

Kingdom of Morocco

Ex-Post Evaluation of Japanese ODA Loan  
Water Supply Sector Development Project (II)

External Evaluator: Keishi Miyazaki, OPMAC Corporation

**0. Summary**

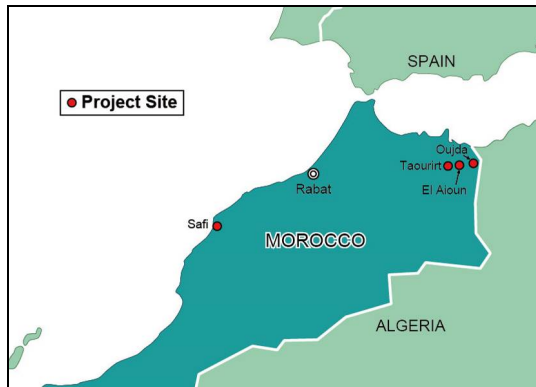
The objective of this project was to provide a stable water supply in Oujda, Taourirt and El Aioun in the Eastern Region, and in Safi in the Western Region of Morocco as well as to conserve ground water in the area surrounding Oujda by new construction and an extension of existing water supply facilities.

The project was highly relevant to Morocco's development plan and development needs, as well as to Japan's ODA policy, and therefore its relevance is high. The water served population, the average and maximum water supply volume and the average water supply volume per person were improved. The percentage of water serving the population was enhanced to more than 90% in the four target cities of the project. Also, the long hours of water outage in the summer season when demand for water was the highest in the year were substantially reduced after project implementation. Thus, the first project objective, that is, a stable water supply, was largely achieved. However, the second objective, that is, conservation of ground water in the area surrounding Oujda has not yet been achieved as the quantity of intake water from ground water in Oujda, Taourirt and El Aioun has not met the target even though there was a reduction in the utilization of ground water in the three cities after project implementation. Overall, however, the project positively contributed to the improvement of people's living conditions in the project target area. Thus, its effectiveness is fair.

Although the project cost was within the plan, the project period was longer than planned, and thus project efficiency is fair. Project sustainability is deemed high in the structural, technical and financial aspects, and the operation and maintenance condition of project facilities and equipment is good.

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

## 1. Project Description



Location of Project Site



Water Purification Plant in Oujda

### 1.1 Background

In 1996, the total annual rainfall in Morocco was 150 billion m<sup>3</sup>, of which 121 billion m<sup>3</sup> (equal to approximately 80% of the total annual rainfall) evaporated. Among the remaining 29 billion m<sup>3</sup> of annual rainfall, water available for utilization was limited to 21 billion m<sup>3</sup> (16 billion m<sup>3</sup> of surface water and 5 billion m<sup>3</sup> of ground water).

Oujda, a central city in the Eastern Region of Morocco and its neighboring cities of Taourirt and El Aioun, depended on groundwater for their water supply, hence a decrease in the ground water level caused by heavy exploitation of ground water had become a serious problem. In addition, there was an increase in water demand due to population growth. Therefore, the development of a water supply system based on new water sources was urgently needed.

Similarly, in Safi, one of the major industrial cities in the Western Region of Morocco, it was estimated that water supply shortages would occur in 1998 due to population growth, and thus an expansion of the existing water supply facilities was an urgent issue.

### 1.2 Project Outline

The objective of this project was to provide a stable water supply in Oujda, Taourirt and El Aioun in the Eastern Region and in Safi in the Western Region of Morocco as well as to conserve ground water in the area surrounding Oujda by new construction and an extension of existing water supply facilities, thereby contributing to the improvement of people's living conditions.

Loan Approved Amount/ Disbursed Amount	9,000 million yen / 7,588 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	May 1997 / December 1997
Terms and Conditions	Interest Rate: 2.5% (for main component) Interest Rate: 2.1% (for consulting services) Repayment Period: 30 years (Grade Period: 10 years) Condition for Procurement: General Untied
Borrower / Executing Agency	Office National de l'Electricite et de l'Eau (ONEE) / ONEE (Moroccan government guarantee)
Final Disbursement Date	May 2009
Main Contractor (Over 1 billion yen)	Flowserve (France) - Vws Wabag France Sas (France)- Cegelec (Morocco) (JV)
Main Consultant (Over 100 million yen)	Scet-Scom S.A. a Directoire et a Conseil de Surveillance (Morocco) - Hidroprojecto (Portuguese) (JV)
Feasibility Studies, etc.	Feasibility study by ONEP in October 1996
Related Projects	Japanese ODA loan project "Water Supply Sector Development Project" (signing of L/A in 1995)

## 2. Outline of the Evaluation Study

### 2.1 External Evaluator

Keishi Miyazaki, OPMAC Corporation

### 2.2 Duration of Evaluation Study

Duration of the Study: October 2012 – October 2013

Duration of the Field Study: February 2-17, 2013, May 15-18, 2013

## 3. Result of the Evaluation (Overall Rating: B<sup>1</sup>)

### 3.1 Relevance (Rating: ③<sup>2</sup>)

#### 3.1.1 Relevance to the Development Plan of Morocco

##### Relevance to National Policies

At the time of the appraisal of this project in 1997, the Moroccan Government's "Five Year Economic and Social Development Plan (1993-1997)" was emphasizing an improvement of public health and people's living standards by an expansion of the rural water supply system.

At the time of the ex-post evaluation, the current 2013 Finance Bill<sup>3</sup> stated the necessity

<sup>1</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory.

<sup>2</sup> ③: High, ②: Fair, ①: Low.

<sup>3</sup> 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.

for improvement of water demand/supply management focusing on the rural drinking water supply, the conservation of ground water, and the recycling of sewerage and waste water.

#### Relevance to Sectoral Policies

At the time of the appraisal of this project in 1997, the Water Supply Sector Development Strategy (1995-2010) aimed at an improvement of the water served population ratio and the water supply service, particularly focusing on an improvement in the accessibility of drinking water for the poor and an improvement in people's living standards. For this end, the National Office for Drinking Water Supply (ONEP: Office National de l'Eau Potable)<sup>4</sup> at that time targeted its improvement of the water served population ratio from 76% in 1995 to 94% in 2010 in urban areas, and from 14% in 1995 to 80% in 2015 in rural areas.

At the time of the ex-post evaluation, the Action Plan of the National Office for Electricity and Drinking Water Supply (ONEE: Office National de l'Electricite et de l'Eau) (2012-2016) emphasized continuous efforts towards enhancement of the provision of drinking water in rural areas with a low accessibility to water, the upgrading of the existing water supply facilities, and the development of individual water pipe connections in rural communities.

#### 3.1.2 Relevance to the Development Needs of Morocco

At the time of the appraisal of this project in 1997, Oujda, a central city in the Eastern Region of Morocco and its neighboring cities of Taourirt and El Aioun depended on groundwater for their water supply. Whilst the allowable amount of ground water to be used in the three cities was 591 litre/second, 1,244 litre/second of ground water was used for water supply in 1996. The ground water level declined by 3 meters every year during 1994 and 1995, and the decrease of the ground water level became a serious problem. Therefore, it was required that the heavy dependence on ground water be reduced and a water supply system based on new water sources such as surface water be developed in order to meet a future water demand associated with population growth and urbanization.

Meanwhile, in Safi, which is one of the major industrial cities in the Western Region of Morocco, the water supply depended on both ground water and surface water. However, it was estimated that water supply shortages in Safi would occur in 1998 due to an expansion of water demand caused by population growth and an increase in the water served population ratio. Therefore, an expansion of the water supply facilities, including the existing water purification plant (capacity: 350 litre/second), was an urgent issue.

