

Islamic Republic of Mauritania

Ex-post evaluation of Japanese Grant Aid Project

“Water Supply Project in the Southern Region in the Islamic Republic of Mauritania”

*(Projet d’Approvisionnement en Potable dans la Région Austale en République Ismamique de Mauritanie)*

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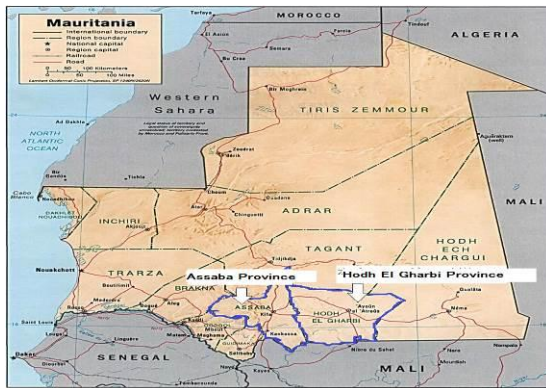
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## **0. Summary**

This project developed water supply facilities and procured survey and maintenance equipment and introduced an operation and maintenance system by community participation for the purpose of a sustainable safe water supply in 47 villages in Hodh El Gharbi Province and Assaba Province. The project objective is consistent with the development policy and development needs of Mauritania as well as with Japan’s ODA policy; therefore its relevance is proved to be high. In addition, the actual percentage of the population that was provided with water, as well as constructed water facilities, through the implementation of the project reached more than 90% of the target value. As a result, expected positive effects of the project were confirmed, such as the following: the waterborne disease rate in the project target areas has decreased, and opportunities to effectively utilize time for daily activities by reduced water-fetching workload have increased. On the other hand, effects of the project are limited compared to the initial plan in terms of improvement of operation and maintenance of boreholes with foot pumps and water supply facilities (hereinafter called “Level 1 water supply facilities”) and improvement of water quality survey technology of the implementing agency. Thus, the effectiveness and impact of the project is fair. Both the project cost and project period were within the plan. Therefore, efficiency of the project is high. While the functioning rate of water supply facilities constructed by the project is relatively good, as shown by the figure of 76% at the time of the ex-post evaluation, operation and maintenance of the facilities leave room for improvement in many ways, such as personnel deployment and financial capacity of the National Office for Rural Water Service (*Office National des Services d’Eau en milieu Rural*, hereinafter called “ONSER”), which is a central organization of maintenance of rural water supply facilities; personnel deployment, technical and financial capacity of community organizations for Level 1 water supply facilities and a system for implementing water quality monitoring. Thus, the sustainability of the project effect is fair.

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

## 1. Project Description



Project Locations



Water Supply Facility Constructed by the Project

### 1.1 Background

In Mauritania, two-thirds of the territory is covered by the Sahara Desert. The country was in a state of chronic water shortages because of repeated drought. In particular, people in rural areas were forced to get water from unsanitary water sources such as shallow wells, swamps and rainwater. Unsanitary water use was one of the main causes of waterborne diseases such as diarrhea and parasites like guinea worm, causing high mortality and morbidity of infants in the country. In addition, women and children in rural areas traveled long distances in search of drinking water. Such harsh labor deprived children from opportunities for education.

Hodh El Gharbi Province and the eastern parts of Assaba Province, target areas of the project are situated in the inland area of Mauritania, 600–800 km from Nouakchott, the capital of the country. The proportion of the poor is relatively high in these provinces. In addition, the safe water supply coverage in rural areas was very low. The people were forced to migrate to get drinking water and water for livestock or to go on with the cattle to Mali nomadically. Such unstable water situations were not only an obstacle to securing health conditions and stable livelihoods of residents but also had a significant impact on social and industrial development and adverse effects, such as concentration of population to urban areas.

Amid such situations, the government of Mauritania requested grant aid from the Japanese government to construct water supply facilities in Hodh El Gharbi Province and the eastern part of Assaba Province for the purpose of a sustainable safe water supply.

### 1.2 Project Outline

The objective of this project was to increase the safe and stable water supply coverage by constructing water supply facilities and procuring survey and maintenance equipment in the 47 target sites in Hodh El Gharbi Province and the eastern part of Assaba Province, thereby contributing to the improvement of living conditions of the local residents.

Grant Limit / Actual Grant Amount	617 million yen / 587 million yen
Exchange of Notes Date (/Grant Agreement Date)	Phase 1/2: June, 2004 Phase 2/2: July, 2005
Implementing Agency	Direction of Water Supply, Ministry of Water Supply and Sewerage ( <i>Direction Hydraulique/Ministère de l'Hydraulique et de l'Assainissement</i> )
Project Completion Date	Phase 1/2 : March, 2006 Phase 2/2 : February, 2007
Main Contractor(s)	Koken Kogyo Co., Ltd.
Main Consultant(s)	Kokusai Kogyo Co., Ltd.
Basic Design	May, 2004
Detailed Design	Phase 1/2: December, 2004 Phase 2/2: N/A
Related Projects	<p><u>Technical Cooperation</u></p> <p>(1) Study on groundwater development for Kiffa city (1997-1999)</p> <p>(2) Study on the development of the Oasis zone (2001-2004)</p> <p>(3) Dispatch of expert in water resources development (1999-2001)</p> <p><u>Grant Aid Projects</u></p> <p>(1) Rural water supply project in south-central region (1993-1997)</p> <p>(2) Drinking water supply project for the eradication of Guinea worm (First Phase) (1997-1998)</p> <p>(3) Project for construction of drinking water supply facilities in the city of Kiffa (2002-2003)</p> <p><u>Other donors</u></p> <p>(1) Construction of boreholes and installation of hand pumps in Assaba province and Hodh El Gharbi province and another province (African Development Bank, Government of Mauritania (1992-2001))</p> <p>(2) Construction and rehabilitation of shallow wells, construction of boreholes in Assaba province, Hodh El Gharbi province and other eight provinces (French Development Fund (1993-1999))</p>

## 2. Outline of the Evaluation Study

### 2.1 External Evaluators

Hisae Takahashi, Ernst & Young Sustainability Co., Ltd.

Maki Hamaoka, Ernst & Young Sustainability Co., Ltd.<sup>1</sup>

<sup>1</sup> Joined the evaluation team of Ernst & Young Sustainability Co., Ltd. as a team member from Foundation for

## 2.2 Duration of Evaluation Study

Duration of the Study: October 2014 - August 2015

Duration of the Field Study: January 21, 2015 - February 9, 2015 (by the local consultant), April 15, 2015 - April 19, 2015

## 2.3 Constraints during the Evaluation Study

- (1) The Basic Design study confirmed that existing wells in the project target area had problems in water quality such as water contamination by nitrate-nitrogen and salinization. Therefore, it was important to ensure a safe water supply through regular water quality monitoring even after the construction of new boreholes<sup>2</sup>. In the project, equipment for water quality analysis was put in place in the Regional Direction of the Direction of Water Supply of the Ministry of Water Supply and Sewerage (*Direction Régionale de l'Hydraulique et de l'Assainissement*, hereinafter called as "DRHA") based on the plan that the DRHA would conduct water quality monitoring regularly. However, the water quality monitoring has been rarely conducted. Therefore, "sustainable safe water supply," one of the viewpoints to evaluate the effectiveness and impact of the project could not be evaluated based on the result of the water quality monitoring. In this ex-post evaluation, "safe water" is judged based on Mauritanian and international standards of safe drinking water<sup>3</sup>.
- (2) As stated in 3.3.2 below, the project supported establishment of an operation and maintenance system by community participation through soft component activities. However, it was confirmed that effects have not been obtained as expected. Since the ex-post evaluation was conducted nearly 10 years after the project completion, it was not easy to contact concerned parties such as staff of the implementing agency and members of community organizations who knew situation of the project implementation stage and subsequent stage. Since the ex-post evaluation team had to follow memories of the above parties to verify project-related information, it was difficult to analyze in detail reasons why soft component activities produced limited effects.

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Advanced Studies on International Development

<sup>2</sup> Water quality monitoring recommended by the project included the measurement of salt density, nitric nitrogen, fluorine, iron and manganese density by simple water analysis equipment, measurement of salt contained in the water by conductance meter and observation of penetration of contaminated water from the surface with an oxidation-reduction potential (ORP) meter (Source: Basic Design study report).

<sup>3</sup> In evaluating one of the Millennium Development Goals, "Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation," safe drinking water refers to water from improved water sources. As definition, to monitor and evaluate the trends of this goal, an improved drinking water source is one that, by the nature of its construction, adequately protects the source from outside contamination, particularly fecal matter. An improved water source includes piped water, public tap/standpost, tubewell/borehole, protected dug well, protected spring and rainwater. Less safe water sources, namely, an unimproved drinking water source, refers to an unprotected dug well, unprotected spring, river, lake, pond, irrigation channels and canals (Source: *Progress on drinking water and sanitation 2014 updated* (World Health Organization and UNICEF 2014)).

### 3. Results of the Evaluation (Overall Rating: B<sup>4</sup>)

#### 3.1 Relevance (Rating: ③<sup>5</sup>)

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

The government of Mauritania placed the top priority on the improvement of the access to drinking water at the planning stage. With regard to the national development plan, the government of Mauritania formulated the “Strategic Framework for Poverty Reduction” (*Cadre Strategique de Lutte contre la Pauvreté (CSLP)*) in December 2000, which stated its medium- and long-term development goals to be achieved in the period of 2001–2015. The CSLP included water supply and sanitation as one of the five priority development areas.

With regard to the water sector policy, the National Water Supply Program (2001) stated goals of the construction of at least one modern water supply facility in all villages of over 150 inhabitants and water supply facilities providing more than 20 liters per person per day in all villages of over 500 inhabitants by 2015.

The improvement of the access rate to drinking water remained a top priority at the time of ex-post evaluation. The second CSLP (2006-2010), which was revised in 2007, included “education,” “health,” “water” and “infrastructures” as the most prioritized four sectors. Having been revised in January 2010, the third CSLP (2011-2015) placed a priority on the water sector. With regard to the water sector policy, the “Development Strategy for the Water and Sanitation Sector” (*Stratégie de Développement du Secteur de l’Eau et de l’Assainissement*), which was established in 2012, stated the national objective to increase drinking water supply coverage in rural areas from 52% in 2010 to 74% in 2015. In order to achieve this objective, the national program for the access to drinking water is being implemented by introducing renewable energy for a sustainable water supply.

In light of the above, the project, which aimed at sustainable safe drinking water supply through construction of water supply facilities, has been highly relevant to the national development plan and water sector plan of the government of Mauritania.

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

At the planning stage, the percentage of the poor in Assaba Province and Hodh El Gharbi Province was higher than in other provinces in Mauritania. The safe water supply coverage in rural areas was about 8% in 2000, which is lower than the national average (41% in 1999). This unstable water supply affected the health of residents and the assurance of stable living bases.

