

Tunisia

Ex-Post Evaluation of Japanese ODA Loan Project
Rades - La Goulette Bridge Construction Project

External Evaluator: Yasuhiro Kawabata, Sanshu Engineering Consultant

0. Summary

The objectives of the project were to: i) mitigate traffic congestion in the regions surrounding the Tunis Lake by diverting traffic concentration into the Tunis central district; and ii) improve accessibility between La Goulette and Rades ports by constructing a bridge connecting La Goulette, located in the north of the Tunis Lake canal, and Rades, located in the south, and thereby contributing to the regional economic development and industrial promotion in the Tunis Lake coastal region. The project has been highly relevant to the development plans and needs of Tunisia, as well as Japan's ODA policies. Regarding mitigation of traffic congestion in the regions surrounding the Tunis Lake by diverting traffic concentration into the Tunis central district and improvement of accessibility between La Goulette and Rades ports which are the project's objectives, since the project has somewhat achieved its objectives, its effectiveness is fair. Although the project cost was lower than planned, the project period was significantly longer than planned. Therefore, the efficiency of the project is fair. Some problems have been observed in terms of budget allocation for maintenance work, therefore sustainability of the project is fair.

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

1. Project Description



Projection Location



Rades - La Goulette Bridge

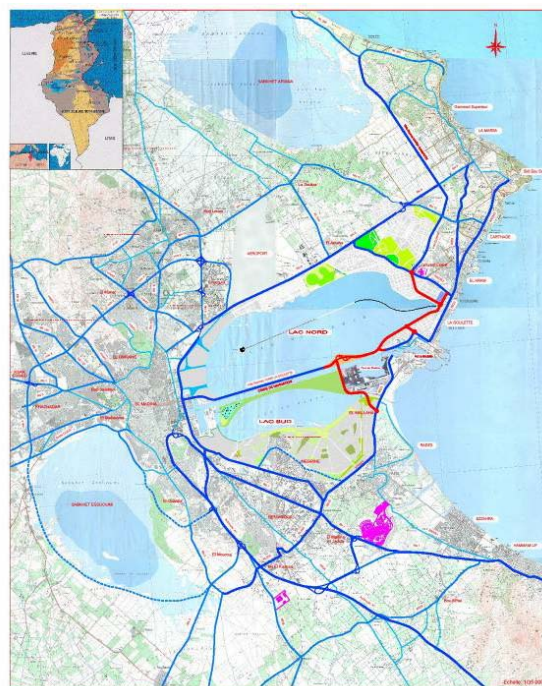
1.1 Background

Greater Tunis, the project's target area consists of four municipalities: i) Tunis, which covers the Tunis central district in the west of Tunis Lake, and Tunis in the east of the lake including Carthage, La Marsa, and La Gourette; ii) Ariana in the north of Tunis (residential area); iii) Ben Arous in the south (industrial zone): and iv) Manouba located in the west of Tunis and Ariana. Arterial highways in Greater Tunis are Mohamed V (MV), which passes around the Tunis

central district, and other highways such as Z4 (Republique), Regional Roads 33 and 34, National Roads 1, 3, and 9, and Sortie Sud, radiating from the city center. The average daily traffic on these highways at the time of appraisal (1999) was 10,000-20,000 vehicles/day. However, the highways with the heaviest traffic had already recorded the highest traffic volume of MV with 100,000 vehicles/day and National Road 9 with 50,000 vehicles/day. Since most of these highways are two-lane highways, the traffic volume had already exceeded its highway capacity. The transporting capacity of the ferries crossing the Tunis Lake at the location where the bridge was planned under the project was 4,000 vehicles/day (only vehicles with less than 3.5 tons loading capacity were permitted), and the waiting time for boarding was at least 30 minutes. Thus, roads around the terminal area had always been congested. Under these circumstances, further increase in traffic volume was expected in the project affected area, and, thus mitigation of traffic congestion was anticipated.

1.2 Project Outline

The objectives of the project were to i) mitigate traffic congestion in the regions surrounding Tunis Lake by diverting traffic concentration into the Tunis central district; and ii) improve accessibility between La Goulette and Rades ports by constructing a bridge connecting La Goulette, located in the north of the Tunis lake canal, and Rades, located in the south, and thereby contributing to the regional economic development and industrial promotion in the Tunis Lake coastal region. The location of the project site is shown in Figure 1.



Note: Red lines are the project highways

Figure 1 Location of Project Site

Loan Approved Amount/ Disbursed Amount	8,403 million yen/8,402 million yen
Exchange of Notes Date/ Loan Agreement Signing Date	March 1999/March 1999
Terms and Conditions	For work: Interest Rate: 2.20%, Repayment Period: 25 years (Grace Period: 7 years) Conditions for Procurement: General untied For Consulting services: Interest Rate: 0.75% Repayment Period: 40 years (Grace Period: 10 years) Conditions for Procurement: Bilateral tied
Borrower / Executing Agency (ies)	Republic of Tunisia/Ministry of Equipment (Department of Bridges and Highways)
Final Disbursement Date	June 2009
Main Contractor (Over 1 billion yen)	Taisei Corp., Kajima/Sumitomo/ARABCO (Egypt), Taisei Corp., SOMATRA Get (Tunisia), SENELEC (Tunisia)
Main Consultant (Over 100 million yen)	Nippon Koei/Pacific Consultant International/SCET Tunisie/STUDI (Tunisia)
Feasibility Studies, etc.	Feasibility Study by JICA (1991), SAPROF (February 1997)
Related Projects (if any))	-

2. Outline of the Evaluation Study

2.1 External Evaluator

Yasuhiro Kawabata, Sanshu Engineering Consultant

2.2 Duration of Evaluation Study

Duration of the Study: July 2011 –September 2012

Duration of the Field Study: December 5 – 19, 2011, January 28 – February 7, 2012, and
May 5 – 15, 2012

2.3 Constraints during the Evaluation Study

none

3. Results of the Evaluation (Overall Rating: B¹)

3.1 Relevance (Rating: ③²)

3.1.1 Relevance with the Development Plan of Tunisia

The Tunisian 9th Five-Year Plan (1997-2001) stated that in order to integrate the Tunisian economy with the world economy, the “grading up” efforts was aimed at enhancing productivity to strengthen competitiveness, and a new development strategy to diversify the

¹ A: Highly satisfactory, B: Satisfactory, C: Partially satisfactory, D: Unsatisfactory

² ③: High, ② Fair, ① Low

Tunisian economy was adopted. Enhancement of industry's productivity, increase of exports, and control of inflation were the major issues to be addressed. The importance of transport sector was emphasized particularly in order to achieve the smooth and speedy logistics and enhance the industrial competitiveness. With respect to highway sector projects to be implemented during the 9th Five-Year Plan, mitigation of traffic congestion in the Greater Tunis was identified as a priority agenda. The project was considered to be an important link in the metropolitan ring road, which connects the southeast region and northwest region in the metropolitan area.