At the time of the ex-post evaluation, the water supply population ratio in the target four cities had improved: from 87.9% (1997) to 98% (2011) in Oujda, from 88.9% (1997) to 97% (2011) in Taourirt, from 68.2% (1997) to 96% (2011) in El Aioun, and from 78% (2004) to 90%

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<sup>4</sup> Office National de l'Electricite et de l'Eau (ONEE) was established in 2012 by the merger of the Office National de l'Eau Potable (ONEP) and the Office National de l'Electricite (ONE).

(2012) in Safi. However, in some places in the target areas, temporary water outages and decreases in the water supply volume have been observed during the summer season when the water demand is at its highest. Since a steady increase in the water served population is expected in the target four cities following progress in industrialization and urbanization and continuing population growth in the target areas and the surrounding areas, it is still necessary to further develop and expand the water supply facilities in order to ensure a stable water supply in response to the current water served population ratio. Meanwhile, it is expected that water demand in Safi will exceed the current water supply capacity in 2017. In order to cope with this, a plan for the construction of a new water purification plant (capacity: 970 litre/second) near Safi has been implemented by ONEE.

### 3.1.3 Relevance to Japan's ODA Policy

At the time of the appraisal of this project, the Japanese Government's Country Assistance Policies for Morocco had the following five priority areas: (i) agricultural and fisheries development, (ii) water source development for agriculture and drinking water, (iii) basic infrastructural development for sustainable economic development, (iv) rural development for narrowing the gap between urban and rural areas, and (v) environmental protection for sustainable development. The objectives of this project are consistent with the second priority area.

This project has been highly relevant to Morocco's development plan and development needs, as well as to Japan's ODA policy. Therefore, its relevance is high.

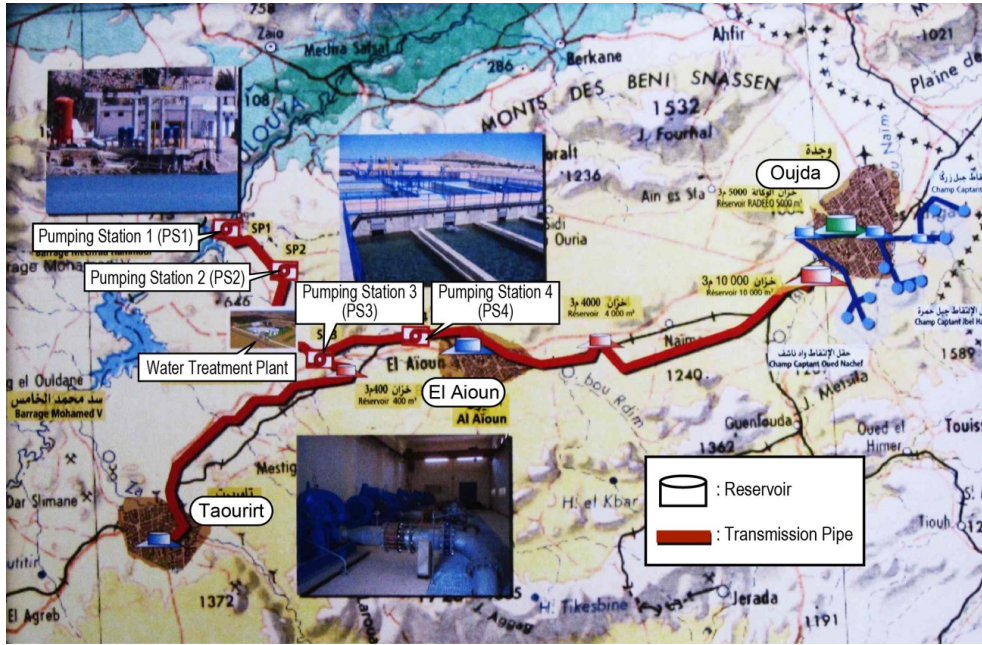
## 3.2 Effectiveness<sup>5</sup> (Rating:②)

### 3.2.1 Quantitative Effects (Operation and Effect Indicators)

This project consisted of two portions: (i) Oujda portion for water supply development in Oujda, Taourirt and El Aioun in the Eastern Region and (ii) Safi portion for water supply development in Safi in the Western Region. The main outputs of the Oujda portion were the new construction of a water purification plant (capacity: 1,050 litre/second), water intake facilities, water conveyance pipes, water pipes, pumping stations and reservoirs for water supply to the above three cities by utilizing water from the Mecraa Hamadi Dam. The main outputs of the Safi portion were the expansion of the existing water purification plant (expanded capacity: 190 litre/second) and the rehabilitation of the existing pumping stations (see the project site map in Figure 1 and Figure 2).

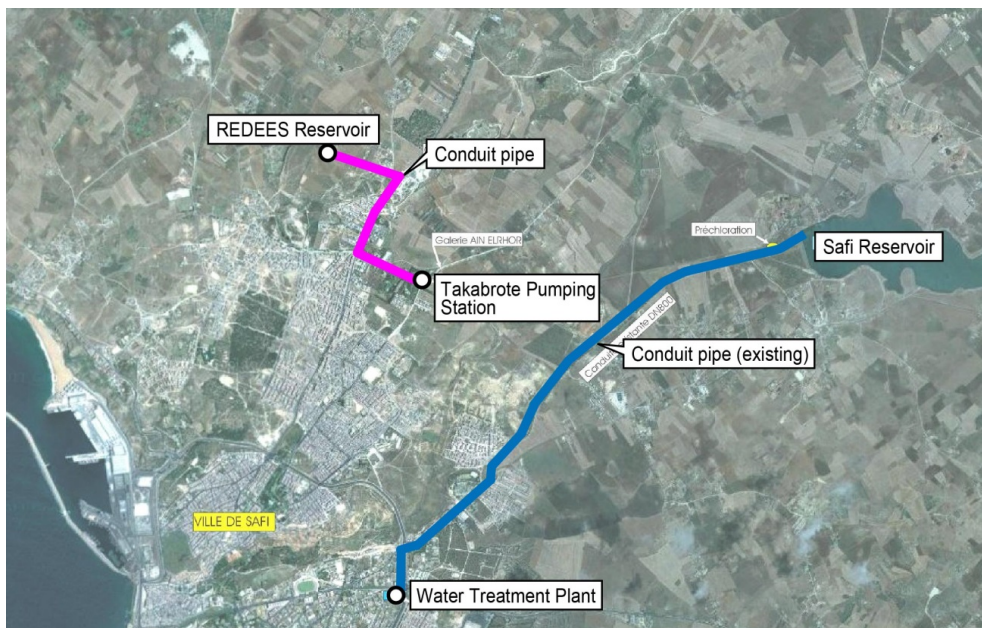
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<sup>5</sup> Sub-rating for Effectiveness is to be put with consideration of Impact.



Source: ONEE

Figure 1: Project Site Map of Oujda Portion



Source: ONEE

Figure 2: Project Site Map of the Safi Portion

The key operation and effect indicators such as the water served population, the maximum and average water supply volumes and the average water supply volume per person in the target four cities, were greatly improved after project implementation (Table 1). In comparison with the situation before and after project implementation in 2007 and 2011, in Oujda, the water

served population increased 1.31 times, the maximum water supply volume increased 1.44 times, the average water supply volume increased 1.44 times, and the average water supply volume per person increased 1.23 times. In Taourirt, the water served population increased 1.71 times, the maximum water supply volume increased 1.78 times, the average water supply volume increased 1.64 times, and the average water supply volume per person increased 1.05 times. In El Aioun, the water served population increased 1.67 times, the maximum water supply volume increased 2.18 times, the average water supply volume increased 2.19 times, and the average water supply volume per person increased 1.85 times. In Safi, the water served population increased 1.13 times, the maximum water supply volume increased 1.15 times, the average water supply volume increased 1.80 times, and the average water supply volume per person increased 1.59 times. Similarly, the percentage of the water served population was largely improved in the target four cities. In Oujda, it was improved from 87.9% in 2007 to 98% in 2011. In Taourirt, it was improved from 88.9% in 1997 to 97% in 2011. In El Aioun, it was improved from 68.2% in 1997 to 96% in 2011. In Safi, it was improved from 78% in 2004 to 90% in 2012.

