Morocco

**Agadir Water Supply Project**

External Evaluator: Hajime Onishi
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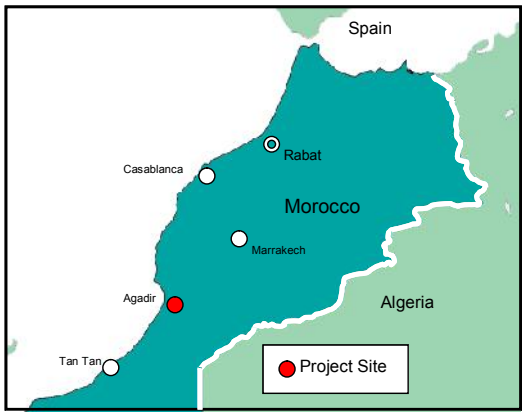
## 0. Summary

This project is highly consistent with government policies and no problems with operation and maintenance (O&M) systems can be found. The financial situation of the executing agency (Office National de l'Eau Potable, ONEP) is in a favorable condition for the timebeing. Major indicators such as the population served by this project, the amount of water supplied, and the facility utilization rate have exceeded 80% of the target value, and there is no particular problem with the quality of the purified water produced. Furthermore, the project contributes to improving the living conditions of the beneficiaries to some extent, and numerous positive impacts have emerged, including the improvement of the service level of water supply and the business environment in the target areas. In addition, in terms of efficiency, although the project period was longer than planned, project cost was kept within the planned amount. In light of the above, this project is evaluated to be highly satisfactory.

## 1. Project Description




Location Map

Tamri Water Purification Plant

### 1.1 Background

In Morocco where the majority of land is located in semi-arid areas, securing "water" for the purposes of irrigation, daily life, etc. is highly prioritized in the government's development policies. At the same time however, water resource management for each river system, as well as the use and reuse of water resources through the development of the water supply and sewage system has made little progress, even after promulgation of the Water Law in 1995 - and there have been similar problems in Agadir, located in the southwestern part of

Morocco.

Agadir is a modern resort city in the seashore of the Atlantic Ocean, which has a temperate climate all year round.[1] After the great earthquake occurred in 1960, Agadir city was dedicated to providing infrastructure that was necessary for reconstruction. However, in 2001, the development of new water source had not proceeded in a timely manner, and the water demand was expanding along with the rapid population increase in the urban area of Greater Agadir. It was predicted by JICA's appraisal documents that the maximum demand for water in 2004 would reach the maximum capacity of existing water supply facilities, thus making the increase of water supply capacity in the Greater Agadir area a pressing task.

Against this backdrop, advancing the implementation of a new water supply project for Greater Agadir was an urgent challenge for the Moroccan government at the time, and the prompt implementation of a water supply project for the purpose of drastically closing this demand-supply gap was desired.

### 1.2 Project Outline

The objective of this project is to meet the increased demand of water and to provide safe water for 8 districts in the Greater Agadir area by constructing new facilities for water supply, thereby contributing to improving residents' quality of life and to stimulate the economic development in the target area.

| | |
|---|---|
| Loan Amount / Disbursed Amount | 6,412 million yen / 6,327 million yen |
| Exchange of Notes / Loan Agreement Signing Date | June 2000 / February 2001 |
| Terms and Conditions | Interest Rate:1.70% (0.75% for Consulting Services)<br>Repayment Period:30 years (40 years for Consulting Services)<br>(Grace Period:10 years)<br>Conditions for Procurement: General Untied (Bilateral Tied for Consulting Services) |
| Borrower / Executing Agencies | Office National de l'Eau Potable, ONEP / The same |
| Final Disbursement Date | June 2008 |
| Main Contractors (over 1 billion yen) | Sogea Maroc S.A.(Morocco) / Omce (Morocco) / Sogetrama Gls (Morocco) (JV), Sogea Moroc S.A. (Morocco) / Sogea Satom S.A. (Morocco) / Sehi (Morocco) (JV)<br>(Note: Sogea Maroc S.A. was awarded two contracts as a member company of Joint Venture.) |

[1] The population as of 2001 was approx. 640,000 people. (Source: Documents provided by ONEP)

| | |
|---|---|
| Main Consultant (over 100 million yen) | Nihon Jogesuido Sekkei Co., Ltd. (Japan) / Team Maroc, S.A. (Morocco) (JV) |
| Feasibility Studies, etc. | 1996 Master Plan Study (by ONEP)<br>1999 Feasibility Study (by ONEP) |
| Related Projects, etc. | AFD: Water Supply Project at Agadir and Fez (1998 – 2003)<br>KfW: Rural Water Supply Project in Agadir (2008 – On going)<br>ONEP: Rural Water Supply Project (2009 – On going) |

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Hajime Onishi (Mitsubishi UFJ Research & Consulting)

### 2.2 Duration of Evaluation Study

Duration of the Study: December, 2010 – December, 2011

Duration of the Field Study: April 20, 2011 – May 4, 2011 / August 15, 2011 – August 22, 2011

### 2.3 Constraints during the Evaluation Study

None.

## 3. Result of the Evaluation (Overall Rating: A[2])

### 3.1 Relevance (Rating: ③[3])

3.1.1 Relevance with the Development Plan of Morocco

Relevance with the national policies

At the time that the project appraisal was being carried out in 2001, the Moroccan government had focused on water sector development as one of the major policies in the Economic and Social Development Plan (2000-2004). In this plan, the population served by water supply systems in the urban area and that in the rural area were 89% and 62% respectively as target values, aiming at an increase in the percentage of the population served both in urban and rural areas in Morocco.

Meanwhile, the enhancement of export competitiveness of the industrial sector and the improvement in service delivery of basic infrastructure to strengthen domestic sectors have been established as the policy goals of the present 2011 Finance Bill,[4] which is the top

[2] A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

[3] ③: High, ②: Fair, ①: Low

[4] Following the completion of the Economic and Social Development Plan (2000-2004), no new five-year long-term development plan has been formulated in Morocco. For the immediate future, it has been decided that provisional development policies will be denoted through the Finance Bill/Finance Act of each year.

priority national plan. In order to achieve these goals, "to promote investment for water supply and sanitation sector" as well as for energy and distribution sectors has been decided upon as one of the priority fields. Additionally, the National Initiative on Human Development, established in May 2005 by His Majesty King Mohamed VI, sought the improvement in accessibility to the basic social services including those of water supply, especially focusing on accelerating the provision of basic infrastructure such as water supply facilities in rural areas.

Therefore, for both the project planning and the ex-post evaluation, water sector development, especially the promotion of investment in the water supply and sewerage projects in urban areas, has been assigned high priority in higher-level national policies. Thus, consistency between this project's objective of "to provide the safe water and to improve resident's quality of life by constructing new facilities for water supply" and national policy is very high.

Relevance with the sector policies

At the time of appraisal in 2001, in both the Master Plan for the Potable Water Supply Sector (approved by the Government of Morocco in 1999) and the Urban Portable Water Supply Plan as part of the investment program 2000-2004 of ONEP, the provision and improvement of water supply facilities in Greater Agadir was positioned as being of the highest priority.

As of 2011 as well, ONEP's next investment program for 2011-2015 continues to hold up the "improvement in access to safe drinking water by the provision of water supply infrastructure" as a mission of the utmost importance. In this program, it is planned that more than 50% of the total budget for five years will be invested in water supply projects in urban areas and the percentage of drinking water supplied by water piping will be targeted to 95% in rural areas by 2015. As for the Greater Agadir area, a seawater desalination project is currently ongoing in anticipation of the water supply shortage in a few years, making progress in the prioritized development of water supply infrastructure.

Therefore, for both program planning and ex-post evaluation, water supply development in the Greater Agadir has been highly prioritized in the objectives for sector policies, and the direction of the project is completely relevant to those policies.