Under the 11th Five-Year Plan (2007-2011), the Tunisian government aimed to achieve the economic development at 6.1% per annum through open market, enhancement of productivity, and creation of new job opportunities. Under the government policy, the transport sector has been an important part to strengthen its industrial competitiveness. The development of arterial highway network is particularly considered a required investment in order to expedite the economic exchange and trade with neighboring countries, and promote the human exchange, such as tourism. Furthermore, promotion of development of arterial highways and rural roads (under the project, National Roads 9 and 10 will be connected with Route 1 in the eastern coastal region), development of the road network connecting the industrial zones and commercial cities, and promotion of the infrastructure development are also considered essential.

3.1.2 Relevance with the Development Needs of Tunisia

At the appraisal stage, Greater Tunis was divided into north and south regions by Tunis Lake Canal, and two alternative routes connecting the south and the north are as follows: i) the route passing through Tunis central district (road), and ii) the route connecting La Gourette and Rades ports by ferry boats. However, since the ferry service had some constraints on the operating hours and its transporting capacity (number of vehicles per vessel and maximum loading capacity of each vehicle), most traffic traveling the north - south direction selected the route passing through the Tunis central district. As a result, there was traffic congestion in the Tunis central district, and the environment, such as air pollution and water pollution³, deteriorated (partly due to drained water from highways) in Tunis Lake. Due to the increase in traffic volume, as a result of the development of economic activities, increase in tourism, demand and integrated development around the lake coastal area in Greater Tunis, mitigation of traffic congestion was anticipated.

Upon completion of the project, since the alternative route, which crosses the bridge

³ The project is located around the channel opening at the eastern edge of Tunis Lake and consideration to water conservation by construction was sought.

constructed under the project was created in addition to the route passing through the city central district, the traffic congestion seen in the central district before the project has somewhat improved. Thus, it is recognized that the project has contributed to the development needs, which is mitigation of traffic congestion.

3.1.3 Relevance with Japan's ODA Policy

At appraisal, the previous version of Japan's ODA Charter (1992) emphasized that infrastructure development was an essential foundation for the economic and social development. Moreover, in the Overseas Economic Cooperation Implementation Strategy (December 1999- March 2002) at appraisal (1999), the basic infrastructure to strengthen Tunisia's international competitiveness and promote private investment to the country was considered a priority sector in Tunisia. Since the objective of the project was to construct a bridge and highways, which is considered to be the basic infrastructure for the regional development and promotion of industry development, the project was in accordance with the Japanese aid policies.

Accordingly, the project has been highly relevant with the Tunisian development plan and needs, as well as Japan's ODA policies. Its relevance is therefore considered high.

3.2 Effectiveness (Rating: ③)

3.2.1 Quantitative Effects (Operation and Effect Indicators)

Since the project's outcome is to mitigate traffic congestion in the regions surrounding Tunis Lake by diverting traffic concentration into the Tunis central district and improve accessibility between La Goulette and Rades ports, the quantified effects were examined.

(1) Mitigation of Traffic Congestion in the Regions surrounding Tunis Lake

In order to examine the contribution of the project in mitigating traffic congestion, changes in traffic volume on the main arterial roads in the Tunis central district need to be examined in terms of traffic volume before and after the project taking into account the increase in vehicles (traffic volume) due to economic development. However, in Tunisia, the traffic volume on main roads is counted every five years. The previous counting was undertaken in 2007 and the next counting is scheduled for this year 2012. Since the data on traffic volume after completion of the project is not available, the traffic counting around the Rades – La Goulette Bridge section (North Extension Highway, Canal Highway, Rades-La Goulette Bridge, and Rades South Approach Road) were carried out under this evaluation work. By analyzing the data on counted traffic, the contribution to mitigation of traffic congestion was examined. Highways/roads included in the project are shown in Figure 2.

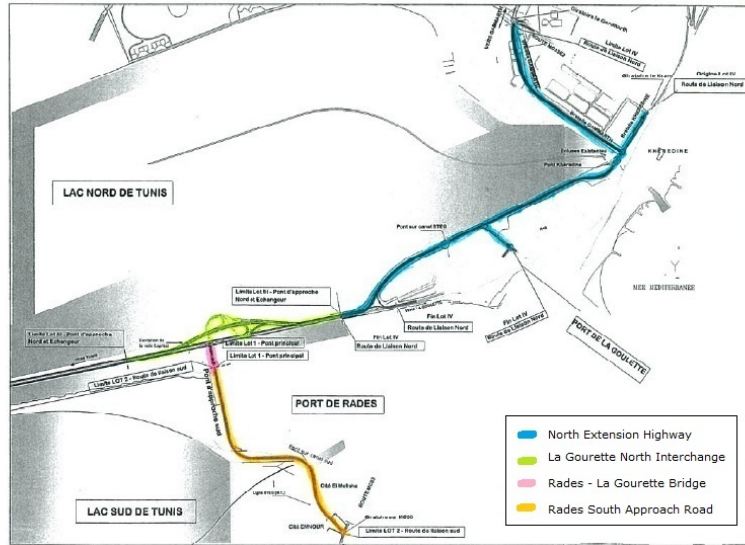


Figure 2 Highways/roads included in the Project

1) Traffic Volume of Crossing the Bridge (Average Daily Traffic)

The traffic volume of crossing the bridge upon completion of the project is shown in Table 1.

Table 1 Average Daily Traffic (Rades - La Goulette Bridge)

	2009	2010	2012
Absolute number (vehicles/day)	27,200 (21,300)	- (22,400)	29,500 (24,400)
Passenger car unit (PCU) (vehicles/day)	36,200 (28,300)	- (29,700)	33,600 (31,000)

Source: Appraisal documents (Summary of SAPROF report) Responses to Questionnaire, Actually surveyed data by the evaluation team

Note 1: Numbers in () are planned volume at the appraisal stage.

Note 2: Actual figures in 2009 are surveyed by MOE right after opening of the bridge to traffic.