Table 1: Operation and Effect Indicators of the Target Four Cities

(i) Oujda

Indicator	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Water Served Population (person)	325,088	334,061	341,478	347,724	353,862	365,383	376,470	386,248	380,621	392,051	393,757	402,299	410,653	418,763	425,619
Maximum Water Supply Volume (m <sup>3</sup> /day)	63,274	73,280	79,006	77,047	75,953	77,817	81,590	89,100	88,301	86,314	87,696	93,053	91,930	93,139	91,152
Average Water Supply Volume (m <sup>3</sup> /day)	48,672	56,370	60,774	59,267	58,425	59,859	62,762	68,538	67,910	66,442	67,478	71,539	70,762	71,626	70,157
Average Water Supply Volume per Person (litre/person/day)	131.6	150.7	160.6	154.8	150.9	152.8	158.4	171.0	167.5	162.0	162.7	170.5	166.7	166.8	161.6
Percentage of Water Served Population (%)	87.9	89.3	90.2	90.8	91.4	93.3	95.0	96.4	93.9	95.6	94.9	95.9	96.8	97.5	98.0
Water Loss (%)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	14.40	6.60	8.90	19.80	16.30

Source: ONEE

Note: Water loss represents water leakage rate in the water piles under the control of ONEE.

(ii) Taourirt

Indicator	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Water Served Population (person)	56,786	59,766	62,868	64,603	66,468	68,991	71,597	74,832	78,614	79,268	82,961	85,659	89,153	93,547	97,292
Maximum Water Supply Volume (m <sup>3</sup> /day)	8,200	9,412	9,879	10,184	11,558	11,053	11,148	11,884	11,232	12,182	12,442	14,170	13,306	14,723	14,584
Average Water Supply Volume (m <sup>3</sup> /day)	6,308	7,240	7,599	7,833	8,891	8,502	8,575	9,141	8,640	9,331	9,590	10,886	10,195	10,195	10,358
Average Water Supply Volume per Person (litre/person/day)	98.8	109.8	111.6	111.4	122.4	113.3	110.7	114.2	104.9	109.3	108.8	119.6	108.4	105.0	103.3
Percentage of Water Served Population (%)	88.9	90.6	92.3	91.9	91.5	92.0	92.4	93.5	95.1	92.9	94.1	94.1	94.8	96.3	97.0
Water Loss (%)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	3.8	4.2	4.8	5.0	8.9	6.1	10.9	12.4

Source: ONEE

Note: Water loss represents water leakage rate in the water piles under the control of ONEE.



(iii) El Aioun

Indicator	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Water Served Population (person)	21,785	22,539	23,717	24,406	25,982	27,022	27,842	29,048	30,359	28,622	29,316	31,907	34,764	35,439	36,339
Maximum Water Supply Volume (m <sup>3</sup> /day)	2,189	2,313	2,474	2,508	2,668	2,611	2,698	3,150	3,629	4,061	4,061	4,234	4,838	4,859	4,780
Average Water Supply Volume (m <sup>3</sup> /day)	1,684	1,779	1,903	1,929	2,052	2,008	2,075	2,423	2,765	3,197	3,110	3,283	3,715	3,974	3,688
Average Water Supply Volume per Person (litre/person/day)	52.7	55.1	58.2	58.2	61.2	59.2	60.4	69.7	78.3	89.7	86.3	90.0	111.6	106.3	97.4
Percentage of Water Served Population (%)	68.2	69.7	72.5	73.7	77.5	79.6	81.1	83.6	86.3	80.3	81.3	87.4	94.1	94.8	96.0
Water Loss (%)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	2.1	2.0	2.0	2.5	2.8	3.4	6.2	8.3

Source: ONEE

Note: Water loss represents water leakage rate in the water piles under the control of ONEE.

(iv) Safi

Indicator	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Water Served Population (person)	268,621	270,770	272,936	275,120	277,321	279,539	281,776	284,750	286,302	288,592	290,901	293,228	295,574	297,939	300,322	302,725
Maximum Water Supply Volume (m <sup>3</sup> /day)	40,433	36,240	36,449	33,790	36,185	44,290	47,815	46,023	42,580	39,134	42,100	36,069	43,065	45,332	41,354	46,596
Average Water Supply Volume (m <sup>3</sup> /day)	18,344	27,553	24,394	25,222	29,608	27,535	28,061	29,642	29,482	30,297	29,513	28,740	29,385	30,228	29,217	32,946
Average Water Supply Volume per Person (litre/person/day)	68.3	101.8	89.4	91.7	106.8	98.5	99.6	104.1	103.0	105.0	101.5	98.0	99.4	101.5	97.3	108.8
Percentage of Water Served Population (%)	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.	78.0	79.0	80.0	82.0	83.0	85.0	86.0	N.A.	90.0
Water Loss (%)	Nearly 0															

Source: ONEE

Note 1: Water loss represents water leakage rate in the water piles under the control of ONEE.

Note 2: The total water supply capacity of Safi city is 640 litre/second which consists of 540 litre/second of Safi Water Purification Plant and 100 litre/second of Takabroute Pumping Station.

Although water loss in the water pipes under the control of the executing agency was nearly zero in 2011 in Safi, it was relatively high in the other three cities: 16.3% in Oujda, 12.4% in Taourirt, and 8.3% in El Aioun. It is assumed that the water loss in the eastern three cities was higher than that in Safi because the total length of water pipes in the three cities is longer than that in Safi. Meanwhile, the volume of stored water at the dam and reservoir supplied to the water purification plants in Oujda and Safi has been stable throughout the year so far and the availability of water at water sources has not had a negative effect on the project effects.

The water purification plant in Oujda (capacity: 1,050 litre/second) has operated since 2007. Its facility utilization rate was 37.3% in 2001 and the plant still has available capacity. The water purification plant in Safi had its capacity extended from 350 litre/second to 540 litre/second through the provision of an additional capacity of 190 litre/second by the project. The additional part of the water purification plant started its operation in 2002. Its facility utilization rate was 64.7% in 2012, which was in the appropriate range (Table 2).

The reason why the facility utilization rate of the Oujda water treatment plant remains less than 40% is that the quantity of the water intake from the dam has been restricted due to water



leakage in the 8 km section of water conveyance pipe between the second and third pumping stations. Maintenance work on the damaged section was conducted by the executing agency and work was completed in April 2013 (see “3.4.1 Project outputs”).

Table 2: Facility Utilization Rate of Water Purification Plants in Oujda and Safi

Indicator	Unit: %															
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Oujda WPP (Capacity: 1,050 litre/second)	—	—	—	—	—	—	—	—	—	—	32.89	25.39	27.40	33.33	37.30	N.A.
Safi WPP (Capacity: 540 litre/second)	60.70	70.50	67.10	53.40	51.90	47.40	47.40	51.20	51.10	52.00	52.00	50.60	53.80	59.30	54.40	64.70

Source: ONEE

Note: Facility Utilization Rate of Safi WPP from 1997 to 2001 indicates that of the existing WPP (Capacity: 350 litre/second).