3.1.2 Relevance with the Development Needs of Morocco

In 2000, water demand in the Greater Agadir area had rapidly increased and it was anticipated that the demand would reach the total supply capacity of 960 liter/sec. in 2004. As shown in Table 1 below, the water supply capacity has been significantly strengthened by approximately 35% in April 2007. This is as a result of the start of operation at the facilities

related to this project, including water treatment plants. On the other hand, the maximum daily demand for water has increased at an average of 11% each year, again approaching the maximum capacity of daily water supply. The demand-supply gap that had once been mitigated by this project is again shortening.[5]

Table-1: Water Demand and Supply in Greater Agadir Area

(Unit: liter/sec., not applied to water connection rate)

| Year | Maximum Daily Water Supply a | Maximum Daily Water Demand b | Demand - Supply Gap b-a | Water Connection Rate % |
|---|---|---|---|---|
| 2000 | 863 | 669 | -194 | 73 |
| 2006 | 1,300 | 1,266 | -34 | 84 |
| 2007[1)] | 1,760 | *1,427* | *-333* | 87 |
| 2008 | 1,760 | *1,588* | *-172* | 90 |
| 2009 | 1,960 | *1,749* | *-211* | 94 |
| 2010 | 1,960 | 1,910 | -50 | 96 |
| 2014 | 3,000 | 2,500 | -500 | n.a. |
| 2020 | 3,000 | 2,800 | -200 | n.a. |
| 2022 | 3,000 | 3,000 | 0 | n.a. |

Source: Answers to the questionnaire to ONEP, documents provided by Régie Autonome Multi-Services d'Agadir (RAMSA), JICA Mid-Term Review Report, etc.

Note-1): Italic figures show estimated ones.

Note-2): The operation of the project facilities started in April 2007 and Phase-II facilities of the project (Capacity: 200 liter/sec.) did in 2009.

Maximum demand is predicted to reach 3,000 liter/sec. in 2022, and the supply of safe water through the expansion of water supply capacity continues to be a pressing task. Had this project—which achieved a substantial increase of water supply capacity and greatly contributed to bridging the supply-demand gap—not been implemented, the demand would have exceeded the supply capacity after 2006. This would have resulted in inducing negative impacts on the service delivery of water supply in the Greater Agadir area.

### 3.1.3 Relevance with Japan's ODA Policy

At the time of the project appraisal in 2001, the former Japan Bank for International Cooperation (JBIC) set the infrastructure for development which supports sustainable growth, enhances global competitiveness and promotes private investments as one of the target sectors on the Medium-Term Strategy for Overseas Economic Cooperation Operations to Morocco. Under this strategy, JBIC undertook a course of assisting Morocco that centered on

[5] Régie Autonome Multi-Services d'Agadir (RAMSA) which is in charge of water distribution in the Greater Agadir area is now implementing a seawater desalination plant construction project with a public-private partnership (PPP). The operation of the plant with the water supply capacity of 1,000 liter/sec. will commence in 2014. Although the demand-supply gap in Greater Agadir will be mitigated by this operation, it is also anticipated that the maximum water demand may exceed the maximum water supply from the latter half of 2011 to 2014. (For this critical situation, possible options such as the utilization of groundwater, an increase in the amount of water intake from the Moulay Abdellah Dam, etc. were currently considered.) As for the seawater desalination project, it is feared that the production cost of water might be increased and it may be passed on to the customers' charge.

infrastructure development, especially on water supply development programs. Therefore, this project was extremely consistent with Japan's aid policies.

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

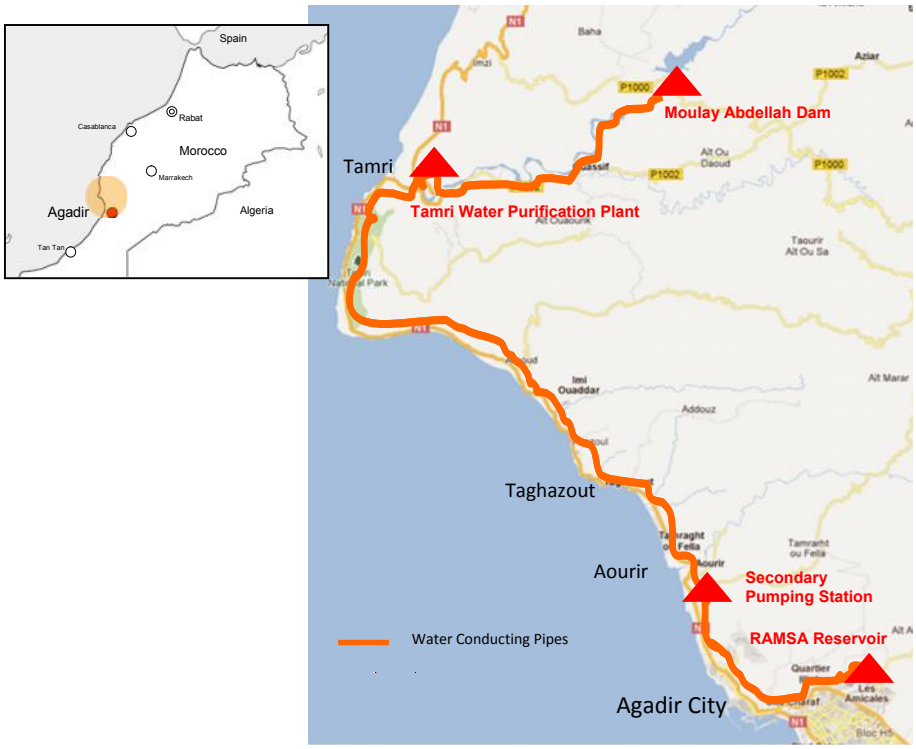



Figure-1: Location of the Project Site

### 3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

A comparison of outputs for both the planned and actual performance is shown in Table 2 below. There is no major change for the following two outputs: iv) Construction of power lines and v) Construction of access roads.[6]

Regarding iv) construction of power lines, there was a 4 km difference between the original plan and the actual output, due to the shortened distance of power lines. The main reason was that the national grid to be connected from the water purification plant became different between the basic design (B/D), which was in charge of ONEP and the detailed design (D/D), which was in charge of the national power utility ONE. As for v) construction of access roads, the budget for construction was provided by the Public Works Department, and then the

[6] The wastewater treatment plant was constructed in the water purification plant site, as originally planned. The sludge after drying process is transported to a cement factory located in the northern part of Agadir City, without charge. The amount of dried sludge donated is about 2,000 tonnages on annual average. (For the detail, refer to the section of Impact.)

component was separated from the project scope.

Table-2: Changes in Output

| Project Components | Original | Actual | Differences |
|---|---|---|---|
| i) Water Intake and Conducting Facilities | | | |
| ・ Water Intake Weir | One location | The same | As planned |
| ・ Primary Pump Stations | 894 liter/sec., 3 units | 895 liter/sec., 3 units | Mostly as planned |
| ・ Surge Tank | 1,000 m³ (500 m³×2) | The same | As planned |
| ・ Water Conveyance Pipelines | 9,159m in total | 8,560m in total | 93% of original plan |
| ii) Water Purification Plant | | | |
| ・ Treatment Capacity | 700 liter/sec. | The same | As planned |
| iii) Water Transmission Facilities | | | |
| ・ Water Conducting Pipes | 57,850m in total | 57,525m in total | Mostly as planned |
| ・ Secondary Pump Stations | 700 liter/sec., 3 units | The same | As planned |
| iv) Power lines | 8.7km | 4.47km | 51% of original plan |
| v) Access Roads | 8.7km | Cancelled (Constructed by Public Works Department) | |
| vi) Consulting Services | | | |
| ・ Consulting Service M/M | 182M/M in total (Foreign:64M/M, Local: 118M/M) | 165.54M/M in total (Foreign:64.36M/M, Local: 101.18M/M) | 91% of original plan |
| ・ Consulting Service TOR | Bid documents review, Bid support, Construction supervision, Training program for ONEP engineers, etc. | As the same, excluding bid documents review | |

Source: JICA internal documents, answers to the questionnaire to ONEP and results of interviews

Regarding vi) consulting services, consultant input and the terms of reference were mostly the same as the original plan. The input from the project manager (who is primarily responsible for the project) and consulting engineers were increased by approximately 10 man-months and five man-months respectively, due to the delay in project implementation. At the same time, some experts' input was decreased by the cancellation of bid documents review (ONEP became in charge of this) and the input from local consulting engineers was also reduced by a review of activities relating to construction supervision, both contributing to the slight reduction of the total amount of consultants' input.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost

The total cost of the project was originally 9,313 million yen (the Japanese ODA loan share was 6,412 million yen) but the actual project cost was 6,587 million yen (the Japanese ODA loan share was 6,327 million yen), which was equivalent to 71% of the original plan.

Main causes for the drastic reduction of the total project cost include the following: (1) a decrease in tax and duty rates (only 3% of the original estimate) due to the tariff reduction

after the commencement of the project, and (2) a decrease in land acquisition costs (28% of the original estimate). As already stated in the Section 3.2.1 Project Outputs, the cancellation of the construction of access roads did not affect the changes in project cost, mainly because of its magnitude to the total project cost. (Note that the original estimate was lower than 100 million yen).