Note 3: Actual figures in 2012 are the traffic volume which was surveyed from 7:00 to 19:00 on March 24 and 26, 2012 and converted to the 24-hour volume⁴. March is the month which has average traffic volume through the year.

Note 4: PCU: passenger car unit

The traffic volume crossing the Rades-La Gourette Bridge as of 2012 is 29,500 vehicles/day, which is about 20% higher than the planned. In terms of PCU, the actual traffic volume is only about 8% higher than the planned. The reason for lower volume is considered to be that the ratio of large vehicles among all the vehicles was only 7%, which is lower than estimated.

⁴ Based on the data on the hourly variation of in-out traffic at Sfax interchange, the ratio of day time and night time traffic was calculated, and the daily traffic was estimated by using this ratio (night time traffic is 20%).

According to the traffic count and movement survey conducted in March 2012, the breakdown of crossing traffic by direction is as follows: i) traffic of Rades-La Gourette direction is 24,600 vehicles/day, and ii) traffic of Tunis-Rades direction is about 4,900 vehicles/day. Before the project was completed, ferries connecting between Rades and La Gpourette transported about 4,000 vehicles/day⁵ (only vehicles with less than 3.5 tons loading capacity were permitted). Thus, it is considered that about 25,000 vehicles/day (29,500 - 4,000), which should have passed through the Tunis central district have contributed to the mitigation of traffic congestion around the central district. However, since the traffic of 25,000 vehicles/day includes generated/induced⁶ traffic, which has occurred after the project was completed, these traffic needs to be excluded. It is considered that the project has contributed to the reduction of at least 20,000 vehicles/day among the traffic passing through the Tunis central district.

2) Traffic Volume of North Extension Highway (Average Daily Traffic)

The traffic volume of the North Extension Highway is shown in Table 2.

Table 2 Average Daily Traffic (North Extension Highway)

	(vehicles/day)		
	2009	2010	2012
Motorway - MC33E2	-	-	44,900
	(14,300)	(15,900)	(19,100)

Source: Appraisal documents (Summary of SAPROF report) Responses to Questionnaire, Actually survey data by the evaluation team

Note: Numbers in () are planned numbers assuming that the project would be completed by 2002.

Because of the improvement to the expressway standard and extension of the route, the traffic volume of the North Extension Highway is substantially higher than planned (about 2.4 times) and the actual traffic volume was 44,900 vehicles/day. The reason for higher traffic volume would be that more traffic than expected at the planning stage heading Carthage and La Marsa in the northeastern region from the Tunis central district avoided National Roads 8 and 9 along the Tunis Lake north coast, which were heavily travelled and made detours to the Canal Crossing Highway and North Extension Highway. More traffic uses North Extension Highway, which was constructed under the project, and consequently contributed to the mitigation of traffic congestion on National

⁵ Transporting capacity per day by two ferries. The operating hour is from 6:00 AM to 9:30 PM and the average crossing time by ferry is about 40 minutes. When the weather was adverse or commercial vessels cross the canal, the ferry operation was stopped.

⁶ Generally, generated and induced traffic is assumed to be 5-10% each. It was conservatively assumed here that each traffic would be 10% and the total 20%.

Roads 8 and 9, which connect directly with the Tunis central district.

(2) Improvement of accessibility between La Goulette and Rades ports

1) Improvement of Accessibility between La Goulette and Rades ports

Before the project, it took 15 minutes (including time for embarkation, crossing and disembarkation) to travel between La Goulette and Rades ports by ferry. However, drivers needed to allow 30-40 minutes given the weather condition, and waiting time. Upon completion of the project, it is now possible to travel in five minutes regardless of the weather condition.

(3) Reduction of Travel Time

In order to examine how much benefits (reduction of travel time, namely enhancement of accessibility) were brought in to users who travel in the high demand section between the Tunis northeastern and southeastern regions, the time needed to travel between two specified points by two routes - the one passing through the Tunis central district (a shortest route passing through arterial highways) and another crossing the bridge - were compared under the post evaluation work. The selected points are the probable center of each northeastern and southeastern region. The selected point in the northeastern region is the merging point of National Road 9 and Gammarth Road in Marsa District, and in the southeastern region is the merging point of National Road 1 and Environment Road in Hammam Lif.

Table 3 Travel Time by the Route Passing through the Central District and the Route Crossing the Bridge

	Section (Route)	Distance (km)	Travel Time (minutes)
Route Passing through the Central District	Passing through Tunis Central District (National Road 9, 9, and 1)	32	55
Route Crossing the Bridge	Crossing Rades - La Goulette Bridge (Route Express, Route 33, Environment Road)	24	31

Source: The time was actually surveyed by the evaluation team during the period of 10:30 AM - 3:00 PM on December 10 (Saturday), 2011. Since Tunisia is an Islamic country, Saturday is a working day (half day) and traffic volume is high.

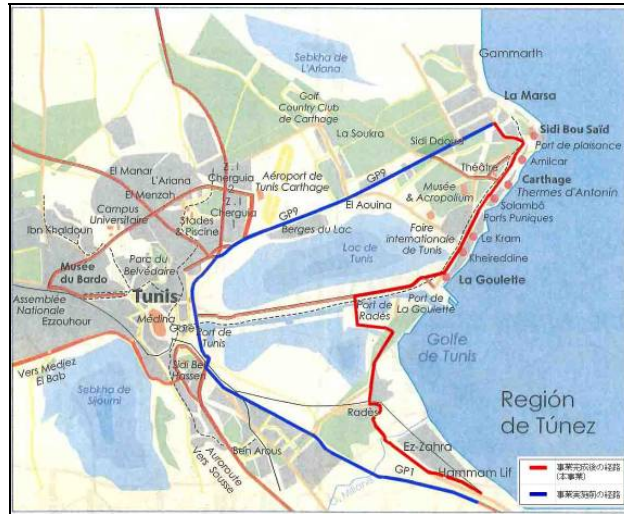


Figure 3 Route passing through the Central District (blue line) and Route crossing the Bridge (red line)

Since the travel distance of the bridge crossing route is shorter than the city passing route by 8 km, the travel time between 2 points is reduced by about 25 minutes. The reasons for reduced travel time are because of the shorter travel distance and lighter congestion on roads. From the results of beneficiary survey, it is apparent that the travel time between northeastern and southeastern Tunis of road users was reduced by 15-20 minutes (average of reduced time of travel by respondents of beneficiary survey) upon completion of the project.