At the time of ex-post evaluation, the safe water supply coverage was 49.6% as a national average, 52.3% in urban areas and 47.7% in rural areas in 2012<sup>6</sup>. The six priority provinces to

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<sup>4</sup> A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

<sup>5</sup> ③: High, ②: Fair, ①: Low

<sup>6</sup> Source: *MDG Report 2014: Assessing Progress in Africa toward the Millennium Development Goal*

improve the safe water supply coverage included Assaba Province and Hodh El Gharbi Province<sup>7</sup>. In light of the above, the development needs for the construction of water supply facilities are high at the time of the ex-post evaluation following the time of the ex-ante evaluation.

### 3.1.3 Relevance to Japan's ODA Policy

Japan has been supporting Mauritania to grow out of poverty to help socially and economically vulnerable people by improving basic human needs and developing basic socioeconomic infrastructure in terms of "poverty reduction" and "sustainable development," which are priority issues of Japan's ODA Charter (2003). Support to ensure safe drinking water was positioned as one of the priority sectors in the basic ODA policy to Mauritania along with basic education, health and fishery<sup>8</sup>. In addition, this project was implemented based on the then Japanese prime minister's announcement made at the Tokyo International Conference on African Development (TICAD) III held in Tokyo in September 2003 and is consistent with "human-centered development," which was one of the three pillars of African development: namely, 1) human-centered development aid, 2) poverty reduction through economic growth and 3) consolidation of peace.

In light of the above, the project, which aimed to support to ensure safe drinking water and improvement of living conditions, was highly relevant to the Japan's ODA policy at the time of ex-ante evaluation.

### 3.1.4 Appropriateness of the Project Plan and Approach

In this project, there was concern that water quality would be deteriorated due to secondary contamination along with the groundwater use, considering natural conditions such as geology and climate of the target area<sup>9</sup>. Therefore, the DRHA was expected to monitor water safety continuously through regular monitoring of water quality after the project completion for the purpose of maintaining the project objective that was "sustainable safe water supply." In the project implementation stage, the consultant in charge conducted a technology transfer briefing on the use of water quality survey equipment with DRHA staff. However, the ex-post evaluation found that water safety had not been monitored since the above equipment procured had not been fully utilized and water quality monitoring had been rarely implemented<sup>10</sup>. The main reasons are the following:

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<sup>7</sup> Source: Results of the questionnaires

<sup>8</sup> Source: ODA Data Book 2003, Ministry of Foreign Affairs

<sup>9</sup> The results of the evaluation of ground water quality of existing wells of the target area in the Basic Design study showed the following characteristics: (1) There were existing wells contaminated with nitrate ion and nitrite ion due to livestock excreta; (2) sandy ground of the surface part had a high permeability, and precipitation and drainage rainwater penetrated the ground along with contaminants and (3) salts integrate easily due to a large amount of evaporation as a dry land peculiar phenomenon (Source: Basic Design study report).

<sup>10</sup> Among different equipment for water quality survey put in place in the DRHA of Assaba Province, the pH meter and the conductance meter have been sometimes used and the simple water quality analysis equipment and the ORP meter have not been used due to the lack of staff, budget and means of transportation. The equipment put in place in the DRHA

- (1) In Mauritania after the water sector reform in 2002, operation and maintenance services of constructed water supply facilities became duties of an organization in charge of operation and maintenance, which was the National Agency for Water Supply and Sewerage (*Agence Nationale de l'Eau Potable et de l'Assainissement*, hereinafter called “ANEPA”) until May 2010 and the ONSER after June 2010. Monitoring of water quality has been considered the jurisdiction of the ANEPA or the ONSER. However, through the Basic Design study implemented in 2004, the concerned parties of Japan and Mauritania agreed that water quality monitoring after the project completion would be the responsibility of the DRHA of the target two provinces, located in the respective provincial capitals. In addition, in the implementation stage, the Japanese consultant explained operation of the water quality survey equipment to DRHA staff, and the water quality survey equipment was put in place in the DRHA. In this regard, the organization where the water quality survey equipment was put in place was not consistent with the duties of water-related organizations.
- (2) Water quality is evaluated when boreholes are newly constructed. It is, however, rarely tested in the operation stage of water supply facilities in Mauritania<sup>11</sup>. It seems that the importance of regular water quality monitoring was not fully recognized by officials in the water sector in Mauritania. An implementation system for water quality monitoring has not been established.
- (3) A detailed plan to use the equipment in the future that includes frequency, executor, necessary reagents and methods for collecting, management of monitoring the results and sharing among parties concerned was not prepared at the planning and the implementation stages, and the technology transfer from the Japanese consultant to the staff of the DRHA of the target provinces was limited to the use of the equipment. Thus, a mechanism to implement water quality monitoring by the DRHA after the project completion was not established.
- (4) Opportunities for provincial offices of the ONSER to conduct an inspection of water supply facilities in the field have been limited due to the lack of budget, personnel and means of transportation. In particular, a field visit has been not conducted except for repair of damaged facilities with regard to the Level 1 water supply facilities.

In light of the above, the project plan and approach to achieve a sustainable safe water supply seemed insufficiently considered.

Although some problems were observed with respect to the appropriateness of the project plan and approach, as described in 3.4 Impact, they do not affect the relevance of the project from the viewpoint that boreholes are internationally classified as “safe water” and they have been used in the project target area. This project has been highly relevant to Mauritania’s development plan and development needs as well as Japan’s ODA policy. Therefore its relevance is high.

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of Hodh El Gharbi Province has not been used due to the lack of staff, budget and means of transportation (Source: questionnaires).

<sup>11</sup> Water quality is tested in cases when users of water supply facilities raise the problem (Source: Interviews with the implementing agency (April 30, 2015)).

### 3.2 Efficiency (Rating: ③)

#### 3.2.1 Project Outputs

A total of 40 Level 1 water supply facilities were constructed by the project, as planned. With regard to the boreholes with motor pumps and water supply facilities including elevated water tanks (hereinafter called “Level 2 water supply facilities”), a total of five against the planned seven facilities were constructed. As total output of Level 1 and Level 2 water supply facilities, 45 water supply facilities were constructed against the planned 47 facilities. The actual number of constructed water supply facilities is 96% of the planned number (see Table 1). The difference between the planned outputs and the actual outputs was caused by the following: as a result of the Detailed Design of Phase 2/2, it was found that a water supply facility had been constructed in one of the target villages in Hodh El Gharbi Province and a water supply facility was being constructed in another village in the same province<sup>12</sup>; however, as a result of discussion between the Mauritanian government and the Japanese consultant, two sites were reduced without replacing them with alternative sites. When constructing a new water supply facility, it is necessary to coordinate to avoid overlapping of target sites of the project and those of projects of other organizations. However, the coordination among different ministries seemed difficult in Mauritania due to frequent mergers and abolitions of ministries. There was a problem with the coordination capacity of the implementing agency, considering that the lack of coordination among different ministries caused decrease in outputs. Even so, the site reduction was a reasonable decision as far as overlapping of the same facilities in the same village was avoided for when water supply needs were met.

Table 1 Project Outputs for Facilities (Comparison between Planned and Actual Values)

Type of facility	Planned Value			Actual Value			Achievement
	Phase 1/2	Phase 2/2	Total	Phase 1/2	Phase 2/2	Total	
1. Level 1 water supply facilities							
Assaba	14		14	14		14	100%
Hodh El Gharbi	1	25	26	1	25	26	100%
Level 1 Total	15	25	40	15	25	40	100%
2. Level 2 water supply facilities							
Assaba	1		1	1		1	100%
Hodh El Gharbi	1	5	6	1	3	4	67%
Level 2 Total	2	5	7	2	3	5	71%
Total	17	30	47	17	28	45	96%

Source: Documents provided by JICA

<sup>12</sup> A water supply facility had been constructed in one of the target villages in Hodh El Gharbi Province in May 2005 with funding from the wealthy class of the village after the Basic Design study. In another village, a water supply facility was being constructed by an affiliated organization of the Ministry of Economic Development of Mauritania since November 2004 (Source: Documents provided by JICA).



With regard to the procurement of equipment, survey equipment for borehole construction and maintenance equipment for operation and maintenance of constructed water supply facilities were procured as planned (see Table 2).

Table 2 Project Outputs for Equipment (Comparison between Planned and Actual Values)

Item	Planned Quantity	Actual Quantity
1. Survey equipment		
Borehole logging device	1	1
Submersible pump for pumping test	1	1
Generator for pumping test	1	1
Simple water quality analysis equipment	2	2
2. Maintenance equipment		
Pick-Up	2	2

Source: Documents provided by JICA

In addition, this project planned to introduce awareness-raising activities (hereinafter called “soft component”), aiming to establish the operation and maintenance system of constructed water supply facilities by local residents of the target villages. Based on this plan, formation of users organizations, awareness-raising activities for users on the importance of community-based operation and maintenance of water supply facilities, and technical training on daily check and minor repair of water supply facilities were implemented as planned.

The inputs of the Mauritanian side included land acquisition and leveling works for construction and installation of fences around the Level 1 water supply facilities<sup>13</sup>. The former was implemented without any problem. On the other hand, with regard to the latter, fences were installed in 25 out of 40 facilities at the time of the inspection after a one-year guarantee. The achievement level was 63%. Reasons for non-installation of fences are assumed as follows:

- (1) In the construction stage, the Japanese consultant and the implementing agency instructed users to install fences after all construction works finished. However, opportunities to verify the status of fences were limited since the Japanese consultant rarely visited target villages after the completion of construction works.
- (2) After constructed facilities started their operation, the ANEPA, an agency in charge of operation and maintenance at that time, rarely implemented field inspection of the Level 1 water supply facilities, and the ANEPA did not continuously encourage users of Level 1 water supply facilities without fences to install fences.

The installation of a fence is necessary to prevent groundwater from direct contamination; excreta have not entered directly inside the facility because of its structure. In addition, since

<sup>13</sup> As part of awareness-raising activities, fences were planned to be installed by users under the direction of the Japanese consultant and the implementing agency (Source: Basic Design study report).

influence on the groundwater caused by excreta mixing into the ground through penetration from the surface takes time, it seemed that the non-installation of fences did not significantly affect the objective of the project, which was “sustainable supply of safe water,” at the time of project completion when achievement of outputs were verified. Thus, the non-installation of the fences was not taken into account in evaluating efficiency.

### 3.2.2 Project Inputs

#### 3.2.2.1 Project Cost<sup>14</sup>

With regard to the cost incurred by Japan with this project, the E/N grant limit was 617 million yen (290 million yen for Phase 1/2 and 327 million yen for Phase 2/2), yet the actual grant amount was 587 million yen (288 million yen for Phase 1/2 and 299 million yen for Phase 2/2), which was lower than initially planned (95% of the planned amount). When the project’s planned cost and actual cost are compared based on the decreased number of facilities with regard to the net construction cost<sup>15</sup> that directly affects the construction of facilities, the actual cost was 313 million yen, which was lower than the planned cost (322 million yen), making up 97% of the planned cost. The difference between the planned cost and the actual cost was caused by construction cost revision associated with the reduction of two sites in Phase 2/2, fluctuation changes and the difference between the ceiling cost of the tender and the contract cost for the construction works brought by the competitive logic of the tender.