### 3.2.2 Qualitative Effects

#### (1) Stable Water Supply

As referred to the above, the percentage of the water served population improved to more than 90% in the target four cities. Furthermore, the water served population, the maximum water supply volume, the average water supply volume, and the average water supply volume per person in the target four cities all improved greatly after project implementation. Before project implementation, there were serious water shortages during peak hours of the day and in the summer season when the water demand was at its highest. However, this situation substantially improved after project implementation. According to RADEEO<sup>6</sup>, a public corporation for water and electricity supply in Oujda, there were water outages on average 10 hours a day during the summer season before project implementation. These outages often caused turbid water as water stayed in the water piles for long hours without flowing. However, these problems were mostly solved after project implementation.

In addition, this project constructed rural water supply facilities with public water taps in 134 communities with an approximate population of 21,000 near Oujda as a part of an additional project scope. Therefore, the project contributed to the improvement in the accessibility of drinking water for rural residents near Oujda in addition to the target four cities.

Thus, it is considered that the project realized a stable water supply in the target four cities.

#### (2) Conservation of Ground Water in the area surrounding Oujda

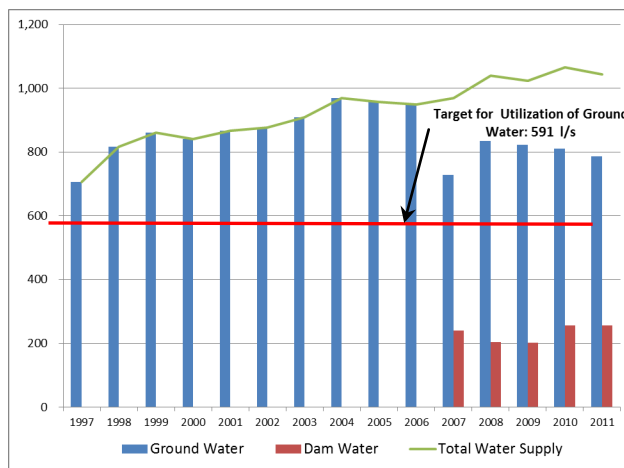
Another objective of this project was to conserve ground water in the area surrounding Oujda by the new construction of water supply facilities that utilize surface water (dam water). Initially, the project assumed that the volume of water supply utilizing ground water would be restricted to 591 litre/second and that the remaining water supply would be substituted by dam water after project implementation. After completion of the Oujda water purification plant in

<sup>6</sup> La Régie Autonome Intercommunale de Distribution d’Eau et d’Electricité d’Oujda.

2007, the volume of ground water that can be utilized for water supply has declined. However, it was 787 litre/second in 2011, which still fell short of the target figure of 591 litre/second (Figure 3).

The main reason for this was that the volume of intake water from the dam was restricted due to the problem in part of the water conveyance pipe (the 8 km section between the second and third pumping stations), as already explained.

The policy on the conservation of ground water has been firmly maintained in Morocco, and the executing agency plans to take the measures necessary for the conservation of ground water in the future, in collaboration with the concerned agencies such as RADEEO, the Agency of the Hydraulic Basin, the Ministry of Energy, Mining, Water and Environment which controls the dams.



Source: ONEE

Note: The above mentioned water supply volume is the sum of water supply volume of Oujda, Taourirt and El Aioun.

Figure 3: Utilization of Ground Water in Oujda, Taourirt and El Aioun

### 3.3 Impact

#### 3.3.1 Intended Impacts

##### Results of the Beneficiary Survey

This ex-post evaluation conducted a semi-structured interview survey<sup>7</sup> concerning the impact of this project with 124 households in the target four cities as well as in rural communities near Oujda<sup>8</sup>.

##### (1) Improvement in People's Living Conditions

The initial target beneficiaries of this project were the residents of Oujda, Taourirt, El Aioun and Safi. Since the residents of the four cities were already provided with water supply services with individual water pipe connections, even before project implementation, there was no change in the type of water supply services before and after project implementation.

<sup>7</sup> The breakdown of interviewed 124 households are: 28 households in Oujda, 10 households in the rural communities near Oujda, 31 households in Taourirt, 26 households in El Aioun, and 29 households in Safi. The above interviewed households were randomly selected at each city and locality.

<sup>8</sup> The rural communities near Oujda were provided the rural water supply facilities by the project as an additional project scope.

Therefore, there was no impact observed on the reduction of water drawing labor in the four cities. However, in rural communities near Oujda, a positive impact on the reduction of water drawing labor was recognized by local residents. In these rural communities, rural water supply facilities with public water taps were provided by the project additionally, and thus the accessibility of drinking water improved in these areas. Regarding the impact of improvements in hygiene and health conditions, 40% of respondents (50 households) recognized that this impact had taken place. In particular, households in the rural communities near Oujda were highly aware of this impact and they began to take baths more frequently after public water taps were provided nearby. Regarding the impact of improvement in convenience of living, 52% of respondents (64 households) recognized this.

### (2) Evaluation of Water Supply Services

Regarding the supplied water volume, 78% of respondents (97 households) answered that there was “no problem at all”. Similarly, those who answered that there was “no problem at all” were: 77% of respondents (95 households) regarding water pressure, 76% of respondents (94 households) regarding water supply service time, and 64% of respondents (79 households) regarding maintenance of water supply facilities. On the other hand, 52% of respondents (64 households) replied that the taste of water was either “bad” or “bad to some extent”. Most of these answers referred to a salty taste. These answers came mainly from the eastern three cities<sup>9</sup>.

Meanwhile, 58% of respondents (72 households) replied the water outages took place during the summer season when the water demand peaked, and 75% of respondents (92 households) answered that the water charge was high. As already mentioned, the problem of long water outages during peak demand times was substantially improved. However, it was observed that some of the target areas still have the problem of water outages at present<sup>10</sup>.

### (3) Satisfaction with the Project

Regarding the satisfaction of beneficiaries with the project, 77% of respondents (96 households) answered that they were “satisfied”. The main comments and requests from the respondents were: (i) improvements in water outages in the summer season, (ii) reduction of the water charge, (iii) improvements in the taste of water. However, it should be noted that the

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<sup>9</sup> According to the executing agency Orient Regional Direction in Oujda, water quality tests of tap water are conducted on three levels, by the executing agency, the municipal health department, and the Ministry of Health. The water quality of tap water in Taourirt and El Aioun met Moroccan water quality standards. Meanwhile, it was suggested that tap water had been supplied by mixing purified water taken from the dam and ground water, and that tap water in Taourirt contained little more sulfur than the others (although the amount of sulfur was within Moroccan water quality standards). In this regard, the executing agency has been making an effort to promote understanding about water on the part of local authorities and people through sensitization and educational activities. These target local people and schools as well being linked to the results of water quality tests.

<sup>10</sup> While respondents referred to water shortages in the summer season, the executing agency recognized that the current capacity of water supply could fully meet peak water demand in the summer season. However, the executing agency said that a temporary water outages occurred during the civil works.

results of the beneficiary survey were based on the perception of the respondents on the water supply services as a whole. This included water production and transmission services which were a target of this project, as well as water distribution services which were not a target of this project, and which were under the management of water and electricity supply public corporations in Oujda and Safi such as RADEEO and RADEES<sup>11</sup>.

### 3.3.2 Other Impacts

#### (1) Impacts on the Natural Environment

##### a) Water Quality

The water purification plants in Oujda and Safi conduct water quality sampling tests (chemical and biological tests) twice a day in their water quality examination laboratory. Table 3 below shows the water quality data of each of the plants in 2012. The parameters satisfy the national water quality standards of Morocco.