3.2.2 Qualitative Effects

As qualitative effects, mitigation of traffic congestion in the regions surrounding the Tunis Lake and improvement of accessibility between La Goulette and Rades ports are considered.

(1) Mitigation of traffic congestion in the regions surrounding the Tunis Lake

According to the Bridges and Highways Department of MOE, since the alternative route was developed in addition to the route passing through the Tunis central district by completion of Rades - La Goulette Bridge, the traffic congestion, seen at the south entrance point to the central district (the merging point of République Road (Z4) and National Road Route 1) was substantially mitigated. It was verified that the traffic, which makes a detour from passing through the central district by crossing the bridge, has increased because the regulation that enforces the time zone for large vehicles to be able to pass through the central district (large vehicles were not allowed to pass until 9:00 AM) was lifted after the project was completed.

(2) Improvement of accessibility between La Goulette and Rades ports

By completion of the project, the missing link (Rades - La Gourette Bridge section) in the ring road surrounding the Tunis Lake has been satisfied, and the network has been completed. Thus, it has enabled the dispersing of traffic, which used to concentrate into the central district. At the same time, La Gourette and Rades ports were connected by land and the accessibility was substantially enhanced. The role allotment of both ports was clarified and the integrated operation of both ports is now possible. La Gourette Port is now a passenger-specific port with some cargo handling, while Rades Port is a cargo-specific port. During project implementation, the old Rades Port was demolished and its functions were integrated into the new Rades Port. During the meeting with the Deputy Director of OMMP Rades Port, he testified that by completion of the Rades-La Gourette Bridge, Rades and La Gourette were integrated, the pressure to Rades region was mitigated, and the trucking firms are pleased with the effective operations in both ports.

In this ex-post evaluation work, beneficiary surveys were conducted, through interviews, in three districts near the Rades - La Gourette Bridge, including Lac 1, Le Kram, and Rades. The number of respondents at each district was 40, with a total number of 120 (50 females and 70 males). Regarding the mitigation of traffic congestion in the Tunis central district, 54% of respondents recognize that the contribution of the project is substantial and 41% think that it is fair. The remaining 5% recognize that the project has made some contribution. Thus, it reveals that the project has contributed to mitigation of congestion, which was one of the obstacles in the promotion of economic activities.

3.3 Impact

3.3.1 Intended Impacts (Contribution to the Regional Development and Industrial Promotion in the Tunis Lake Coastal Region

(1) Regional Development and Industrial Promotion in the Tunis Lake Coastal Region

As the regional development proceeds, the number of enterprises starting up a new business generally increases, as well as the migration of people as a result of increase in land prices. The comparison of land prices in the project affected area before and after the project showed that there were no major changes in land prices in the northern and southern regions around Rades - La Gourette Bridge. It was determined that there were no major changes in the northern region because there was no vacant land and the subject area was already a well-developed commercial area. The southern region (Rades side) is an industrial and warehouse zone. However, the development projects are planned in the project affected areas, including the area between National Road 9 and the Tunis Lake northern area (Bergus du Lac, and Lac 2 districts with a total area of about 1,300 ha), Ain

Zaghouan district located in the north of Lac 2, and Bhar Lazrak located in further north. The residents who would live in these developed areas will have access to the route passing through North Extension Highway, which was constructed under the project and the existing Canal Crossing Expressway when National Road 9 is congested. Completion of an alternative highway route (this project) will provide more benefits to the residents. This could be a factor in generating more economic development.

(2) Mitigation of Air Pollution in Greater Tunis

Among the substances, which are the sources of air pollution, major substances originating from exhausted gas from motor vehicles, includes suspended particulate matter and nitrogen dioxide. Since sulfur compounds are included in the low quality petroleum, its combustion generates a trace of sulfur oxides, which is also one of pollutants. In order to assess the air quality (air pollution), the yearly changes of three substances monitored in Tunis, including suspended particulate matter, nitrogen dioxide and sulfur dioxides are discussed below.

1) TSP

Regarding TSP, changes in suspended particulate matter (in PM10) monitored at two locations in Tunis are shown in Table 4 and 5.

Table 4 Changes of Suspended Particulate Matter in Tunis Central District (in PM10)

Monitoring location	2006	2007	2008	2009	Allowable limit	Recommended targets
Bab Saadoun	316	328	190	170	260	120

Source: Agence Nationale de Protection de l'Environnement (ANPE) – Indicateurs régionaux d'amélioration des conditions de vie-OTEDD- Juin 2010

Note 1: Figures are the maximum value recorded within 24 hours.

Note 2: The allowable limit and recommended targets are Tunisian standards.

Note 3: Bab Saadoun is in the central district.

Since 2007, the maximum value within 24 hours of PM10 has been decreasing. Although the actual recorded value is within the allowable limit, it has not reached the recommended target level.

**Table 5 Changes of Suspended Particulate Matter (in PM10)
(at the monitoring station close to the project site)**

Monitoring location	2007	2008	2009	2010	Allowable limit	Recommended targets
Monthly variation in Ben Arous	71 - 87	57 - 90	61 - 84	56 - 150	260	120
Annual monthly average	81	76	72	94		

Source: ANPE

Note 1: Figures are 24 hours average

Note 2: The monitoring station is located about 7 km (linear distance) away from the project site.

Since 2007, the urban air quality has been improving. However, due to increase in traffic volume, it deteriorated in 2010. Since the PM10 values deteriorated, particularly in the summer time (exceeded the recommended targets in August and September), the annual monthly average was also higher than the previous year.

2) Nitrogen Dioxide (NO₂)

Changes of Nitrogen Dioxide (NO₂) in Greater Tunis are shown in Table 6.

Table 6 Changes of Nitrogen Dioxide (NO₂)

Monitoring location	2006	2007	2008	2009	2010	Allowable limit (1-hour average)	Recommended targets (1-hour average)	WHO standards (1-hour average)
Bab Saadoun	104	56	150	-	126 (Dec.)	660	400	200
El Ghazela	-	-	139	98	48 - 102 (Jan. - Nov.)			
Bab Alioua	-	-	365	395	133 - 363 (Jan.- Jun.)			
Mannouba	-	-	122	115	81 - 151 (Jun. - Sept.)			

Source: ANPE - Indicateurs régionaux d'amélioration des conditions de vie-OTEDD- Juin 2010 Rapport National sur l'Etat de l'environnement en 2006, 2008, Ministère de l'Environnement et du Développement durable and Bulletin de l'air-2010 ANPE

Note 1: The Bab Saadoun monitoring station is in the Tunis central district.