3.2.2.2 Project Period

The project period was longer than planned. The project was scheduled from February 2001 to January 2007, a period of 72 months, but it was extended to 75 months, from February 2001 to April 2007[7], which was equivalent to 104% of the original plan. The main reasons for the delay included: (1) Delays caused by the changes in the design and (2) Delays relating to the bidding process.

Table-3: Comparative Table of Project Periods

| Task | Original Schedule (months) | | Actual (months) | | Differences (months) |
|---|---|---|---|---|---|
| Consulting Service | Jan. 2001 – Feb. 2004 | (38.0) | Aug. 2002 – May 2007 | (58.0) | - 20.0 |
| Tender / Contract / Procurement | Mar. 2001 – Feb. 2002 | (12.0) | Dec. 2001 – Mar. 2004 | (28.0) | - 16.0 |
| Civil Works | Mar. 2002 – Jan. 2007 | (59.0) | Sep. 2003 – Dec. 2007 | (52.0) | + 7.0 |
| Completion Certificate | | n.a. | | May 2008 | n.a. |
| Total[1)] | Feb. 2001 – Jan 2007 | (72.0)[2)] | Feb. 2001 – Apr. 2007 | (75.0)[3)] | - 3.0 |

Source: JICA internal documents, answers to the questionnaire to ONEP and results of interviews

Note-1): Project commencement was defined as the date of L/A conclusion (Feb.2001). For the definition of the date of project completion, refer to the Footnote-7.

Note-2): While the overall project period was planned for 38 months from February 2001 to April 2004, it was agreed between ONEP and JICA that the project would extend to January 2007, through the exchange of the Project Memorandum (P/M) signed in January 2002.

Note-3): Although the construction works was completed in December 2007 and project completion certificate was issued in May 2008, the operation of the constructed facilities started in April 2007.

Regarding (1), changes in water intake location, water purification plant location, specifications of water conducting pipes, of which all are the critical points for the design of the project, resulted in a one-and-a-half year delay from the original plan as a result.

For (2) Delays relating to the bidding process, it took 28 months in total (Original plan: 12 months) to complete the bidding process and contract negotiation, because of i) breaking the contracting lots related to the water conducting pipe construction into smaller lots (from two to three packages), ii) retendering of some of the contracting lots, and iii) delays in evaluation of some of the contracting lots.

[7] Although the loan completion date for this project was June 2008, as shown in Table 3 above, the majority of construction was completed in April 2007, and all of the related facilities began operating in April 2007. From that time onwards, water was supplied throughout the Greater Agadir area and project effects began to appear, thus it is considered reasonable to set the project completion to the above date of the start of operation.

Construction work was made very difficult as a result of restrictions on construction work due to topographical and geographical conditions along the construction sites.[8] However, the construction period was shortened by seven months compared with the original duration, due to the strengthening of the construction supervision and the dedicated efforts taken by the executing agency ONEP and the consultant team. In addition, the cancellation of the construction of access roads did not affect the project period.

Although the project cost was lower than planned, the project period was longer than planned (104% of the original plan), therefore efficiency of the project is fair.

### 3.3 Effectiveness (Rating: ③)

3.3.1 Quantitative Effects

3.3.1.1 Results from Operation and Effect Indicators

(1) Population served, average water supply per capita and percentage of population served

**Population served by this project:** As of the end of 2010, the population served by this project within the target areas reached to approximately 780,000 people, which exceeded the target value (as of five years after the plant operation) of 688,000. After completion of facilities related to this project, various work[9] aimed at increasing connections led by RAMSA has succeeded, and the number of households connected to the distribution network has been steadily growing at an average of 7.6% a year since 2006.

**Average water supply per capita:** The per capita water volume supplied for Greater Agadir, which includes the area in this project, was 137 liters/day (converted with an average of 4.27 persons per household) as of the end of 2011, being slightly lower than the target value (as of five years after the operation) of 160 liters/day. Two main factors are thought to be behind the target: (1) The increase in the water tariff in 2006, and (2) The awareness activities such as the water conservation campaign developed nationwide by ONEP and environmental ministries and agencies.

**Percentage of population served:** The percentage of the population served by the water supply in the Greater Agadir area has reached 96% as of 2010, which greatly exceeds the original target of 77%, due to the aforementioned steady growth of the population served by this project.

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[8] The contractor had a hard time securing the space for construction, transporting materials and equipment, and ensuring safety (especially in heavy rain) because approximately 50% of the pipe construction work, among the construction of water conducting pipeline of 57km in total, was implemented along the national highway that was located on top of the cliff in a coastal terrace. (Source: Results of interview with ONEP Agadir Office)

[9] Customer service improvements through the removal of public taps, construction of distribution pipeline, appropriate operation and maintenance of distribution network, etc.

Table-4: Achievement Rate of Main Indicators

| Operation and Effect Indicators | Baseline Data (1996) | Target Value (5 Years After Plant Operation) [2)] a | Actual Value (2006, At the Time of Mid-Term Review) | Actual Value (As of 2010) b | Achievement Ratio (%) b/a |
|---|---|---|---|---|---|
| Population Served in Greater Agadir | 364,000 | 688,000 | 669,000 | 778,000 | 113% |
| Average Water Supply per Capita [1)] | 168 liters/day | 160 liters/day | 130 liters/day | 137 liters/day [3)] | 86% |
| Percentage of Population Served in Greater Agadir | 67% | 77% | 90% | 96% [3)] | 125% |
| Maximum Water Supply in Greater Agadir | 73,198 $m^3$/day | 132,106 $m^3$/day | 104,480 $m^3$/day | 128,045 $m^3$/day | 97% |
| Average Water Supply in Greater Agadir | 60,998 $m^3$/day | 110,074 $m^3$/day | 87,067 $m^3$/day | 106,704 $m^3$/day | 97% |
| Rate of Facility Utilization | n.a. | 70% | 100% | 70% | 100% |
| Water Supplied Hours (for Target Area of the Project) | Not Known | 24 hrs | 24 hrs | 24 hrs | 100% |
| Water Supplied Hours (for Greater Agadir Area) | Not Known | 24 hrs | 24 hrs | 24 hrs | 100% |

Source: Answers to the questionnaire to ONEP, results of interviews with ONEP, documents provided by RAMSA, JICA internal documents, etc.

Note-1): Average Water Supply per Capita = Average Water Supply / Population Served

Note-2): At the time of project appraisal, it was considered as preconditions that the water supply capacity of 700 liter/sec. could be added through the new purification plant of Phase-I (which means this project), after the construction of Moulay Abdellah Dam (former Ait Hammou Dam) in 2002.

Note-3): Estimated figures by various sources

(2) Water supply volume, rate of facility utilization and water supplied hours

Due to the abovementioned steady increase in the population served by this project, the original water supply volume target of 110,000 $m^3$/day has been mostly achieved. The rate of facility utilization has also reached 100%. As for the hours of water supplied per day, 24 hours-water supply has been achieved in each district of the target areas of the project.

(3) Water quality

This project's water quality monitoring at water intakes is conducted, daily or every two days (depending on monitoring indicators), at laboratories set up in water purification plants. To date, no serious problems with water quality have been confirmed.

Table-5: Quality of Water Produced by Tamri Purification Plant (This Project)

| Monitoring Indicators | Measured Value (May 2007) | Moroccan Standard | Judgment |
|---|---|---|---|
| Salinity (mg/l) | 734 | 1,000 | Cleared |
| pH | 7.32 | 6.5～8.5 | Cleared |
| Turbidity | 0.11 | 1.00 | Cleared |
| Dissolved Oxygen (DO, mg/l) | 1.9 | 5.0～8.0 | Cleared |
| Temperature (℃) | 23.9 | n.a. | n.a. |
| Iron (mg/l) | 0.01 | 0.30 | Cleared |
| Magnesium (mg/l) | 0 | 100 | Cleared |
| Calcium (mg/l) | 76.8 | n.a. | n.a. |
| Coliforms | 0 | 0 | Cleared |

Source: JICA internal documents

The quality of water produced by the Tamri purification plant (constructed by this project) has cleared the drinking water quality standards in Morocco, as shown in Table-5. There are

no problems with the quality of water.

