Republic of Tunisia

FY2016 Ex-Post Evaluation of Japanese ODA Loan

"Water Pipeline Construction Project in Northern Tunisia"

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0. Summary

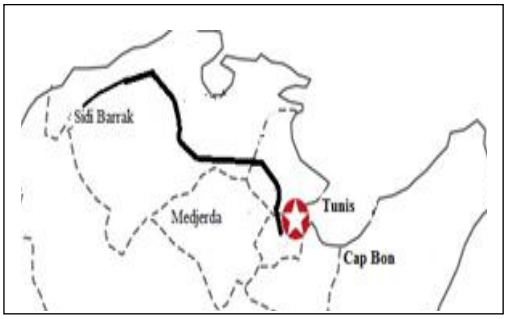
The aims of this project are to source the financial aid needed to construct water pipes (a total extension of about 90 km), undertake this extension of existing pump facilities, and source consulting services in the north of Tunisia; the endpoint of these aims is to provide high-quality drinking, industrial, and irrigation water to the Greater Tunis[1] Area and to the areas surrounding Tunis, Tunisia's capital city. As part of the Water Resources Development in accordance to the Master Plan drawn up by the government of Tunisia , this project also looks to contribute to measures that address the population growth and, hence, the increased water demand—as well as the expansion of agricultural production in the Greater Tunis Area and surrounding areas—by constructing water-supply pipes (triplication), extending the existing pump facilities in three sections (Sidi El Barrak–Sejnane, Sejnane–Joumine, and Joumine–Medjerda) which are located in the northern part from Tunis, and reinforcing the high-quality supply of waterworks and irrigation water for the area (Cap Bon, Sahel, and the Greater Sfax[2] Area).

The operation of this project is sufficiently consistent with Tunisia's development policy, Tunisia's development needs, and Japan's aid policy; as such, it is highly appropriate. Its outputs are completed nearly as planned. The operating cost is within the planned budget, but the timeframe of this project far exceeds that mentioned in the initial plan. Therefore, the project's efficiency is assessed as fair. At the time of this ex-post evaluation, the objective amount of water supply brought about by this project had not been achieved; it is expected to be achieved by 2019. However, other effectiveness indicators exceeded the objective values, and so, on balance, the project's effectiveness can be assessed as fair. Thus, the project effectiveness and impacts are assessed as fair. As expected at the time of the appraisal, the institutional, technological, and financial aspects of both management and operations have reached essential and sufficient levels, and both have been adequately carried out. Thus, project sustainability is considered high.

In light of these findings, this project's outcomes are assessed as being highly satisfactory.

[1] The Greater Tunis is a name of the large metropolitan area of Tunis and its environs.
[2] The Greater Sfax is a name of the large metropolitan area of Sfax and its environs

1. Project Description



Project Location
(Solid line shows water-supply pipeline)

Triplicated Water-supply Pipes (along the Medjerda River)
(Photo taken in April 2017)

1.1 Background

1.2 Project Outline

One-half of Tunisia is arid, and its yearly overall precipitation is scarce: in 2011, for example, it amounted to only 207 mm.[3] The value gets remarkably scarce in some years. Such scarcity can lead to water shortages. According to the documents of the Japan International Cooperation Agency (JICA) at the time of the appraisal, although Tunisia has 4,700 million m^3 of water resources comprising surface and underground water, almost 60% of the resources (i.e., 2,700 million m^3) converge in the northern mountainous region, which comprises the northernmost area and the Medjerda basin. Therefore, in terms of geography, precipitation, and annual available surface, water supplies are unevenly distributed.

Moreover, the Greater Tunis Area—which is in the northern region and the center of Tunisia's economic development—has suffered from impending demands for drinking water on account of its rapidly increasing population and a lack of irrigation water in the dry seasons. Thus, the Tunisian government has been carrying out an integrated water development plan for the whole northern area ("Water Resources Development Master Plan in Northern Tunisia" of 1975) to secure drinking water, industrial and irrigation water resources.

Based on this master plan, major water-supply channel and water conduit to each city have been installed. One example is the Cap Bon Canal, which connects the Medjerda River with Cap Bon (an area that produces citrus fruits which are major agricultural exports) in the southwest peninsula of Tunisia; another is the Sejnane–Joumine–Medjerda pipeline, which was built in the course of this project.

In 2004, water resource development in Tunisia had helped satisfy 80% of the developable amount of the water demand, and in the northern region, the resource amount

[3] See http://www.mlit.go.jp/common/001131547.pdf (2017-9-22 retrieved).

exceeded the gross demand. A dearth of pipelines, however, meant that these developed water resources were not being sufficiently distributed to the demanding areas (i.e., the Greater Tunis area and its environs [Cap Bon, Sahel, the Greater Sfax Area, and the like]). On the other hand, the water supplies in Sejnane–Joumine–Medjerda— was parts of this project —were expected to improve upon project completion of pipeline duplication ("The Project for the Development of Irrigated Areas of Northern Tunisia" L/A in February 1996, whose completion was originally planned for 2004). Originally, the approved amount for the project—JPY 14,130 million—was supplied in the form of a yen loan. In any case, in the case of droughts in some years, water supply capacity was unable to keep up with water demands, thus leading to water shortages. Therefore, triplication was needed to secure water supplies that would meet overall demands.

Loan Approved Amount/ Disbursed Amount	JPY 8,026 million/JPY 6,668 million	
Exchange of Notes Date/ Loan Agreement Signing Date	March 2004 / March 2004	
Terms and Conditions	Interest Rate	1.5%
	Repayment Period	25 years
	(Grace Period)	(7 years)
	Conditions for Procurement	General Untied (Including Consultant)
Borrower / Executing Agency	Government of the Republic of Tunisia / Directorate General of the Dams of the Great Hydraulic Works, Ministry of Agriculture, Environment, and Water Resources[4]	
Project Completion	January 2017[5]	
Main Contractors (Over JPY 1 billion)	EL KANAOUET (Tunisia), BBMP (Tunisia), SOMATRA (Tunisia), CWE (China Inter Water Electric Corp; China), APLICO (Tunisia), SOCOOPEC (Tunisia), SAM (Tunisia), ADEV (Tunisia), STAFIM-PEUGEOT (Tunisia and France)	
Main Consultant (Over JPY 100 million)	STUDI (Tunisia)	
Feasibility Studies, etc.	SAPROF Water Resources Development Project in Northern Tunisia (II) (October 2003)	
Related Projects	Official Development Assistance (ODA) Loan Projects: "Water Pipeline Construction and Irrigation Project in the North of Tunisia" (1996) "Irrigated Project of Goubellat" (1998) "Irrigated Project of Barbara" (1998) "Water Resource Management Project" (1999) "Sfax Sea Water Desalination Plant Construction Project" (July 2017)	

[4] Currently, the name of this office is the Directorate General of the Dams of the Great Hydraulic Works, Ministry of Agriculture, Environment, and Fisheries (DG/BGTH) (Direction Générale des Barrages des Grands Travaux Hydrauliques in French).