Note 2: The El Ghazela monitoring station is about 12 km north of Tunis central district and near Ennahli Park.

Note 3: The Bab Alioua monitoring station is in the Tunis central district, and about 1.2 km west of Tunis Marina.

Note 4: The Mannouba monitoring station is about 8 km west of the Tunis central district.

For the past five years (2006 - 2010), the concentration of NO₂ at three monitoring stations, except at Bab Alioua, was within the WHO standards. The higher NO₂ value at Bab Alioua was due to heavy traffic in the area since the monitoring station is close to Tunis railway station and Z4, which is located along the Tunis Lake west coast.

3) Sulfur Dioxide (SO₂)

Changes of Sulfur Dioxide (SO₂) in Greater Tunis are shown in Table 7.

Table 7 Changes of Sulfur Dioxide (SO₂)

Monitoring location	2008	2009	2010	Allowable limit	Recommended targets	WHO standards
El Ghazela	13	30	3 - 8	365	125	20
Bab Alioua	32	40	11 - 27			

microgramme/m³

Source: ANPE - Indicateurs régionaux d'amélioration des conditions de vie-OTEDD- Juin 2010, Rapport National sur l'Etat de l'environnement en 2008, Ministère de l'Environnement et du Développement durable and Bulletin de l'air – 2010- ANPE

Note 1: Figures are 24 hours average

Note 2: The allowable limit and recommended targets are Tunisian standards.

Note3: The El Ghazela monitoring station is about 12 km north of Tunis central district and near Ennahli Park.

Note 4: The monitoring station at Bab Alioua is about 1.2 km west of Tunis Marina.

As shown in Table 7, for the past two years (2008 and 2009), the concentration of SO₂ was worst. However, the pollution level both in the central district and suburban area has improved in 2010.

It is difficult to examine the effects on mitigation of air pollution by the project by referring to changes in the amount of air pollutants because: i) the locations of monitoring stations in the regions are irrelevant to the project; and ii) the traffic volume has been increasing yearly. However, it is apparent that SO₂ and NO₂ values, which originate in the exhaust gas emitted from motor vehicles has been decreasing.

(3) Promotion of Economic Development in Greater Tunis

By completion of the project, the missing link (Rades - La Gourete Bridge section) in the ring road surrounding the Tunis Lake has been satisfied, and the network has been completed. Thus, the accessibility for road users has been substantially enhanced. Because of completion of an alternative route, which goes around the Tunis central district, plans for development of residential areas, and attraction and promotion of industry promotion in the lake coastal regions (particularly in the northern coastal regions) have been developed. Thus, it is expected that the project will greatly contribute to the promotion of the economic development in Greater Tunis.

The beneficiary surveys showed that the project has contributed to the regional economic development around Tunis Lake, with 14% of respondents recognized the contribution as substantial, 66% think that it is fair, and that 20% acknowledged that it has made some

contribution. With regards to contribution in the promotion of business opportunities around the Tunis Lake, 41%, and 50% recognized that it is substantial and fair, respectively. Nine percent (9%) acknowledged that it has made some contribution.

Regarding the overall assessment of the project, 83% of respondents answer that the quality of life has improved with the completion of a detour route, not passing through the central district. Thus, it was confirmed that citizens also acknowledged the effectiveness of the project.

3.3.2 Other Impacts

(1) Impacts on the natural environment

The main issues before commencement of the project were conservation of the water quality in Tunis Lake and protection of traffic noise to the houses along the North Extension Highway corridor during the project implementation and operation stage. Although MOE has entrusted the monitoring of the water quality in Tunis Lake to a private firm engaged in the development of the south lake, no problems have been reported. These were due to the: i) revision of the alignment of North Extension Highway so that the area, where seaweeds are expected to proliferate, was also minimized by installing the geotextile screens and floating barriers when implementing the embankment work along the coast; and ii) flow of water in the channel connecting between the lake and sea was eased by reducing the obstacles, such as bridge piers in the channel.

Regarding the noise protection, the realigned route is located along the coast, therefore no houses exist along the right-of-way. There were no issues reported. Planting work has been undertaken in order to improve the aesthetic environment.

(2) Land Acquisition and Resettlement

The total land area acquired was 64 ha, of which 54 ha of public land and 10 ha of private land. Among two ordinary houses to be relocated, one was demolished and the other was relocated under the national solidarity program. Since it was discovered that the elementary school that was originally to be relocated was outside the right-of-way, relocation did not take place. The total amount spent for land acquisition and compensation is 4.3 million dinars. Resettlement was implemented as per the implementation schedule and there have been no compensation complaints received.

(3) Other Positive and Negative Impacts

Upon completion of Rades - La Gourette Bridge, the ferry service was stopped, and crews and staff were reassigned to the positions in Tunis Regional Bureau.

This project has largely achieved its objectives, therefore its effectiveness and impact are considered high.

Detailed Analysis of Achievement of Expected Effects including Impacts

The objective of the project was to i) mitigate the traffic congestion in the regions surrounding Tunis Lake by diverting traffic concentration into the Tunis central district; and ii) improve accessibility between La Goulette and Rades ports by constructing Rades-La Goulette bridge, thereby contributing to the regional economic development and industrial promotion in the Tunis Lake coastal region. Thus, in order to examine the impact to the regional development and industrial promotion by the project in quantifiable terms, it was essential to select the appropriate monitoring indicators, establish the baselines before the project, and plan the targets after the project (in several years). Consideration is needed to be taken to select indicators that will make it possible to easily collect existing statistical information or data without conducting specific studies after the project.

The detailed impact analysis was not planned before the commencement of the project. Thus, indicators regarding the actual condition before and after the project could be examined in quantifiable terms were selected for each evaluation item (four items in this analysis), and availability of the existing data and effectiveness of the data (monitoring location, date of monitoring and others) were examined. The availability and effectiveness of data on monitoring indicators for each evaluation item are shown in the following table. Among the information collected for purposes of the analysis in the report, discussions were based only on the indicators which are considered to be directly relevant to the project. Regarding the indicators on which quantitative data were not available, the qualitative information collected through interviews is supplemented.