(4) Target and status of the revenue water rate

After 2006, the revenue water (RW) rate shows signs of leveling off at 78%, as shown in Table-6. On the other hand, this level, namely the non-revenue water (NRW) rate is 22%, is relatively favorable in developing countries, and it is very difficult to expect the higher rate any more, considering the technological constraints and their cost-effectiveness. An engineer from ONEP pointed out that the technological limit of the RW rate in Morocco might be approximately 80%.[10]

Table-6: Revenue Water Rate in the Target Area of the Project

| Area | 1996 (Baseline) | 2006 | 2010 |
|---|---|---|---|
| Inside Greater Agadir Area | Not known | 78.0% | 78.5% |

Source: Answers to the questionnaire to ONEP and JICA Mid-Term Review Report

(5) Water intake volume from the Moulay Abdellah Dam (former Ait Hammou Dam)

The construction of the Moulay Abdellah Dam (former name: Ait Hammou Dam), the raw water source of this project, was completed in March 2002 as originally scheduled. It was assumed that this dam would be used as a water source for this project. Given this, the effects from this project would not have emerged if this dam had not been constructed in a timely manner.

Table-7: Water Intake Volume from Moulay Abdellah Dam after the Project Completion

| Year | Annual Water Intake Volume (Million $m^3$) |
|---|---|
| 2007 | 13.16 |
| 2008 | 21.44 |
| 2009 | 21.41 |
| 2010 | 20.33 |

Source: Answers to the questionnaire to ONEP

Note): Water intake from the Moulay Abdellah Dam by this project has started in April 2007.

At the time of project appraisal, it was pointed out that “careful monitoring of the flow volume of the Tamri River might be needed on the grounds that the flow fluctuates annually, although the simulation results demonstrated that the river flow volume would become lower than the estimated intake volume at maximum for only six years out of 50 years time”. Relating to this issue, no major fluctuations in the intake volume from the Moulay Abdellah Dam have occurred since the start of water intake in 2007, as shown in Table-7.[11]

[10] Source: Results of interview with ONEP Agadir Office and several engineers at ONEP Headquarters

[11] Note that some difficulties in securing water intake volume currently happened especially at the time of flooding in rainy seasons, due to the design of intake facilities and other factors, as stated in the Section of Sustainability. At the same time, this malfunction does not relate to the maximum capacity of water intake volume from the Moulay Abdellah Dam itself.

3.3.1.2 Results of Calculation of Internal Rates of Return (IRR)

(1) Financial Internal Rate of Return (FIRR)

FIRR figures were recalculated with several conditions described in Table 8 below.

The result of recalculating the FIRR was 10.16%, which was much higher than the 7.60% projected at the time of the project appraisal. The reason for this will be the drastic reduction in the total project cost, which is 70% of the original estimate.

Table-8: Recalculation of FIRR

| Timing | Preconditions and Assumptions for Recalculation (Project Life: 30 years after the completion of the Project for each case) | | FIRR |
|---|---|---|---|
| At the time of appraisal (in 2001) | Costs: | Construction cost, consulting service cost, operation and maintenance cost, repairing cost for aged facilities (5% of total project cost 15 years after the plant operation) | 7.60% |
| | Revenue: | Water tariff revenue (assuming 15% increase in water tariffs for the first three years after operation, then a 5% increase every year) | |
| At the time of ex-post evaluation (in 2011) | Costs: | Construction cost, consulting service cost, operation and maintenance cost (based on the actual expenditure up to 2010), repairing cost for aged facilities (5% of total project cost 15 years after the plant operation) | 10.16% |
| | Revenue: | Water tariff revenue (assuming 10% increase in water tariffs every 5 years after 2015) | |
| | NRW: | Assuming 5% reduction every 5 years from 2015 up to 2040, being 20% in 2015 as a base rate and being 5% after 2040 as a convergence rate. | |

(2) Economic Internal Rate of Return (EIRR)

The economic internal rate of return (EIRR) was not calculated due to limited resources for this study. To do so, it would have been necessary to clarify input data from the beneficiary side, such as beneficiaries' WTP (Willingness to Pay) for water usage through individual interviews or through the estimation by using prices of substitution goods and water tariff level.

3.3.2 Qualitative Effects

Effects such as the improvement of public health and betterment of the living environment through the upgrading of water supply conditions are appearing. Details are in the Impact section below.

To sum up, the main indicators, including the population served by this project, the amount of water supplied, and the facility utilization rate, have all reached 80% of the target or greater. This is in addition to there being no particular problem with the quality of treated water produced. While the revenue water (RW) rate shows signs of leveling off at 78%, this level is extremely high in developing countries, and it is very difficult to expect the higher rate, taking the technological constraints and their cost-effectiveness into account.

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

### 3.4 Impact

3.4.1 Intended Impacts

(1) Impact on living environment by the distribution of new water

For the four villages (Aourir, Taghazout, Tamri and Immsouane) where the drinking water was provided through an independent water tank, purified water produced by this project is currently supplied through the distribution network. The quality of water and hours of water supply were improved dramatically.[12]

Table-9: Customer Satisfaction in Water Quality

i) Turbidity (N=149)

| Answers | Before | After |
|---|---|---|
| Satisfactory | 13 | 145 |
| Moderately Satisfactory | 10 | 4 |
| Not Satisfactory | 126 | 0 |
| Total | 149 | 149 |

Source: Results of beneficiary survey[13]

ii) Water Pressure (N=149)

| Answers | Before | After |
|---|---|---|
| Satisfactory | 20 | 146 |
| Moderately Satisfactory | 8 | 3 |
| Not Satisfactory | 121 | 0 |
| Total | 149 | 149 |

Source: Results of beneficiary survey

iii) Water Quantity (N=149)

| Answers | Before | After |
|---|---|---|
| Satisfactory | 15 | 146 |
| Moderately Satisfactory | 11 | 3 |
| Not Satisfactory | 123 | 0 |
| Total | 149 | 149 |

Source: Results of beneficiary survey

iv) Continuity (N=149)

| Answers | Before | After |
|---|---|---|
| Satisfactory | 27 | 148 |
| Moderately Satisfactory | 4 | 1 |
| Not Satisfactory | 118 | 0 |
| Total | 149 | 149 |

Source: Results of beneficiary survey

A survey of beneficiaries' level of satisfaction regarding the quality (turbidity, water pressure, quantity, and continuity) of water services revealed the following results shown in Table-9. It can be seen that through the implementation of this project, the level of water supply services improved greatly.

To the separate question regarding continuity, the number of beneficiaries who responded that water outages occurred once or more per month was 74% or 110 people before project completion, while only 20% or 31 people had the same response after project completion.

[12] Before the project: It took four to five days to receive new water tanks, After the project: 24 hours water supply has started.

[13] Beneficiary survey implementation overview:

Locations: Areas served by this project (Seven districts in total, both inside and outside Agadir City)

Subjects: General population, private companies (tourism, manufacturing, service sector, etc.), and public institutions (hospitals, schools, etc.)

Total sample: 149 (120 from general population, 21 private companies, 8 public institutions), segmented two-stage random sampling

Data collection method: Face-to-face interview

**Column – Sewerage Development Project for Agadir City**

In the Greater Agadir area, the aforementioned RAMSA is in charge of delivering sanitation services since 1993. The Sewerage Development Project in Greater Agadir Area (Phase-I) was implemented from 1998 to 2007, with the financial support from AFD (French Development Agency) and EIB (European Investment Bank). Details are as follows:

- Wastewater Treatment Capacity: 50,000 $m^3$/day (primary treatment), 10,000 $m^3$/day (secondary treatment)
- Construction of sewer pipelines: 72 km in total
- Total Project Cost: 828 mil Moroccan Dirhams (35 mil. Euro in total were financed by AFD and EIB while 476 mil Moroccan Dirhams were self-financed by RAMSA)

The phase-II of the above project is currently on-going, with the following specifications.

- Duration of Phase-II: From 2008 to 2015
- Wastewater Treatment Capacity: 20,000 $m^3$/day (secondary treatment) to be added to Phase-I
- Total Project Cost: 1,635 mil Moroccan Dirhams (35mil.Euro will be financed by AFD only.)
- Reuse of treated wastewater is the additional scope to Phase-I.

As mentioned above, a treatment plant with a certain capacity has started its operation while the secondary treatment capacity is only 10,000 $m^3$/day as of 2011. This level of capacity is not sufficient to response to the increased water supply capacity in the Greater Agadir (approx. 100,000 $m^3$/day in total as of now, refer to the Section of Effectiveness for more detail), remaining a particular concern that the volume of untreated water may increase in the future in this area.