[5] At the time of appraisal, project completion was defined by the expiration of the guaranteed period. However, this ex-post evaluation defines completion in terms of the final transfer of the executing agency (see details in 3.2.2.2 "Project Period").

2. Outline of the Evaluation Study

2.1 External Evaluators

The external evaluators of this project are Vincent GRAMMONT, Sadaharu KATAOKA, and Takeshi DAIMON, all of Waseda University.

2.2 Duration of the Evaluation Study

This ex-post evaluation study was conducted according to the following schedule.

Study period: December 2016 – March 2018

Field study period: April 2, 2017 – April 15 and July 4, 2017 – July 19, 2017

2.3 Constraints during the Evaluation Study

As this project was expected to complete in 2017 the evaluators had no data—especially effectiveness data—regarding project effects for the two years following the project completion. Thus, prior to this ex-post evaluation, the evaluators collected as much data as possible, for as long of a period as possible, on the expressed effects of this project. Additionally, in areas for which there was a lack of data, they took account of estimated time-variance values.

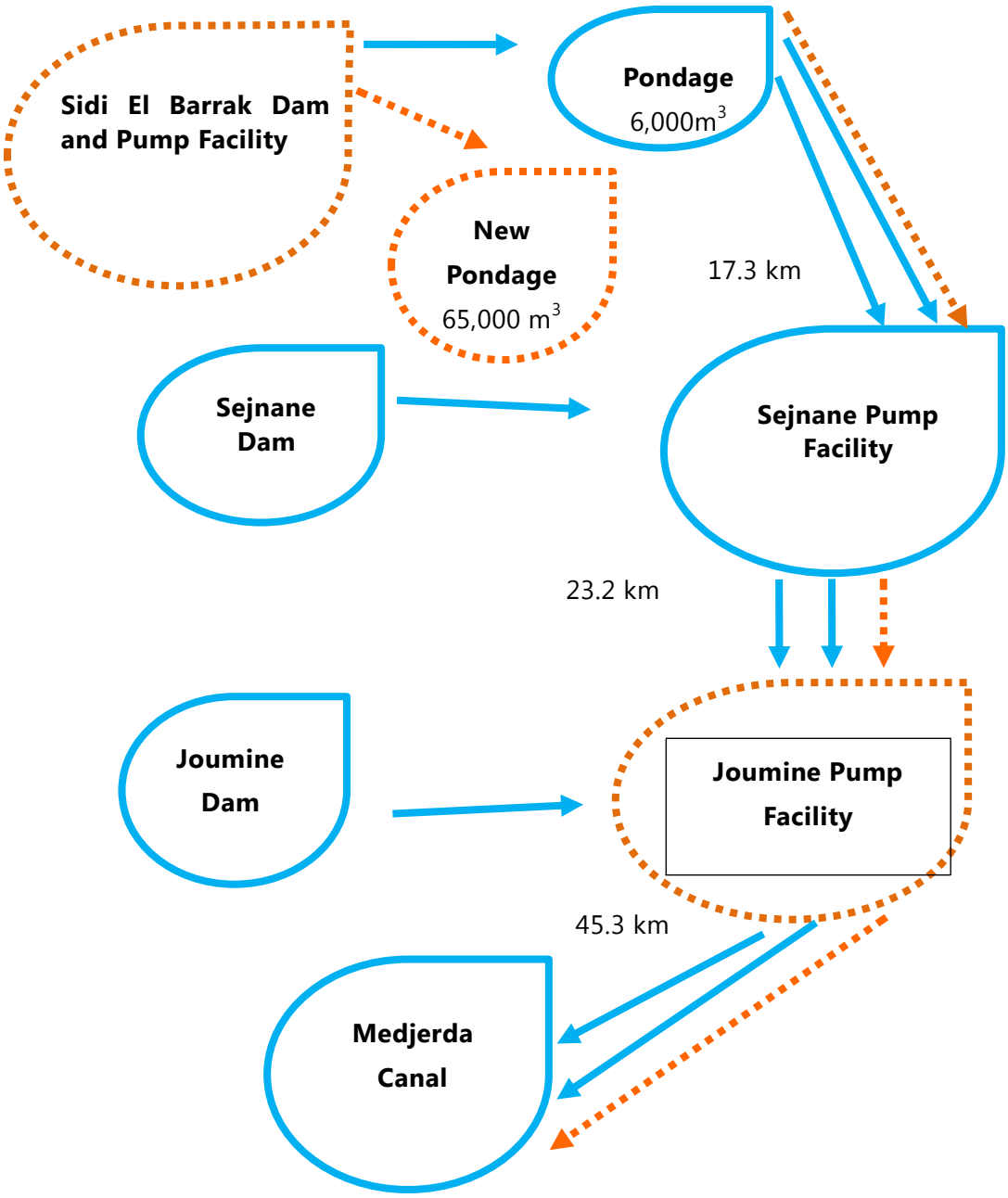


Figure 1 Project Outline (Plan)

Note: Facilities projected during this project are shown with dashed lines; existing facilities are shown with solid lines.

3. Evaluation Results (Overall Rating: B[6])

3.1 Relevance (Rating: ③[7])

3.1.1 Consistency with the Tunisian Development Plan

The government of Tunisia has been executing an integrated water resource development project in the whole northern region ("The Project for the Development of Irrigated Areas of Northern Tunisia" of 1975) to secure water supplies for drinking, industrial use, and irrigation; this project featured the building of dams and water pipelines. Overall, 80% of the available water resources envisioned in the framework of this master plan (decided in 1975 and revised in 1982) have been realized. This framework featured three objectives: 1. Develop water resources to meet the growing need for drinking and irrigation water; 2. Improve water quality; and 3. Convey drinking and irrigation water from northern Tunisia to Gran Tunis, Nabeul, Souse, and the Sfax Area. As of this ex-post evaluation, this master plan has been succeeded by "Water in 2000" (Eau 2000) (a plan in 1990–2010) and "Water in the 21st Century" (Eau XXI) (plan for 2000–2030); water resource development for the north of Tunis remains a national priority policy.