#### 3.2.2.2 Project Period

The project was planned to be 32 months long. It was actually 32 months from June 2004 to February 2007 (100%), as planned.

Both the project cost and project period were within the plan. Therefore, efficiency of the project is high.

### 3.3 Effectiveness<sup>16</sup> (Rating:②)

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

##### (1) Increase of water supplied population as a result of this project

As described in Table 3, the actual number of people who were newly served with water

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<sup>14</sup> For this ex-post evaluation, only the costs of the Japanese side were compared since the data about the actual cost borne by the Mauritanian side was not available.

<sup>15</sup> The net construction, which is composed of direct construction cost and common temporary works cost, refers to cost directly necessary to implement construction works. When the project’s planned cost and actual cost are compared based on the decreased number of facilities with regard to the net construction cost, (1) the actual direct construction cost was 269 million yen (111 million yen for Phase 1/2 and 158 million yen for Phase 2/2) against the planned direct construction cost, which was 278 million yen (111 million yen for Phase 1 and 166 million yen for Phase 2), and (2) the actual temporary works cost was 44 million yen (30 million yen for Phase 1/2 and 14 million yen for Phase 2/2) against the planned temporary works cost, which was 44 million yen (30 million yen for Phase 1/2 and 14 million yen for Phase 2/2).

<sup>16</sup> Sub-rating for Effectiveness is to be put with consideration of Impact.

through this project was 23,145 at the time of the project completion (2006 and 2007). Although it is slightly less than the original target value of 24,454, as set out in the Basic Design study, it reached 95% of the planned target. Therefore, the intended target value of this project was largely achieved. The actual number being slightly lower than the target was because borehole constructions were reduced by two of the Level 2 facilities in Hodh El Gharbi Province as a result of the Detailed Design in Phase 2/2, as stated in 3.2.1. The planned target water-supplied population after removal of the excluded two sites was 22,489, which is 103% of the actual number of people of 23,145 as of the project completion. In light of the above, effects of the project are worth outputs of the project, and the target value was achieved as expected.

Table 3 Water-supplied Population and Functioning rate of the Constructed Facilities in the Project Target Villages<sup>17,18</sup>

Indicator	Target	Result							
	(2006)	Project completion (Phase 1/2:2006, Phase 2/2:2007)		Inspection survey (Phase 1/2:2006, Phase 2/2:2007)		Ex-post evaluation (2015)			
	Pop. served with water	No. of facility	Pop. served with water	No. of functioning facility	Functioning rate	No. of facility	No. of functioning facility	Functioning rate	Pop. served with water
<u>Level 1 water supply facilities</u>									
Assaba	5,892	14	6,187	13	93%	6	6	100%	3,059
Hodh El Gharbi	12,778	26	12,898	23	88%	20	12	60%	6,147
Level 1 Total	18,670	40	19,085	36	90%	26	18	69%	9,206
<u>Level 2 water supply facilities</u>									
Assaba	1,197	1	1,175	1	100%	9	7	78%	5,237
Hodh El Gharbi	4,587	4	2,885	4	100%	10	9	90%	6,016
Level 2 Total	5,784	5	4,060	5	100%	19	16	84%	11,253
Total	24,454	45	23,145	41	91%	45	34	76%	20,459

Source: Target: Basic Design study report (2004), Result (2006) (2006) (2007): Documents provided by JICA, Result (2015): Documents provided by the implementing agency.

## (2) Functioning rate of the facilities

As shown in Table 3, functioning rates of the facilities at the time of project completion, inspection survey and ex-post evaluation are the following, respectively: (1) with regard to Level 1 water supply facilities, 100% (40/40 facilities), 90% (36/40 facilities) and 69% (18/26 facilities); (2) with regard to Level 2 water supply facilities, 100% (5/5 facilities), 100% (5/5 facilities) and 84% (16/19 facilities, 89% (8/9 solar-powered facilities) and 80% (8/10 generator-powered

<sup>17</sup> In the ex-post evaluation, for the purpose of grasping whether constructed water supply facilities are utilized effectively or not, non-functioning facilities are defined as the following; (1) facilities out of operation at the time of the ex-post evaluation and (2) facilities which were in operation but were not utilized.

<sup>18</sup> 14 out of 40 Level 1 water supply facilities constructed through the project were upgraded to Level 2 water supply facilities after the project completion with support from the government of Mauritania, other donors such as the World Bank, GIZ and NGOs. Background factors for this change were that Government of Mauritania announced in 2009 a policy to upgrade Level 1 water supply facilities to Level 2 water supply facilities gradually due to problems that financial capacity of community organizations was not sufficient and some spare parts were not available. Through such a government policy, the number of Level 1 water supply facilities decreased from 40 to 26 and that of Level 2 water supply facilities increased from 5 to 19 from the project completion to the ex-post evaluation.

facilities)); and (3) the total functioning rate of Level 1 and 2 water supply facilities was 100% (45/45 facilities), 91% (41/45 facilities) and 76% (34/45 facilities).

The average functioning rate of Level 1 water supply facilities is 50% in Mauritania. Although the functioning rates at the time of inspection survey and ex-post evaluation were much higher than the national average, it did not reach the target value (80%) set by the Ministry of Water Supply and Sewerage. Therefore, the functioning rate of Level 1 facilities is moderate.

With regard to the Level 2 water supply facilities, the national average functioning rate is 98% for solar-powered facilities and 75% for generator-powered facilities. The target value set by the Ministry of Water Supply and Sewerage is 90% for solar-powered facilities and 80% for generator-powered facilities. In this regard, the functioning rate of Level 2 water supply facilities constructed through the project is nearly equal to the national average. The overall functioning rate of water supply facilities constructed through the project is high from the project completion to the ex-post evaluation. In this respect, project effects have been maintained at the time of the ex-post evaluation.

Causes of nonfunction of Level 1 water supply facilities were the following: (1) water from the boreholes constructed through the project was salty in three facilities which were left unused<sup>19</sup> and (2) malfunction of pumps in five facilities. Users of nonfunctioning Level 1 water supply facilities used traditional shallow wells or Level 2 facilities near to or in the same villages<sup>20</sup> as alternative sources. Causes of nonfunctioning of Level 2 water supply facilities were malfunction of electric systems, such as generator and switchboard, in two facilities and malfunction of the pump in one facility. Users of nonfunctioning Level 2 water supply facilities used protected shallow wells near to or in the same villages during the period of facilities being out of operation.

### 3.3.2 Qualitative Effects

#### (1) Sustainable safe water supply<sup>21</sup>

##### 1) Change in water sources used by the target population

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<sup>19</sup> One of these 3 sites was not a target of the field survey of the ex-post evaluation. Therefore, the reason for non-utilization of the facility was based on the interview with the implementing agency.

<sup>20</sup> A traditional shallow well is located in the 2-10 meters of shallow ground water level. Since the well wall is encased in wood and straw, this type of well is collapsed easily and another well is then dug frequently (Source: Basic Design study report).

<sup>21</sup> In this project, with respect to the Level 1 water supply facilities, the installation of the fence was planned in order to avoid the effects of direct groundwater contamination by excreta of livestock. In order to evaluate the use of safe water more strictly, it should be evaluated whether the fence has been functioning effectively in ensuring water quality safely at the time of the ex-post evaluation, however, the safe water was evaluated mainly based on the definition of safe drinking water that is used in Mauritania and internationally, as described in 2.3 in consideration of the following. As stated in 3.2.1, the installation of fence was not completed in some of the target sites at the time of inspection survey. Among the 19 Level 1 water supply facilities as of the ex-post evaluation, the fence was not installed in six facilities at the time of inspection survey. Among these six facilities, five facilities were broken or not utilized without fence. With regard to the one functioning facility, the installation of fence was not verified since this facility was not visited through the field survey of the ex-post evaluation and information on the fence was not available from the implementing agency. In addition, the fence was not verified with regard to 13 Level 1 water supply facilities since the field survey of the ex-post evaluation Study prioritized water supply facilities for which fences were not installed at the time of the inspection survey and facilities for which fences had been installed at the time of the inspection survey were not surveyed.

As a result of study on drinking water sources before and after the project through a beneficiary survey<sup>22</sup>, 80% of interviewed households used protected shallow wells in both the rainy season and dry season. In addition, about 20% used traditional shallow wells and hand-dug wells<sup>23</sup> which are classified as less safe water sources<sup>24</sup>. About 30% of the interviewed households used those less safe water sources in the dry season. The ex-post evaluation study confirmed that none of the interviewed households used less safe water sources both in the rainy and the dry seasons and that 90% of the interviewed households used safer water sources that are water supply facilities with boreholes, such as communal taps, yard connections and hand pumps (see Figures 1 to 4).

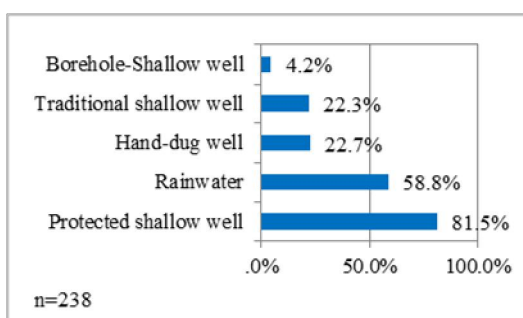


Figure 1 Water Sources in the Rainy Season Before the Project (Multiple Answers)

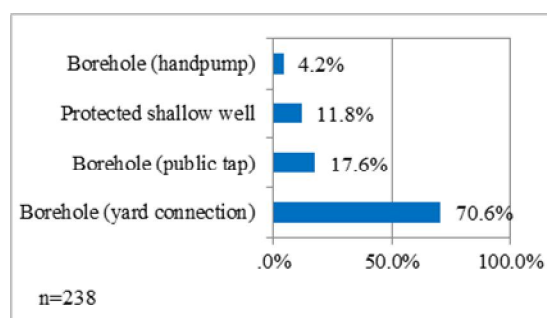


Figure 2 Water Sources in the Rainy Season After the Project (Multiple Answers)

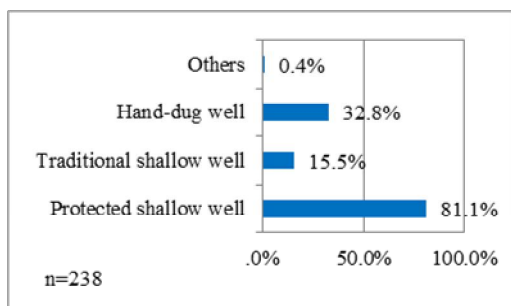


Figure 3 Water Sources in the Dry Season Before the Project (Multiple Answers)

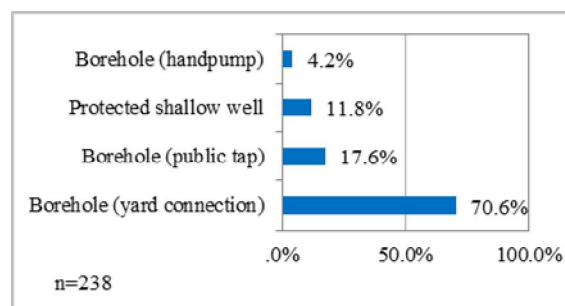


Figure 4 Water Sources in the Dry Season After the Project (Multiple Answers)

Source: Results of the beneficiary survey

<sup>22</sup> The beneficiary survey targeted 19 water supply facilities in total: six Level 1 water supply facilities and 13 Level 2 water supply facilities (eight generator-powered facilities and five solar-powered facilities) among 45 facilities constructed through the project. Target facilities were selected based on the following criteria: (1) easier to access from the provincial capital in consideration of time constraints and (2) the fence was not installed at the time of the inspection survey. Users of the above targeted facilities were interviewed based on the questionnaire. Samples of the survey were selected at random from residents who lived in the target villages before the project. Sampling size was 238. The breakdown of respondents is 161 males and 77 females. The age composition is the following: four samples from respondents 20-29 years old, 40 samples from respondents 30-39 years old, 68 samples from respondents 40-49 years old, 72 samples from respondents 50-59 years old, 48 samples from respondents 60-69 years old and 6 samples from respondents over 70 years old.