(2) Impact on public health – decrease in waterborne diseases

Regarding waterborne diseases before and after the completion of this project, the following results shown in Table-10 were obtained from a beneficiary survey. It can be seen that the health conditions of some beneficiaries was greatly improved by the implementation of this project.[14] On the other hand it is hard to describe the decreasing trend in infectious waterborne diseases as solely due to the impact of this project, as it is naturally also thought to be largely due to the educational activities such as the Cleaning Campaign being implemented throughout the country by the Moroccan ministries, as well as the strengthening of health education.

Table-10: Health Condition of Beneficiaries before/after the Project (N=149)

| Answers by Beneficiaries | No. of Respondent | Percentage |
|---|---|---|
| By receiving high quality water, my health condition was greatly improved. | 42 | 28% |
| By receiving high quality water, my health condition was improved to some extent. | 11 | 8% |
| There is no change in my health condition even after receiving high quality water. | 33 | 22% |
| No answers / I cannot judge the difference, etc. | 63 | 42% |
| Total | 149 | 100% |

Source: Beneficiary survey

At the same time, sewerage facility development in the Greater Agadir area was not implemented timeously in order to cope with the rapid increase of water supply capacity, as

[14] "Health condition" described in Table-10 includes waterborne diseases such as diarrhea.

stated in the "Column – Sewerage Development Project for Agadir City". At the time of analysis regarding the improvement of public health, it will be important to pay attention to the existence/nonexistence of a wastewater management project and related developments, and it seems that the positive effect by the existing sewage system can be limited in this case. Given these, we can suppose that this project contributed a certain extent to waterborne disease reduction in Greater Agadir, along with an improvement in the quality of water supplied and an increase in the percentage of population served.

(3) Impact on business environment

Regarding level of improvement of business environment for private companies, in-depth interviews of three (3) tourism companies in Greater Agadir conducted during the field survey provided the following views on the direct effects associated with project completion.

Table-11: Results of In-Depth Interviews with Private Companies in Greater Agadir Area

| Answers by Interviewees | Type of Interviewees |
|---|---|
| Conditions of water quality, pressure, and hours supplied all improved markedly. | The hotel in Taghazout [1)] |
| Water quality has improved. (Decrease in turbidity, Decrease in salinity due to the change in water source from groundwater to purified water, etc.) | Hotels in the "touristic zone" [2)] |
| Cost of safe drinking water was reduced by 50%, compared to before the project. (Before project: Purchasing water tanks on a case-by-case basis | The hotel in Taghazout [1)] |
| Because of no complaints about quality of water (due to the continued supply of safe purified water), sales and the number of customers were increased. | The hotel in Taghazout [1)] |
| There are no remarkable changes in water pressure and hours supplied. | Hotels in the "touristic zone" [2)] |

Note-1): The hotel which becomes to receive purified water from the project (located in Taghazout in the outskirts of Agadir City)

Note-2): Two hotels which already received purified water through RAMSA's distribution system before the completion of this project (located in the "touristic zone" in the seashore of Agadir City)

Similarly, regarding change in the business environment after project completion, the following responses were obtained from a total of 21 private companies in the beneficiary survey.

Table-12: Business Environment before/after the Project (N=21, Multiple Answers)

| Answers by Private Companies | No. of Respondents |
|---|---|
| Production / sales were increased after receiving new water from the project | 3 / 21 |
| Quality of products / services were improved after receiving the new water from the project | 12 / 21 |
| Water purchase cost was reduced after receiving the new water from the project | 8 / 21 |

Source: Results of beneficiary survey (for 21 private companies)

Note): Type of business and the number of respondents: 12 companies for tourism (including small and medium-sized hotel, restaurant, etc.), 2 companies for manufacturing (food processing) and 7 companies for service sector (including grocery retailing, hardware dealing, café, etc.)

Agadir is one of the most popular resort cities in the northern Africa and it attracts many tourists from Europe and the United States (especially from France and southern European countries) throughout the year. According to the result of Table-11, the business environment

of hotel industry in Agadir was surely improved by the implementation of the project. As for the hotel located in the rural area outside of Agadir City, in particular, some positive impacts (such as sanitary conditions, water purchase cost, sales, etc.) were realized in the course of the continued delivery of safe, purified water.

According to the beneficiary survey results demonstrated in Table-12, through the provision of quality water services that came with project completion, various positive impacts are being enjoyed by some companies located in Agadir City. Especially for the tourism sector including hotels and restaurants, this project contributed to improve the quality of service of this sector, by the continued delivery of safe purified water as well.

In addition to these, many of the interviewee companies in this survey were small and medium-sized enterprises run by a small number of staff. As the answers in Table 12 show, companies have been able to increase sales and to improve the quality of products and services. This is likely to have several indirect beneficial impacts on the owners and employees of these small and medium-sized companies (rise in income, etc.).

### 3.4.2 Other Impacts

#### 3.4.2.1 Impact on Natural Environment

(1) Implementation status of EIA and Environmental Monitoring during Construction

While this project was not required, by the Moroccan law, to conduct an Environmental Impact Assessment (EIA), an EIA report was prepared during 2000 by an external consultant. This report corresponded with the guidelines[15] of the Overseas Economic Cooperation Fund (presently JICA).

Given the EIA report, where possible, mitigation measures were taken to minimize the environmental effects[16], specifically the damage to Argan trees[17], regarding the route alignment of water conducting pipes and the location of related facilities at the time of design. Special attention was paid to the cutting activities of an Argan tree during the construction period.[18] In addition, it is reported that there was no environmental effect on the habitat of many wild birds, which was part of the precautions considered at the time of the project appraisal.

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[15] The proper name was "Guidelines for Environmental Consideration" formulated in 1999.

[16] When implementing the civil works of water conducting pipes, for example, it was fully considered to mitigate environmental damage on the ecosystem as much as possible, by changing in the route alignment of conducting pipes, cutting trees as little as possible, etc.

[17] The Argan tree is found mostly in southern Morocco and belongs to the family of Sapotaceae. The "Argan Oil", squeezed from the fruit of the Argan tree, is receiving remarkable attention in these years as beauty products.

[18] Every single Argan tree along the construction route of a water conducting pipe was registered in the ledger, and cutting activities were approved and fully monitored by the Department of Forestry under the Ministry of Agriculture and Fishery if the need arose. (At the same time, this process was extremely time consuming, especially to obtain approval of cutting an Argan tree down, thus resulting in one of the main reasons for the project delay.)

As for environmental monitoring and management during construction, contractors monitored noise, dust and wastewater as appropriate. The Environmental Management Plan (EMP) was also prepared and related monitoring activities were reinforced, based on the recommendations by the environmental specialist who was employed specifically for this issue. As a result of these measures and activities, no complaints from the residents living in the vicinity, etc. were reported.[19]

Water sprinkling was also carried out as appropriate during construction operations in order to prevent any dust problems from occurring. The project was not seen to have any particular negative impacts on the natural environment. Also, some of the above recommendations (the preparation of an EMP, an introduction of checklists, etc.) were actually fed back to the civil works, contributing greatly to enhance the quality of environmental monitoring activities of the project.[20]

(2) Influence on the downstream of Tamri River by water intake

At the time of the project appraisal in 2001, there were some concerns that the increase in the volume of water intake by this project might cause a negative impact on the downstream of the Tamri River, such as the salination of underground water resources and a subsequent effect on plantation.[21]

With regards to the above caution, ONEP understands that no serious environmental problems with the increase of water intake volume have been confirmed in the downstream region.[22]

(3) Sludge from wastewater treatment plant

The dried sludge, which is the byproduct from the wastewater treatment plant, is currently donated to a cement factory in the northern part of Agadir City and the amount of donation reached to 2,000 tonnages on annual average. This can be regarded as one of the positive impacts of the project. Negative effects such as noise, odor, etc. from the sludge production have not been reported so far.

3.4.2.2 Implementation Status of Resettlement and Land Acquisition

The project involved land acquisition. No resettlement of local residents occurred during

[19] Source: Results of interview with ONEP

[20] Note that a specific environmental monitoring plan was not prepared after the project completion; given that no environmental impact was reported so far.

[21] Specifically, it was advised in the EIA report for the Moulay Abdellah Dam (Ait Hammou Dam at that time) project, which was conducted by Direction générale de l'hydraulique (DGH), that some detailed assessment of environmental impact on the downstream of Tamri River shall be implemented. (Source: JICA internal documents)

[22] Regarding the banana plantations that are sparsely located in the downstream of Tamri River, ONEP answered to the ex-post evaluator that "ONEP cannot be in the position of being responsible for taking actions for this issue, mainly because of illegal activities". (Source: Results of interview with ONEP)

the implementation of the project. Table-13 below shows the scale and process of the acquisition.