On the other hand, the 11th Socioeconomic Development Plan (2007–2016)—which followed the 10th Socioeconomic Development Plan (2002–2006)—was decided, which confirmed the importance of water resource development. Moreover, this plan was followed by the Orientation Note for Strategic Development Plan ("Note d'orientation du plan stratégique de développement"), the latter of which was decided in 2015. This Note has been incorporated into the 5-year National Development Plan of 2016–2020 for the whole Tunisian government (Plan 2016-2020). The present project relates to this Note as issued in June 2016.

As mentioned, the policy importance of water resource development in northern Tunisia is consistently high, as of the time of appraisal and this ex-post evaluation. Therefore, this project is considered highly relevant to the country's development plan.

3.1.2 Consistency with Tunisia's Development Needs

During the appraisal, it was found that the existing water-supply pipes cannot provide or convey sufficient water to various areas demanding water (e.g., the Greater Tunis Area, Cap Bon, the Sahel region, and the Greater Sfax Area). Although the duplication project for the pipeline of the existing Official Development Assistance (ODA) loan project "The Project for the Development of Irrigated Areas of Northern Tunisia" was completed, water-supply shortages were expected to occur in drought years. Thus, it was necessary to build new water pipes. In addition, reductions in salinity were expected, in line with environmental,

[6] The four-point scale used here is as follows: A, highly satisfactory; B, satisfactory; C, partially satisfactory; D, unsatisfactory.
[7] The three-point scale used here is as follows: ③, high; ②, fair; ①, low.

agricultural, health, and sanitation needs.

The water demand estimated during this project's preparation period and the present water-supply amount show the importance of water resource development and a water-supply project in northern Tunisia. Therefore, development needs in this sector remain high.

Table 1 Water Demand in Tunisia

	Gross Demand (millions m^3)		Water Resources (millions m^3)	
	For Drinking	For Irrigation*	Project Site**	This Project
2004	212	509	1,283	
2014	303	727 (69)	1,107	147
2015	306	734 (70)	1,082	151
2016	311	746 (62)	705	117

Source: Various documents provided by the executing agency.

Notes: *"Gross demand for irrigation water" values are estimated; the values in parentheses show actual amounts of water supplied (sold) for irrigation purposes. **Because of the constraints of data, "Project site" water resource amounts are from 2005.

Table 2 Population (millions) of Various Areas, and Growth Rates (average % per year) of Project and Non-Project Sites

	2004	2009	2014
Greater Tunis Area	2.250	2.399 (3.0%)	2.548 (3.0%)
Cap Bon	1.382	1.465 (1.7%)	1.550 (1.7%)
Sahel Region	1.381	1.506 (2.5%)	1.636 (2.6%)
Greater Sfax Area	2.238	2.421 (3.7%)	2.611 (3.8%)
Non-project Sites	4.059	4.173 (2.3%)	4.228 (1.1%)

Source: Various documents provided by the executing agency.

Note: Values in this table reflect the most recent data available as of this ex-post evaluation (from 2017).

As Table 1 shows, gross water demand—including that for drinking and irrigation—prompted a 77-million m^3 surplus in 2014; in comparison, there was a 42-million m^3 surplus in 2015. Additionally, the drought in 2016 led to a 352-million m^3 shortage. Except in 2016—which may be a special case—there has been a balance between demand and supply since 2014, when most of this project was completed. However, as Table 2 shows, the population growth rates of the project sites were higher than those of the non-project sites, and project-site populations have been increasing since the appraisal. Therefore, the selection of the project sites is appropriate.

Compared to southern water systems (e.g., present water sources, such as those in Sidi Salem), the northern water-system sources in this project (e.g., those in Sidi El Barrak,

Sejnane, and Joumine) contain less salt. Thus, sources have been appropriately selected for desalination. In addition, an ODA loan will be offered to desalinate water in the Sfax[8] Area post-project; this facility was expected to meet the water demands of the Sfax Area. As of this ex-post evaluation, the Sfax Area was already being supplied on account of this project.

Overall, this project is considered highly relevant to the country's development needs.

3.1.3 Consistency with Japan's ODA Policy

Tunisia enjoys stable economic growth (at the time of appraisal[9] the average annual economic growth rate was 4.5%), but it does suffer from some challenges, such as agricultural outcomes being affected by climate, high unemployment among young people, and growing socioeconomic inequality among the country's regions. In this context, the Japanese government has offered aids, centered on ODA loans and technical cooperation, especially in three important fields: level-up support for industry, support for water resource development and management, and support for environmental initiatives. Support for the current project is consistent with "Infrastructure improvement of water supply, transportation etc.," a field important to the government's Country Assistance Policy for Tunisia (decided in October 2002), the Operations Policy for Tunisia (in 2003), and the Overseas Economic Cooperation Operations Policy (in 2002–2004) of the JICA. Additionally, it corresponds with policies pertaining to "Infrastructure development for sustainable growth," "Support for reducing poverty," and "Reducing disparities among regions" in Tunisia. This is because issues in northern Tunisia have included how to tackle water-supply demand in those urban areas whose populations are expected to increase, how to increase the water-supply ratio in the northwest region, or how to tackle the demand for separate water supplies in rural areas.

Moreover, "Improvements to water, its supply, and transportation infrastructure" occupies an important part of the Country Assistance Program and Overseas Economic Cooperation Operations Policy, both of which are highly relevant to this project.

As mentioned before, the current project was and is necessary and relevant to Tunisia's development policy and to demands for water resources in northern Tunisia, as of the time of both this appraisal and this ex-post evaluation. Implementation of this project has been highly relevant to the country's development plan and development needs, as well as Japan's ODA policy. Therefore, its relevance is high.

3.2 Efficiency (Rating: ②)

3.2.1 Project Outputs

[8] "Sfax Sea Water Desalination Plant Construction Project" (JPY 366.76 billion) L/A in July 2017; this is slated to be completed in 2023.

[9] At the time of the Jasmine Revolution which took place in Tunisia from the end of 2010 to 2011, Tunisia's economic growth was negative growth. But since then it has turned to pick up.

Comparisons of outputs between the time of appraisal and the time of this ex-post evaluation are as follows, in Table 3.

