

## **Chapter 6. Bridges**

Many bridges have been built to allow roads and rails to cross the Mejerda River and its tributaries in Zone D2, but it is clear that they need to be improved (replaced, raised) because there are places where the design river channel of this Study will not have sufficient downflow capacity.

Thus, as in the Master Plan, this Study includes improvements to existing bridges and the building of new bridges to accompany river improvements. The 11 bridges investigated in the Master Plan will be improved to accommodate changes to the design high-water level and channels.

### **6.1 Fully Understanding the Current State of Existing Bridges and the Capabilities They Lack with Respect to River Improvements**

#### **6.1.1 Current State of Existing Bridges**

Basic information about existing bridges was gathered prior to investigating bridge improvement policy.

##### **(1) Bridges Built in Zone D2**

###### 1) Bridges built in Zone D2

The list on the next page shows the 29 locations in which bridges have been built in Zone D2.

###### 2) Organizations that manage bridges

The table below shows organizations that manage bridges in Zone D2 and organizations that manage various bridges:

**Table 6.1-1: Organizations that Manage Bridges and Structures**

<b>Structures</b>	<b>Organization</b>
Bridges built for roads (national, governorate and regional roads)	MEHAT*, Civil Engineering Department
Tunis-Bizerte Highway	Tunisia Highways
Railway bridges	SNCFT**, Equipment Survey Department
Bridges built for farm roads (short, do not require technology)	MA***
Historical bridges	Ministry of Culture

\*MEHAT: Ministry of Equipment, Housing and Land Development

\*\*SNCFT: Tunisian Railways

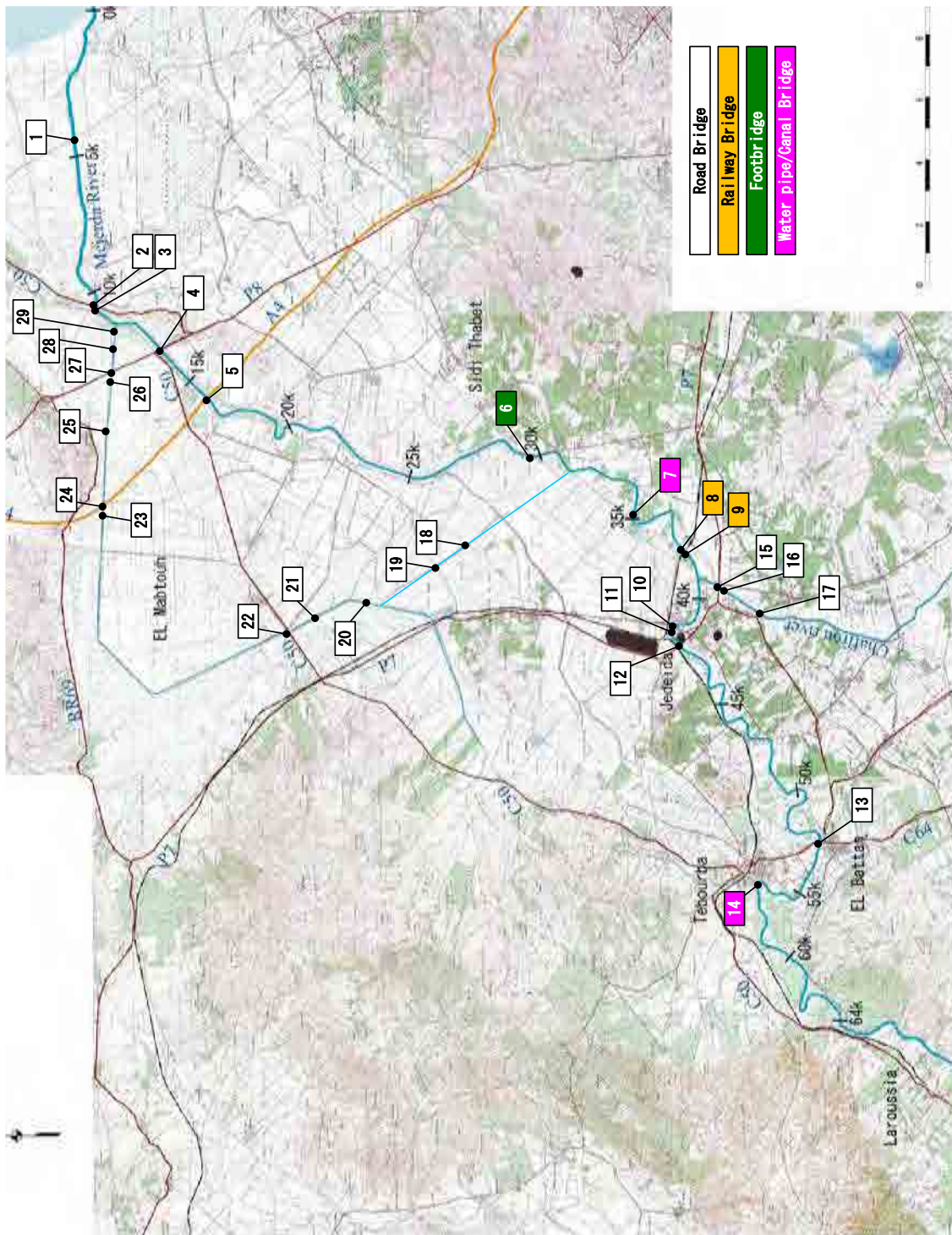
\*\*\*MA: Ministry of Agriculture

Source: Preparatory Study

**Table 6.1-2: Existing Bridges**

No.	Bridge Name	Channel		Route	Bridge Length	Bridge Width	Remarks
		Name	Distance				
1	K.LANDAOUS BRIDGE	Medjerda	4.664	Rue Sadok Belhadi	19.600	8.750	
2	TOBIAS BRIDGE	Medjerda	10.828	MC50	87.400	10.500	
3	TOBIAS OLD BRIDGE	Medjerda	10.836	MC50	81.400	5.100	New bridge and location of piers do not match up
4	GP8 BRIDGE OVER OUED MEJERDA	Medjerda	13.728	GP8	145.200	9.040	
5	A4 MOTORWAY BRIDGE	Medjerda	16.017	MOTORWAY A4	126.500	14.500	
6	FOOTBRIDGE	Medjerda		Sidewalk	60.000	1.200	Wooden suspension bridge
7	WATER PIPE BRIDGE	Medjerda	34.440	Water supply	-	5.540	
8	JEDEIDA RAILWAY OLD BRIDGE	Medjerda	37.848	RAILWAY	60.500	4.160	New bridge and location of piers do not match up
9	JEDEIDA RAILWAY BRIDGE	Medjerda	37.834	RAILWAY	63.000	10.000	Girders show evidence of afflux from flooding
10	JEDEIDA BRIDGE	Medjerda	41.071	RVE507	87.200	12.000	
11	JEDEIDA OLD BRIDGE	Medjerda	41.091	RVE507	64.500	5.600	Historical bridge over narrow channel
12	JEDEIDA BRIDGE ON GP7	Medjerda	41.926	GP7	73.600	11.300	
13	EL BATTAN BRIDGE	Medjerda	53.111	MC64	94.070	8.500	Historical bridge
14	TEBOURBA IRRIGATION CANALS BRIDGE	Medjerda	56.899	IRRIGATION CANALS	125.000	5.540	
15	GP7 BRIDGE ON CHAFUROU	Chafourou		GP7	38.200	11.000	Bridge abutments located in flood channel
16	GP7 OLD BRIDGE ON CHAFUROU	Chafourou		GP7	-	-	New bridge and location of piers do not match up
17	EL H'BIBIA BRIDGE	Chafourou		Local Road	16.900	8.140	
18	Bridge on the local road	Mabtouh		Local Road	20.700	5.700	
19	FARM BRIDGE ON Driving CHANNEL	Mabtouh		Farm Road	-	-	Bridge for small farm road
20	FARM BRIDGE ON Driving CHANNEL	Mabtouh		Farm Road	-	-	Bridge for small farm road
21	FARM BRIDGE	Mabtouh		Farm Road	-	-	Bridge for small farm road
22	MC50 EL MABTOUH BRIDGE	Mabtouh		MC50	20.460	14.610	
23	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	-	-	Bridge for small farm road
24	A4 BRIDGE OVER Mabtouh	Mabtouh		MOTORWAY A4	52.600	14.000	
25	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	-	-	Bridge for small farm road
26	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	-	-	Bridge for small farm road
27	GP8 BRIDGE AND ROAD OVER Mabtouh	Mabtouh		GP8	36.500	9.900	
28	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	-	-	Bridge for small farm road
29	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	-	-	Bridge for small farm road

Source: JICA Survey Team



Source: JICA Survey Team

Figure 6.1-1: Current Bridge Locations

**(2) Studies of Existing Bridges**

1) Documentation of existing bridges

During site surveys, a study was done to determine whether design drawings serving as documentation for existing bridges existed. Design drawings could only be confirmed for the three bridges on the table below.