Table 3: Water Quality Data from the Water Purification Plants in Oujda and Safi (2012)

Parameters	Unit	Oujda WPP		Safi WPP		Moroccan Norms	
		Minimum	Maximum	Minimum	Maximum	Recommended Maximum Value	Acceptable Maximum Value
Temperature	°C	10.0	39.5	11.6	28.0	-	-
Turbidity	NTU	0.30	0.51	0.06	0.60	5.0	1.0
pH	pH	7.34	7.70	7.01	7.54	6.5~8.5	9.2
Conductivity	µs/cm	1,020	1,490	938	1,159	1,300	2,700
Aluminum	mg/L	0.1	0.1	0.00	0.15	-	0.2
Ammonium	mg/L	0.02	0.03	0.00	0.013	-	0.5
Chloride	mg/L	112	220	205.9	255.6	300	750
Nitrite	mg/L	0	0	0.00	0.0057	-	0.5
Hardness	mg/L	9.80	11.0	21.2	27.0	30.0	-
Iron	mg/L	0.08	0.08	0.00	0.00	-	0.3
Manganese	mg/L	0.00	0.00	0.00	0.00	-	0.5

Source: ONEE

Note: NTU: Nephelometric Turbidity Unit.

##### b) Sludge

The sludge produced by the Oujda water purification plant is kept in the compound of the plant according to the guidelines. Since intake water from the dam is not polluted, the sludge does not contain any harmful substance. The Safi water purification plant has not conducted any treatment of sludge as very little sludge is produced by the plant. The intake water from Safi reservoir contains very little mud and sand. Currently, a plan for the recycling of sludge is being prepared by the executing agency.

<sup>11</sup> La Régie Autonome Intercommunale de Distribution d'Eau et d'Electricité de Safi.

### c) Results of the Beneficiary Survey on Environmental Impacts

According to the results of the beneficiary survey, 72% of respondents (90 households) answered “No, not at all” or “No, not so much”, regarding negative environmental impacts associated with the implementation of the project. At the same time, 16% of respondents (19 households) replied “Yes, very much” or “Yes, to some extent”. These respondents gave “corrosion of water pipes”, “water leakage” and “pipe explosions” as examples of negative environmental impacts. However, these problems were mostly associated with the water distribution network, and the direct causal relationship between the problems and this project is uncertain. Meanwhile, 42% of respondents who recognized negative environmental impacts of the project also answered that the necessary counter-measures such as repair of damaged water pipes had been taken by the local authorities.

### d) Environmental Monitoring System of ONEE (Water Branch)

During project implementation, environmental monitoring of the area surrounding the project was conducted by the executing agency, ONEE (Water Branch). So far, no negative environmental impacts near the project site have been observed. Since project completion, the Water Quality Control Direction of the head office in Rabat and the Water Quality Examination Laboratories of the Oujda and Safi water purification plants have been responsible for environmental monitoring focusing on water quality management. For the rural water supply facilities in the 134 communities near Oujda which were constructed as an additional project scope, the executing agency did not conduct an Environmental Impact Assessment (EIA) as the size of the project was small.

## (2) Land Acquisition and Resettlement

Initially it was planned that 1,510,000 m<sup>2</sup> of land would be acquired (1,500,000 m<sup>2</sup> in Oujda, Taourirt and El Aioun, and 10,000 m<sup>2</sup> in Safi) for the construction of pumping stations and water purification plants, etc. However, 1,796,707 m<sup>2</sup> of land (1,792,558 m<sup>2</sup> in Oujda, Taourirt and El Aioun, and 4,149 m<sup>2</sup> in Safi) were actually acquired by the project (Table 4). The reason for this increase in area in the eastern three cities was that the project needed the additional land for the construction of the rural water facilities in the 134 communities near Oujda. In Safi, the project initially anticipated that 3,000 m<sup>2</sup> of land would need to be acquired for the expansion of the water purification plant. However, this 3,000 m<sup>2</sup> of land became unnecessary as the new water purification plant was constructed in the same compound as the existing plant. In addition, the cancellation of some project components was another reason for the decrease in the area of acquired land. As a result of all this, the actual area of acquired land in Safi decreased by half. The land acquisition process met the requirements of Moroccan law and regulations. There was no resettlement of people associated with the project.

Table 4: Planned and Actual Land Acquisition

	Plan	Actual
Oujda, Taourirt, El Aioun	1,500,000	1,792,558
Safi	10,000	4,149
Total	1,510,000	1,796,707

Unit: m<sup>2</sup>

Source: ONEE

### (3) Other Impacts

The increase in water volume and the reduction in water outages through the project contributed to a stabilization of water pressure in the water pipes. This led to improvements in water loss and a decrease in the frequency of maintenance for the water distribution system, which eventually improved the efficiency of the water distribution network. Also, the water distribution companies were able to postpone investment plans as the durability of the existing water distribution pipes improved and their product life increased.

In sum, the key operation and effect indicators such as the water served population, the maximum and average water supply volume, and the average water supply volume per person in the target four cities were greatly improved after project implementation. The facility utilization rate of the Oujda water purification plant still has capacity available, and that of the Safi water purification plant was in the appropriate range. Water outages during peak demand were greatly reduced, and a stable water supply was maintained in the target four cities. Meanwhile, the degree of dependency on ground water in Oujda, Taourirt, and El Aioun did not decrease as planned since the utilization of dam water for the water supply did not increase as anticipated. This was due to the problem of the water pipe between Mecraa Hamadi Dam and the Oujda water purification plant. Therefore, the project effect of the conservation of ground water has not materialized so far. However, the project made a positive contribution to improvements in peoples' living conditions in the project target area through improvements in hygiene and health conditions and convenience. No negative impact on the natural environment was observed and no resettlement of people was associated with the project. Thus, the effectiveness with impact of the project is evaluated as moderate.

## 3.4 Efficiency (Rating: ②)

### 3.4.1 Project Outputs

#### (1) Oujda Portion

The planned project outputs of the Oujda Portion were the construction of a water intake facility, water conveyance pipes (3 km), four pumping stations, water piles (124.5 km), a water purification plant (capacity: 1,050 litre/second) and reservoirs (3 units). These were mostly implemented as planned. Also, small-scale rural water supply facilities with public water taps

were constructed as an additional project scope.

There was a problem of water leakage in the 8 km section of the water conveyance pipe between the second and the third pumping stations. The maintenance work for the damaged section was conducted by the executing agency and the work was completed in April 2013<sup>12</sup>.

#### Photographs: Oujda Portion



Mecraa Hamadi Dam



Water Intake Facility



Oujda Water Purification Plant



Pumping Station No. 2



Reservoir



Public Water Tap in Rural Village

#### (2) Safi Portion

The planned project outputs of the Safi Portion were the expansion of the existing water purification plant (additional capacity: 190 litre/second), the rehabilitation of two pumping stations (Takabrote and Ain Thami pumping stations), and the construction of water conveyance pipes (1.9 km). These were implemented as planned except for the rehabilitation of Ain Thami pumping station as this was cancelled. The reason for this cancellation was that there was a problem with the water quality of the deep well at Ain Thami pumping station. The well was closed in 2001, and therefore rehabilitation of the Ain Thami pumping station was no longer necessary. Also, 4.4 km of water conveyance pipes from Takabrote pumping station to the Safi water purification plant was constructed as an additional project scope.

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<sup>12</sup> The investigation by the executing agency pointed out that damage to the water conveyance pipe was caused by defects of the contractor as cracks in the pipe were made by mixing chloride with concrete. However, the contractor challenged this and the liability issue is pending in court. The aforementioned contractor also provided a service for the other contract package of this project. They utilized the same type of water conveyance pipes which were produced at same period of time as the damaged pipes for other locations. However, no problems occurred in the other package.