Table 3 Comparison of Planned and Actual Outputs

Items	Planned Outputs	Actual Outputs
① Construction	(a) Sidi El Barrak–Sejnane ("S–S section"): 18.3-km triplication of water-supply pipe and building of pondage (b) Sejnane–Joumine ("S–J section"): 23.2-km triplication of water-supply pipe (c) Joumine–Medjerda ("J–M section"): 45.3-km triplication of water-supply pipe (d) Sidi El Barrak–Joumine Pump Facility: procuring and building pump facility	(a) Sidi El Barrak–Sejnane ("S–S section"): 18.7-km water-supply pipe was built; however, building of pondage was canceled (b) Sejnane–Joumine ("S–J section"): 22.9-km water-supply pipe was built almost as planned (c) Joumine–Medjerda ("J–M section"): 42.5-km water-supply pipe was built almost as planned (d) Sidi El Barrak–Joumine Pump Facility: Sidi El Barrak Pump Facility was expanded as planned
② Consulting Services	(a) Review of detailed design (b) Assistance for reviewing bidding procedure (c) Management	All services were carried out as planned

Joumine Dam

Joumine Pump Facility

With regards to the building of 65,000 m^3 of pondage—which was supposed to be built by the time of the appraisal—construction was suspended because of a neighboring resident's refusal[10]. During that suspension, an additional survey was carried out to look into geometrical problems. It was then decided that a pondage reduced in capacity (30,000 m^3) would be built, which was in consideration with soft-soil conditions and residents' opinions. Thereafter, attempts were made to initiate construction, but this had to be canceled because it was found that the construction would not be completed before expiration of the ODA loan terms. As of this ex-post evaluation, some parts of the building site had been dug, and machines intended for use were left behind, ready for resumption of construction[11].

However, the purpose of building the pondage was to facilitate and ensure the supply of private power facilities, to power the pumping of water resources from Sidi El Barrak, and ultimately to save power-generation costs. Therefore, this is not a critical factor affecting project evaluation.

As mentioned, the scope remained largely unchanged, and project outputs were almost as planned.

3.2.2 Project Inputs

3.2.2.1 Project Cost

At the time of appraisal, the overall cost was JPY 10,701 million (JPY 5,331 million in foreign currency and JPY 5,370 million in domestic currency[12]), and the loan coverage was JPY 8,026 million (JPY 5,331 million in foreign currency and JPY 2,695 million in domestic

[10] According to the DG/BGTH, neighboring residents feared that the water of the pondage would leak and damage their residence and their land.
[11] This was confirmed in July 2017, during the field study.
[12] Approximately TND 60 million. As of March 2004, the exchange rate was TND 1 = JPY 89.50.

currency[13]). The planned amount to be paid by Tunisia was JPY 2,675 million.

Table 4 Total Costs: Comparison of Planned and Actual Amounts

	Planned Amount	Actual Amount
Foreign Currency	JPY 5,331 million	JPY 6,668 million
Domestic Currency	JPY 5,370 million	JPY 2,757 million
Total	JPY 10,701 million	JPY 9,425 million
ODA Loan	JPY 8,026 million	JPY 6,668 million
Paid by Tunisia	JPY 2,675 million	JPY 2,757 million

As of this ex-post evaluation, the total project cost was JPY 9,425 million,[14] and the ratio of the actual amount to the planned amount was 88%. Although the exchange rate changed (i.e., yen appreciation) and the costs of imported materials (e.g., steel) soared, the cost was within the plan parameters, as the scope had actually been reduced due to cancellation of the pondage project. Even if the pondage would have been built, the construction could have been carried out for less than an additional JPY 500 million. When taking into account this additional cost, the total cost was within the parameters stated by the appraisal. Therefore, the project efficiency from the viewpoint of project cost is high.

3.2.2.2 Project Period

The project period was supposed to be from March 2004 to December 2008 (4 years and 10 months; i.e., 58 months).[15] The project was defined as completed when the guaranteed period for the water-supply pipes, pump facility, and system services had expired.

As of this ex-post evaluation, the evaluators confirmed that the start date of this project was March 2004, that the final acceptance date[16] by the "Société d'exploitation du canal et des adduction des eaux du nord" (SECADENORD) was January 2017, and that the project period was 13 years and 11 months (i.e., 239% longer than planned). Clearly, the project period is significantly longer than planned.

The reasons for the delay are as follows.

(1) Resistance Movement by Local Residents

[13] Approximately TND 40 million.
[14] Approximately TND 135.5 million. The exchange rate was the International Monetary Fund average rate from March 2004 to the end of 2016; TND 1 = JPY 69.66 as of March 2004.
[15] While the project period (including the guaranteed period) was defined as ending in December 2009 at the time of appraisal, the guaranteed period did not end at the time of this ex-post evaluation. Because of that the evaluators applied the project period excluding the guaranteed period, as the project period both at the time of appraisal and at the time of the ex-post evaluation.
[16] This ex-post evaluation considered this project as completed upon final acceptance by the executing agency. In addition, because the sub-rating for the project period is considered low if it exceeds 150%, the subrating for the project period would not change even if the evaluators were to define this project as being completed after the guaranteed period.

Because local residents prevented the construction of the water-supply pipe from Sidi El Barrak to Sejnane[17] by force, construction was suspended. Thereafter, an administrative decree reinitiated the construction by executive order, whereupon it was finished in June 2016; the final transfer to SECADENORD took place in January 2017. The guaranteed period was supposed to be 12 months following the completion of the construction, which was meant to be finished in July 2017.[18]

Expansions of the Sidi El Barrak Pump Facility and the Joumine Pump Facility were completed in December 2014. However, the actual start of operations by these facilities was in June 2016, due to the resistance of local residents; the final transfer took place in January 2017.

(2) Rebidding by the Consultants

Because the consultants carried out rebidding[19] at the time of selection, the agreement related to the consulting service contract delayed 49 months.

(3) Soil Deterioration Due to heavy rain

Because the soil at the project site is soft, considerable volumes of rainwater remain whenever a sudden heavy rain occurs. If rainwater remains, construction works need to be suspended, and for this very reason, construction in Sidi El Barrak–Sejnane was delayed by 3.8 months, in Sejnane–Joumine by 3.1 months, and in Joumine–Medjerda by 2.8 months. The total delay was 9.7 months.

(4) Stagnation of Administrative Procedure due to Tunisian Revolution ("Arab Spring")

National rights awareness and an antigovernment attitude led to sabotage by the residents mentioned in point (1) above. In addition, many executives were exiled following the 2011 revolution; this led to overall stagnation in administrative procedures. However, this does not mean there was a total absence of administrative organization: indeed, line ministries in charge of basic infrastructure—including police, fire departments, and military—continued to hold their function.

Therefore, no subperiods should be removed from the project period as *forces majeure*.

3.2.3 Results of Calculations for Internal Rates of Return (Reference Only)

Because this project generates no financial profits (e.g., toll revenue), a quantitative analysis of the financial internal rate of return since the appraisal has not been possible. On the other hand, the economic internal rate of return (EIRR) was 11.4%. The methodology by which we calculated the EIRR considered the following factors.

[17] This will be explained in point (4), below.

[18] Upon the completion of the field study, the evaluators confirmed with the executing agency that the guaranteed period was expanded even as of October 2017.

