates with due consideration of low-income group.

In addition, although WAJ is pursuing an organizational strategy, which looks into profitability, structures and restructuring of revenues, there has not been any explicit policy indication to move toward an independent accounting system in the future. It is preferable that WAJ present a vision towards an independent accounting system, which includes stabilization of profitability and revenue structures, and make further efforts to strengthen its finances.

4.3 Lessons Learned

None.