Table-13: Status of Resettlement and Land Acquisition of the Project

| Item | Actual Status |
|---|---|
| Project-Affected Families (PAFs) | 207 households |
| Scale of Resettlement | N.A. |
| Detailed Process of Land Acquisition | ✓ Public announcement of land sales in "Official Bulletin"<br>✓ Decision of land price by the special committee<br>✓ Negotiation with the land owner, agreement and transfer of rights, etc. |
| Scale of Land Acquisition | 139.4 ha in total (21.6 ha for forestry, 117.8 ha for public land) |
| Expenses for Land Acquisition | 4.86 million Moroccan Dirhams |

Source: Answers to the questionnaire to ONEP

Regarding the private land, land acquisition was conducted with 207 land owners in total, as shown in Table-13, and there were no disputes.[23] Sites for the surge tank, pumping stations and some areas along the water conducting pipes are on the state-owned land under the administration of the Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification (HCEFLCD) and HCEFLCD is still the owner of these lands. As stated in Table-14, some lease expenses are paid from ONEP to HCEFLCD for the lease of these lands.

Table-14: Status of Land Acquisition and Lease by Project Facilities

| Type of Facilities | Owner before Project | Owner after Project | Notes |
|---|---|---|---|
| Water Purification Plant Site | Privately owned | ONEP | Purchased through the process shown in Table-13 |
| Surge Tank Site | Haut Commissariat aux Eaux et Forêts et à la Lutte Contre la Désertification (HCEFLCD) | The same | Lease expenses are paid from ONEP to HCEFLCD. |
| Pumping Stations Sites | HCEFLCD | The same | The same with the above |
| Water Conducting Pipe Sites | Privately owned<br><br>HCEFLCD | ONEP<br><br>The same | Purchased through the process shown in Table-13<br>Lease expenses are paid from ONEP to HCEFLCD. |

Source: Answers to the questionnaire to ONEP

3.4.2.3 Unintended Positive/Negative Impact

In the course of the implementation of this project, many side effects occurred as follows. These can be regarded as the induced positive impacts from the project.

- "Rural Water Supply Project in Agadir" was implemented by KfW, a German agency. This project aims at providing purified water for the rural area in the northern part of Agadir City where the water conducting pipe was constructed by the JICA's Agadir Water Supply Project. With the usage of the above conducting pipe, the KfW project will distribute the water through the new distribution pipelines to be constructed under the project, which cannot be started without the JICA project.

[23] Source: Results of interview with ONEP Agadir Office

・ Similarly, the rural water supply project, which is currently implemented by ONEP in the vicinity of the target areas of the KfW project, also plans to utilize the JICA's conducting pipe for distributing the water. If the JICA project had not been implemented, this project could not have been launched as well.

To sum up, in addition to making contributions to improving the living environment of beneficiaries, this project, through its implementation, has significantly improved water supply services and service levels, and is contributing to the amelioration of the business environment for local companies. One can say that many positive impacts have been generated through this project's implementation.

### 3.5 Sustainability (Rating: ③)

3.5.1 Structural Aspect of Operation and Maintenance

ONEP[24], the executing agency of the project, is responsible for the operation and maintenance (hereafter O&M) of the related facilities that were built in the project. The ONEP's organizational structure includes departments involved in policy and strategy making, and water supply project implementation, as well as Regional Direction (RD) set up in 10 regions throughout the country. One of the abovementioned RDs, Regional Direction 1 (RD-1, also known as "ONEP Agadir Office"), is in charge of O&M for facilities related to this project, namely water intake, purification and transmission facilities.

Table-15: Responsibility Matrix of Operation and Maintenance Activities of Project Facilities

| Type of Facilities | ONEP DR-1 (Agadir Office) | RAMSA |
|---|---|---|
| Water Intake and Raw Water Transmission | In charge | n.a. |
| Water Purification Plant in Tamri | In charge | n.a. |
| Water Transmission Facilities | In charge | n.a. |
| *Water Distribution Facilities (outside the project scope)* | *Water distribution facilities in 3 rural districts[1)]* | *Related facilities in Agadir City[2)] and in 1 rural district[3)]* |

Source: Answers to the questionnaires to ONEP and RAMSA
Note-1): Three rural districts consisting of Tagazout, Tamri and Immousane
Note-2): Four urban districts consisting of Agadir, Ait Melloul, Inzegane and Dcheira
Note-3): Aourir (rural district)

Note that ONEP is only responsible for the water intake, purification and transmission facilities that are located in the urban areas, and Régie Autonome Multi-Services d'Agadir (RAMSA) is in charge of O&M for water distribution facilities (which is out of the scope of

[24] ONEP is a public corporation with financial autonomy, which is a predecessor of Industrial Exploitation Authority (REI) established in 1929 and was renamed as Office National de l'Eau Potable (ONEP) in 1972. The national drinking water authority ONEP is in charge of (1) the construction, operation and maintenance of water intake, purification and transmission facilities (in the urban areas such as Casablanca and Agadir), and (2) water distribution to the small and medium cities and rural areas. In addition to (1) and (2) of the above, (3) sanitation services delivery to the rural areas started in 2007 under the subcontract agreement with rural municipalities. As for the (2) and (3), the ONEP is also in charge of fare collection.

this project) located in the target areas of this project. Moreover, RAMSA is also responsible for the water tariff collection from customers and ONEP is just selling purified water to RAMSA. With regard to the service delivery in the rural areas, the responsibility between ONEP and RAMSA is complicated as shown in Table-15.

As shown in Table-16, O&M activities of the related facilities under ONEP Agadir Office's responsibility are implemented by (1) direct management for daily maintenance and (2) outsourcing to contractors for periodical and large scale maintenance. O&M manuals have been prepared by the consultant. No particular problems regarding the implementation structure of DR1 have been found for the planning, bidding and management of the contractors.

Table-16: Operation and Maintenance System of Project Facilities (for ONEP only)

| Stage/Category of Maintenance Activities | Planning | Preparation of Tender Documents | Implementation | Supervision |
|---|---|---|---|---|
| Daily Maintenance | SP / LT | n.a. | SP / LT | SP / DR1 |
| Periodical Maintenance | SP / DR1 | SP / DR1 | Contractors | SP / DR1 |
| Large Scale Maintenance | SP / DR1 | SP / DR1 | Contractors | SP / DR1 |

Source: Answers to the questionnaire to ONEP

Note): DR1 refers to the headquarters of ONEP Agadir Office, and SP refers to the Sector Production Department of ONEP Agadir Office, and LT refers to the operation team in the site office of Tamri Water Purification Plant under the Sector Production Department.

As shown in Table-17, the number of workers engaged in O&M activities has increased for these four years. On the other hand, the number of O&M workers exclusively in charge of project facilities was only four people[25] (who are the operators of the water purification plant and others. Part-time workers and staff who are temporarily engaged in daily and periodical O&M activities for water intake, conveyance and transmission facilities are not included.). Although it seems that the number of full-time O&M staff might be small compared to the scale of the facilities in charge, there have been no serious problems, and this can be indirectly attributed to the (1) highly skilled professionals and (2) accumulated O&M experiences in similar facilities. There seem to be no problems in the structure of O&M work.

Table-17: Number of Staff of ONEP Agadir Office (DR1)

| Year | ONEP Staff in Total | Of which, O&M Staff exclusively in charge of project facilities |
|---|---|---|
| 2007 | 28 | 4 |
| 2008 | 28 | 4 |
| 2009 | 35 | 4 |
| 2010 | 36 | 4 |

Source: Prepared from answers to the questionnaire to ONEP

To sum up, no problems can be found in the institutional structure of O&M implementation,

[25] The total number of staff of ONEP was 7,265 at the end of 2008, which increased from 6,750 in 2004, with the growth rate of 8% for five years.

despite the relatively small number of workers in charge of O&M activities.

### 3.5.2 Technical Aspects of Operation and Maintenance

Technical skills of engineers and workers

The total number of employees at the ONEP Agadir Office (DR1) assigned to technical jobs for operation, maintenance, and management are 36 people as of 2011, consisting of 12% of university graduates, 32% of vocational schools, and 56% of others. They each have about ten years' average experience in operation and maintenance of the water supply facilities.

As shown in Table-17, the number of O&M workers at the ONEP Agadir Office has trended slightly upward from 2007. Measures to increase the number of staff engaged in O&M work at facilities related to this project have been taken, and the proportionate volume of personnel is being secured on an ongoing basis. ONEP has many similar water facilities in Morocco, and is amply accumulating O&M skills through the operation of these facilities. It would appear that there is no problem with the quantity and quality of engineering and technical staff.