[19] The executing agency took too many times to create a document of the request for the proposal to consultants and the submitted proposal and application form by consultant was completely deficient. For the executing agency, it was very difficult to evaluate this proposal and finally through the judgment of the government of Tunisia the executing agency has rebid.

Cost: Construction cost and management cost (in this project, for six dams in the northern region and for water-supply facilities)

Benefit: Increased profit due to increasing supplies of drinking, industrial, and irrigation water, and to increasing agricultural production by virtue of desalination

Project life: 50 years

As a reference, the evaluators recalculated EIRR based on costs, benefits, and project life as cited, and found it to be 18.9%. The EIRR increased because the actual profit of agricultural products in 2016 exceeded the forecast at the time of the appraisal. However, increases in the prices of agricultural products were not considered. Although the evaluators did consider the costs of managing those dams not covered by this project, these management costs were excluded, as they do not originate from this project. Additionally, the construction cost was calculated on a per-capita basis, as there were no materials relating to this factor.

As mentioned, all of the outputs—save for the cancelled pondage construction—were completed. Although the project cost was within the plan parameters, the project duration exceeded that of the plan. Therefore, the project efficiency is assessed as fair.

3.3 Effectiveness[20] (Rating: ②)

3.3.1 Quantitative Effects (Operation and Effect Indicators)

At the time of appraisal, the target values when we evaluated this project were 200 million m^3 for the amount of water taken from the Medjerda River 2 years post-completion; 211 million m^3 for the amount of water conveyance from the triplication pipes between Sidi El Barrak and Sejnane; 244 million m^3 between Sejnane and Joumine; and 290 million m^3 between Joumine and Medjerda. Moreover, the target value of the land utilization rate was set as 120%, that for the rate of salinity concentration of Cap Bon (g/l) (maximum in a month) as 1.0 g/l, and that of the water-supply salinity concentration (g/l) (maximum in a month) as 1.0 g/l. The evaluation results are shown in Table 5.

[20] The subrating for effectiveness is to be grouped with a consideration of impact.

Table 5 Indicators of the Effects of the Operation (Target and Actual Values)

Year	Reference Value 2002	Target Value Two Years Post-completion	Actual Value 2010	Actual Value 2014	Actual Value 2016	Actual Value 2017 Post-completion	Estimated Value 2017
Amount of Water Taken from Medjerda River (1 million m^3/year)	163	200	135	218	249	n/a	n/a
Amount of Water Conveyed by Triplicated Pipe							
S–S (1 million ^{3}/year)	0	211	7.5	10.5	61	140	196–201
S–J (1 million ^{3}/year)	33	244	95	100	103	198	234–243
J–M (1 million ^{3}/year)	62	290	158	142	117	200	234–291
Land Utilization Rate (%)	108	120	n/a	n/a	117	n/a	n/a
Salinity Concentration of Cap Bon (g/l)	1.5	1.0	1.5	1.5	1.5	n/a	n/a
Tap Water Salinity Concentration (g/l)	1.3	1.0	n/a	1.0	1.0	n/a	n/a

Source: Evaluation materials from the organization.

Note 1: While this projected is not estimated to increase the amount of water taken from the Medjerda River, this project does assume that needs are satisfied by both the water from the Medjerda River and by the project's increased water-conveyance volumes. Therefore, we use the amount of water taken from the Medjerda River to analyze the factors of the water supply of the area of demand and salinity concentration. The target value is set as the maximum value in order to maintain that salinity concentration of the lower stream (upper water and irrigation) is under 1.0g/l.

Note 2: Land Utilization Rate: total crop acreage divided by cultivated acreage.

Note 3: 2017 data comes from the timeframe ranging from July 2016 (i.e., following the completion of the construction) to August 2017. All other data is annual.

At the time of the ex post evaluation as we have previously mentioned within "2.3 Constraints during the Evaluation Study", this project did not achieve to the targeted year (two years following the project completion). Because of that we confirmed the following points by considering the estimated value with a secular change.

First of all, although the amount of water taken from the Medjerda River is not a result of

this project and acts only as a reference, the results suggest that the target value was reached since 2014 as shown in Table 5.

Second, with regard to the amount of water conveyed from the triplication pipe, although the real values do not reach the target for S–S (66% of the target value) or for J–M (69%), that for S–J has been nearly realized (i.e., 81%). However, the estimated value for S–S in 2019 which we have calculated by using the existing data is in the range of 201 million m^3 (upper bound) and 196 million m^3 (lower bound) (when little rain falls) per year, and that way we can attain the target value if it is an upper-bound case[21]. On the other hand, we can reach the target value regardless of whether it is an upper (243) or lower-bound (234) case. Even if we assume the lower-bound case, the target values will be achieved in all sections. We can estimate that 80% of target will be achieved 2 years post-completion either in any section or in the lower-bound case.

Third, the target value of the land utilization rate has been almost reached. Given that some citrus fruit and vegetables derive from double-cropping, the total crop acreage exceeds the cultivated acreage, and the percentage was achieved to 117% in the actual value of 2016. Moreover, when one considers that land utilization rate is directly proportional to the water-conveyance amount, the land utilization rate is less likely to decrease from 2016 on, in accordance with data on the water-conveyance amount. We can therefore estimate that the target value will also be achieved in 2019.

Fourth, regarding salinity concentration, the real values in 2016 did not achieve the target value in Cap Bon, but water-supply targets were achieved. Assuming an increase in water conveyance, we can attain the target value of the water-supply salinity concentration, but we cannot estimate whether the Cap Bon value will be attained: this will depend on the quality of the southern water system. However, since the southern water system is not covered by this project, we should consider the salinity concentration of the Cap Bon as a reference value.

3.3.2 Qualitative Effects (Other Effects)

The target value was not set both at the time of the appraisal and of the ex-post evaluation.

As one can see, with regards to the water-conveyance amount, although the real values in 2017 did not reach the target values (save for those between Sejnane and Joumine), it can be estimated that over 80% of the target values will be achieved by 2019, even in a lower-bound scenario. Additionally, the target value for the land utilization rate has been nearly achieved; it is estimated that this value will be attained in 2019, assuming that the water-conveyance

[21] We calculated the upper and lower-bound estimated values based on certain assumptions, based on the (monthly) real values of 2016–2017: in the upper-bound case, the water-source dams will fill with water and be fully operational, and in the lower-bound case, a certain portion of the dams (e.g., the Sejnane Dam, which flows into Ichkeul Lake) will be unusable.

amount increases. Additionally, the target value of the amount of water taken from the Medjerda River has already been achieved. As for salinity concentration, the plan's value for tap water has already been attained and, considering the estimated increase in water-conveyance amount, we can assume that that value will be sustained. Therefore, the effectiveness of the project is assessed as fair.