<sup>23</sup> Simple holes dug in low grounds or wadi where people get water from the surface (Source: Basic Design study report)

<sup>24</sup> See footnote 3.

## 2) Change in water consumption

While 80% of the respondent families used less than 20 liters of water per day on average before the project, more than 80% of respondent families used more than 20 liters of water at the time of the ex-post evaluation. Improvement was confirmed in quantitative terms.

### (2) Water quality monitoring to ensure safe water and utilisation of the monitoring result

As stated in 3.1.4, the equipment for water analysis was procured through the project in order to continuously check the safety of water quality as drinking water through regular monitoring of water quality with the goal of ensuring the project objective, which is “sustainable safe water supply.” However, the above equipment was used in a limited manner, and the monitoring of water quality has been rarely implemented. In this regard, effects intended at the planning stage were not produced with regard to the water quality monitoring and utilization of the monitoring result. The reasons for this include the equipment was put in place in the organization which was not consistent with the job description of organizations of the water sector and a concrete system of monitoring of water quality was not established before the project completion.

### (3) Improvement in operation and maintenance of Level 1 water supply facilities

At the planning stage, it was recognized as an issue that, with regard to operation and maintenance of Level 1 water supply facilities in particular, water supply facilities were not well repaired when they were broken due to insufficient operation and maintenance by community participation since methods to organize user groups composed of residents and those to conduct technical trainings for them had not been established. In order to avoid such an issue, in the implementation stage of the project, a water point committee formed for each water point (hereinafter called “WPC”), and a village water committee formed at the village level (hereinafter called “VWC”). A facility utilization plan was developed with prospective users as well as training on accounting, and technical training on daily inspection of water supply facilities and repair of minor breakdowns was implemented through soft component activities.

In the ex-post evaluation, improvement in operation and maintenance of Level 1 water supply facilities was evaluated based on the following: 1) frequency of meetings of the VWC and the WPC, 2) frequency of cleaning around water supply facilities and 3) frequency and content of daily inspection of water supply facilities by caretakers.

#### 1) Frequency of VWC and WPC meetings

At the time of the ex-post evaluation study, the field survey on some of the water supply found that the VWC and the WPC did not exist and that regular meetings of the VWC and the WPC were not held<sup>25</sup>. Assumed reasons of this phenomenon are the following. The soft component did not

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<sup>25</sup> In addition to the Level 1 water supply facilities directly verified through the field survey of the ex-post evaluation, a VWC and WPC also did not exist in most of the Level 1 water supply facilities, and regular meetings of these

spend enough time to organize a VWC and WPC. As a result, the right people were not selected. One training session was not sufficient for VWC and WPC members who attended the training to understand role of VWC and WPC members fully. The ANEPA, an organization in charge of operation and maintenance at the time of the project completion, did not make periodical follow-ups on operation and maintenance by the VWC and the WPC sufficiently<sup>26</sup>.

## 2) Frequency of cleaning around water supply facilities

With regard to six water supply facilities surveyed, cleaning was not implemented in five nonfunctioning facilities. It was rarely implemented in Level 1 facility since the facility was rarely used<sup>27</sup>. According to an interview conducted in the field survey of the ex-post evaluation, cleaning was implemented twice a week when water supply facilities were in operation.

## 3) Frequency and content of daily inspection of water supply facilities by caretakers

According to the operation and maintenance manual developed through soft component activities, the function of the pump and the discharge volume (whether discharged water is enough or not) are to be verified every six months as regular inspection. Such a regular inspection has not been implemented in the six facilities directly verified. Assumed reasons are that since technical intervention in Level 1 water supply facilities has been limited in the same type of facilities in Mauritania except for repair of malfunctioning facilities, the necessity of preventive maintenance was not well recognized by the ONSER and users of water supply facilities<sup>28</sup>. Under such circumstances, only soft component activities were not sufficient to make VWC and WPC members recognize the importance of regular inspection of the facility.

In light of the above, effects are produced in limited manner with regard to operation and maintenance of Level 1 water supply facilities.

## (3) Improvement of survey technology of the implementing agency

At the planning stage, improvement of borehole survey technology and water quality survey technology was listed as one of the intended project effects. The Basic Design study found that the borehole survey equipment of the implementing agency was decrepit, and the borehole survey technology was particularly poor in the rock site where the success rate of borehole drilling was low. With regard to water quality survey technology, while the necessity of regular water quality monitoring to ensure sustainable safe water supply was recognized, the implementing agency did not have water quality survey equipment and the experience of the above survey. Thus, the project

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committees have not been held (Source: Interview with the implementing agency).

<sup>26</sup> Source: Interview with the implementing agency (January, 2015).

<sup>27</sup> This functioning Level 1 water supply facility was used only when the Level 2 water supply facility constructed in the same village was out of operation (Source: Interview with residents of village at the time of field survey).

<sup>28</sup> With regard to Level 1 water supply facilities, the ONSER does not conduct periodical visits except for visits to respond to requests for repair of malfunctioning facilities by users (Source: Result of questionnaire survey).

was planned to procure the water quality survey equipment and to implement technology transfer of operation of the above equipment.

With regard to the improvement of borehole survey technology, the Japanese contractor conducted a technology transfer briefing on operation of a borehole logging device and submersible pump for pumping tests procured through the project for the drilling team of the implementing agency (4-5 persons in a team) during the construction period. After the project completion, when staff without knowledge on operation of the above equipment is newly assigned to the Direction of Water Supply, a technology transfer briefing is provided within the division. The ex-post evaluation study confirmed that the equipment, such as the borehole logging device and submersible pump for pumping tests, was effectively utilized in drilling new boreholes, ensuring sufficient water discharge<sup>29</sup>. In this regard, the borehole survey technology has been improved.

On the other hand, with regard to the water quality survey technology, although simple water quality analysis devices and water quality analysis measurement devices were procured following the above objective, effects were not produced as initially intended since the water quality analysis equipment has been used in a limited manner.

### **3.4 Impacts**

#### **3.4.1 Intended Impacts**

##### **(1) Decrease in the number of people affected by waterborne diseases<sup>30</sup>**

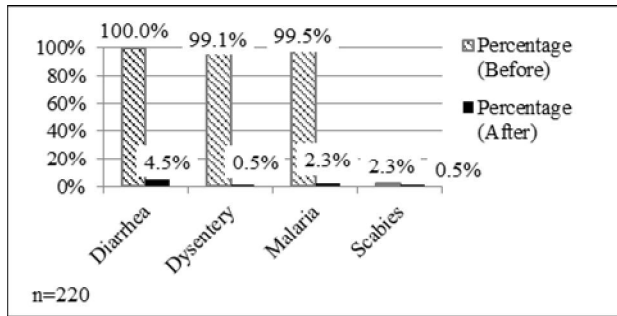
The result of the beneficiary survey showed that health condition improved largely in 92% of the respondents (220/238 households). In particular, a significant decrease was observed in the waterborne diseases such as diarrhea and dysentery (see Figures 5 and 6). Diarrhea and dysentery may be caused by factors other than water (unsanitary food, fecal-oral infection, etc.); it cannot be said categorically that only use of highly safe water contributes to the reduction of waterborne diseases. However, the project seems to contribute to the reduction of waterborne diseases to a certain degree in view of the point that households responding that there has been a change in health condition are users of boreholes and households responding that there is no change in health condition are users of protected shallow wells without using Level 1 water supply facilities constructed through this project because of salty taste of water from the boreholes.

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<sup>29</sup> Source: Result of the questionnaire survey

<sup>30</sup> With regard to waterborne diseases, morbidity of diarrhea, and cholera, dysentery, malaria, Guinea worm, virus hepatitis, typhoid, scabies, food poisoning and stomach infection before and after the project was surveyed. Prevalence of diseases except for diarrhea, dysentery, malaria and scabies were not reported both before and after the project.





Source: Results of the beneficiary survey

Figure 5 Change in Major Diseases Prevalence Before and After the Project (Children) (Multiple Answers)

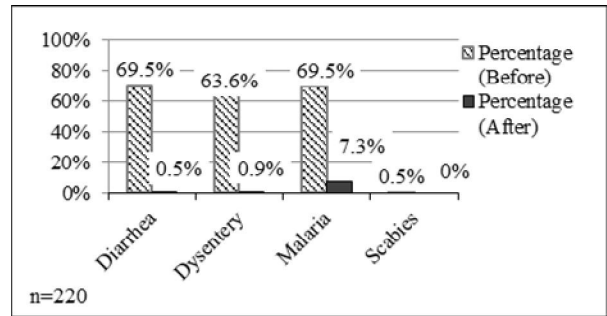
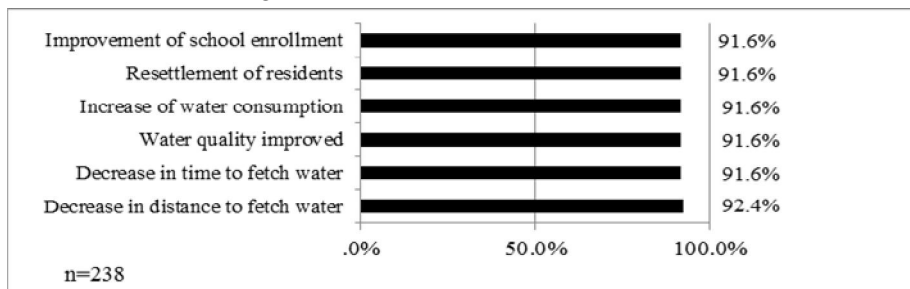


Figure 6 Change in Major Diseases Prevalence Before and After the Project (Adults) (Multiple Answers)

## (2) Improvement of living and hygienic conditions of residents

According to the results of the beneficiary survey, there has been a change in living conditions after the project in 92% of the surveyed households (220/238 households). Details of changes include settlement of residents and improvement of school enrollment in addition to improvement of conditions of water use, as Figure 7 shows.