### Photographs: Safi Portion



Safi Water Purification Plant



Water Quality Examination Laboratory



Takabrote Pumping Station

### 3.4.2 Project Inputs

#### 3.4.2.1 Project Cost

The actual project cost was 10,693 million yen against 11,999 million yen planned cost; 89% of the planned cost (Table 5). Even including the additional scope of the rural water supply facilities in 134 communities near Oujda, the actual project cost was within the planned cost.

Table 5: Planned and Actual Project Cost

	Plan			Actual		
	FC (Mil. JPY)	LC (1,000 MAD)	Total (Mil. JPY)	FC (Mil. JPY)	LC (1,000 MAD)	Total (Mil. JPY)
1. Construction	3,704	391,400	8,635	984	767,314	10,181
a) Oujda Portion	3,334	366,200	7,948	916	735,978	9,737
b) Safi Portion	370	25,200	687	68	31,336	444
2. Contingency	370	39,100	864	0	0	0
3. Consulting Services	109	10,800	245	106	13,314	266
4. Land Acquisition	0	35,700	450	0	0	0
5. Tax and Duties	0	134,200	1,805	0	20,534	246
Total	4,183	620,300	11,999	1,090	801,162	10,693

Source: JICA appraisal documents and answer to the questionnaire to ONEE.

Note 1: FC: Foreign Currency, LC: Local Currency.

Note 2: Exchange rate used: (Plan) MAD 1 = JPY 12.60 (as of December 1996), (Actual) MAD 1 = JPY 11.99 (average between 1997 and 2011).

#### 3.4.2.2 Project Period

The actual project period was 171 months from December 1997 (signing of the loan agreement) to February 2012 (project completion) against 39 months from February 1997 to April 2000. This was significantly longer than planned, at 438% of the planned project period (Table 6). For reference, the actual project period, excluding the period of the additional scope, was 154 months from December 1997 and September 2010; 395% of planned period. This was 60 months longer than the planned period.

Table 6: Planned and Actual Project Period

	Plan	Actual
1. Signing of Loan Agreement	February 1997	December 1997
2. Oujda Portion	February 1997 – April 2000 (39 months)	June 2002 – September 2010 (99 months)
3. Safi Portion	October 1997 – August 1999 (23 months)	January 2000 – November 2002 (35 months)
4. Additional Scope (Rural Water Supply System in area surrounding Oujda)	–	December 2006 – February 2012 (63 months)
5. Project Completion	April 2000	February 2012

Source: JICA appraisal documents and answers to the questionnaire to ONEE.

The overall delay of the project period was mainly caused by the delay in the Oujda Portion and the additional scope whose reasons are mentioned below. Due to this delay, the expiry date of loan agreement was finally extended to May 20, 2009 after extension procedures were made twice, in 2003 and 2007.

- (1) Delay in signing of the Contract Program<sup>13</sup> between the Moroccan government and the executing agency

At the time of the appraisal in 1997, a new investment program (2000-2004) was under preparation, in which the water supply project in Oujda (Oujda Portion) was included as one large-scale investment project. However, a discussion of the new investment program took a long time, how to modify the water charge system to maintain the financial self-sufficiency of the executing agency being a particular issue. As a result, the schedule for the signing of the Contract Program between the Moroccan government and the executing agency was delayed from 1997 to May 2005.

- (2) Delay in the Special Agreement between RADEEO and the executing agency

Price negotiations for the water charge and administration procedures between RADEEO and the executing agency took a long time. As a result, the special agreement was signed in November 2000.

- (3) Delay in implementation of the Oujda Portion

Due to the delay in signing of the Contract Program and the special agreement mentioned above, the commencement of the Oujda Portion was delayed. This also caused delays in the activities and procedures that followed such as detailed design, the preparation of tender

<sup>13</sup> The Contract Program is an agreement between the executing agency and the Moroccan government on the sharing of responsibility regarding the investment program of the executing agency. For example, the government guarantees rises in the water charge to the executing agency in order to maintain the financial capacity of the executing agency if the latter implements new investments. In other words, without the Contract Program, the executing agency cannot implement the investment program.

documents, the employment of consultants, and so on. In addition, modification of the procurement package and terms of reference also caused a delay in the closing date of tender several times.

(4) Delay due to additional project scope

Initially, the construction period for the rural water supply facilities in the 134 communities near Oujda was estimated at 3 years from 2006 to 2009. However, in fact, it was 5 years until completion in 2012.

### 3.4.3 Results of Calculations of Internal Rates of Return (IRR)

#### Financial Internal Rate of Return (FIRR)

The FIRR at the appraisal was 5.9% for the Oujda Portion and 13.9% for the Safi Portion. The results of the recalculation of FIRR at the ex-post evaluation were negative for the Oujda Portion and 8.9% for the Safi Portion. The reason for the negative FIRR for the Oujda Portion was that the operation and maintenance cost was higher than the water sales revenue<sup>14</sup>. The FIRR calculation at the appraisal was based on the precondition below:

<Precondition of FIRR calculation at appraisal>

- Cost: Project cost, tax and duties, and operation and maintenance cost
- Benefit: Water sales revenue
- Project life: 40 years after project completion

Although project cost was within the plan, the project period was significantly longer. Therefore the efficiency of the project is fair.

## 3.5 Sustainability (Rating: ③)

### 3.5.1 Institutional Aspects of Operation and Maintenance

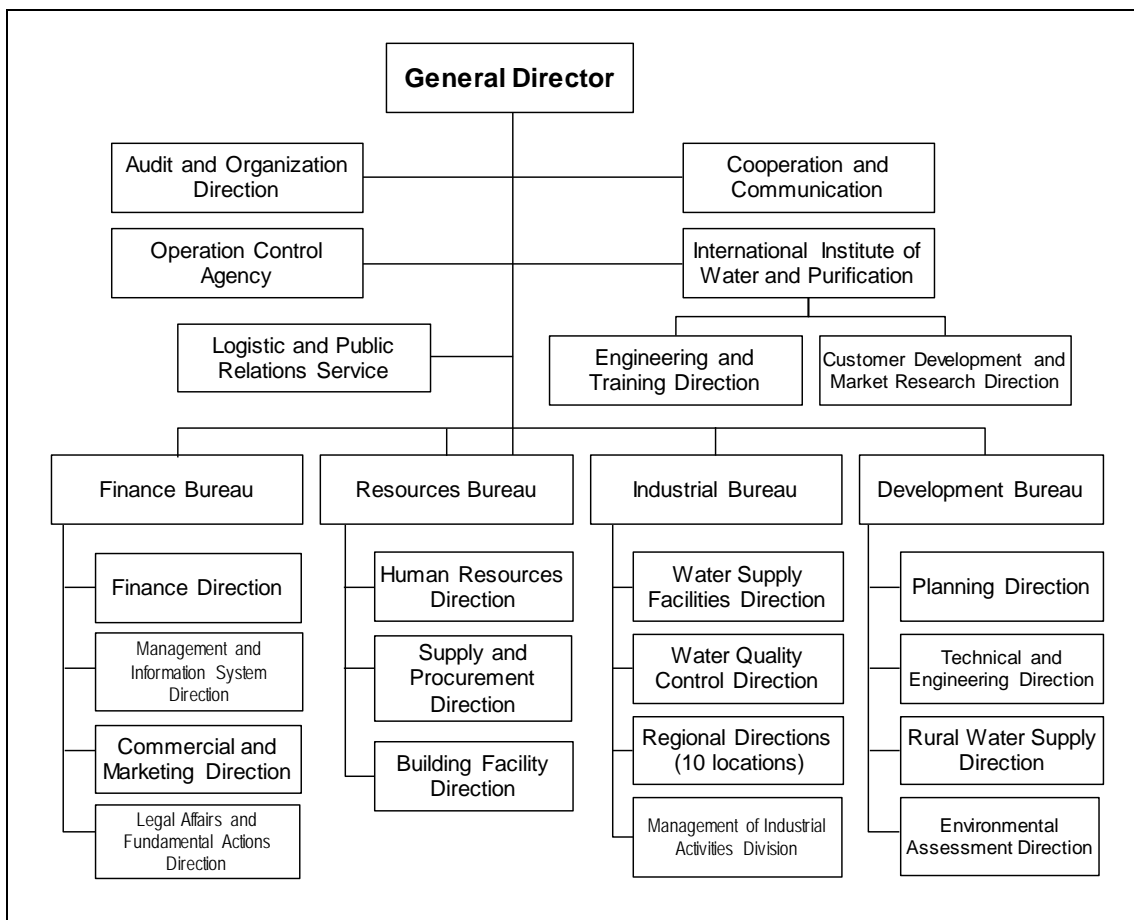
The operation and maintenance (O&M) agency of this project was the National Office for Electricity and Drinking Water Supply (ONEE: Office National de l'Electricite et de l'Eau). The ONEE was established in April 2012 by the merger of the National Office for Drinking Water Supply (ONEP: Office National de l'Eau Potable) and the National Office for Electricity Supply (ONE: Office National de l'Electricite). ONEE (Water Branch) (former ONEP) and ONEE (Electricity Branch) (former ONE) were put in charge of the O&M of the water supply business and the electricity supply business respectively.