3.4 Impacts

3.4.1 Intended Impacts

3.4.1.1 Quantitative Impacts

Upon the appraisal, the target values for water consumption, water-supply population, piped water-supply coverage ratio, and farm products were set as quantitative impacts. Upon the ex-post evaluation, as one can see in Table 6, it can be assumed that, in those circumstances, most of the construction of all pipelines except for a storage pump was completed by 2014 and that water was conveyed without storage pumps thereafter; therefore, a portion of the impact can be observed. Because project completion was planned for 2017, it does matter whether the impacts can be sustained until 2019. However, using the estimated water-conveyance volume for 2019—based on the efficiency level calculated in the previous section—one can predict that water consumption and water-supply population will increase, and that the quantity and quality of citrus production in Cap Bon will be sustained.[22]

Table 6 Post-evaluation Values

Year	Standard Value	Target Value	Real Value		Year of Completion
	2002	2010	2010	2014	2016
Water Consumption (1 million m^3/year)	195	256	272	303	311
Water-supply Population (1 million)	4.4	5.6	6.3	6.7	n/a
Piped Water-supply Coverage Ratio (%)	100	100	100	100	100
Citrus Fruit Output in Cap Bon (1,000 tons/year)	240	<240	n/a	328	450
Main Farm Products Unit Crop in Cap Bon (Citrus Fruit) (tons/ha/year)	15	17	n/a	18	24
Amount of rainfall (in Cap Bon) (as a reference)(㎜/year)	317	462	462	419	468

Source: Various documents provided by the executing agency.

Note: The numerical values of "Water Consumption", "Water supply population" and "Piped Water-supply

[22] We include contributions other than those of this project, such as those of the southern water system.

Coverage Ratio" are the data of the whole project area (Greater Tunis). The target values are assumed to be two years after the completion (2019); however, because the year 2019 is not suitable for predicting sector-based change, for convenience, we evaluated its impacts based on values from 2016. And as we have conducted the field survey in 2017, we are not able to obtain the year 2017 data.

3.4.1.2 Qualitative Impacts

In the evaluation, qualitative effects were evaluated in terms of increases in water supply to local residents, improvement of health and sanitation conditions, and improvement of standard of living, all by virtue of improving the water quality.

Following the evaluation, we confirmed that this project had contributed to an increase in the supply of higher-quality water, given that the water-conveyance target values had been achieved. However, while salinity concentration had improved in the northern water system, the salinity concentration value was not reached to target value in Cap Bon because of the confluence of the southern water system.

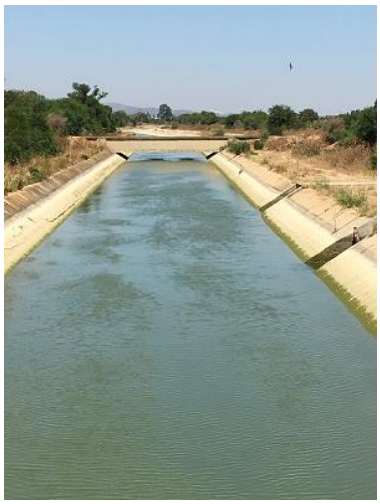
As there was no objective data before and after the project concerning public health, improvements to sanitation, or improvements to standards of living, the evaluators inquired about the standard of living in a beneficiary survey (as discussed below); they concluded that there had been improvements. Likewise, as there was no objective data about the impact of water supply on socioeconomic aspects, the evaluators asked about similar topics; they generally found good results. Additionally, as Table 6 shows that both the production price and unit income of citrus products had increased[23], and that price is rather rising, thus giving rising to an upward trend in agricultural income. Therefore, it can be said that this project contributes to improvements in the local standard of living.

For the beneficiary survey[24], the evaluators selected six available sites within the overall area that objectively benefit from pipe triplication.[25] The number of effective respondents comprised 117 households. The number of drinking water users was 90 households, and that of irrigation water was 27 households. The evaluators sampled two areas for irrigation water (Talef, which has a pump facility, and its neighboring city, Sidi Othmane) and four areas for drinking water (the northern and southern parts of City Mateur, Aryanah, and Ben Arous). The populations of City Mateur, Aryanah, and Ben Arous are 32,000, 115,000, and 88,000, respectively; Aryanah and Ben Arous are located in the Grand Tunis area. Regarding gender distribution, 30% of all respondents were found to be female.[26]

[23] Many of the citrus fruit to be exported and generally the export price is higher than the domestic price.
[24] The water supply to the residents did not take place with this project. Therefore, there is a possibility that the result of the beneficiary survey is not the effect of this project and we should treat it as a reference.
[25] Random sampling was impossible, given the difficulty of sourcing the resident register. We therefore targeted representative households living within 100–200 m of the conduit pipes, and nonrandomly selected respondents.
[26] Occupationally, the beneficiaries covered by this survey could be broken out as follows: corporate managers, 3%; merchants, 11%; self-employed people, 11%; public servants, 9%; and farmers, 22%.

(1) Drinking Water (90 Households)

Many survey respondents said that there had been no water-supply outage. However, a portion of them—especially those living at high altitudes—answered that there had been a drop in water pressure. One-half of residents responded that they drink tap water, while the other half responded that they do not because they do not trust its quality. One-half of the residents answered that they were satisfied with the quality of the drinking water.



Medjerda River

Planned Site of New Pondage
(Sidi El Barrak)

Table 7 "Has there been any change in water pressure, such as water outage?" (Multiple selections allowed)

Water Outage	Change in Water Pressure	None
19	14	56

Note: One household did not answer the question.

Source: Beneficiary survey.

Table 8 "Can you drink the tap water?"

Yes, I can.	No, I cannot.	I don't know.
41	48	1

Source: Beneficiary survey.

Table 9 "Are you satisfied with the water pipe services?"

Satisfied.	Not Satisfied.	I don't know.
45	41	4

Source: Beneficiary survey.

(2) Irrigation Water (27 Households)

This project has four supply points for irrigation water, and the *Commissariat régional de développement agricole de Bizerte* (CRDA) manages each of them. A beneficiary survey was conducted in the vicinity of these points. According to the results, regarding the target of increasing the water supply to area residents, 26 of the 27 households were satisfied with the current water quality, 23 with water-supply services, and 26 with economic activities. Although this data only complements the water-quality data, given that 80% of the respondents showed satisfaction, it can be said that the targets have been roughly achieved.