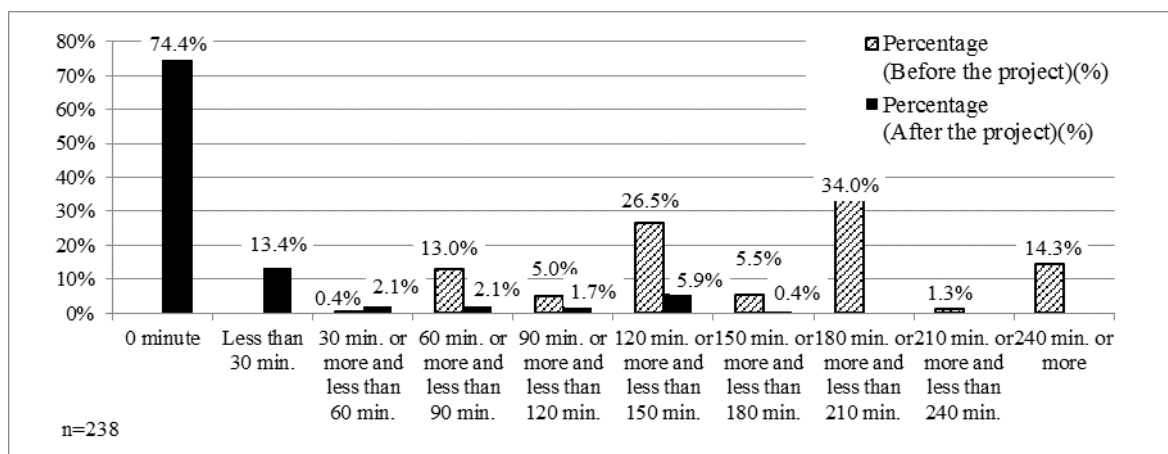


Source: Results of the beneficiary survey

Figure 7 Changes Observed After the Project (Multiple Answers)

Time to fetch water was reduced after the project in 92% of the surveyed households (220/238 households). As shown in Figure 8, while around 80% of the surveyed households spent more than 2 hours per day fetching water before the project, 80% of the surveyed households spent less than 30 minutes fetching water at the time of the ex-post evaluation study<sup>31</sup>. Great impacts were observed in households that could reduce time to fetch water; women transferred time previously spent for fetching water to other economic activities (agriculture/vegetable gardening, commerce, etc.), and children were able to go to school and so on.

<sup>31</sup> 74% of the surveyed households did not spend time fetching water at the time of the ex-post evaluation study since these households used yard connections. 14 of 19 Level 2 water supply facilities as of the ex-post evaluation study were upgraded from Level 1 water supply facilities after the project completion with support of the government of Mauritania and other donors. All of the 13 Level 2 water supply facilities introduced yard connections, and the time taken to fetch water has been greatly reduced. It should be noted, however, that a significant reduction in time to fetch water was achieved not only through this project but also due to the Mauritanian government and other donors.



Source: Results of the beneficiary survey

Figure 8 Water Fetching Time Before and After the Project

### 3.4.2 Other Impacts

#### (1) Impacts on the natural environment

At the planning stage, it was recommended that regular water quality monitoring was to be implemented in order to ensure sustainable safe water supply in the project and that the implementing agency conduct detailed water quality analysis in collaboration with relevant organizations in case of water quality problems. At the time of the ex-post evaluation, three water supply facilities were found to be unused due to salty taste. There is a possibility that the salinity of these facilities is beyond the environmental standards of Mauritania<sup>32</sup>; however, water quality has never been checked by relevant organizations of Mauritania such as the ONSER and the National Institute of Public Health after the facilities started their operation.

#### (2) Land acquisition and resettlement

There was no resettlement in this project. The land for construction of water supply facilities was agreed upon representatives of local residents in community meetings before the commencement of construction works<sup>33</sup>; therefore, no problems were found in the process of acquiring the land.

#### (3) Other Unintended Positive/Negative Impact

Other indirect positive and negative impact was not observed.

<sup>32</sup> In general, the electrical conductivity (EC) has a high correlation with the salt concentration and is used for estimation of the quality and salinity of the water. The value of EC as a water quality standard and guideline was not set in Mauritania. According to the interview with the Direction of Water Supply and Sewerage in the planning stage, water with EC over 50mS/m was judged not suitable for drinking. The interview with residents of the target area in the planning stage showed that most of them feel the water is salty with EC over 150mS/m and some of them feel the water is salty with 100mS/m (Source: Basic Design study report).

<sup>33</sup> Individual consensus document was not exchanged between the project and the land owner (Source: Interview with the consultant in charge).

With regard to effects intended at the planning stage, firstly, the project objective, namely, sustainable safe water supply, was achieved to a certain degree in view of the following point: although regular water quality monitoring aiming at ensuring sustainable safe water supply has not been implemented, as stated in 2.3, use of water sources that are considered unsafe internationally has not been observed through construction of water supply facilities with boreholes in this project; hence, safe water sources (boreholes) have been in use continuously. Users except for those using shallow wells are satisfied with water supply services and have been using water supply facilities with boreholes, and negative influence on health due to water quality has not been reported.

On the other hand, among other effects expected at the planning stage, while borehole drilling technology, one of the intended improvements of survey technologies, was improved to a certain degree, effects were limited in some aspects; improvement of operation and maintenance was limited since operation and maintenance activities such as regular meetings and cleaning around water supply facilities have not been sufficiently practiced; water quality analysis technology, another intended improvement of survey technology of the implementing agency, was not improved as intended since the procured equipment for water quality survey has been poorly used. In addition, many positive impacts have been confirmed, such as significant reduction in water fetching time, and the reduced time has allowed the use of time for other economic activities and school attendance. In particular, the life of women and children has improved; moreover, the number of people affected by waterborne diseases has decreased. Meanwhile, some problems were observed in the environment aspect since no measures have been taken with respect to possible water quality problems observed in some of the constructed water supply facilities.

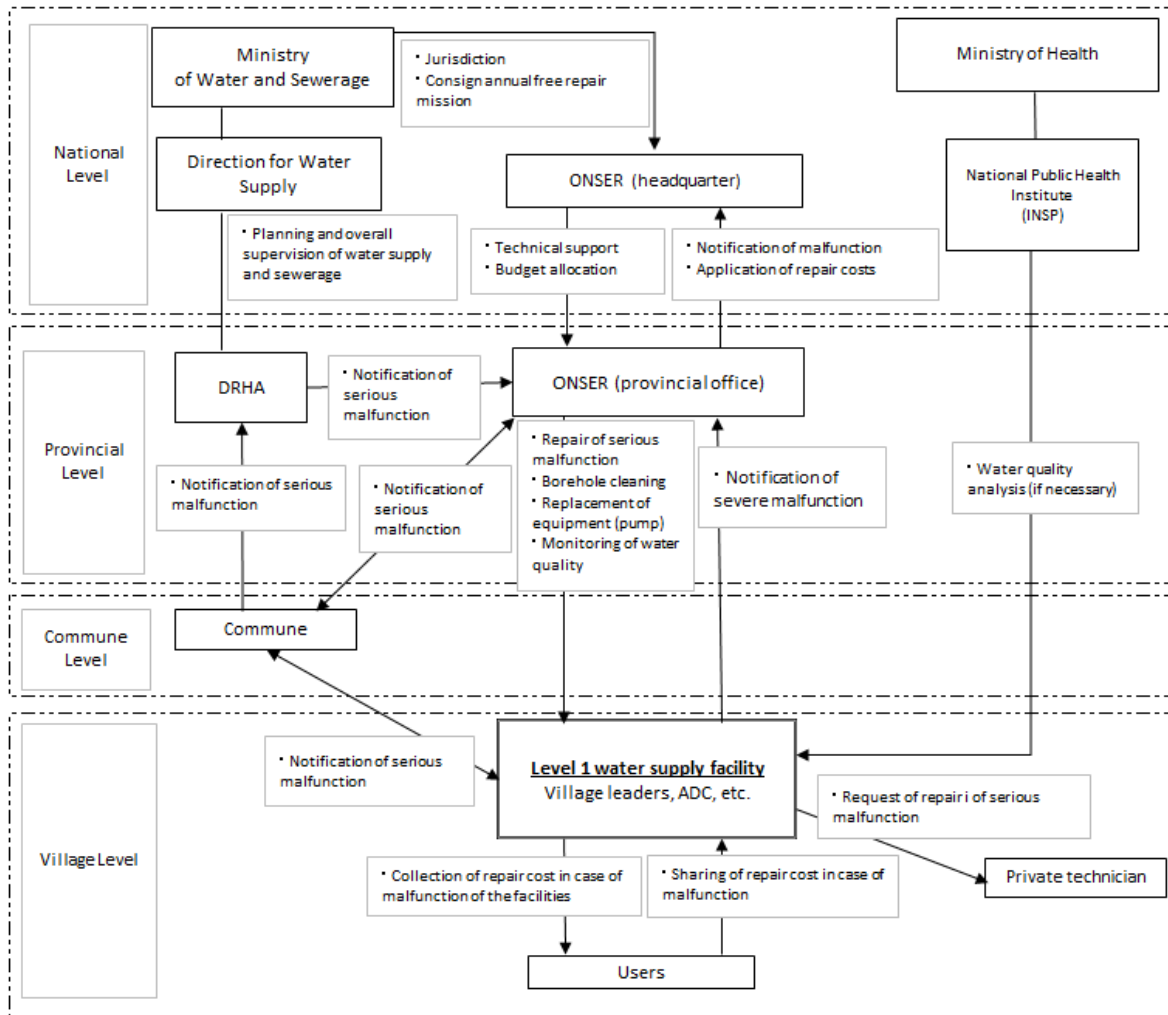
In light of the above, this project has to some extent achieved its objectives as intended, including the project purpose. Some of effects have not been achieved. Therefore, effectiveness and impact of the project are fair.