Training programs provided by contractors of the Project

Various trainings for technical staff for operation and maintenance have been conducted by the contractors. Two types of training are provided; (1) lectures[26] and (2) On-the-Job Training (OJT) during the commissioning period, with the total number of participants at 20. Training is conducted by the contractor constantly, and the contents of the training are valued by the trainees.[27]

### 3.5.3 Financial Aspects of Operation and Maintenance

The financial situation of ONEP is sound and stable at this moment. Taking facilities related to this project alone into consideration, a certain amount of revenue has already been secured and it can be expected to continuously earn/generate a considerable amount of revenue from the purchases of the water produced by the project. At the same time, the decreasing trend in the gross profit margin and the increasing trend in receivables might be of some concern with regard to the financial management of ONEP overall. The ongoing upgrade of the fee collection system is desirable in order to improve financial soundness.

(1) Earnings condition

From 2004 onward, ONEP has posted a surplus every year, and it maintains an extremely favorable position as a public water utility. While the surplus had fallen to 9.2 million

[26] Subjects include control systems for water purification facilities, chemical products, bacteriological analysis of water quality, electrical components, hydraulics, etc.
[27] Source: Results of interviews with employees who underwent training.

Morocco Dirhams (MAD) in FY2008, it has recovered rapidly in FY2009 to the FY2007 level, due to the recovery in the accounts of non-operating profit and loss. The main reasons for the increase in sales are: (1) the start of operations of the new water supply facilities (including those of this project), (2) the increase in the volume of sales of water, due to the increase in water connections in the urban areas, (3) the increase in the population connected in the rural areas, and (4) the increase in the number of contracts of sanitation services delivery with rural municipalities. (The growth of sales was 18% for these four years.)

Table-18: Profit and Loss (P/L) Statement of ONEP

Unit: Million MAD

| Year / Item | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Sales | 2,958 | 3,118 | 3,325 | 3,488 |
| Cost of Sales | ▲2,295 | ▲2,579 | ▲2,823 | ▲3,045 |
| *Material cost* | ▲468 | ▲610 | ▲677 | ▲755 |
| *Overhead Cost* | ▲855 | ▲869 | ▲940 | ▲995 |
| *Project investment, etc.* | ▲972 | ▲1,100 | ▲1,206 | ▲1,295 |
| Gross Profit on Sales | 663 | 539 | 502 | 443 |
| Operating Profit | 382 | 473 | 614 | 580 |
| Non-Operating Profit and Loss | ▲245 | ▲244 | ▲378 | ▲188 |
| Ordinary Income | 136 | 229 | 237 | 392 |
| Extraordinary Income and Loss | 83 | ▲4 | ▲67 | ▲167 |
| Net Income before Tax | 220 | 225 | 170 | 225 |
| Net Income after Tax | 134 | 137 | 92 | 124 |

Source: Prepared from documents provided by ONEP

At the same time, the increase in the rate of cost of sales is greater than that of sales, thus making the gross profit margin (operating profit on sales of water) decrease in trend. The causes for the increase in cost of sales are: (1) the sharp rise in the procurement cost of materials and equipment, (2) the growing investment into new water supply projects, and (3) the increase in the number of staff corresponding to the start of operations at new facilities, and the increase in associated overhead costs. Specifically, the procurement cost of materials and equipment has increased by 61% during the time between 2006 and 2009, which is supposed to be caused by the rise in electricity, fuel, and other fees associated with the sharp global rise in the price of oil.

As for trends in the water tariff increase, tariffs were raised a total of two times in April 2004 and March 2006 respectively. However, the recent increase in 2006 had a limited impact on the sales (the growth rate of sales from 2005 to 2006 was 7.6%), and there has been no tariff increase since 2006. In order to further boost earning capacity, there are expectations for further periodical increases in the water tariff on a continued basis, along with the curtailment of costs and development of new projects.

As for measures to reduce non-revenue water (NRW), ONEP is not in the position of taking practical measures on this issue because it is not responsible, as already mentioned earlier, for O&M of water distribution facilities located in the urban areas (When it comes to the measures to be taken for the water supply in the rural areas, this is a separate issue.).

Measures to prevent water leakage from water conveyance and transmission pipes of the project are operated successfully and are monitored by ONEP without any issues, given that.the rate of leakage is maintained at about 2%.

(2) Financial status

The capital ratio at the end of FY2009 was about 53%, maintaining a relatively high level. The current ratio and quick assets ratio were maintained at very high levels as well. There are no concerns regarding short-term financial security and short-term solvency.

Table-19: Balance Sheet (B/S) of ONEP

Unit: Million MAD

| Year / Item | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Assets | | | | |
| Current Assets | 4,375 | 5,143 | 5,605 | 6,709 |
| Quick Assets | 1,593 | 1,939 | 2,276 | 3,041 |
| Fixed Assets | 17,710 | 19,527 | 22,467 | 24,412 |
| **Total Assets** | **22,086** | **24,670** | **28,702** | **31,121** |
| Liabilities and Equity | | | | |
| Equity Capital | 13,301 | 14,135 | 15,169 | 16,535 |
| Current Liabilities | 2,408 | 2,582 | 3,391 | 3,583 |
| Fixed Liabilities | 6,376 | 7,953 | 9,512 | 11,004 |
| **Total Liabilities and Equity** | **22,086** | **24,670** | **28,702** | **31,121** |

Source: Prepared from documents provided by ONEP

Table-20: Financial Indices

| Year / Item | 2006 | 2007 | 2008 | 2009 |
|---|---|---|---|---|
| Gross Margin Ratio (%) | 22.4 | 17.3 | 15.1 | 12.7 |
| Sales to Receivable Ratio (%) | 1.9 | 1.6 | 1.5 | 1.1 |
| Days Sales Outstanding | 196 | 227 | 250 | 318 |
| Gross Debt (Mil. MAD) | 8,784 | 10,535 | 12,903 | 14,587 |
| Current Ratio (%) | 181.7 | 199.2 | 165.3 | 187.3 |
| Quick Asset Ratio (%) | 142.0 | 168.3 | 137.8 | 183.5 |
| Fixed Assets to Fixed Liability Ratio (%) | 90.0 | 88.4 | 91.0 | 88.6 |
| Capital Ratio (%) | 60.2 | 57.3 | 54.0 | 53.1 |

Source: Prepared from P/L and B/S

However, total liability is consistently trending upward. The burden of interest payments on loans and repayment of principals are not urgent issues, but the future trends on these indicators must be noted. Receivables generated from unpaid water charges, etc., have been almost doubled in three years from 2006 to 2009. Regarding the sanitation services for the rural areas that started in 2007, the delay in collecting the service fee billed to the rural municipalities (client) is becoming a concern on the financial management of ONEP. As shown in Table-20, the sales to receivables ratio of 1.1 and the average days' sales outstanding at 318 are very high in 2009, thus resulting in a situation where an average of one year is needed to collect fees. In order to improve financial soundness, an ongoing upgrade of the fee collection system is desirable.

(3) Operation and maintenance expenditure relating to the Project

The income and expenditure relating to the facilities of this project is shown in Table-21. The annual O&M expenditure relating to the facilities of the project was ranged from 15 to 16 million Morocco Dirhams (for the Tamri Water Purification Plant only) after the start of plant operations in April 2007. Utilities costs such as electricity account for the majority of the overall expenditures.

The operating balance relating to the facility of this project was not clear because the O&M

personnel costs and operating costs of the water intake and transmission facilities were not disclosed. Considering the financial situation shown in Table-21 where the sales of water to RAMSA was accounted for 160 million Morocco Dirhams in total and the sales relating to this project was 57 million MAD, no concerns will be raised.

Table-21: Income and Expenditure relating to Project

Unit: Thousand MAD

| Item | 2008 | 2009 | 2010 |
|---|---|---|---|
| Sales of Water to RAMSA | 146,841 | 158,679 | 160,614 |
| For this project (Estimated) | 52,443 | 56,671 | 57,595 |
| **Total Income** | **52,443** | **56,671** | **57,595** |
| Utility Costs (Electricity, Fuel, etc.) | 13,081 | 13,487 | 12,049 |
| Chemicals Cost | 3,169 | 2,466 | 2,146 |
| Repairing Costs, etc. | 450 | 555 | 650 |
| **Total Expenditure** | **16,700** | **16,508** | **14,845** |

Source: Prepared from documents provided by ONEP

Note-1): Total expenditure only includes the O&M costs related to the Tamri Water Purification Plant that was constructed by this project.