3.4.2 Other Positive and Negative Impacts

3.4.2.1 Impacts on the Natural Environment

At the time of the appraisal, this project was categorized as B, based on the "JBIC Environmental Guidelines for ODA Loans." Additionally, an assessment report based on the *Tunisian Environmental Assessment Act* was issued, and it was approved by the National Agency of Environment Protection. Some of the water induced during this project was used to desalinate Ichkeul Lake in order to mitigate salt damage incurred by the lake. (This lake had been cited in the list of World Heritage in Danger issued by the United Nations Educational, Scientific and Cultural Organization (UNESCO), and in 1994, the number of wintertime migratory birds reduced by 90% compared to the 1980s (about 200,000 birds).)

Our ex-post evaluation confirms that that this project incurred no adverse environmental effects. Additionally, according to results of the beneficiary survey, a large proportion of the residents answered that they had experienced no problems, such as noise, during the construction phase.

Table 10 Did you have noise problems during the construction?

Yes, I did.	No, I did not.	I have no idea.
3	22	2

Source: Beneficiary survey.

Note: Total number of respondents: 27 households (i.e., the beneficiaries of irrigation water).

While the salinity concentration percentage of Ichkeul Lake was 10 g/l and more at the time

of the appraisal, this number reduced[27] to 2 g/l and less at the time of the post evaluation. The number of migratory birds to the Ichkeul Lake in the winter was not the object to be monitored in this project. Just for reference we asked the confirmation to the Ministry of Environment. According to the Ministry of the Environment the number of migratory birds to the Ichkeul Lake in the winter from 2006 was restored from 200,000 to 400,000. Therefore Ichkeul Lake was removed from UNESCO's World Heritage in Danger list in July 2006 and the survey of collecting data of migratory birds was canceled.

Consequently, this project contributed to the desalination and the salt damage mitigation of Ichkeul Lake.

3.4.2.2 Land Acquisition and Resettlement

When we evaluated the already-acquired land, we determined that no residents had been resettled on account of the project; the results of the ex-post evaluation further support this assertion.

Land used to construct water conduits between Joumine and Medjerda were expropriated by Tunisia's government in 1987 when the first water conduits were constructed in the same region. Therefore, land acquisition did not take place during this project. Local residents protested further land expropriation in a neighboring area before the start of the 1987 project. Their descendants again raised this issue and demanded compensation after the start of this project. In April 2011, these residents sabotaged the construction of a water-supply pipe from Joumine to Medjerda; thus, although materials had been procured in July 2012, the construction had yet to start. Eventually, the construction of the water-supply pipe started at the behest of an administrative order; it was completed in July 2016 and transferred to SECADENORD in January 2017. As a salient opposite action did not take place after the completion of this project, we confirm that there was not a big negative impact.

3.4.2.3 Unintended Positive and Negative Impacts of the Project

During the appraisal and ex-post evaluations, the project was not found to have any other impact, whether positive or negative.

As mentioned, the real values of water conveyance in 2017 did not reach the target values, save for that of the Sejnane and Joumine section; however, it is highly likely that80% of the targets will be achieved at least in 2019. Additionally, the land utilization rate and salinity concentration objectives have been nearly achieved, and regarding land utilization rate, the probability of the deterioration of target achievement status will be low (under the assumption that water conveyance will increase). However, the salinity concentration target value has not been reached in one of the two areas, and it cannot be said that it will be reached before 2019.

[27] According to the public data of the Tunisian Ministry of the Environment.

Therefore, the effectiveness of the project is assessed as fair.

Moreover, targets regarding the water supply, water-supply population, citrus fruit outputs in Cap Bon, and unit crops had already been achieved in 2016.[28] Therefore, while quantitative data suggest the project's high impact, the impact was more moderate.

While the project's impact tends to be high, when we combine the effectiveness and the impact, the proportion of the effectiveness is relatively large. Therefore, the project's effectiveness and impact are assessed as fair.

3.5 Sustainability (Rating: ③)

3.5.1 Institutional Aspects of Operation and Maintenance

The appraisal cites DG/BGTH as the executing agency until the completion of this project; following its completion, SECADENORD took over the operation and management of each facility. At the end of 2016, SECADENORD had 445 workers in total, and occupationally, they can be described as follows: 9 executives, including the president; 10 bureau chiefs; and 13 chief engineers, with the remainder comprising normal engineers (about 20% of whom are qualified engineers) and clerical employees. SECADENORD is a public corporation, and its organization is similar to that of Tunisia's bureaucracy with a top-down chain of command. However, when one considers its accountability among intra and inter-organizations, there appears to have been no particular problems with regards to policy-making mechanisms and decision-making processes. The results of the ex-post evaluation confirm that the management system has not changed since the appraisal.

Therefore, we confirm that this project involves a sufficient management system.

3.5.2 Technical Aspects of Operation and Maintenance

According to SECADENORD's org chart, the maintenance division that executes large projects operates under the auspices of the technical station. Additionally, based on the activity reports of SECADENORD for 2014–2016, we can confirm that the plan for developing technicians was documented and the budget was distributed.[29]

[28] Contributions other than those of this project (e.g., those of the southern water system) are included.
[29] This information is based on domestic records from SECADENORD.

Table 11 SECADENORD Materials

	FY2016	FY2017
Training (Budget)	TND 121,400	TND 124,100
Content	Budget management and financial training, training on the law for land management, and technical training (such as techniques for the management of water sources)	Same as in FY2016

Source: SECADENORD.

According to the annual activity reports, the charge of each engineer is described in detail based on job classification. The classes are on a 10-point scale in accordance with the level of the acquisition of technique quality and the management level; promotions are based on experience and techniques.

Save for a guidebook written by the contractor, there are no manuals regarding the parts or machines used; however, upon being tasked with operational maintenance at the pump stations, workers are trained on the job, and they face no special technical difficulties. Moreover, based on their needs, they can acquire some techniques through external organizations, such as manufacturers and universities[30].

Therefore, we assess the operational and maintenance technical level as being high.

3.5.3 Financial Aspects of Operation and Maintenance

At the time of the appraisal it was found that this project was given high priority under the 10th five-year plan; no problems were found with regards to local currency budget allowances. The ex-post evaluation confirmed that project maintenance budgets were defined by section (Table 12).

Table 12 Management Budget (Unit: TND)

Year / Section	2014	2015	2016	2017
S–S	431,700	336,900	285,280	298,430
S–J and J–M (Combined)	707,300	788,200	1,100,600	914,700
Total	1,139,000	1,125,100	1,385,880	1,213,130

Source: SECADENORD.

[30] This information is based on hearings to SECANDENORD.