### **3.5 Sustainability (Rating: ②)**

#### **3.5.1 Institutional Aspects of Operation and Maintenance**

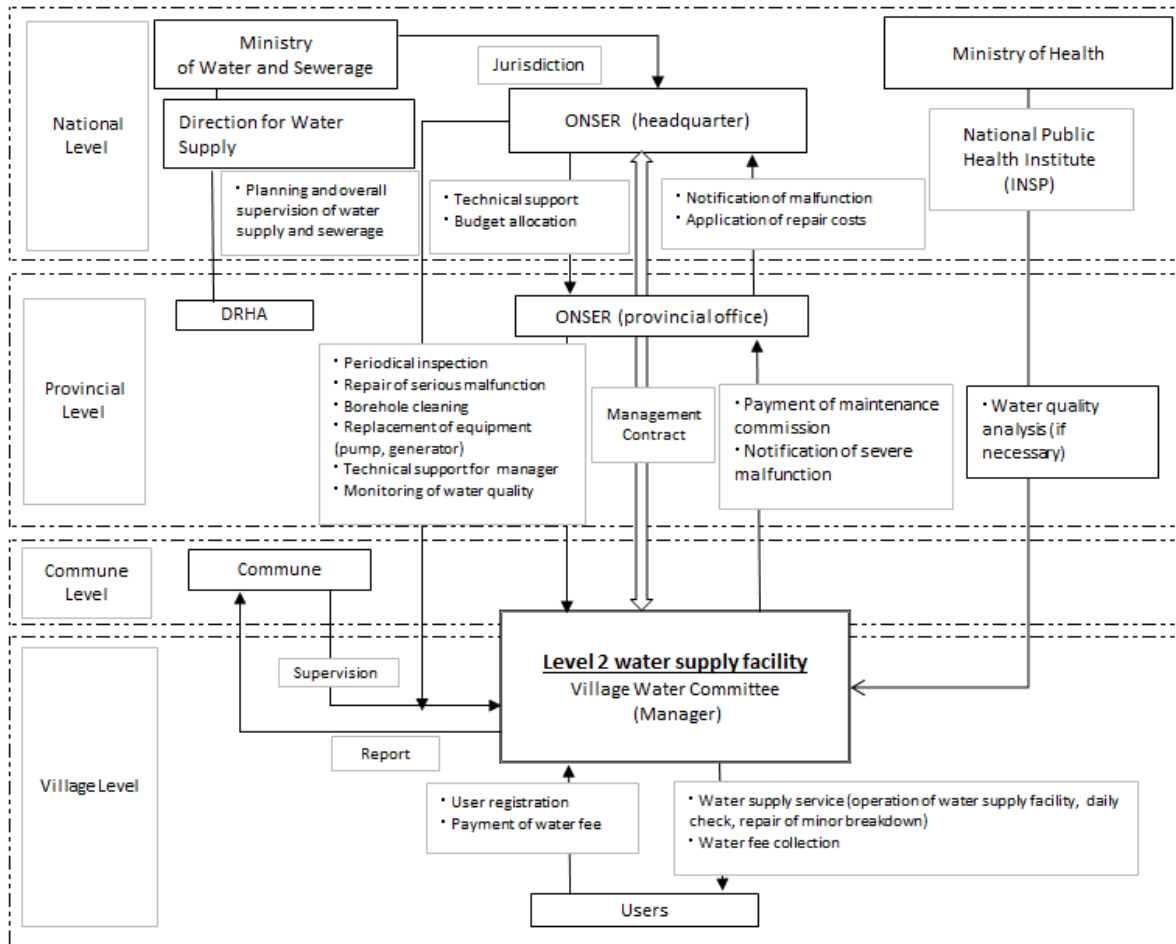
##### **(1) Framework of operation and maintenance and role of relevant organizations**

The role of organizations in operation and maintenance of rural water supply facilities is shown in Figure 9 and 10.



Source: Developed by the evaluators of the ex-post evaluation based on the interview with the implementing agency

Figure 9 Organizational Chart of Operation and Maintenance (Level 1 Water Supply Facilities)



Source: Developed by the evaluators of the ex-post evaluation based on the interview with the implementing agency

Figure 10 Organizational Chart of Operation and Maintenance (Level 2 Water Supply Facilities)

### 1) National level

The Direction of Water Supply of Ministry of Water Supply and Sewerage, the implementing agency of the project, is responsible for the planning of construction of new water supply facilities, overall supervision and coordination of the water sector. As part of this role, the Direction of Water Supply and the DRHA are required to grasp the current status of water supply facilities such as the operation of facilities and usage of facilities by target users; however, they have not pooled, shared and managed relevant information sufficiently. As a result, the following problems were observed: Level 2 water supply facilities were constructed, despite that Level 1 water supply facilities had been constructed by this project. As a result, Level 1 water supply facilities are rarely used; Level 2 water supply facilities were constructed while Level 1 water supply facilities remain unrepaired. In addition, they got to know cases where there were water supply facilities unused due to salty taste for the first time through the field survey of the ex-post evaluation. In this regard, there is room for improvement on the supervision to the ONSER and overall information management. With regard to operation and maintenance of water supply facilities, operation and maintenance

section of boreholes that belonged to the DRHA was transferred to the ANEPA through water sector reform in 2002. As organizations playing central roles in operation and maintenance of rural water supply facilities under the jurisdiction of the Ministry of Water Supply and Sewerage, the ANEPA was responsible for regular field visits to Level 1 water supply facilities, repairs of severe breakdowns beyond capacity of community users to repair, regular inspection of, repairs of severe breakdowns and collection of operation and maintenance commission fee of Level 2 water supply facilities. The Government of Mauritania changed the organization in charge of operation and maintenance from the ANEPA to the ONSER in June 2010 with view to reinforcement of operation and maintenance of rural water supply facilities. The name of the organization in charge of operation and maintenance changed, but the fundamental role of the ANEPA and the ONSER has been the same. The number of staff of ANEPA headquarters was 65 from 2003 to 2006 and has doubled to more than 130 since 2007. Even after the ONSER was established, there has not been a significant change in the number of staff. The number of staff of ONSER headquarters was 137 in 2013. Similarly to information management of the Direction of Water Supply, as pointed out above, there is also room for improvement in information management of the ONSER, since the ONSER has pooled, shared and managed information on water supply facilities poorly due the lack of staff in its provincial offices and capacity of information management of staff assigned in provincial offices.

The ONSER implements charge-free annual missions for repairs of Level 1 water supply facilities on behalf of the Ministry of Water Supply and Sewerage. However, this mission is not able to cover a sufficient number of water supply facilities due to limited inputs such as personnel, commission fee and means of transport. The frequency of visit per facility is once every 2-3 years.

In principle, water quality inspection is under the control of the Direction of Water Supply of the Ministry of Water Supply and Sewerage at the time of drilling of new boreholes and under the control of the ONSER after water supply facilities are operated. The National Institute for Public Health under the Ministry of Health conducts water quality inspection in case of necessity. However, in practice, water quality has rarely been inspected after water supply facilities start their operation in Mauritania. Causes of this phenomenon are assumed as follows: the importance of regular water quality inspection is not fully recognized since water quality is rarely inspected after water supply facilities start their operation<sup>34</sup>; and a system for implementing water quality inspection, analysis, management and sharing of results from the inspection has not been built.

## 2) Provincial level

The DRHA, a provincial division of the Direction of Water Supply, is placed in the provincial capital, and undertakes the role of planning of water and sewerage, coordination of related organizations, and overall supervision. Although the DRHA transfers the information to the

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<sup>34</sup> In Mauritania, water quality is tested upon request from users (Source: Interview with implementing agency; April 30, 2015).

provincial office of the ONSER when there is a notification of breakdown from the residents or community, it does not perform substantial maintenance activities.

The ONSER, an organization in charge of operation and maintenance, also places its provincial office in the provincial capital, undertaking the role of the operation and maintenance of water supply facilities in the province. For the Level 1 water supply facilities, it repairs a facility when it received the request from residents, the DRHA or community for a serious breakdown of the facility. For the Level 2 water supply facilities, the ONSER concludes a management contract with the village water committee (actually one manager, with one assistant in some cases) to perform the regular inspections of equipment, repair of the facility for a serious breakdown, cleaning of boreholes and replacement of equipment and the like based on this contract. For the target provinces of the project, the provincial office of Assaba Province has four personnel (office head and three technicians), that of Hodh El Gharbi Province had three personnel until 2011, and has increased to five personnel (office head, two electricians, one mechanic and one personnel in charge of periodic maintenance) since 2013.

Institutional aspects of operation and maintenance at the provincial level are not sufficient for performing the operation and maintenance activities such the regular inspections of water supply facilities that are scattered in the provinces including those constructed through the project<sup>35</sup> as well as repairing a facility at the time of breakdown since the personnel, means of transportation and repair materials are not sufficient<sup>36</sup>.

### 3) Commune level

In Mauritania, in particular, with respect to operation and maintenance of the Level 1 water supply facilities, many problems were observed as the following; the regular inspections of the facilities and water fee collection were hardly done since the community organization did not continue for a long time even if the community people were organized; they were not able to quickly repair a facility at the time of breakdown since there were spare parts difficult to obtain. In response to this situation, the commune<sup>37</sup>, which is a one-level higher administrative unit than the village, has begun to intervene in the operation and maintenance of the water supply facilities as a coordinator since a few three years ago. The role of the commune is to request the ONSER or the DRHA for repairing a facility without delay when there is a request for repairing the facility from residents, to supervise the maintenance activities of the manager in the Level 2 water supply

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<sup>35</sup> At the time of the ex-post evaluation, the number of Level 2 water supply facilities for which users and the ONSER conclude a management contract is 616 in Mauritania in total, 96 in Assaba Province and 168 in Hodh El Gharbi Province. The number of technical staff in charge of operation and maintenance is 30 at national level, 4 in the provincial office of Assaba Province and 3 in the provincial office of Hodh El Gharbi. The number of facilities per one personnel is 20 at national level, 24 in Assaba Province and 35 in Hodh El Gharbi Province. Although the exact number of the facilities is not available, repair works and annual mission for free-charge repair works of Level 1 water supply facilities is also the duties of the ONSER (Source: Documents provided by the ONSER).

<sup>36</sup> Source: Answer to questionnaires and interview (February 2015).

<sup>37</sup> Administrative division of Mauritania is composed of the province (*Wilaya*), prefecture (*Moughataa*), county (*Commune*), and village (*Localité*).

facilities. Although the mechanism that the commune intervenes has not passed so long time after introducing it, a certain effect of intervention has been recognized for the Level 1 water supply facilities, such as urging the ONSER to repair them on behalf of the residents.

#### 4) Village (facility) level

##### 1) Level 1 water supply facilities

For the Level 1 water supply facilities, a system has been planned for establishing the WPC composed of three people for each pump and the VWC composed of four people in each village to make these organizations perform the daily operation and inspection of the facilities, repair of the facilities at the time of breakdown, cleaning, water fee collection, etc. at the time of planning. In the project implementation stage, organization of these community organizations, establishment of management system (developing the facility use rules, training on the daily accounting (water fee collection and accounting management method)), and technical training on the daily inspections and the repair for minor breakdowns were implemented through the soft component activities.

As previously described in 3.4.1, the VWC and the WPC did not exist for six facilities among the Level 1 water supply facilities for which the field survey was conducted at the time of post-evaluation. Among them, five facilities are not used because of facilities' breakdown or salty, and for 1 facility, the manager of the Level 2 water supply facilities in the same village repairs the Level 1 water supply facilities at the time of breakdown. According to the interviews with the relevant people such as the former staff of the DRHA, the ONSER and the VWC, the following reasons why community organizations for operation and maintenance had not continued were listed: adequate persons were not selected because the time spent on the selection of committee members during the soft component activities was not sufficient<sup>38</sup>; the time spent on strengthening the capacity of the selected committee members was too short to establish the understanding of the role and the content of the community based operation and maintenance; regular inspection by the organization in charge of operation and maintenance (the ANEPA or the ONSER) after the completion of the project were hardly performed because of the lack of personnel, budget, transportation means, without having conducted adequate follow-up for WPC and VWC; and the like.