Hierarchy of Objectives	Indicators	Source of Data Collection	Availability of Data/Information
Upper Goal: Regional economic development and industrial promotion in the Tunis Lake coastal region.		(originally planned)	
Outcome: 1) Integrated Development of Ports in Tunis	<ul style="list-style-type: none"> · Traffic volume crossing Rades - La Goulette Bridge (vehicles/day) · Required time to cross the bridge (minutes) · Handling volume of cargo by type of goods at 4 ports (Tunis, New Rades, Rades, and La Goulette) (tons/year), volume of transit cargo, Number of passengers (ferry users), waiting time at each port 	MOE Port Authority	Actual data counted under the impact study (March 2012) Actual survey under the impact study (December 2011) OMMP's Annual Statistics available No data available on volume of transit cargo and waiting time
2) Mitigation of Air Pollution in Greater Tunis	<ul style="list-style-type: none"> · Emitted volume of SO₂, Dust, and NO_x in 10,000 tons/year in Greater Tunis, · Concentration of SO₂, TSP, and NO₂ (mg/m³) in Greater 	Ministry of Agriculture and Environment (MAE)	Data on all the substances were collected from ANEP. (However, data at the relevant locations were not available)

	<ul style="list-style-type: none"> · Tunis, Emitted volume and concentration of PM · Number of patients having respiratory diseases · Traffic volume on main highways (ADT) by type of vehicle, Congestion rate 	<ul style="list-style-type: none"> Ministry of Health (MOH) Ministry of Equipment (MOE) 	<ul style="list-style-type: none"> Data collected from MOH Since only the data as of 2007 was available, traffic volume on roads around the Rades - La Gourette Bridge was counted under the Impact Study (March 2012), Congestion rates were calculated by the evaluation team. Data not available
3) Economic Development in the Tunis Lake Region	<ul style="list-style-type: none"> · Growth rate of GRDP, Number of new enterprises moved in, number of stores newly opened · Land price, Developed area for housing, Population · Number of bus operations connecting between the developed areas and Tunis central area. · Change of transport cost after discharge · Invested amount, development of industry, attraction of industries to the west 	<ul style="list-style-type: none"> Statistics Bureau Development Authority Transport Bureau Development Authority 	<ul style="list-style-type: none"> No data available by small jurisdiction /district Collected from newspaper articles, Data on area partly available Collected from Transtu Data partly available through interview with OMMP, Information on development plan partly available
4) Other Quantifiable Impacts	Number of tourists visiting tourist spots	Statistics Bureau	Partly collected form annual statistics (data not available by spot)

As shown in the above table, data on the main substances of air pollutants were available. However, data at the sites where it is considered to be directly relevant to the project were not available. Since traffic counting has been undertaken every five years and the previous counting was made in 2007, data on traffic volume, which is an important indicator, after the project completion were also not available. Thus, a brief traffic counting was undertaken for two days (only day time) at four locations during the impact analysis and the results were used as data for examination. Regarding indicators to examine the economic development impacts, because the data by each small jurisdiction (district) are not available, it is difficult to compare the condition before and after the project and to make a quantitative impact examination is not feasible. Consequently, since the data to examine the impact to the regional development and industrial promotion in quantifiable terms was not sufficient, it was difficult to undertake the impact analysis/study with enough accuracy. In order to examine the impact by the project in quantitative terms not only at the outcome level but also at the impact level, it is essential to establish the most probable monitoring indicators at the planning stage and continue monitoring during the operation stage.

3.4 Efficiency (Rating: ②)

3.4.1 Project Outputs

The original and actual output of the project is shown in Table 8.

(1) Civil Work

Table 8 Output (original and actual)

Item	Original	Actual
1) Canal Crossing Bridge	Length: 260 m, 2-lane x 2 (Extra-dosed Bridge)	as planned
2) Rades South Approach: viaduct, bridge	Approach viaduct:400 m Approach road: 2,190 m	Approach viaduct: as planned Approach: 2,000 m
3) La Goulette North Interchange and Expressway	Interchange viaduct:500 m Ramp way: 4 viaducts (about 1 km), 4 connecting highway (about 680 m), Relocation of existing expressway: 1.8 km	Interchange viaduct:720 m Ramp way: 4 viaducts (about 340 m), 4 connecting highway (about 850 m), Relocation of existing expressway: 2.4 km
4) North Extension Highway	Length: 2.3km	Lenght5.5km + 2 branch lines (1 km)
5) Lighting Facility	Not planned	Lighting and substation (15 km) Additional work

Source: Appraisal documents, PCR, Responses to Questionnaire

Note: The original planned outputs are at the time of appraisal. The final planned outputs were determined based on the detailed designs, which were undertaken under the project.

Regarding the output, the main components have been completed almost as planned. However, the scope of work and design specifications has been partly revised. Revisions were made and the reasons for revision are as follows:

- 1) Regarding La Gourette North Interchange and its connecting expressway, the length of bridges and viaducts and the dimension of the cross section of ramps (roadway width) were revised based on the analysis at the detailed design stage.
- 2) At the feasibility study stage, the route of North Extension Highway was planned so that it passes in the west of the power plant and continued directly to the north toward Carthage. However, at the detailed design stage, in order to avoid the community division around the power station, the route alignment was revised as the route traversed along the coast of the Tunis Lake. The route turns left to the west at the crossing point with MC33E2 in order to connect with National Road 9. The section from the east of the Rades-La Gourete Bridge to the crossing point with Mohamed V Road was defined as the project section. (revision of routing and length)
- 3) It was decided to install lightings along the whole stretch of the project roads together with substations considering the road user's safety and comfort.



North Extension Road



Rades-La Gourette Bridge and Ramps

(2) Consulting Services

The original consulting services included detailed designs/field surveys, assistance in bidding, construction supervision, detailed environmental impact assessment, training/technical assistance, and monitoring (5 months) the assignments of 96 M/M by foreign experts and 344 M/M by local experts. However, because of additional work (review of work implementation related documents, which was not included in the original scope of work) and delay of the implementation period, the actual assigned man/months were 147 M/M by foreign experts and 482 M/M by local experts. The original scope of work was implemented almost as planned.

3.4.2 Project Inputs

3.4.2.1 Project Cost

The estimated project cost at appraisal was 11.205 billion yen, of which the total Japanese ODA loan of 8.43 billion yen was to be used on foreign currency and part of local currency portions, and the rest was to be funded by the Tunisian government. The actual project cost was 11.477 billion yen, of which the Japanese ODA loan used was 8.42 billion yen and the rest was funded by the Tunisian government. Thus, the actual cost was slightly higher than planned, which is equivalent to 102% of the planned cost. In terms of the local currency, the actual cost exceeded the plan, which is equivalent to 141% of the plan. As mentioned above, the length of North Extension Highway was extended by 2.4 times and the lighting facilities were added, which resulted in higher scope of work against the original plan. If the total cost included the cost for the additional work (about 370 million yen) and officially amended in the contract, is compared with the plan, the actual cost was within the plan (99.7% of the plan).