**Table 6.1-3: Bridges Confirmed on Design Drawings**

No.	Name	Drawings
2	TOBIAS BRIDGE	13 structural and other drawings
10	JEDEIDA BRIDGE	Overall drawings
9	JEDEIDA RAILWAY BRIDGE	Seven overall and other drawings

Source: JICA Survey Team

2) Historical bridges

Bridges of historical value in Tunisia can be designated as important cultural properties. Of the 29 bridges listed in the table above, the Jedeida Old Bridge and El Battan Bridge have received that designation.

**Table 6.1-4: Bridges/Structures Designated as Important Cultural Properties**

No.	Name	Registered on	Photo
11	JEDEIDA OLD BRIDGE	15 January 2001	
13	EL BATTAN BRIDGE	15 January 2001	

Source: JICA Survey Team



Source: Preparatory Study

**Figure 6.1-2: Display Showing Structure's Registry as Important Cultural Property**

### 6.1.2 Problems with Current Conditions

The table above shows problems with bridges in their current state; the table below lists those problems and aligns them with the need for bridge improvement. Fifteen of the 29 bridges need to be replaced, and three need to be built anew. It is worth noting that the Kalaat Landaous Bridge, the bridge farthest downstream, needs to be replaced as part of river channel improvement, but it is outside the scope of this project because it will probably be treated as a road project.

**Table 6.1-5: Problems with Bridges in Their Current State**

No.	Bridge Name	Channel		Downflow Capacity	Condition	Historical Bridge
		Name	Distance			
1	K.LANDAOUS BRIDGE	Medjerda	4.664	NG		
2	TOBIAS BRIDGE	Medjerda	10.828			
3	TOBIAS OLD BRIDGE	Medjerda	10.836	NG		
4	GP8 BRIDGE OVER OUED MEJERDA	Medjerda	13.728		Not Good	
5	A4 MOTORWAY BRIDGE	Medjerda	16.017			
6	FOOTBRIDGE	Medjerda				
7	WATER PIPE BRIDGE	Medjerda	34.440			
8	JEDEIDA RAILWAY OLD BRIDGE	Medjerda	37.848	NG	Not Good	○
9	JEDEIDA RAILWAY BRIDGE	Medjerda	37.834	NG		
10	JEDEIDA BRIDGE	Medjerda	41.071			
11	JEDEIDA OLD BRIDGE	Medjerda	41.091		Not Good	
12	JEDEIDA BRIDGE ON GP7	Medjerda	41.926	NG		
13	EL BATTAN BRIDGE	Medjerda	53.111			○
14	TEBOURBA IRRIGATION CANALS BRIDGE	Medjerda	56.899		Not Good	
15	GP7 BRIDGE ON CHAFUROU	Chafourou		NG		
16	GP7 OLD BRIDGE ON CHAFUROU	Chafourou		NG	Not Good	
17	EL H'BIBIA BRIDGE	Chafourou		NG	Not Good	
18	Bridge on the local road	Mabtouh		NG		
19	FARM BRIDGE ON Driving CHANNEL	Mabtouh		NG		
20	FARM BRIDGE ON Driving CHANNEL	Mabtouh		NG		
21	FARM BRIDGE	Mabtouh		NG		
22	MC50 EL MABTOUH BRIDGE	Mabtouh		NG		
23	FARM BRIDGE ON Oued Mabtouh	Mabtouh				
24	A4 BRIDGE OVER Mabtouh	Mabtouh				
25	FARM BRIDGE ON Oued Mabtouh	Mabtouh				
26	FARM BRIDGE ON Oued Mabtouh	Mabtouh				
27	GP8 BRIDGE AND ROAD OVER Mabtouh	Mabtouh		Shorter than existing dike	Not Good	
28	FARM BRIDGE ON Oued Mabtouh	Mabtouh				
29	FARM BRIDGE ON Oued Mabtouh	Mabtouh				
30	FARM BRIDGE(NEW)	Mabtouh				
31	FARM BRIDGE(NEW)	Mabtouh				
32	FARM BRIDGE(NEW)	Mabtouh				

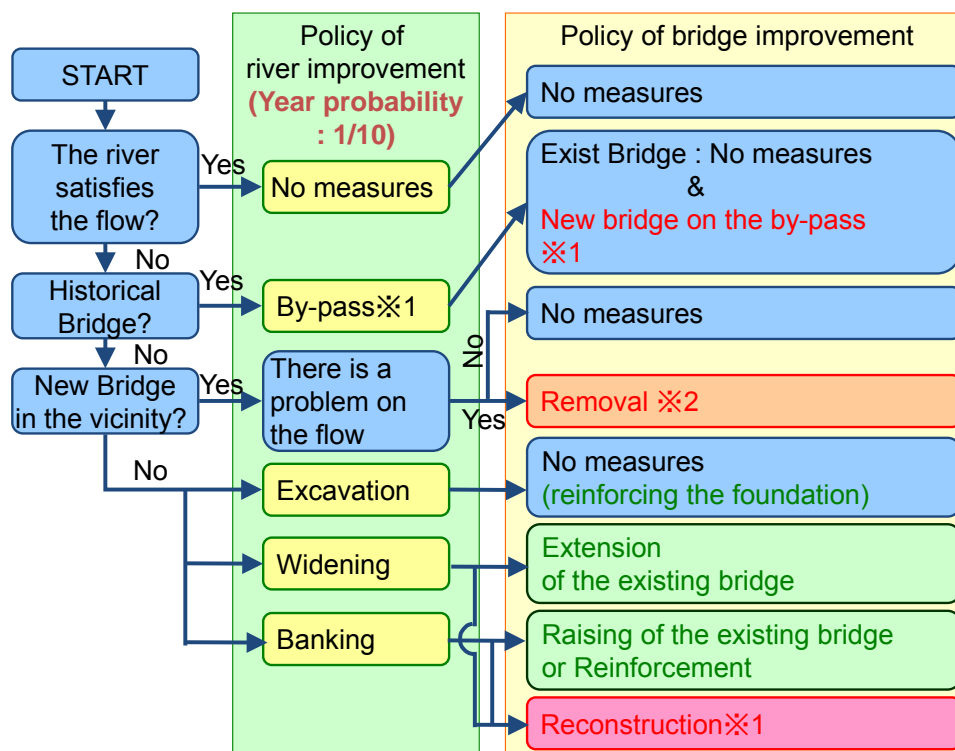
\* Outside the scope of the Project

Source: JICA Survey Team

## 6.2 Improvement Policy Selection Flowchart

### 6.2.1 Improvement Policy Selection Flowchart

Below is a selection flowchart used to develop bridge improvement policy in response to the problems with current conditions described in the previous sections:



Confirmation

※1: The plan guarantees the increase of design flood in the future.

※2: It is necessary to confirm to the Ministry of Culture.