While the VWC and the WPC have not continued, with respect to the repairs to the breakdown of the water supply facilities, there are various ways at present, such as that the residents having received technical training in this project or neighboring technicians repair the facility in the case of minor breakdown, the manager of the Level 2 water supply facilities responds it if the Level 2

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<sup>38</sup> As an example, there was a case that persons who are not residents (nomads) were selected as members of the WPC and VWC according to the interviews with the implementing agency. Since there are many nomads in the project target area, sometimes there were only women depending on the timing of the implementation of activities. The absence of male residents made it difficult to make decisions easily. Such a situation was the target area-specific difficulties (Source: Interviews with the consultant in charge).



water supply facilities exist in the same village, the Association for Community Development<sup>39</sup> (hereinafter called "ADC") responds if the ADC exists. Whenever a breakdown occurs, the leader group of the village, the manager of the Level 2 water supply facilities and the ADC collect the repair costs from the users without carrying out the planned accumulation of the operation and maintenance costs. In the case of a serious breakdown, village leaders, the manager of the Level 2 water supply facilities, and the ADC request the repair to the DRHA, the ONSER provincial office or private technicians. In this way, although somehow repairing the facility in a spot fashion when a breakdown occurs, it does not become a system that can daily implement the operation and maintenance, such as the regular facility inspections and accumulation of repair costs that will occur in the future.

## 2) Level 2 water supply facilities

For the Level 2 water supply facilities, it was planned to organize the WPC for each public tap and the VWC for each village, and to make the VWC perform the collection of maintenance costs from the users depending on the amount of usage, the payment of operation and maintenance cost to the ANEPA, regular inspections of the facilities and repair of the facility when a minor failure occurs, based on the management contract with the ANEPA.

At the time of ex-post evaluation, not the operation and maintenance system by the WPC and the VWC organized through soft component activities but one manager (with one assistant in some cases) has performed the daily operation of the facilities, water fee collection from users, regular inspections, request of repair to the ONSER or private technicians at the time of serious breakdown of the facility, and the payment of maintenance cost to ONSER (if a management contract with ONSER is concluded). In the background that one manager performs the operation and maintenance, there may be a reason such as that it has become possible to perform the operation and maintenance fee collection more efficiently along with the introduction of water supply by yard connection in many Level 2 water supply facilities<sup>40</sup>, but there is no systematic problem because necessary activities have been carried out without any problem.

The maintenance management contract of each water supply facility with the ONSER is concluded in eight facilities among the 13 facilities that we visited in the field survey at the post-evaluation. If the contract is not concluded, private technicians repair the facility or the ONSER undertakes the repair with a free service when a serious breakdown occurs.

As described above, for sustainability from institutional aspects of the operation and maintenance, there is no particular problem in the staff assignment of the Direction of Water Supply, though showing a room for improvement in the supervisory function for the ONSER. In

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<sup>39</sup> ADC is a community organization formed by the rural development project funded by the World Bank. *Association de Développement Communautaire*

<sup>40</sup> At the time of the ex-post evaluation, yard connection water supply is introduced in 17/26 Level 2 water supply facilities (Source: Interview with the implementing agency).

addition, for the ONSER headquarters, there are problems in the mechanism for implementing water quality inspection and the free-repair mission of the Level 1 water supply facilities, and also for the ONSER provincial offices, there is a slight shortage in the funding to intervene in the timely and appropriate water supply facilities and to continuously provide the technical support to the residents. For the community based operation and maintenance system, there is no particular problem in the Level 2 water supply facilities, but for the Level 1 water supply facilities, there is no organization to undertake the daily operation and maintenance, revealing the necessity to rebuild the operation and maintenance system. In light of the above, sustainability from technical aspects is fair.

### 3.5.2 Technical Aspects of Operation and Maintenance

#### (1) ONSER headquarter and provincial offices

At the time of planning, the ANEPA (presently the ONSER) headquarters was expected to dispatch technicians for boreholes cleaning and repair works of broken facilities beyond the repair capacity of the regional offices. Currently, the ONSER headquarters allocates budget, dispatches technicians and repairs broken facilities each time the regional offices are not able to repair broken facilities. After the project completion, the ANEPA or the ONSER manage most of repairs requested by users, therefore, the ONSER can be said to have the basic technical skills for carrying out maintenance of facilities. For instance, among 13 Level 2 water supply facilities surveyed during the field survey, ONSER repaired nine facilities when they were severely broken.

Meanwhile, with regard to Level 1 water supply facilities, the ex-post evaluation study found that there were facilities left unrepaired for a few years and that no measure had been taken for facilities that had been faced with eventual salinization. In this regard, some problems have been observed in terms of technical capacity of the ONSER headquarters and provincial offices.

#### (2) Village (facility) Level

##### 1) Level 1 water supply facilities

At the planning time, VWC and WPC organized through soft component activities were expected to implement cleaning of the surroundings of the facility, daily maintenance of the facility and repair works in case of minor breakdown. At the time of the ex-post evaluation, broken facilities are repaired by residents trained through the project, operators or managers of Level 2 water supply facilities constructed in the same village. Sometimes, users ask for repairs by private technicians. Technical intervention to the facility occurs only when it breaks down; preventive maintenance such as periodical inspection of inside of the pump and replacement of consumable parts is rarely implemented. Although users have managed to repair broken facilities, it is difficult to say that they have sufficient technical capacity to conduct daily maintenance, inspection and repairs.

## 2) Level 2 water supply facilities

As described above, although the current operation and maintenance system is different from the planned system in which the WPC is formed for (every public tap and VWC manages the entire facility at the village level), water supply facilities have been well maintained in general since managers or the ONSER inspect equipment of the facility periodically<sup>41</sup> and have managed to repair minor breakdowns of the facility. Managers have the basic technical skills required for operation and maintenance of the facility.

In light of the above, there is no problem in principle with respect to technical capacity of ONSER headquarters and provincial offices judging from their periodic inspection and repairs of broken facilities. However, some problems have been observed as seen in some of the Level 1 water supply facilities that have been left unused due to malfunction or possibility of salinization. With regard to technical capacity of users, no particular problem has been observed in Level 2 water supply facilities; however, users' technical capacity of Level 1 water supply facilities is found to be insufficient to conduct daily maintenance, inspection and repairs. In light of the above, sustainability from technical aspects is fair.

### 3.5.3 Financial Aspects of Operation and Maintenance

#### (1) Financial aspects of the ONSER

Financial resources of the ONSER are from the budget of the government of Mauritania, income from water fee collection and others. The percentage of each item in the total income, which differs from year to year, is 30-60% from the government budget, 20-40% from income from water fee collection<sup>42</sup> and 10-20% from others<sup>43</sup>. In Mauritania, Level 1 water supply facilities have been upgraded to Level 2 water supply facilities following the government policy. With the number of Level 2 water supply facilities increasing, the income of ONSER is also expected to increase along with an increase in income from water sales. However, there are water supply facilities getting older and breaking down frequently. The water fee is not collected in the downtime of such facilities. Then, the income from water fee collection, which is one of financial resources of operation and maintenance for the ONSER, may not reach an expected level, affecting the ONSER in stabilizing its income.

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<sup>41</sup> For instance, in most of the 13 facilities surveyed in the field, inspection of pump and generator is conducted once a year; that of elevated tank is once a month, every six months or once a year. Pipelines and valves are checked out every six months (Source: Result of the questionnaire).

<sup>42</sup> When operation and maintenance services were transferred from the ANEPA to the ONSER in June 2010, the ONSER was not able to collect the water fee in the fiscal year 2010 and 2011 in due time. The ONSER regained the water fee for the fiscal years 2010 and 2011 in 2012. Therefore, the amount of the fiscal year 2012 is much larger than others (Source: Interview with the implementing agency (April 2015)).

<sup>43</sup> As stated in Table 4, since some information was not available in some of the fiscal years surveyed, it was difficult to judge whether the income of the ONSER was stable or not over these years.

Table 4 Budget of ONSER

(Unit: Mauritanian Ouguiya)

Item	2010	2011	2012	2013	2014
<b>Income</b>					
Government subsidy	192,178,324	179,790,152	264,581,882	n.a.	273,925,143
Water fee collection	120,000,000	130,000,000	242,099,633	134,021,130	140,000,000
Replacement of equipment	275,747,240	n.a.	95,540,000	31,925,143	130,000,000
Total	587,925,564	n.a.	602,221,515	n.a.	543,925,143
<b>Expenditure</b>					
Personnel expenses	220,842,170	242,617,913	258,446,715	n.a.	284,097,104
Maintenance (repair works)	69,770,759	41,213,840	125,303,427	n.a.	50,001,450
External charges	56,300,637	n.a.	40,682,521	n.a.	47,405,507
Miscellaneous expense	14,271,118	n.a.	6,387,850	n.a.	4,283,000
Purchase of equipment	235,351,663	169,233,126	223,024,969	n.a.	103,859,852
Total	596,536,347	n.a.	653,845,482	n.a.	489,646,913

Source : Documents provided by ONSER

The budget for the provincial offices of the ONSER comes from the headquarters upon each request instead of a one-time transfer in the beginning of the fiscal year, except for personnel expense. There is almost no budget secured for different activities at the regional offices, which has prevented implementation of regular inspection of facilities. As a result, the provincial offices are not able to know the status of a problem facility, and appropriate interventions are not provided<sup>44</sup>.

Thus, there are some problems in financial aspects of the ONSER in grasping the status of water supply facilities through regular inspection and repairing broken facilities promptly.

## (2) Village (Facility) level

### 1) Level 1 water supply facilities

Through soft component activities implemented within the project, users agreed on the payment of the water fee by a monthly flat rate. VWC members were trained on the management including account management bookkeeping. Since the VWC and the WPC did not exist in the Level 1 water supply facilities surveyed in the field survey of the ex-post evaluation, daily water fee collection and keeping an account book were not implemented in these facilities. When these water supply facilities break down, stopgap measures are taken such as collection of repair costs by village leaders or ADC. There are problems in terms of financial sustainability of Level 1 water supply facilities in that the water fee has not been collected and operation and maintenance costs

<sup>44</sup> In addition to budget, other factors such as the lack of personnel and means of transport may be causes of such problems. For instance, since the ONSER has not checked the status of utilization of facilities regularly, the ONSER got to know cases for the first time through the field survey of the ex-post evaluation in which there were facilities that residents had not used due to salty taste.

have not been saved systematically in preparation for expenses for repair works in case of the breakdown of facilities.

## 2) Level 2 water supply facilities

With regard to the Level 2 water supply facilities, the field survey of the ex-post evaluation study confirmed that the water fee has been collected and an account book has been kept in 11 out of 13 facilities. The result of the beneficiary survey shows that the current water fee is set at an affordable level to pay for most of the users as far as 76% of households paying for water consider the current water fee “reasonable” and “cheap”<sup>45</sup>.

There is no problem in principle in financial aspects of Level 2 water supply facilities. However, the interview and questionnaire survey of the ex-post evaluation found that expenditure (in particular, that of fuel of generator) had so increased that running costs had not been generated in generator-powered water supply facilities. As a result, the discharge time was limited and then the discharge volume became insufficient. Users of such facilities request the ONSER to change the power source from the generator to the solar power generation. Since the ONSER set the maximum water rate as 250UM/m<sup>3</sup> according to the management contract between the ONSER and users of the water supply facility, it is not possible to collect the water fee additionally in case of the deficit of the income or to increase the water rate. In this regard, there are slight problems in financial sustainability of generator-powered water supply facilities.