The ONEE (Water Branch) is in charge of the O&M for water purification and the water transmission system (water production and transmission part) in Morocco as well as the water

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<sup>14</sup> The revenue from water sales refers to the revenue from the wholesale of water to RADEEO and RADEES.

supply system, including water distribution, in small and medium cities in the county. The ONEE (Water Branch) consists of headquarters in Rabat and 10 regional directions (regional offices) nationwide. The total number of employees was 7,512, as of December 2011. The project facilities in Oujda, Taourirt and El Aioun are under the management of the Orient Regional Direction in Oujda (682 employees), while the project facilities in Safi are under the management of the Safi-Youssoufia Joint Office (94 employees) under the Tensift-Marrakech Regional Direction. The organization chart of ONEE (Water Branch) is shown in Figure 4 below.



Source: ONEE

Figure 4: Organization Chart of ONEE (Water Branch)

Principally, there is a demarcation in the drinking water supply services in urban cities in Morocco. In Oujda and Safi, the water production and transmission services, including water intake, water purification, and water transmission to reservoirs are undertaken by ONEE (Water Branch). Meanwhile, the water distribution services from reservoirs to households/water consumers are handled by RADEEO (Oujda) and RADEES (Safi). As far as Taourirt, El Aioun and the 134 communities near Oujda are concerned, ONEE (Water Branch) is responsible for

the entire water supply service from water production to water distribution to end users, including the collection of water charges. The O&M of the Mecraa Hamadi Dam and the Safi reservoir, which were the main water sources for this project, are under the management of the Agency of the Hydraulic Basin, Ministry of Energy, Mining, Water and Environment.

RADEEO is responsible for the O&M of the water distribution services in the city of Oujda as a whole, with a total water pipe length of 1,310 km. The total number of employees in RADEEO is approximately 260 and there are approximately 110,000 water subscribers in their service area. Since 2003, RADEEO has actively expanded its service area to cover the area surrounding the city through continuous annual investments in extension and renewal of the water distribution network.

RADEES is responsible for the O&M of the water distribution services in the city of Safi as a whole, with a total water pipe length of 465 km. The total number of employees in RADEES is approximately 340 and there are approximately 57,000 water subscribers in their service area. RADEES has also continuously invested in the extension of water pipes, and new construction and the upgrading of pumping stations and reservoirs. Recently, RADEES has constructed a new reservoir with 5,000 m<sup>3</sup> of storage capacity, and there are further plans to construct another new reservoir with 3,000 m<sup>3</sup> of storage capacity.

### 3.5.2 Technical Aspects of Operation and Maintenance

The current technical staff of the Orient Regional Direction in Oujda includes six engineers, six technicians, four workers, and another ten staff. At the Safi-Youssoufia Joint Office, one electrical engineer, two technicians, and other five staff are allocated as technical staff. Some O&M works are outsourced when this is necessary due to a shortage of staff. The periodic maintenance works are conducted daily, weekly, monthly and quarterly, according to the annual maintenance plan, and they are practiced based on the maintenance manual.

The ONEE (Water Branch) has promoted training for the improvement of the technical capacity of staff. In 2011, ONEE (Water Branch) organized a total of 21,475 days of training sessions with 5,103 participants. Each Regional Direction (Regional Office) conducts technical training for their staff according to the local annual training program. In addition, ONEE (Water Branch) have been actively involved in a technical training program for water supply engineers from African and Middle Eastern countries such as Burkina Faso, Guinea, Mauritania, Rwanda, and Saudi Arabia. This is a part of south- south cooperation in collaboration with foreign donors.

### 3.5.3 Financial Aspects of Operation and Maintenance<sup>15</sup>

The O&M budgets of the Orient Regional Direction in Oujda and the Tensift- Marrakech Regional Direction have increased year by year (Table 7).

Table 7: Operation and Maintenance Budget of Regional Directorates

Unit: 1,000 Dirham

	2009		2010		2011		2012	
	Plan	Actual	Plan	Actual	Plan	Actual	Plan	Actual
Oujda, Orient Regional Direction (DR6)	152,634	171,178	170,176	168,218	188,252	196,244	217,415	202,783
Tensift-Marrakesh Regional Direction (DR2)	110,875	138,189	139,703	141,807	140,400	159,220	179,799	147,336

Source: ONEE

According to each regional direction, the necessary O&M budget is allocated every year, and when any additional expense is needed, a special budget is provided on an ad-hoc basis. No problem has been observed in the procurement of spare parts. It is recognized that the O&M budget for the project facilities is appropriately ensured. There are no concerns regarding the O&M budget.

ONEE (Water Branch) is a financially self-sufficient public entity. On the one hand, the water supply business is an infrastructure-intensive business that requires continual investment and renewal of facilities. On the other hand, the water charge is determined with the approval of the government in consideration of profitability and openness to the public<sup>16</sup>. For this reason, the profitability of ONEE (Water Branch) is not high when compared to other sectors. For example, the return on total assets was 0.3-0.5%, the return on sales was 2.1-3.2%, and the total assets turnover was 14-16 during 2009 and 2011. However, the sales and operation revenue has steadily increased every year. At the same time, the expenditure has increased due to increases in energy and employment costs<sup>17</sup>.

The equity to asset ratio was 49-56% in the last three years from 2009 to 2011, maintaining a relatively high level. The current ratio is 108-124%, also maintaining a high level. Therefore, there are no concerns regarding short-term financial security and short-term solvency. The day sales outstanding were around 130 days in the last three years. ONEE (Water Branch) is

<sup>15</sup> ONEE adopted a consolidated account after the merger of ONEP and ONE in April 2012. However, at the time of the ex-post evaluation, the financial statement of ONEE for the fiscal year of 2012, based on the consolidated account, had not yet been formally approved by the board of directors. Therefore, the analysis on the financial capacity of the executing agency was made based on the financial statement of ONEP for the fiscal year of 2011, before the merger.

<sup>16</sup> The ONEE adopted a nationwide unified water charge system, which has not been revised since March 2006. Currently, ONEE is preparing a new investment program which will include a rise in the water charge.

<sup>17</sup> While operation revenue from the water supply business in urban areas is in the black, that of the water supply business in rural areas has a chronic deficit due to low profitability. Overall, however, the operation revenue of ONEE has remained in the black.

expected to maintain and further improve the current level of the day sales outstanding in the future.