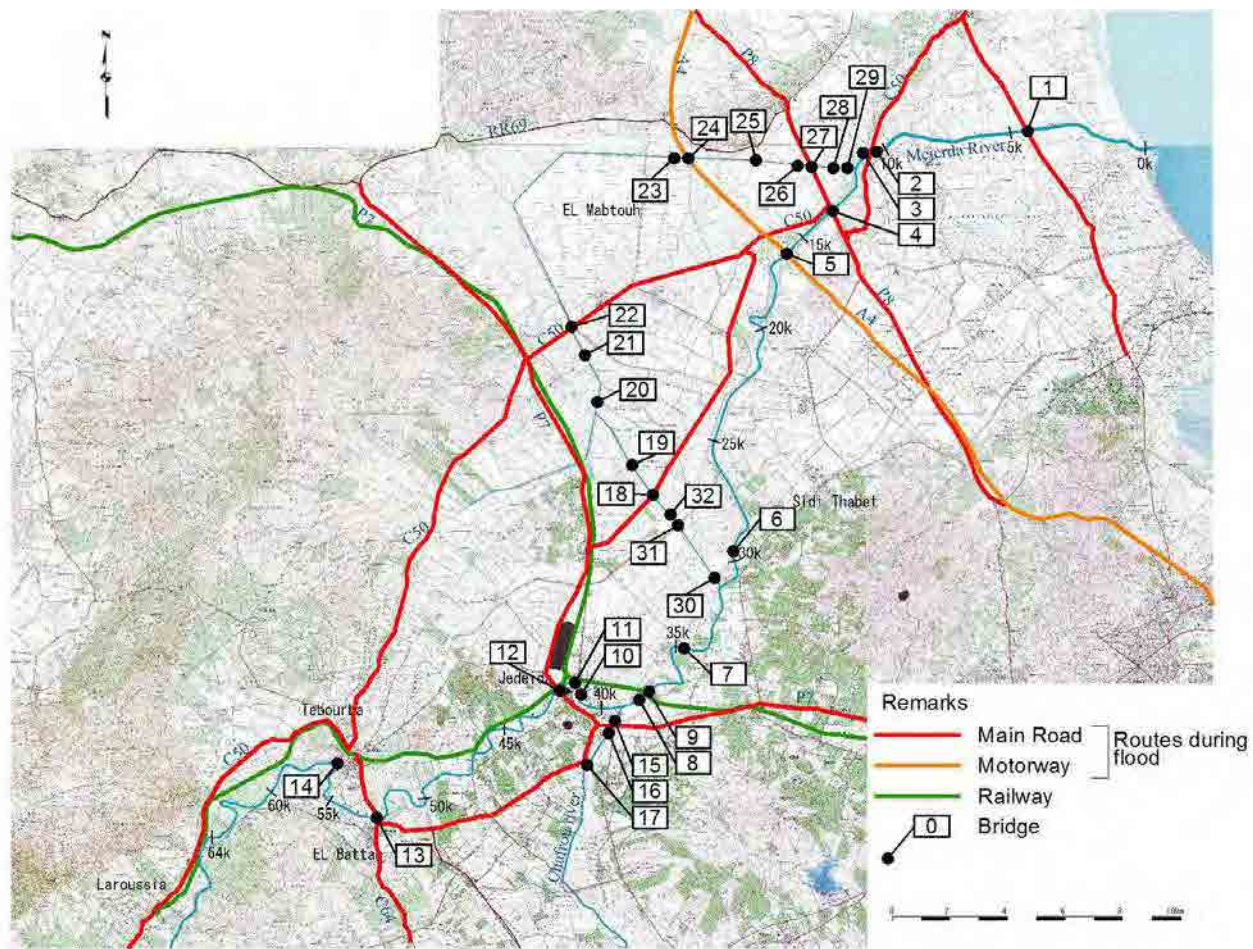
Removal of old railway bridge is necessary to confirm to SNCFT.

Source: JICA Survey Team

**Figure 6.2-1: Bridge Improvement Policy Selection Flowchart**

Required capabilities differ for each location in which bridges are to be replaced or built anew, so required main roads should be passable during floods so that people and supplies could be moved and transported. Bridges on farm roads may be impassable on the condition that consideration was given such that the bridges' impassability would not cause areas to become isolated during floods.

Below are the roadways to ensure passability during floods (with ten-year flood design HWL):



Source: JICA Survey Team

**Figure 6.2-2: Roadways Guaranteed During Floods**

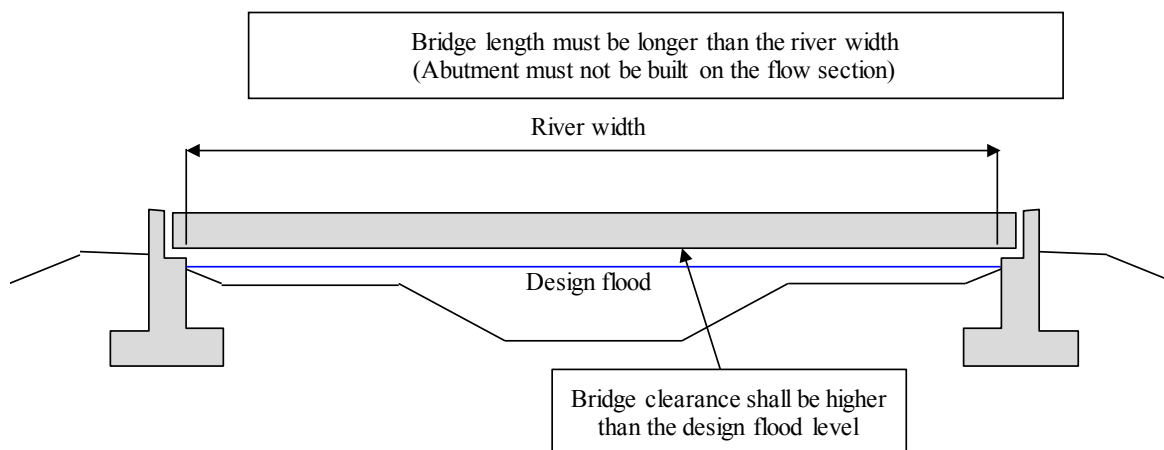
Bridges to be replaced or built anew and those located on roadways guaranteed during floods will have Class A capabilities as described on the table below; bridges over all other roadways will have Class B capabilities.



**Table 6.2-1: New Bridge Classifications**

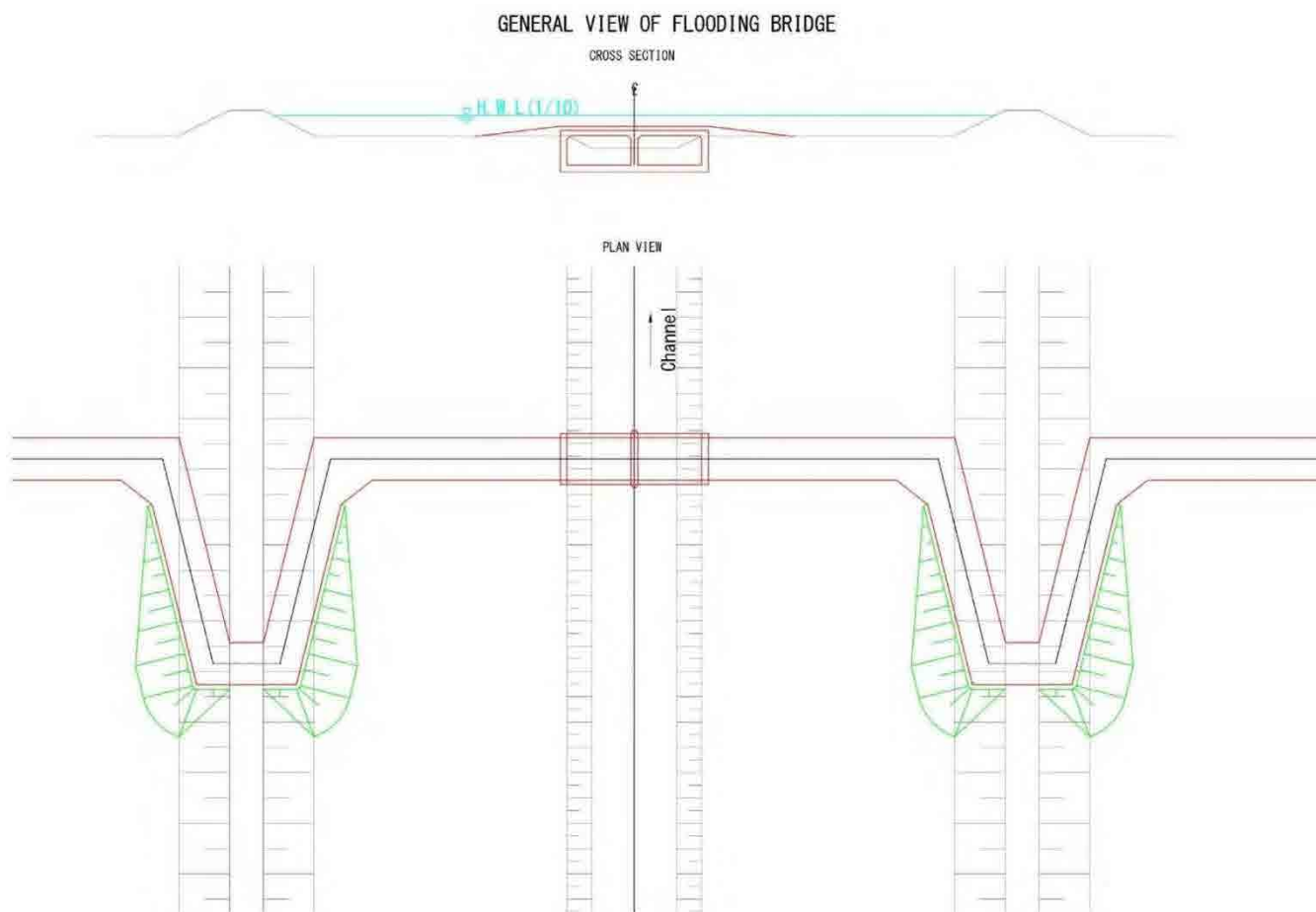
	Class A	Class B
Description	Passable during floods to move people and transport supplies	Bridges of minimum length to reduce costs since they are impassable during floods and necessitate detours to other bridges
Passability	Normal times: Passable	Normal times: Passable
	During floods: Passable	During floods: Impassable
Required Capabilities	Bridge functions guaranteed, even during floods	Bridge functions over low-channel rivers guaranteed during normal times
Bridge Plans	Vertical clearance higher than design high-water level, length longer than river width	These bridges only cross low channels; they are designed to become submerged during floods

Source: JICA Survey Team



Source: JICA Survey Team

**Figure 6.2-3: Overview of Class A Bridges**



Source: JICA Survey Team

**Figure 6.2-4: Overview of Class B Bridges**

Bridges over roadways not guaranteed during floods will be of the minimum possible scale and only cross low channels passable under normal flow conditions. They are designed to become submerged during floods.