Table 9 Comparison of Project Cost (Planned and Actual)

unit: million yen

Item	Planned					Actual				
	Foreign ODA loan	Local		Total		Foreign ODA loan	Local		Total	
		Own fund	ODA loan	Total	ODA loan		Own fund	ODA loan	Total	ODA loan
Civil work	3,135	156	3,823	7,114 (61.33)	6,959	2,926	1,024	4,424	8,374 (99.65)	7,350
Consulting Services	433	0	698	1,131 (9.75)	1,131	610	93	434	1,137 (13.53)	1,044
Contingency	314	397	0	711 (6.13)	314	-	-	-	-	-
Land Acquisition	0	804	0	804 (6.93)	0	0	439	0	439 (5.22)	0
Management Cost	0	116	0	116 (1.0)	0	0	79	0	79 (0.94)	0
Taxes	0	1,329	0	1,329 (11.46)	0	0	1,440	0	1,440 (17.14)	0
Administration Cost	-	-	-	-	-	8	0	0	8 (0.10)	0
Total	3,882	2,802	4,521	11,205 (96.60)	8,403	3,544	3,075	4,858	11,477 (136.58)	8,402

Source: Appraisal documents, Responses to Questionnaire

Exchange rate: 1TND=116 yen at appraisal, 1TND=84.03 yen (average during the period between January 2001 and September 2009) at post evaluation

Note: Numbers in () are in million TND

The main reasons for the cost increase (in local currency) are as follows:

- 1) The length of bridges and viaducts and the dimension of the cross section of ramps (roadway width) in La Gourette North Interchange and its connecting expressway were revised based on the detailed designs.
- 2) At the detailed design stage, the alignment of the North Extension Highway was changed and extended (additional cost with 205 million yen).
- 3) Additional work for lighting facilities (168 million yen)
- 4) Increase by price escalation due to extension of the project period

However, since the Japanese yen appreciated by 38% from the appraisal stage, the total project cost was almost as planned in Japanese yen.

3.4.2.2 Project Period

The project period was much longer than planned. The project period planned at appraisal was from March 1999 (signing of the Loan Agreement) to October 2003 (open to public) with a total period of 56 months. The actual project period was from March 1999 (signing of the Loan Agreement) to March 2009 (open to public) with a total period

of 121 months, or equivalent to 216% of the plan.

The main reasons for the delay are as follows:

- 1) Commencement of the consultant selection process was delayed by 5 months, and it took 21 months, which is about double the plan to complete the selection process.
- 2) Due to delay in the consultant selection process, commencement of detailed designs was delayed by 14 months and the detailed design took 17 months, which is about double the plan.
- 3) Due to delay in the completion of detailed designs, the advertisement for bidding for civil work commenced with a 21-month delay from the original schedule. Moreover, it took longer to complete the bidding procedures (particularly to secure clearance on the bidding results), an actual total of 39 months, which is more than double the planned period.
- 4) Since the geotechnical and soil investigation at the design stage was not comprehensive enough, the following countermeasures were needed during project implementation: i) changes in construction methodologies because it was found that the planned boring machine was not suitable; and ii) soft ground treatment work since the surcharge in the soft ground area was not planned in the original design.
- 5) Preparation of equipment (support members for viaduct sections, pre-stress concrete members and others) and its delivery was delayed.

Delay in the project period is partly due to the problems that occurred during project implementation. However, it is considered that the main reason is the implementation schedule prepared at the appraisal stage, which was not practical in Tunisia. For instance, 9 months for consultant selection, 7 months for detailed designs (including bidding documents), 15 months for procurement of civil work through the ICB procedures and 36 months for construction work are considered to be optimistic.

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

(1) Economic Internal Rate of Return (EIRR)

EIRR at the appraisal stage was estimated at 14.4%. Since data on the construction cost spent by year, the spending plan for operation and maintenance work and details of benefits (vehicle operating costs, time saving costs and others) are not available, calculation of EIRR at the post evaluation stage is difficult to carry out.

Although the project cost was lower than planned, the project period was significantly longer than planned. Therefore, efficiency of the project is considered fair.

3.5 Sustainability (Rating: ②)

3.5.1 Structural Aspects of Operation and Maintenance

As originally planned, the executing agency, Department of Highways and Bridges of Ministry of Equipment (MOE) has been responsible for operation and maintenance of the project after completion of the project. However, with regards to the actual routine inspection and maintenance (signals, safety facilities, lighting facilities, changes of parts, repairs), Tunis Regional Bureau (staffed with about 50 employees for 268 km road sections) is responsible for the crossing bridge, La Gourette North Interchange and its connecting expressways, and North Extension Highway; while Ben Arous Regional Bureau (for 313 km road sections) is responsible for Rades South approach viaducts and bridges. The operation and maintenance of the monitoring system for the crossing bridge, detailed inspection of completed work, maintenance of plants and drainage facilities, and cleaning of expansion joints and rain water catchment facilities are entrusted to private companies.

Each team, responsible for the project components among the staff responsible for maintenance within the Tunis and Ben Arous Regional Bureaus, consists of a Chief Engineer responsible for maintenance work, an Engineer responsible for the region, three workers and a Lighting Engineer. Since the periodic maintenance work requires high technology (particularly on the extra-dosed bridge) and major repairs/improvement work are planned in the near future, the high-level planning strategy, including establishment of medium/long-term maintenance work implementation plans and decision making on priority of work to be done, needs to be developed. Thus, engineers and technicians, who are specialized in maintenance of bridges and structures are required, and increasing the number of staff in charge of maintenance and operation needs to be considered.

3.5.2 Technical Aspects of Operation and Maintenance

The technical capacity of staff in charge of operation and maintenance (routine inspection and maintenance) at both Regional Bureaus is considered appropriate. Regarding the training of staff, the consultant in charge of construction supervision invited a few engineers responsible for maintenance to Japan and UAE for overseas study training. The periodic inspection/maintenance and major rehabilitation work (particularly bridge sections), which will occur in the near future, will be contracted out to private companies since the number of assigned technical staff is insufficient. However, it is essential to prepare the future maintenance work schedule, and determine the work priority to be implemented under the budget constraints on a timely basis, as well as further training of staff on the new maintenance technology and methodology, which was introduced under the project.