Debt, including foreign debt, meanwhile, has been increasing and has reached 17 billion dirham (equivalent to approximately 201.5 billion yen) including 8.7 billion dirham of foreign debt (equivalent to approximately 103.1 billion yen). Financial expenses for the repayment of interests and principals of loans have also been increasing year by year. As the Moroccan dirham was devalued against foreign currencies after 2009, the particular burden of interest payment for Japanese yen and Euro dominated loans grew considerably. This affected the increase in financial expenses in 2010 and 2011: they increased by 1.7 times and 2 times respectively in comparison with 2009. Meanwhile, the debt ratio, which represents the percentage of debt among total assets, had been kept under 50% in the last three years from 2010 to 2012. ONEE (Water Branch) continues to make efforts towards appropriate debt management (Table 8).

Table 8: Financial Data of ONEE (Water Branch)

<b>Profit and Loss</b>				<b>Key Financial Indicators</b>			
Unit: 1,000 Dirham							
<b>Item</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>Item</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>
Sales	4,074,673	4,340,172	4,664,580	Return on total assets (%)	0.5	0.5	0.3
Operation expenditure	3,494,606	3,570,119	3,885,231	Return on sales (%)	3.0	3.2	2.1
Operation revenue	580,067	770,053	779,349	Total assets turnover	16	15	14
Financial expenditure	709,554	1,230,780	1,479,269	Current ratio (%)	124	108	113
Gross profit on sales	391,960	-7,301	168,562	Equity to assets ratio (%)	56	52	49
Special income	-167,233	234,947	34,698	Days sales outstanding (days)	130	127	132
Net profit/loss before tax	224,727	227,646	203,260				
				<b>Item</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>
				Debt ratio (%)	45	47	48

Sour: ONEE

As explained above, although attention should be paid to the future trend of financial expenses, generally there are no concerns regarding the financial aspects of ONEE (Water Branch).

### 3.5.4 Current Status of Operation and Maintenance

In general, the project facilities have been utilized and maintained without problems. During the field survey by the ex-post evaluation team, visits were made to the project facilities in Oujda and Safi including water purification plants, pumping stations, reservoirs, and so on. It was confirmed that they were operated well and kept in a good condition. Regarding the damaged 8 km section of the water conveyance pipe in Oujda, ONEE (Water Branch) had already taken necessary measures by replacing the pipe.

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



## **4. Conclusion, Recommendations and Lessons Learned**

### **4.1 Conclusion**

The objective of this project was to provide a stable water supply in Oujda, Taourirt and El Aioun in the Eastern Region, and in Safi in the Western Region of Morocco as well as to conserve ground water in the area surrounding Oujda by new construction and an extension of existing water supply facilities.

The project was highly relevant to Morocco's development plan and development needs, as well as to Japan's ODA policy, and therefore its relevance is high. The water served population, the average and maximum water supply volume and the average water supply volume per person were improved. The percentage of water serving the population was enhanced to more than 90% in the four target cities of the project. Also, the long hours of water outage in the summer season when demand for water was the highest in the year were substantially reduced after project implementation. Thus, the first project objective, that is, a stable water supply, was largely achieved. However, the second objective, that is, conservation of ground water in the area surrounding Oujda has not yet been achieved as the quantity of intake water from ground water in Oujda, Taourirt and El Aioun has not met the target even though there was a reduction in the utilization of ground water in the three cities after project implementation. Overall, however, the project positively contributed to the improvement of people's living conditions in the project target area. Thus, its effectiveness is fair.

Although the project cost was within the plan, the project period was longer than planned, and thus project efficiency is fair. Project sustainability is deemed high in the structural, technical and financial aspects, and the operation and maintenance condition of project facilities and equipment is good.

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

### **4.2 Recommendations**

#### **4.2.1 Recommendations to the Executing Agency**

The serious problem of water outages in peak seasons/hours was greatly improved in the target four cities as the percentage of the water served population, the average and maximum water supply volume and the average water supply volume per person were improved due to expansion of water supply capacities. However, this problem has not been totally alleviated as there are still temporary water outages in the summer time. A continuous increase in water demand is expected in the target areas with progress in urbanization and population growth. In this regard, ONEE (Water Branch) in collaboration with RADEEO and RADEES is expected to cope with this issue by improving the efficiency of the water transmission and distribution network, including reducing water loss.

In the Oujda Portion, the quantity of intake water from the dam was restricted due to

damage to the water conveyance pipe. However, this problem was solved in April 2013 by maintenance work on the damaged section. ONEE (Water Branch) is expected to take necessary measures for the conservation of ground water in Oujda, Taourirt and El Aioun in collaboration with the concerned agencies such as RADEEO and the Agency of the Hydraulic Basin, Ministry of Energy, Mining, Water and Environment, which controls the dams.

#### 4.2.2 Recommendations to JICA

None.

### 4.3 Lessons Learned

The delay in the signing of the Contract Program between the Moroccan government and the executing agency and the delay in the Special Agreement between RADEEO and the executing agency were the reasons for the prolonged project implementation period. If a project requires preconditions such as the signing of contracts and agreements with the Moroccan government as well as with concerned agencies, it will be necessary to estimate a realistic and feasible project implementation schedule after carefully examining the maturity of consensus building among the stakeholders and the expected time frames up to the signing of the contracts and agreements, during the project planning stage.

End

## Comparison of Original and Actual Scope

Item	Plan	Actual
<b>1. Project Outputs</b>		
<b><u>Oujda Portion</u></b>		
a) Water Intake Facility	Capacity: 1,050 litre/second	Same as plan
b) Water conveyance pipe	3km (PS1-PS2) Capacity: 1,050 litre/second	Same as plan
c) Pumping Station (PS)	4 units	
d) Water Pipe	Total length: 124.5 km • PS2-PS3: 17.6 km • PS3-PS4: 12.4 km • PS4-Oujda: 58.5 km • Branch pipe to Taourirt: 34 km • Branch pipe to El Aioun: 2 km	Mostly same as plan
e) Water Purification Plant (WPP)	Rapid filtration system Capacity: 1,050 litre/second	Same as plan
f) Reservoir	Oujda: 2 units (10,000 m <sup>3</sup> + 4,000 m <sup>3</sup> ) Taourirt: 1 unit (10,000 m <sup>3</sup> )	Same as plan
<Additional Scope> g) Rural Water Supply System	—	Rural water supply system at 134 communities near Oujda (Installation of public water tap and water pipes)
<b><u>Safi Portion</u></b>		
a) Extension of existing WPP	Capacity: 190 litre/second (extension)	Same as plan
b) Rehabilitation of ➤ Takabrote PS ➤ Ain Thami PS	Replacement of pumping machine Replacement of control panel and water hammer prevention device	Same as plan Cancelled
c) Water Pipe	1.9 km (Takabrote PS - RADEES 5,000 m <sup>3</sup> reservoir) Capacity: 350 litre/second	Same as plan
<Additional Scope> d) Water Pipe	-	4.4 km (Takabrote - WPP)
Consulting Services	34 M/M	54 M/M
<b>2. Project Period</b>	February 1997 – April 2000 (39 months)	December 1997 – February 2012 (171 months)
<b>3. Project Cost</b>		
Amount paid in foreign currency	4,183 million yen	1,090 million yen
Amount paid in local currency	7,816 million yen (620.3 million dirham)	9,603 million yen (801 million dirham)
Total	11,999 million yen	10,693 million yen
Japanese ODA loan portion	9,000 million yen	7,588 million yen
Exchange rate	MAD 1 = JPY 12.6 (as of November 1996)	MAD 1 = JPY 11.99 (Average between 2007 and 2011)