However, such roads will run diagonally up and down the slopes of dikes to avoid causing discontinuity of the dikes.

### (1) Bridge Improvement Policy Selection Results

The table below shows the results of improvement policy selected based on the flowchart above:

**Table 6.2-2: Improvement Policy Selection Results**

No.	Bridge Name	Channel		Historical Bridge	flow	Condition	Policy of bridge improvement
		Name	Distance				
1	K.LANDA OUS BRIDGE	Medjerda	4.664		NG		Reconstruction(Outside the scope of the project)
2	TOBIAS BRIDGE	Medjerda	10.828		OK		No measures
3	TOBIAS OLD BRIDGE	Medjerda	10.836		NG *1		Removal
4	GP8 BRIDGE OVER OUED MEJERDA	Medjerda	13.728		OK	Not Good	Reconstruction
5	A4 MOTORWAY BRIDGE	Medjerda	16.017		OK		No measures
6	FOOTBRIDGE	Medjerda			OK		No measures
7	WATER PIPE BRIDGE	Medjerda	34.440		OK		No measures
8	JEDEIDA RAILWAY OLD BRIDGE	Medjerda	37.848		NG *1	Not Good	Removal
9	JEDEIDA RAILWAY BRIDGE	Medjerda	37.834		NG		Extension of the existing bridge
10	JEDEIDA BRIDGE	Medjerda	41.071		-- *2		No measures
11	JEDEIDA OLD BRIDGE	Medjerda	41.091	○	-- *2	Not Good	No measures
12	JEDEIDA BRIDGE ON GP7	Medjerda	41.926		NG		Extension of the existing bridge
13	EL BATTAN BRIDGE	Medjerda	53.111	○	-- *2		No measures
14	TEBOURBA IRRIGATION CANALS BRIDGE	Medjerda	56.899		-- *2	Not Good	No measures
15	GP7 BRIDGE ON CHAFUROU	Chafouou			NG		Reconstruction
16	GP7 OLD BRIDGE ON CHAFUROU	Chafouou			NG *1	Not Good	Removal
17	EL H'BIBIA BRIDGE	Chafouou			NG	Not Good	Reconstruction as "Flooding Bridge"
18	Bridge on the local road	Mabtouh			NG		Reconstruction
19	FARM BRIDGE ON Driving CHANNEL	Mabtouh			NG		Reconstruction as "Flooding Bridge"
20	FARM BRIDGE ON Driving CHANNEL	Mabtouh			NG		Reconstruction as "Flooding Bridge"
21	FARM BRIDGE	Mabtouh			NG		Reconstruction as "Flooding Bridge"
22	MCS0 EL MABTOUH BRIDGE	Mabtouh			NG		Reconstruction
23	FARM BRIDGE ON Oued Mabtouh	Mabtouh			-- *2		No measures
24	A4 BRIDGE OVER Mabtouh	Mabtouh			-- *2		No measures
25	FARM BRIDGE ON Oued Mabtouh	Mabtouh			-- *2		No measures
26	FARM BRIDGE ON Oued Mabtouh	Mabtouh			-- *2		No measures
27	GP8 BRIDGE AND ROAD OVER Mabtouh	Mabtouh			NG *3	Not Good	Reconstruction
28	FARM BRIDGE ON Oued Mabtouh	Mabtouh			-- *2		No measures
29	FARM BRIDGE ON Oued Mabtouh	Mabtouh			-- *2		No measures

\*1: The pier locations are not aligned with the streamline

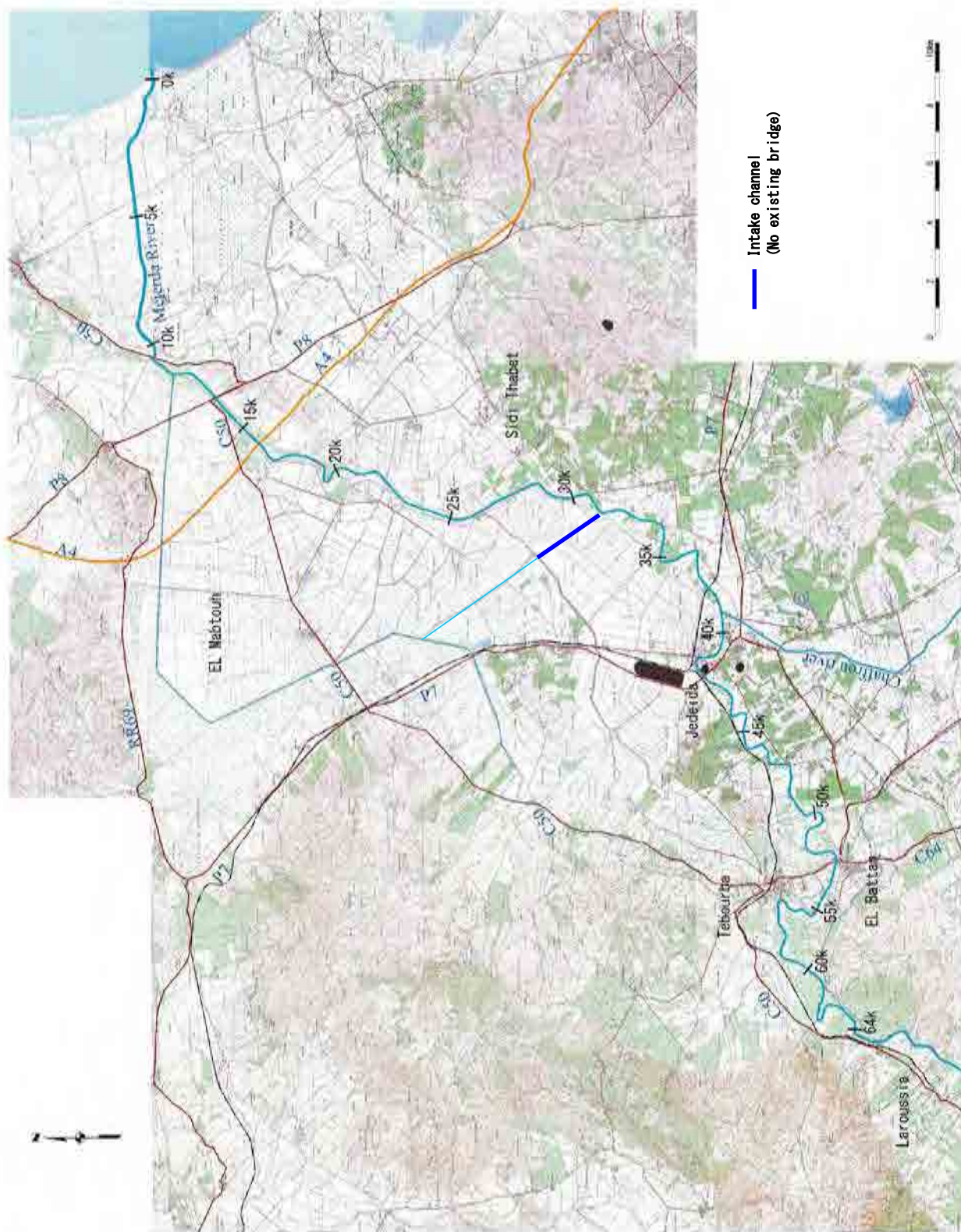
\*2: No river channel improvement

\*3: Lower than the existing levee

Source: JICA Survey Team

### 6.2.2 New Bridge Design

The river improvement of this Project includes the section from the Mejerda River to the El Mabtouh Retarding Basin. In some parts of this section, there are no existing waterways and, thus, no existing bridges, so new bridges will be built in places in this section where the new channel intersects existing roads.