Note-2): The water tariff revenue from the rural areas located in the target areas of this project (under the administration of ONEP) can be negligible.

As already described in the Section of Effectiveness, the number of households connected to the distribution network in Agadir City (where RAMSA is in charge of water distribution) has been growing steadily in recent years. Given this, this is expected to secure a certain amount of sales of water by RAMSA's needs.

### 3.5.4 Current Status of Operation and Maintenance

In general, the utilization status and O&M of the various facilities and equipment under the administration of the ONEP (such as the intake, water purification, transmission, and related equipment) are good, and no major problem has occurred to date. Items such as an O&M manual have been developed through this project.

Although some problems have occurred after the facilities went on-line, including: (1) Frequent power outages and unstable power supply[28] and (2) Difficulty in securing water intake volume[29], the ONEP Agadir Office (DR1) is continually looking for original solutions,

[28] **Frequent power outages and unstable power supply:** There has been difficulty in supplying power to the water purification plant due to frequent power outages (one time a week in some cases). Also, the voltage is sometimes unstable due to the problems with the power transmission line. In case of power cut, three generators were newly purchased by the own budget of ONEP (0.3 million Euro for the purchase cost). At the same time, a dedicated power line of approx. 40 km is being laid from the major power grid to the project's purification plant, since continuous use of a generator during outages has cost disadvantages. Project cost is estimated as MAD 12 million.

[29] **Difficulty in securing water intake volume:** The huge amount of floating debris is clogging up the water intake facility especially at the time of flooding in rainy seasons, and difficulties in securing intake volume currently happened. While there are some fences to protect the intake point from those debris and obstacles, it did not properly function because the unexpected amount of floating debris (which were not anticipated at the time of design) are continually coming from upstream to the intake area. ONEP is frequently doing the cleaning work to tackle with this issue at the moment. In addition to this, the project consisting of the construction of (1) a new water intake facility and (2) a new water conveyance pipe which directly connects

which it is steadily putting into practice. This development is the fruit of the technical capacity and ability of the relevant personnel of DR1 to act on them, as well as the sufficient O&M budget for the project facilities, and is highly commendable as a timely and pioneering response by the implementing agency.

Regarding the generators, as described in Footnote-28, these machines were not procured under the project but purchased by the ONEP's own budget after the completion of the project. Although the situation of frequent power outages and unstable power supply cannot be anticipated at the time of project planning, it might have been necessary to plan to install the generators at least for the purification plant, as a part of the contingency plan.

As for the issues of difficulty in securing the water intake volume, it seems that the situation of floating obstacles might have been easily anticipated from the beginning, although its amount was higher than initially estimated. It would have been more necessary to have considered some appropriate measures at the time of detailed design and other stages.

No major problems have been observed in the operation and maintenance system, therefore sustainability of the project is high.

## 4. Conclusion, Lessons Learned and Recommendations

### 4.1 Conclusion

This project is highly consistent with government policies and no problems with operation and maintenance (O&M) systems can be found. The financial situation of ONEP is in favorable conditions at the moment. Major indicators such as the population served by this project, the amount of water supplied, and the facility utilization rate have exceeded 80% of the target value, and there is no particular problem with the quality of the purified water produced. Furthermore, the project contributes to improving the living environment of the beneficiaries to some extent, and numerous positive impacts have emerged, including the improvement of the service level of the water supply and the business environment in the target areas. In addition, in terms of efficiency, although the project period was longer than planned, the project cost was kept within the planned amount.

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

### 4.2 Recommendations

4.2.1 Recommendations for Executing Agency

Receivables generated from unpaid water charges, etc., have been increasing in these years, making for a situation where an average of one year is needed to collect these outstanding

between the intake and Tamri Water Purification Plant is currently ongoing, as a fundamental solution. As of August 2011, the project is in the tender stage and the African Development Bank (AfDB) will co-finance to this project. Project cost is estimated as MAD 16 million.

fees (the average days' sales outstanding is 318 days). The soundness of the financial position of ONEP may not be questioned by this situation, at the same time, however, it must be especially noted that the delay in collecting the sanitation services' fee billed to the rural municipalities is becoming a concern for the financial management. From the long-term perspective, it is critical at an early stage to prevent the occurrence of a "possible influential factor" with regard to the financial sustainability, and it is desirable to take the necessary measures to encourage the client to pay service fees. More specifically, some practical options such as urging the central government to solve the issue, the case of violations of laws (i.e. payment in arrears to a municipal council, etc.) for example, should be considered.

#### 4.2.2 Recommendations for JICA

Regarding the sewage system development in the Greater Agadir area, a treatment plant with a certain capacity has started operations, thanks to the financial support by the AFD and the EIB. On the other hand, the secondary treatment capacity is 10,000 $m^3$/day and this level of capacity is not a sufficient response to the increased water supply capacity. The water supply capacity is approximately 100,000 $m^3$/day in this region, thus the concern remains that the volume of untreated water may increase in the future. Moreover, the secondary treatment capacity may not be enough, even after the completion of the second phase of "The Sewerage Development Project in Greater Agadir Area" which is currently implemented by RAMSA.

Because water supply development will impose an increased burden on the environment, for example indirectly through the increasing wastewater, it is vital to advance measures for wastewater treatment concurrently with water supply development. It may be necessary for JICA to consider the possibility of cooperation in the sewage system development in the Greater Agadir area, under the donor coordination structure in Morocco. If the situation allows, exploration should commence with the possible cooperation with the AFD and the EIB, including the possibility of co-finance.

### 4.3 Lessons Learned

As for the issues of difficulty in securing the water intake volume at the Moulay Abdellah Dam, it seems that the situation of floating debris and obstacles during the flooding and rainy seasons might have been anticipated from the beginning, although its amount was much more than estimated. It would have been more necessary to have considered some appropriate measures at the time of detailed design and other stages.

Because it is one of the critical factors for a water supply project to continuously secure the stable quantity of water intake, some countermeasures to protect intake facilities from floating obstacles should be considered, with some detailed and appropriate technical studies, at the time of both basic and detailed design stages.

**Comparison of Original and Actual Scope**

| Item | Plan | Actual |
|---|---|---|
| A) Output | | |
| 1.1 Water Intake and Conducting Facilities | | |
| ・ Water Intake Weir | One location | As planned |
| ・ Primary Pump Stations | 894 liter/sec., 3 units plus 1 backup, H=67m | 894 liter/sec., 3 units plus 1 backup, H=70m |
| ・ Surge Tank | 1,000 m³ (500 m³×2) | As planned |
| ・ Water Conveyance Pipelines | 9,159m in total | 8,560m in total |
| ✓ Intake – Surge Tank | 3,651m | 3,430m |
| ✓ Surge Tank – Purification Plant | 5,508m | 5,130m |
| 1.2 Water Purification Plant | | |
| ・ Treatment Capacity | 700 liter/sec. | As planned |
| 1.3 Water Transmission Facility | | |
| ・ Water Conducting Pipes | 57,850m in total | 57,525m in total |
| ✓ Purification Plant – Secondary Pump Station | 40,800m | 40,275m |
| ✓ Secondary Pump Station – RAMSA Reservoir | 17,050m | 17,250m |
| ・ Secondary Pumping Station | 700 liter/sec., 3 units plus 1 backup, H=98m | 700 liter/sec., 3 units plus 1 backup, H=98.5m |
| 1.4 Power Lines | 8.7km | 4.47km |
| 1.5 Access Roads | 8.7km | Cancelled (Constructed by Public Works Department) |
| 1.6 Consulting Service | | |
| ・ Consulting Service M/M | 182 M/M in total (Foreign:64M/M, Local: 118 M/M) | 165.54M/M in total (Foreign:64.36M/M, Local: 101.18M/M) |
| ・ Consulting Service TOR | Bid documents review, Bid support, Construction supervision, Training program for ONEP engineers, etc. | As the same, excluding bid documents review |
| B) Project Period | February 2001 – January 2007 (72 months) | February 2001 – April 2007 (75 months) |
| C) Project Cost | | |
| Foreign currency | 3,438 million yen | 193 million yen |
| Local currency | 5,875 million yen | 6,394 million yen |
| Total | 9,313 million yen | 6,587 million yen |
| Japanese ODA loan portion | 6,412 million yen | 6,327 million yen |
| Exchange rate | 1MAD ＝10.76 yen (as of November 1999) | 1MAD ＝ 12.80 yen (Average between Aug.2002 and May 2008) |