Table 13 Financial Statements (FY2014–FY2016)

	2014	2015	2016
Owned Capital	3,630	3,630	3,630
Annual Reserve Funds	244	290	288
Carried Forward	12,407	14,293	16,412
Net Profits before Taxation	18,208	20,333	20,526
Total Debt	9,169	9,411	12,973
Total Assets	27,378	29,744	33,500

Source: SECADENORD.

Note: Unit is millions of TND.

Fiscal resources are based on fee revenues. As Table 13 shows, with regards to financial statements, SECADENORD does not operationally rely upon loans as the organization, but rely on revenues from clients. For example, "pre-tax net income" (fee revenues) in Table 13 accounts for 60% of all revenues.) Therefore, the project's financial condition can be considered healthy. For management, the budget allocated until FY2017 will suffice in executing this project. Therefore, there are no particular finance problems, and considering the sufficiency of the fee revenues and reserve funds, the project's financial resources will be sustainable in the foreseeable future.

In conclusion, the project does not have any problem in terms of financial management.

3.5.4 Current Status of Operations and Maintenance

Our evaluation confirmed that this project's conduit pipes are regularly subject to on-the-spot investigations. Additionally, the maintenance budget has remained unchanged. Maintenance, repairs, and other work has been conducted, and as needed, the control office of each dam informs SECADENORD's head office in Tunis about the maintenance. However, there is no online monitoring system, in cases where repairs are necessary, communication is restricted to telephone and email. SECADENORD intends to use online (remote) monitoring systems at each dam regulated by the Central office and hopes for donor aid to finance them.[31]

On the other hand, we confirmed that on-the-spot investigations had been executed and updated at each watering place under the management plan (i.e., 24-hour treble-shift system), and that inspections, repairs, and other duties have been carried out. Spare parts are stored at each pump facility and, if they are in short supply, they are provided domestically or by other

[31] This information is based on hearings to the executing agency.

countries (mainly Germany).

In essence, we report that there have been no major problems with this project's operation or maintenance.

In conclusion, no major problems have been observed regarding institutional, technical, or financial aspects of this project, or in the current status of the project's operation and maintenance system. Therefore, the sustainability of the project's effects is considered high.

4. Conclusion, Recommendations, and Lessons Learned

4.1 Conclusion

The aims of this project are to source the financial aid needed to construct water pipes (a total extension of about 90 km), undertake this extension of existing pump facilities, and source consulting services in the north of Tunisia; the endpoint of these aims is to provide high-quality drinking, industrial, and irrigation water to the Greater Tunis Area and to the areas surrounding Tunis, Tunisia's capital city. As part of the Water Resources Development in accordance to the Master Plan drawn up by the government of Tunisia , this project also looks to contribute to measures that address the population growth and, hence, the increased water demand—as well as the expansion of agricultural production in the Greater Tunis Area and surrounding areas—by constructing water-supply pipes (triplication), extending the existing pump facilities in three sections (Sidi El Barrak–Sejnane, Sejnane–Joumine, and Joumine–Medjerda) which are located in the northern part from Tunis, and reinforcing the high-quality supply of waterworks and irrigation water for the area (Cap Bon, Sahel, and the Greater Sfax Area).

The operation of this project is sufficiently consistent with Tunisia's development policy, Tunisia's development needs, and Japan's aid policy; as such, it is highly appropriate. Its outputs are completed nearly as planned. The operating cost is within the planned budget, but the timeframe of this project far exceeds that mentioned in the initial plan. Therefore, the project's efficiency is assessed as fair. At the time of this ex -post evaluation, the objective amount of water supply brought about by this project had not been achieved; it is expected to be achieved by 2019. However, other effectiveness indicators exceeded the objective values, and so, on balance, the project's effectiveness can be assessed as fair. Thus, the project effectiveness and impacts and impacts are assessed as fair. As expected at the time of the appraisal, the institutional, technological, and financial aspects of both management and operations have reached essential and sufficient levels, and both have been adequately carried out. Thus, project sustainability is considered high.

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

Regarding the new pondage whose construction was interrupted, in consideration of the environmental effects in the surrounding areas, we can reduce the scale and mitigate environmental damage. Additionally, it must be stated that even an abrupt power cut happens the new pondage can continue to work without stopping the function of the pump station. Therefore, the agency should make the efforts to examine the future orientation by making continuing the dialogue with the residents.

4.2.2 Recommendations to JICA

We have no recommendations to make to JICA.

4.3 Lessons Learned

Follow-up for the projects with final disbursement before the project completion.

During each term of this project, the executing agency submitted a progress report to the JICA Tunisia office; this progress report pointed out the possibility that a part of the project would not be completed before the final disbursement, given resident opposition. JICA also recognized this and called upon the executing agency to expedite the project. However, the executing agency did not submit request for the (re)extension of the loan period, and the time limit of the final disbursement was reached. JICA had continued dialogue with the executing agency on the uncompleted component of the ODA loan. However, there was no official agreement on change of scope for defining project completion, budgetary measurement of Tunisian Government or schedule for the project completion. In the future, when the project is uncompleted by the final disbursement, it is recommended to have written official agreement on responsibilities for the executing agency. So that the effective follow-up would be possible.

Comparison of Original and Actual Project Scopes

Item	Planned	Actual
1. Project Outputs	① Engineering Works (a) Triplication of 18.3 km of water pipes between Sidi El Barrak and Sejnane, and the construction of regulating reservoir (b) Triplication of 23.2 km of water pipes between Sejnane and Joumine (c) Triplication of 45.3 km of water pipes between Joumine and Medjerda (d) Pump stations in Sidi El Barrak and Joumine; procurement and installation of water-lifting devices ② Consulting Services (a) D/D review (b) Bidding evaluation support (c) Management of operations	① Engineering Works (a) Construction of 18.7 km of water pipes between Sidi El Barrak and Sejnane; construction of the regulating reservoir was stopped (b) Construction of 22.9 km of water pipes between Sejnane and Joumine (c) Construction of 45.3 km of water pipes between Joumine and Medjerda (d) Pump stations in Sidi El Barrak and Joumine constructed as planned ② Consulting Services: executed as planned
2. Project Period	March 2004–December 2009 (58 months)	March 2004–January 2017 (167 months)
3. Project Cost Amount Paid in Foreign Currency Amount Paid in Local Currency Total ODA Loan Portion Exchange Rate	 JPY 5,331 million JPY 5,370 million (TND 60 million) JPY 10,701 million JPY 8,026 million TND 1 = JPY 89.50 (As of March 2004)	 JPY 6,668 million JPY 2,757 million (TND 40 million) JPY 9,425 million JPY 6,668 million TND 1 = JPY 69.66 (Average of IMF exchange rate between March 2004 and the end of 2016)
4. Final Disbursement	July 2014	

<End>