In light of the above, with regard to financial sustainability, some problems are identified in financial capacity of the ONSER. Although some issues remain, problems are not seen in general in financial aspects of Level 2 water supply facilities. With regard to the Level 1 water supply facilities, there is room for improvement in water fee collection and saving of operation and maintenance costs. In light of the above, sustainability from technical aspects is fair.

### 3.5.4 Current Status of Operation and Maintenance

#### (1) Status of operation and maintenance of water supply facilities

As stated in 3.3, the functioning rate of the water supply facilities constructed through the project as of the ex-post evaluation is 69% for Level 1 water supply facilities (18/26 functioning facilities), 84% for Level 2 facilities (by pumping power source, 89% (8/9 functioning facilities powered by solar power generation)) and 80% (8/10 functioning facilities powered by generator). The total functioning rate is 76% (34/45 functioning facilities). The functioning rate is evaluated to be satisfactory in general, and project effects have been produced continuously as of the ex-post evaluation although the functioning rate of Level 1 water supply facilities is below 80%, which is

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<sup>45</sup> Among 178 households paying for water at the time of ex-post evaluation, three of them (2%) consider the current water fee “very expensive,” 40 of them (22%) consider it “a bit expensive,” 116 of them (65%) consider it “reasonable” and 19 of them (11%) consider it “cheap” (Source: Result of the beneficiary survey).

the national target set by the Ministry of Water Supply and Sewerage. The reasons for a relatively high functioning rate are as follows. Since 2010, among 40 Level 1 water supply facilities as of the project completion, 15 facilities were upgraded to Level 2 water supply facilities following the government policy<sup>46</sup>. These upgraded facilities have not been used long since they started operation. Moreover, the operation and maintenance system for Level 2 water supply facilities was already established at the planning stage and the same system has been maintained even after the operation and maintenance services were transferred from the ANEPA to the ONSER.

Although the functioning status of the water supply facilities is generally satisfactory, looking at the project objective that is “sustainable safe water supply” from qualitative aspects, there remain concerns to implement monitoring of water quality continuously, since mechanism to perform water quality monitoring in systematic manners is not established due to insufficient implementation system and budget of ONSER and insufficient supervisory function of the Direction of Water Supply. In addition, there is a problem that no prospect has seen in repairing Level 1 water supply facilities that were left unrepaired, especially with regard to the Level 1 water supply facilities newly constructed in villages where Level 2 water supply facilities had been constructed in the same village.

## (2) Status of operation and maintenance of procured equipment

Among the equipment procured through the project, the borehole survey equipment, such as the borehole logging device put in place in the Direction of Water Supply of the Ministry of Water Supply and Sewerage, are being utilized as initially planned. There is no problem in maintenance and inspection of the equipment.

On the other hand, the ex-post evaluation study found that the equipment for water quality analysis put in place in the DRHA had not been fully utilized. The reasons are described in 3.1.4.

## (3) Availability of spare parts

With regard to the procurement of spare parts for Level 2 water supply facilities, no concern was identified as far as users did not find any particular problem to get necessary parts. On the other hand, with regard to Level 1 water supply facilities, a part positioned at the bottom of the pump called “bladder” is often difficult to procure<sup>47</sup>. Taking such a situation into account, the government of Mauritania decided to upgrade Level 1 water supply facilities to Level 2 water supply facilities gradually after 2009.

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<sup>46</sup> The number of Level 1 water supply facilities upgraded to Level 2 water supply facilities was three in 2010, one in 2011, eight in 2012 and three in 2013 through funding from the Mauritanian government, other donors and NGOs (Source: Documents provided by the implementing agency).

<sup>47</sup> Source: Result of questionnaires

Some minor problems have been observed in terms of institutional, financial and technical aspects. Therefore, sustainability of the project effects is fair.

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

### **4.1 Conclusion**

This project developed water supply facilities and procured survey and maintenance equipment and introduced an operation and maintenance system by community participation for the purpose of a sustainable safe water supply in 47 villages in Hodh El Gharbi Province and Assaba Province. The project objective is consistent with the development policy and development needs of Mauritania as well as with Japan's ODA policy; therefore its relevance is proved to be high. In addition, the actual percentage of the population that was provided with water, as well as constructed water facilities, through the implementation of the project reached more than 90% of the target value. As a result, expected positive effects of the project were confirmed, such as the following: the waterborne disease rate in the project target areas has decreased, and opportunities to effectively utilize time for daily activities by reduced water-fetching workload have increased. On the other hand, effects of the project are limited compared to the initial plan in terms of improvement of operation and maintenance of Level 1 water supply facilities and improvement of water quality survey technology of the implementing agency. Thus, the effectiveness and impact of the project is fair. Both the project cost and project period were within the plan. Therefore, efficiency of the project is high. While the functioning rate of water supply facilities constructed by the project is relatively good, as shown by the figure of 76% at the time of the ex-post evaluation, operation and maintenance of the facilities leave room for improvement in many ways, such as personnel deployment and financial capacity of the ONSER, which is a central organization of maintenance of rural water supply facilities; personnel deployment, technical and financial capacity of community organizations for Level 1 water supply facilities and a system for implementing water quality monitoring. Thus, the sustainability of the project effect is fair.

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

### **4.2 Recommendations**

#### **4.2.1 Recommendations to the Implementing Agency**

##### Short-term actions

- (1) Improvement of the functioning rate of the water supply facilities (recommendations to the Direction of Water Supply and the ONSER)

Especially with regard to the Level 1 water supply facilities, the ex-post evaluation study confirmed the facilities that remain out of order or are left unused; thus, it is advisable that the ONSER allocates needed human resources and budget for repairable non-operational facilities. Moreover, for the water supply facilities with the possibility of water salinization, it is advisable to conduct detailed analysis of water quality, and when there is no safe alternative water source in the

same village, to plan development of a new water source or take other measures.

#### Mid-Long Term Measures

- (2) Establishment of a system for water quality monitoring (recommendations to the Direction of Water Supply and the ONSER)

With regard to the equipment for water quality analysis, which is confirmed not to have been fully utilized at the time of the ex-post evaluation, it is advisable for it to be transferred from the DRHA, where the equipment is currently put in place, to the regional office of the ONSER, the main implementer of water quality monitoring. Furthermore, it is recommended that the ONSER draw up a feasible, detailed plan of water quality monitoring (who does monitoring, when/how often, etc.) and allocate human resources and budget for it. In such case, it is advisable to establish a method of sharing the results of water quality monitoring and a coordination mechanism with relevant organizations under the Ministry of Health, which are to be supervised by the Direction of Water Supply in an appropriate manner.

- (3) Improvement of management of basic information on water supply facilities  
(recommendations to the Direction of Water Supply and the ONSER)

In this ex-post evaluation, it is confirmed that the ONSER, the operation and maintenance body, does not grasp the current situations of the respective facilities, including the operational status of the water supply facilities, the utilization status by the local residents, construction of facilities by other donors and NGOs and the introduction of yard connection water supply. These are due to a lack of regular visits to the facilities, insufficient water fee collection, consolidation, recording of data and so on. From now on, it is recommended to upgrade the Level 1 water supply facility to the Level 2 water supply facility efficiently, without overlapping among donors, and to review the communication and reporting system and information management between the Direction of Water Supply and the ONSER in order to establish new water supply facilities.

#### 4.2.2 Recommendations to JICA

Considering that the water sector in Mauritania does not have much experience and knowledge in regular water quality monitoring, and that the implementation mechanism has not been fully established, it is hoped that the following be considered to support establishment of a water quality monitoring system when implementing the abovementioned recommendation (4.2.1(2) Establishment of a system for water quality monitoring): to plan assistance with feasible means in the capital (e.g., to invite staff from the regional offices of the DRHA and the ONSER to the capital to transfer the skills on how to use the equipment and manage data, to jointly make a monitoring plan, to introduce cases from other countries, etc.) when the situation continuously prevents entrance into the project target areas due to a security issue, as at the time of the ex-post evaluation, and to provide on-the-job training at the ONSER provincial offices when it is possible



to enter into the project areas.

### **4.3 Lessons Learned**

- (1) Assistance to the implementing agency for an effective utilization of the procured equipment for water quality monitoring

In the project, the equipment for water quality analysis, one of the procured equipment, has been little used. One of the reasons is the insufficient consideration on where to allocate the equipment for water quality monitoring after the project's end by those concerned, including the main implementers. Moreover, the water sector in Mauritania does not have much experience in water quality monitoring after construction of a water supply facility. Despite the fact that the implementation management system had not been fully established, the technical transfer during the project implementation mainly focused on how to use the equipment. Moreover, no consideration was given to implementers and frequency of water quality monitoring, budget for supply of reagent, and detailed plan for utilization of the equipment such as method of consolidation and sharing of results from water quality monitoring.

When the rural water supply sector in the subject country does not have much experience in water quality monitoring at the time of operation of a water supply facility, it is necessary to carry out capacity assessment of concerned organizations during the planning stage and to carefully review the appropriateness of the organizations to place the equipment. The assessment includes such issues as personnel of the organizations in charge of water quality monitoring and their experiences in water quality testing, sources of budget for reagent supply and others, and capacity of a supervising organization. On that basis, it is desirable to include in the Basic Design study a detailed water quality monitoring plan that is linked to effective use of the procured equipment. When the host organization does not fully possess the capacity to utilize the equipment, technical assistance by soft component is desirable to be included. Furthermore, it is preferable during the project implementation to check the appropriateness of the organization that received the equipment—namely, whether there is no problem in the number of personnel who use the equipment, their capacity, and continuously securing inputs including budget and vehicles. It is also desirable to check the method of sharing of the monitoring results among the concerned organizations and whether it is possible to coordinate with the concerned organizations under the Ministry of Health when there is a problem. It is desirable to complete the project in the state where it has established the system that can sustain water quality monitoring even after the project's completion.

- (2) Establishment of the community based operation and maintenance of rural water supply facilities

In the project, with the aim of establishing the mechanism of community-based operation and maintenance, the training was conducted on community organization and operation and

maintenance. However, with regard to the Level 1 water supply facilities, the time spent on organization and capacity building of the community members was short, and in addition, the follow-up by the ONSER on the activities of the community organizations was limited. Thus, the local residents who were selected as members of the operation and maintenance committee did not understand the importance of preventative operation and maintenance and the role expected of them to allow operation and maintenance activities by local residents themselves. Especially, with regard to the water supply project through the grant aid, soon after the start of the operation of a facility, the project period ends, and the follow-up by the Japanese side until the community organizations become independent and are able to engage in operations and maintenance activities is often limited. In the case of rural development programs by other donors in Mauritania, some cases are reported where the community groups have become well-functioning by spending a long time on community organization and capacity building. In the case where time is limited for the capacity building of community organizations, as with the grant aid, and where it is deemed necessary for further assistance at the time of the project completion, it is desirable to consider coordination with other schemes such as dispatch of volunteers and experts or with technical cooperation projects while evaluating possible assistance schemes in the subject country.

(End)