Source: JICA Survey Team

Figure 6.2-5: Location where New Bridge is required

### 6.2.3 List of Bridges Requiring Improvement (Bridge Reconstruction/New Bridge Construction)

As mentioned above, 15 of the 29 existing bridges need to be replaced, and three need to be built anew. It is worth noting that the Kalaat Landaous Bridge, the bridge farthest downstream, needs to be replaced as part of river channel improvement, but it is outside the scope of this project because it will probably be treated as a road project.

**Table 6.2-3: List of Bridges Requiring Improvement**

No.	Bridge Name	Channel		Route	Policy of bridge improvement	Classification
		Name	Distance			
1	K LANDAOUS BRIDGE	Medjerda	4.664	Rue Sadok Belhadi	Reconstruction *	
2	TOBIAS BRIDGE	Medjerda	10.828	MCS0	No measures	
3	TOBIAS OLD BRIDGE	Medjerda	10.836	MCS0	Removal	
4	GP8 BRIDGE OVER OUED MEJERDA	Medjerda	13.728	GP8	Reconstruction	A
5	A4 MOTORWAY BRIDGE	Medjerda	16.017	MOTORWAY A4	No measures	
6	FOOTBRIDGE	Medjerda		Sidewalk	No measures	
7	WATER PIPE BRIDGE	Medjerda	34.440	Water supply	No measures	
8	JEDEIDA RAILWAY OLD BRIDGE	Medjerda	37.848	RAILWAY	Removal	
9	JEDEIDA RAILWAY BRIDGE	Medjerda	37.834	RAILWAY	Extension of the existing bridge	
10	JEDEIDA BRIDGE	Medjerda	41.071	RVE507	No measures	
11	JEDEIDA OLD BRIDGE	Medjerda	41.091	RVE507	No measures	
12	JEDEIDA BRIDGE ON GP7	Medjerda	41.926	GP7	Extension of the existing bridge	
13	EL BATTAN BRIDGE	Medjerda	53.111	MC64	No measures	
14	TEBOURBA IRRIGATION CANALS BRIDGE	Medjerda	56.899	IRRIGATION CANALS	No measures	
15	GP7 BRIDGE ON CHAFUROU	Chafouou		GP7	Reconstruction	A
16	GP7 OLD BRIDGE ON CHAFUROU	Chafouou		GP7	Removal	
17	EL H'BIBIA BRIDGE	Chafouou		Local Road	Reconstruction	B
18	Bridge on the local road	Mabtouh		Local Road	Reconstruction	A
19	FARM BRIDGE ON Driving CHANNEL	Mabtouh		Farm Road	Reconstruction	B
20	FARM BRIDGE ON Driving CHANNEL	Mabtouh		Farm Road	Reconstruction	B
21	FARM BRIDGE	Mabtouh		Farm Road	Reconstruction	B
22	MCS0 EL MABTOUH BRIDGE	Mabtouh		MCS0	Reconstruction	A
23	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	No measures	
24	A4 BRIDGE OVER Mabtouh	Mabtouh		MOTORWAY A4	No measures	
25	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	No measures	
26	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	No measures	
27	GP8 BRIDGE AND ROAD OVER Mabtouh	Mabtouh		GP8	Reconstruction	A
28	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	No measures	
29	FARM BRIDGE ON Oued Mabtouh	Mabtouh		Farm Road	No measures	
30	FARM BRIDGE(NEW)	Mabtouh		Farm Road	New construction	B
31	FARM BRIDGE(NEW)	Mabtouh		Farm Road	New construction	B
32	FARM BRIDGE(NEW)	Mabtouh		Farm Road	New construction	B

\* Outside the scope of the project

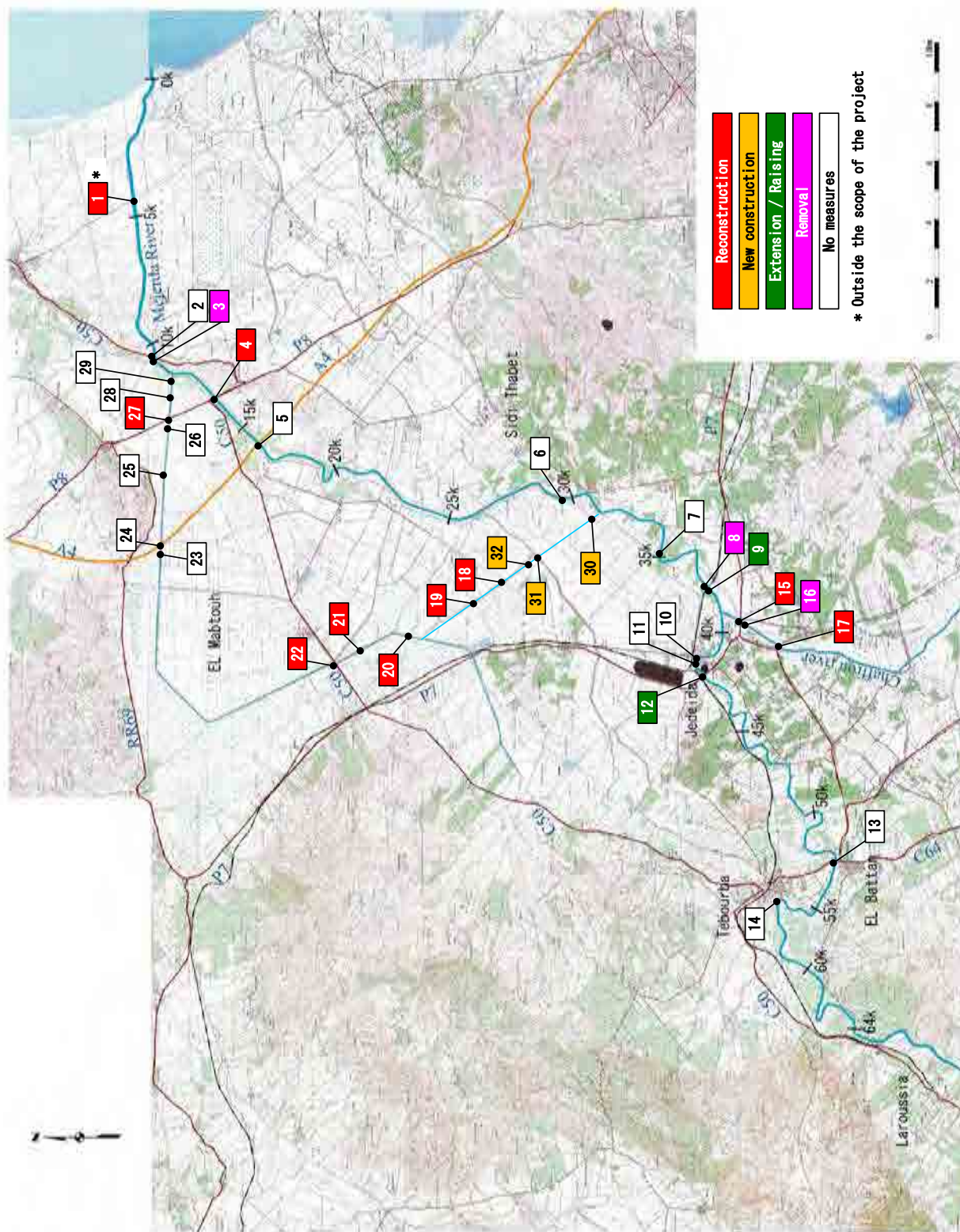
Source: JICA Survey Team

**Table 6.2-4: Numbers of Bridges**

Policy of bridge improvement	Medjerda	Chafouou	Mabtouh	TOTAL
Reconstruction	1	1	3	5
Reconstruction as "Flooding Bridge"		1	3	4
Extension of the existing bridge	2			2
Removal	2	1		3
No measures	8		6	14
Reconstruction *1	1			1
Existing bridge	14	3	12	29
New construction as "Flooding Bridge"			3	3
<b>TOTAL</b>	<b>14</b>	<b>3</b>	<b>15</b>	<b>32</b>

Source: JICA Survey Team

\*1 Outside the scope of the project(K.LANDAOUS BRIDGE)



Source: JICA Survey Team

Figure 6.2-6: Locations of Bridges to be Reconstructed/Newly Built

## **Chapter 7. Construction Plan and Project Cost Estimation**

### **7.1 Overview of Construction and Compensation**

#### **7.1.1 Construction**

The table below contains details of the main construction to be implemented during this Project:

**Table 7-1: Mejerda River Improvement Project Construction Details**

<b>River Improvement Construction</b>	<b>Main Construction Details</b>
1. Preparation work	<ul style="list-style-type: none"> <li>• Material and equipment yard</li> <li>• Setting up worker lodging, management office</li> </ul>
2. Temporary works	<ul style="list-style-type: none"> <li>• Construction roads, river-crossing roads, temporary docks</li> <li>• Cofferdams, cut-and-cover work, large sandbags</li> </ul>
3. River earthwork	<ul style="list-style-type: none"> <li>• Remove trees/roots, demolish existing structures, scrape topsoil</li> <li>• Excavation and banking</li> </ul>
4. River structures	<ul style="list-style-type: none"> <li>• Stone pitching, riprap work, gabions</li> </ul>
4.1 Protective dikes	<ul style="list-style-type: none"> <li>• Main groundsill work, front aprons, bed protection work</li> <li>• Sidewall protection, crest concrete</li> <li>• Main overflow dike work, front aprons, bed protection work</li> <li>• Sidewall protection, crest concrete</li> <li>• Main sluiceway work, flap gate work</li> </ul>
4.2 Groundsill work	
4.3 Overflow dike/diversion facilities	
4.4 Sluiceways/sluice gates	
5. Bridge work	<ul style="list-style-type: none"> <li>• Bridge improvement</li> <li>• Bridge building</li> <li>• Bridge demolition</li> </ul>

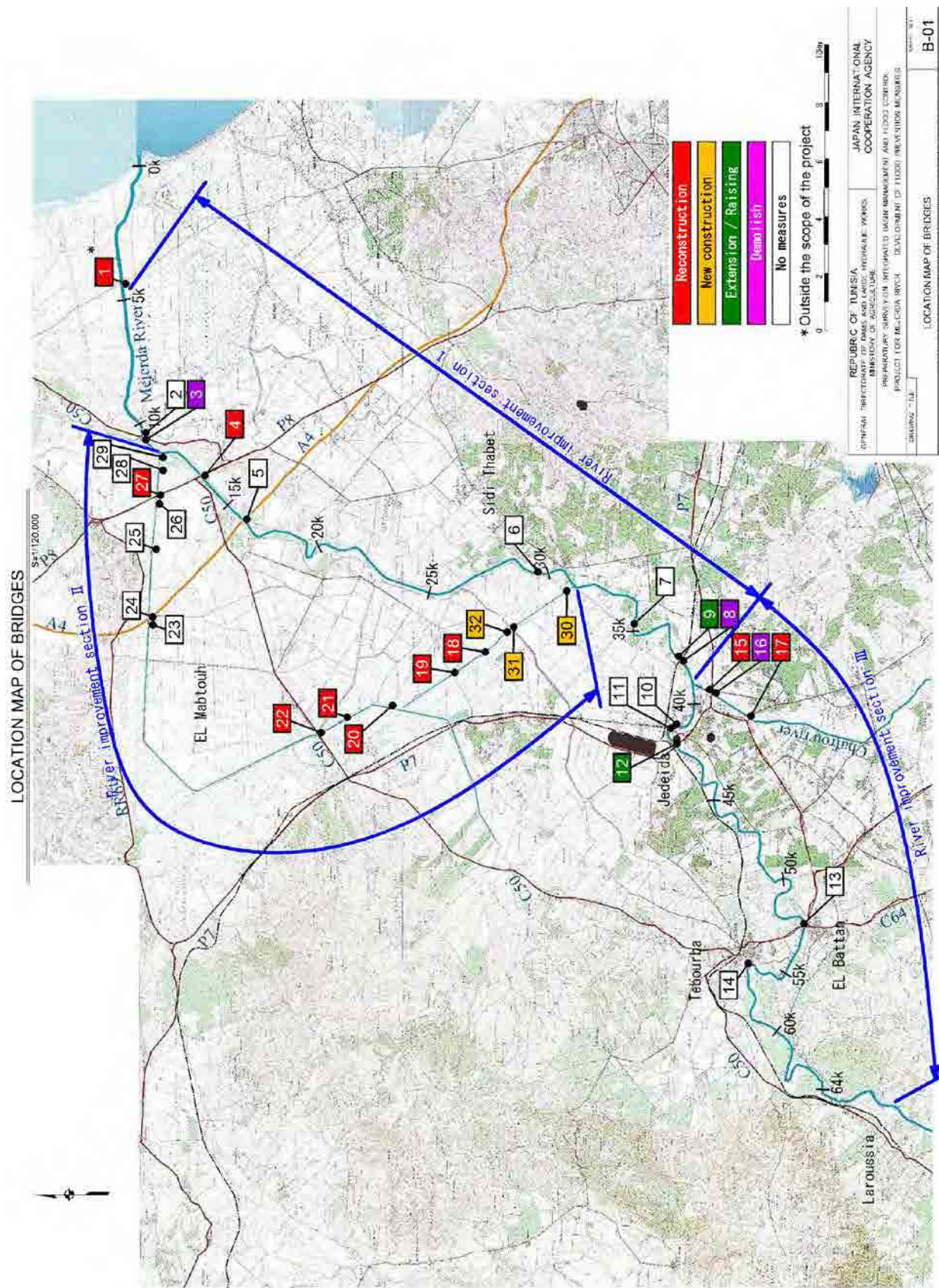


### 7.1.2 Construction Zones

Construction work under this Project has been divided into three major construction zones, each of which is divided into smaller construction zones.

**Table 7-2: Construction Zone Chart**

JOB DIVISION No.	STATION No. (Point No.)	NOTE	DISTANCE		FLOW DISCHARGE (m <sup>3</sup> /sec)	TYPICAL CROSS SECTION
			SUPPLEME NTARY (km)	SECTION (km)		
I	I-1	MD447-α RIVER-MOUTH	0.00		600	MD428
		MD434 K.LANDAOUS BRIDGE	4.66	4.66		
		MD416 TOBIAS DAM	10.78	6.12		
		MD411 OUTLET WORKS	11.81	1.03		
					600	MD380
	I-2	MD353 DIVERTING WEIR	32.35	5.50	800	MD344
	I-3	MD338 JEDEIDA OLD(NEW) RAILWAY BRIDGE	37.85	0.94		
		MD336 CHAFFROU RIVER CONFLUENCE	38.79			
II (EL MABTOUH BASIN)	II-1	-- (POINT⑩) OUTLET WORKS	0		200	
		85(POINT⑧) EXPRESSWAY CROSS POINT	6.16	6.16		
		78(POINT⑦) CONTOROL GATE WORKS	7.77	1.61		
		54(POINT⑥) OVERFLOW WEIR	13.63	5.86		
		36(POINT⑤) ROAD CROSS POINT (C50)	18.38	4.75		
		22(POINT④) CONFLUENCE PIONT	22.10	3.72		
		1(POINT②)	27.27	5.17		
		-- (POINT①) DIVERTING WEIR	31.00	3.73		
III	III-1	MD336 CHAFFROU RIVER CONFLUENCE	38.79		800	MD296
		MD328 JEDEIDA ROAD BRIDGE	41.07	2.28		
				12.04		
	III-2	MD285 EL BATTANE WEIR BRIDGE	53.11			
	MD252 LARROUSIA DAM	64.97	11.86			



Source: JICA Survey Team

Figure 7-1: Construction Zone Map

### 7.1.3 Construction Figures

#### (1) Main Types of Construction

The table below shows the main types of construction in each construction zone:

**Table 7-3: Main Types of Construction in Each Construction Zone**

<b>(1) Construction Zone I: Mejerda River Improvement (Lower)</b>	
(1) Channel excavation work (widening) (2) Banking (protective dike) work (3) Bridge work  (4) Sluiceway work	<ul style="list-style-type: none"> <li>• Demolition/rebuilding</li> <li>• Expanding/raising</li> <li>• Demolition</li> <li>• Demolition/rebuilding</li> <li>• Demolition</li> </ul>
<b>(2) Construction Zone II: Retarding Basin Improvement</b>	
(1) Inflow channel work (2) Channel bridge work (3) Overflow dike work (4) Flow control (gate) work (5) Diversion channel improvement (dike leveling) (6) Diversion gate work (7) Raising area roads (8) Bridge work	<ul style="list-style-type: none"> <li>• Excavation</li> <li>• Banking</li> <li>• Demolition/rebuilding</li> <li>• Building</li>        <li>• Demolition/rebuilding</li> <li>• Building</li> </ul>
<b>(3) Construction Zone III: Mejerda River Improvement (Upper)</b>	
(1) Channel excavation work (widening) (2) Banking (protective dike) work (3) Bridge work	<ul style="list-style-type: none"> <li>• Expanding/raising</li> </ul>

#### (2) Construction Figures

The table below shows figures related to river construction and bridge construction:

**Table 7-4: Quantities and Types of River Construction**

Classification	Job Division	Works	Unit	River Improvement I	River Improvement II	River Improvement III	Total
Structural Measures	Length		Km	34.1	31.2	26.1	91.4
	River Improvement						
		Excavation	1000m <sup>3</sup>	5,659	2,361	2,048	10,068
		Embankment	1000m <sup>3</sup>	508	525	73	1,106
		Removal	1000m <sup>3</sup>	5,151	1,815	1,975	8,941
	River Facilities						
	El Mabtouh						
		Inflow Weir	Unit	-	1	-	1
		Discharge Control	Unit	-	1	-	1
		Outflow Gate	Unit	-	1	-	1
		Overflow Weir	Unit	-	1	-	1
	Mejerda River						
		Sluiceway	Unit	5	0	4	9
	Bridges			9	15	8	32
		Reconstruction	Bridge	2	6	2	10
		Construction	Bridge	0	3	0	3
		Raising	Bridge	1	0	1	2
		Demolish	Bridge	2	0	1	3
		No Measures	Bridge	4	6	4	14

Source: JICA Survey Team

## 7.1.4 Compensation Figures

### (1) Acquiring Work Sites

At Construction Zone I and II, land acquisition cost is required for the expansion of river channel in the course of improving the Mejerda River. At the El Mabtouh retarding basin (Zone II), land acquisition is required to the new construction and expansion of discharge channel. Construction Zone II is divided into two (2) areas, state-owned land and private land. Therefore no acquisition cost is necessary for the former. The area requiring land acquisition cost is shown on the Table below. The Tunisia side is responsible for work site acquisition costs to which loan money cannot be applied.

**Table 7-5: Breakdown of Work Sites Acquisition Areas**

Construction Zone	River Channel Width (m <sup>2</sup> )	Expansion of Bridge Access Road Width (m <sup>2</sup> )
Zone I	619,000	3,630
Zone II	1,254,800	1,910
Zone III	443,800	1,110
Subtotal	2,318,200	6,650
Total	2,324,850 m <sup>2</sup>	

Source: JICA Survey Team

### (2) House Compensation

Two houses will have to be moved to widen the river channel in the course of improving the Mejerda River. Loan money cannot be applied toward the money used for house compensation; the Tunisia side is responsible for the resulting cost.

**Table 7-6: Resident Relocation Compensation Figures**

Construction Zone, Distance Marker	House Compensation Area (m <sup>2</sup> )
Zone I, 24.7 km (right bank)	150
Zone III, 46.5Km (left bank)	500

Source: JICA Survey Team

## 7.2 Construction Plan

### 7.2.1 Methods for Main Types of Construction

The main types of construction in Mejerda River are as follows.

- (1) Removing Trees/Roots (flood channel)
- (2) Topsoil Scraping/Excavation (flood channels and slopes)
- (3) Banking
- (4) Concrete Slope Cribwork and Bed Protection Work as Part of Protective Dike Work
- (5) Expanding El Mabtouh Retarding Basin, Excavating Low Channels
- (6) Banking in El Mabtouh Retarding Basin
- (7) El Mabtouh Retarding Basin, Flow Control Facilities, Overflow Dike, etc.
- (8) Bridge Construction, Replacement
- (9) Bridge Jacking, Expansion

### **7.2.2 Construction Plan**

#### **(1) Construction Plan (Main Construction)**

It is necessary to plan and implement properly the following items as Construction Plan for Mejerda River Improvement.

- Preparation Work
- Preparatory Surveying (Groundbreaking Survey)
- Grade Stakes
- Drainage Earthwork
- Procedures for Related Laws, Regulations and Agencies
- Temporary Works
- Excavation and Transportation
- Banking
- Structure Construction (Diversion Facilities, Overflow Dike, etc.)
- Bridge Work
- Borrow Areas/Dumping Areas/Vegetation Dumping Areas

#### **(2) Construction Plan**

It is necessary to plan and implement properly the following items as Temporary Works.

- Construction Roads
- Temporary Facilities

##### **a. Directly Related Temporary Facilities**

- 1) Rebar/Formwork
- 2) Machinery, Heavy Machinery
- 3) Temporary Bridges
- 4) Temporary Docks
- 5) Jacking Work
- 6) Steel Sheet Pile Cofferdams
- 7) River-Crossing Roads
- 8) Cofferdam Work for Overflow Dike, Diversion Facilities

- 9) Drainage Work
- 10) Dumping Areas

**b. Indirectly Related Temporary Facilities**

- 1) Offices, Laboratories, Storehouses, Garages
- 2) Lodging
- 3) Electricity

**(3) Excavation and Transportation**

It is necessary to plan and implement properly the following items as Excavation and Transportation.

- Excavation
- Loading and Transportation

**(4) Banking**

It is necessary to plan and implement properly Banking.

**(5) Structure Construction (Diversion Facilities, Overflow Dike, etc.)**

It is necessary to plan and implement properly the following items as Structure Construction.

- Structure Foundation Excavation
- Pouring Concrete for Structures

**(6) Bridge Works**

It is necessary to plan and implement properly the following items as Bridge Works.

- Cast-in-Place Piles
- PC Girder Installation (Using Cranes)
- Bridge Jacking

**(7) Borrow Areas/Dumping Areas/Vegetation Dumping Areas**

It is necessary to plan and implement properly the following items as Borrow Areas/Dumping Areas/Vegetation Dumping Areas.

- Borrow Areas
- Dumping Area

According to the site survey, confirmed candidates of dumping area are the following three locations. Since the surplus earth acceptable amount at the three sites becomes 13,825Km<sup>3</sup>, processing of 7,931Km<sup>3</sup> surplus earth generated by the use is capable.

**Table 7-7: Candidates for Dumping Area-1**

No	Location	Current Application	Capacity
1	Nali, Ariana Governorate	Empty Lot of Quarry/Soil Sampling	6,950Km <sup>3</sup>
2	Express Way Side in Bizerte Governorate	Empty Lot of Soil Sampling for Express Way	675Km <sup>3</sup>
3	Charofi, Aiyari in Manouba Governorate	Quarry/Soil Sampling Site	6,200Km <sup>3</sup>
		Total	13,825Km <sup>3</sup>

The table below shows the work schedule based on the construction plans above. The construction is expected to take four years.

**Table 7-8 River: Construction Zone I Work Schedule**

Job division	Type of works	Classification	BQ		Daily workload	Party formation	Number of days	Number of available day	2018												2019												
			Unit	Quantity					1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
River improvement I																																	
-1	Preliminary work	Preliminary work	1	LS					■																								
-2	Bridge works	Reconstruction	1	Bridge	-	5MB			■																								
		New construction	0	Bridge	-	4MB																											
		Extension/Raising	2	Bridge	-	3MB			■																								
		Removal	2	Bridge	-	2MB			■																								
-3	Earth works	Clearing and grubbing(tama)	2,470,614	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
		Stripping	2,470,614	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
		Excavation	6,987,235	m <sup>3</sup>	300	m <sup>3</sup> /day	41	568	860	■																							
		Embankment	391,495	m <sup>3</sup>	690	m <sup>3</sup> /day	7	81	130	■																							
		Trimming of slope	1,141,129	m <sup>2</sup>	-	m <sup>2</sup> /day				■																							
		Surplus soil disposal	6,595,740	m <sup>3</sup>	-	m <sup>3</sup> /day				■																							
-4	Sluice way works	Main body	6	Num	-	3MN			■																								
		Gate works	6	Num	-	3MN			■																								
-5	Service road works	Asphalt pavement	10,739	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
		Course base	40,956	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
-6	Temporary construction road	Crushed rock	54,608	m <sup>3</sup>	-	m <sup>3</sup> /day			■																								
-7	Clearance work	Clearance work	1	LS					■																								

Source: JICA Survey Team

**Table 7-9: River Construction Zone II Work Schedule**

Job division	Type of works	Classification	BQ		Daily workload	Party formation	Number of days	Number of available day	2018												2019												
			Unit	Quantity					1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	
River improvement II																																	
-1	Preliminary work	Preliminary work	1	ump sum					■																								
-2	Bridge works	Reconstruction	6	Bridge	-	5MB			■																								
		New construction	3	Bridge	-	4MB			■																								
		Extension/Raising	0	Bridge	-	3MB																											
		Removal	0	Bridge	-	2MB																											
-3	Earth works	Clearing and grubbing(tama)	10,000	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
		Stripping	10,000	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
		Excavation	2,330,935	m <sup>3</sup>	300	m <sup>3</sup> /day	25	310	470	■																							
		Embankment	524,666	m <sup>3</sup>	690	m <sup>3</sup> /day	7	108	170	■																							
		Trimming of slope	501,893	m <sup>2</sup>	-	m <sup>2</sup> /day				■																							
		Surplus soil disposal	1,806,260	m <sup>3</sup>	-	m <sup>3</sup> /day				■																							
-4	Facility works	Sluicing outlet works	1	Num					■																								
		Control gate works	1	Num					■																								
		Overflow weir	1	Num					■																								
		Inlet overflow dike	1	Num					■																								
-5	Service road works	Asphalt pavement	7,452	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
		Course base	29,808	m <sup>2</sup>	-	m <sup>2</sup> /day			■																								
-6	Temporary construction road	Crushed rock	19,872	m <sup>3</sup>	-	m <sup>3</sup> /day			■																								
-7	Clearance work	Clearance work	1	LS					■																								