The monitoring and maintenance manuals for the structures completed under the project

were prepared by a local consultant on behalf of contractors, and they are now being reviewed by MOE for final approval.

3.5.3 Financial Aspects of Operation and Maintenance

Among the total budget allocated to the Department of Highways and Bridges of MOE, 88% are used for new construction of roads and improvement, and 12% are allocated for maintenance work. The ratio of budget allocation is more or less the same compared to other developing countries. The maintenance budget allocated to Tunis and Ben Arous Regional Bureaus for the past four years - covering 2009 through 2012 - after completion of the project is shown in Table 10.

Table 10 Maintenance Budget for the past Four Years

unit: million TND

Regional Bureau	2009	2010	2011	2012
Tunis	2,345	2,605	2,805	2,920
Ben Arous	875	1,265	1,255	1,350

Note 1: Maintenance budget for Tunis Regional Bureau includes 1,600 million TND for electricity for lighting.

Note 2: Fiscal year is from January 1 to December 31

From the maintenance budget allocated to the Regional Bureau, one million TND per year have been spent for the maintenance of the project sections (routine inspection and maintenance) for the past three years. It is reported that the budget allocated has been sufficient. While the completed infrastructure facilities are still new, this amount of budget might be sufficient for routine inspection and maintenance. However, when the periodic maintenance work and large-scale rehabilitation develops in the future, additional budget allocation is needed. MOE also acknowledged that they are concerned about the financial source for increase in budget for major rehabilitation and maintenance.

3.5.4 Current Status of Operation and Maintenance

The routine inspection and maintenance on roads and bridges constructed under the project has been implemented as per the annual implementation plan by MOE. However, the overlay of asphalt pavement and pavement of shoulders are contracted out to contractors by selecting contractors through competitive bidding. To-date after completion of the project, no major repairs have been undertaken, except for some minor work during the defect liability period, and thus, the surface condition has been well maintained. During the ocular inspection in the field, no cracks, pot holes and damaged joints were found on the surface of bridge and viaducts sections. As traffic volume (particularly large trucks) increases, the degree of damage to the bridge decks needs to be inspected from the bottom

of the decks (this applies to the existing bridges as well), and thus, procurement of special equipment for bridge inspection needs to be considered. The operation and maintenance of the project has been properly implemented, and the effectiveness by the project is expected to continue. However, it is essential to continuously monitor the degree of damage of the crossing bridge with increase in traffic volume, and properly maintain the completed work.

Some problems have been observed in terms of budget to be allocated for maintenance work, therefore sustainability of the project effect is considered fair.

4. Conclusion, Lessons Learned and Recommendations

4.1 Conclusion

The objectives of the project were to: i) mitigate traffic congestion in the regions surrounding the Tunis Lake by diverting traffic concentration into the Tunis central district; and ii) improve accessibility between La Goulette and Rades ports by constructing a bridge connecting La Goulette, located in the north of the Tunis Lake canal, and Rades, located in the south, and thereby contributing to the regional economic development and industrial promotion in the Tunis Lake coastal region. The project has been highly relevant to the development plans and needs of Tunisia, as well as Japan's ODA policies. Regarding mitigation of traffic congestion in the regions surrounding the Tunis Lake by diverting traffic concentration into the Tunis central district and improvement of accessibility between La Goulette and Rades ports which are the project's objectives, since the project has somewhat achieved its objectives, its effectiveness is fair. Although the project cost was lower than planned, the project period was significantly longer than planned. Therefore, the efficiency of the project is fair. Some problems have been observed in terms of budget allocation for maintenance work, therefore sustainability of the project is fair.

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

4.2 Recommendations

4.2.1 Recommendations to the Executing Agency

It is recommended to conduct regular traffic counting at the same location and same time of the year. The traffic volume is a fundamental data in planning and programming its yearly and future maintenance and management work, and for preparation of future road development plans. The Maintenance Bureau of MOE could be an appropriate unit responsible for collecting data on traffic count, and analyzing and storing the data.

4.2.2 Recommendations to JICA

It is recommended to continue monitoring the maintenance and management condition focusing on the bridge section (the bridge has unique structure, which is new to Tunisia). It is also essential to implement the training program on the maintenance methodology for the special bridge structure and assist financially in procuring special maintenance equipment (for bridge inspection).

4.3 Lessons Learned

After the project had commenced, design changes on the substance of the project scope (changes of cross section, extension of the North Extension Highway, addition of lighting facilities) were made. Consequently, along with the optimistic project implementation schedule prepared at the appraisal stage, the project period was substantially delayed. Thus, it is considered that the review on the technical appropriateness of the project at the appraisal stage was insufficient. It is essential in an infrastructure project that requires high-technology, such as the extra-dosed bridge introduced under this project (first bridge type in Tunisia), to invite outside expert/s or specialist/s in the relevant sector (bridge planning and designs in this case) to review the appropriateness of the plans and designs, and maintenance plans from the technical viewpoints at the appraisal stage.

Comparison of the Original and Actual Scope of the Project

Item	Original	Actual
1. Output		
1) Canal Crossing Bridge	Length: 260 m, 2-lane x 2	as planned
2) Rades South Approach:	Approach viaduct:400 m Approach road: 2,190 m	Approach viaduct: as planned Approach: 2,000 m
3) La Goulette North Interchange and Expressway	Interchange viaduct:500 m Ramp way: 4 viaducts (about 1 km), 4 connecting highway (about 680 m) , Relocation of existing expressway: 1.8 km	Interchange viaduct:720 m Ramp way: 4 viaducts (about 340 m), 4 connecting highway (about 850 m), Relocation of existing expressway: 2.4 km
4) North Extension Highway	Length: 2.3km	Lenght5.5km + 2 branch lines (1 km)
5) Lighting Facility	Not planned	Lighting and substation (15 km) Additional work)
6) Consulting Services	Foreign experts 96M/M, Local experts 344M/M	Foreign experts 147M/M., Local experts 482M/M
2. Project Period	March 1999 - October 2003 (56 months)	March 1999 - March 2009 (121 months)
3. Project Cost		
Amount paid in Foreign currency	3,882 million yen	3,544 million yen
Amount paid in Local currency	7,323 million yen	7,933 million yen
Total	11,205 million yen	11,477 million yen
Japanese ODA loan portion	8,403 million yen	8,402 million yen
Exchange rate	1TND = 116 yen (as of July 1998)	1TND = 84.3 yen (average between January 2001 and September 2009)

Attachment: Map of Greater Tunis