Source: JICA Survey Team



**Table 7-10: River Construction Zone III Work Schedule**

Job division	Type of works	Classification	BQ		Daily workload	Party formation	Number of days	Number of available day	Schedule																																													
			Unit	Quantity					Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec										
River improvement III																																																						
	-1 Preliminary work	Preliminary work	1	1S																																																		
	-2 Bridge works	Reconstruction	1	Bridge	-	6MB																																																
		New construction	0	Bridge	-	4MB																																																
		Extension/Raising	2	Bridge	-	3MB																																																
		Removal	1	Bridge	-	2MB																																																
	-3 Earth works	Clearing and grubbing/trim	2,371,908	m <sup>2</sup>	-	m <sup>2</sup> /day																																																
		Stripping	2,371,908	m <sup>2</sup>	-	m <sup>2</sup> /day																																																
		Excavation	6,039,726	m <sup>3</sup>	300	m <sup>3</sup> /day	41	491	740																																													
		Embankment	0	m <sup>3</sup>	690	m <sup>3</sup> /day	7	0	0																																													
		Trimming of slope	952,952	m <sup>2</sup>	-	m <sup>2</sup> /day																																																
		Surplus soil disposal	6,039,726	m <sup>3</sup>	-	m <sup>3</sup> /day																																																
		-4 Sluice way works	Main body	4	Num	-	3MN																																															
	Gate works		4	Num	-	3MN																																																
	-5 Service road works	Asphalt pavement	7,854	m <sup>2</sup>	-	m <sup>2</sup> /day																																																
		Course base	31,416	m <sup>2</sup>	-	m <sup>2</sup> /day																																																
	-6 Temporary construction road	Crushed rock	41,888	m <sup>3</sup>	-	m <sup>3</sup> /day																																																
	-7 Clearance work	Clearance work	1	1S																																																		

Source: JICA Survey Team

### 7.3 Project Cost Estimation

#### 7.3.1 Project Cost Estimation System

The system below was used to estimate the cost of the Mejerda River Improvement Project:

- (A) Direct construction cost
- (B) Consulting service (CS) cost (cumulative)
- (C) Work site compensation cost (cumulative)
- (D) Administrative cost (5% of total project cost)
- (E) Price increase (foreign currency: 2.1%, domestic currency: 0.2%)
- (F) Reserves (5%)
- (G) Taxes (VAT: 18%)

#### (A) Direct Construction Cost (Direct Cost, Base Cost for Construction)

The construction costs were set based on bidding prices on past projects implemented by the Ministry of Agriculture (MA) and on recent market price construction within Tunisia.

Also, according to interviews with the Ministry of Agriculture and local construction workers, most of the required materials, equipment and workforce can be procured from within Tunisia.

#### (B) Consulting Service Cost

The consulting service is calculated by multiplying the cost per engineer by the required man-month (MM) with respect to the required items.

**(C) Compensation Cost**

As compensation costs, land acquisition cost and house compensation cost will be appropriated.

**(D) Administrative Cost**

Administrative cost to the owners of this project of 5% of total project cost will be recorded.

**(E) Inflation Costs (annual rate)**

Inflation of 2.1% for foreign currency and 0.2% for domestic currency indicated by JICA will be recorded.

**(F) Contingency**

Contingency was reported as a uniform 5% of price increases for foreign and domestic currency.

**(G) Tariffs/Taxes**

Customs duties/ Value Added Tax (VAT) were set as 18%. The customs duties are exempted and the tax will be returned within 45 days after submission of receipt for the procured material to MA.

- a. Exchange rates: 1 USD = 1.61 TND = 79.0 JPY  
1 TND = 49.0 JPY (November 6, 2012)
- b. Currency composition: Local Currency Portion ( )  
Foreign Currency Portion ( )
- c. Interest: construction: 1.7%, consultants: 0.01%
- d. Commitment charge: 0.1%

**(H) Project Taking-over and Defect Liability**

The Project shall be taken over at the completion of construction.

As for the bond, the term of the performance security (bond) shall be until the construction completion and defect correction, and thus it applies also during the defect period. (Standard Bidding Documents Under Japanese ODA Loans, Procurement of Works, JICA, October 2012)

**7.3.2 Project Cost Unit Price Estimation**

The following unit price charts were used to calculate the cost of the Mejerda River Improvement Project. The division of foreign and local currencies of the unit price (FC, LC) is determined by the unit price of work type in reference to the following ratio used in the SAPROF (Special Assistance for Project Formation) survey of JBIC and JICA provided by the Ministry of Agriculture (MA).

**Table 7-11: Ratio of Foreign and Local Currencies by Work Type (JBIC, SAPROF)**

Chapter 6. Description	Foreign currency (%)	Local Currency (%)
1. Transmission Pipeline		
1) Transportation of PC and fitting	70	30
2) Earthworks	70	30
3) Pipe installation and test	60	40
4) Civil works including building works	60	40
5) Installation of hydro-mechanical equipment & fitting	70	30
6) Other minor works	50	50
7) Supply of hydro-technical and fitting	90	10
8) Supply of PC pipes & fitting	55	45
9) Supply of Vehicle	95	5
2. Pump Station		
1) Transportation of PC and fitting	70	30
2) Earthworks	70	30
3) PC Pipe installation	60	40
4) Civil works including building works	60	40
5) Other minor works	50	50
6) Supply and Installation of pumping equipment	85	15
7) Supply of PC pipes & fitting	55	45

Source: Foreign and local currency portions applied in 1995 and in 2003 for the SAPROF studies of projects financed by JBIC and JICA (Ministry of Agriculture)

**Table 7-12: Unit Prices for Construction Cost Estimation (1)**

No	item	unit	Unit Price			Ratio		Remarks
			Foreign	Local	Total	Foreign	Local	
			yen	TND	TND	%	%	
<b>Earth work excavation</b>								
100	clearing and grubbing (tamarix $\phi$ 20cm>)	unit	2998	21.7	82.9	70	30	
101	clearing and grubbing (tamarix $\phi$ 10-20cm)	unit	1766	12.7	48.7	70	30	
102	clearing and grubbing (tamarix $\phi$ 10cm<)	m2	85.5	0.63	2.37	70	30	
103	Stripping t=0.5m	m2	53.2	0.38	1.47	70	30	
104	branch cutting	day	67382	486	1861	70	30	
105	plant spraying	day	39376	285	1089	70	30	
106	filling materials transport	m3km	23.4	0.17	0.65	70	30	
107	trimming of slope	m2	204	1.47	5.63	70	30	
108	temporary drainage(pump,generator)	day	40573	294	1122	70	30	
109	Surplus soil disporsal	m3	70.2	0.51	1.94	70	30	
<b>Excavation</b>								
201	Excavation for river common soil (with average hauling distance of 1km)	m3	152	1.1	4.2	70	30	
202	excavation (common soil)	m3	238	1.73	6.59	70	30	
203	Excavation for river loose sand (with average hauling distance of 1km)	m3	720	5.21	19.9	70	30	
204	Excavation for river hard soil (with average hauling distance of 1km)	m3	720	5.21	19.9	70	30	
205	Excavation for river rock (with average hauling distance of 1km)	m3	825	5.96	22.8	70	30	
<b>Earth work filling(dike)</b>								
301	Stripping	m3	84.9	0.62	2.35	70	30	
302	fill grading t=0.35m	m3	93.4	0.68	2.59	70	30	
303	Backfill surrounding structures due to excavation	m3	284	2.06	7.86	70	30	
304	gabion	m3	4315	31.2	119	70	30	
305	drainage(t=0.15m)	m3	1431	10.4	39.6	70	30	
306	geotextile	m2	499	3.6	13.8	70	30	
307	riprap(l=5.5m,t=1.0m)	m2	1219	8.81	33.7	70	30	
308	foot protection(w=1.5m,h=1.0m)	m2	1219	8.81	33.7	70	30	
<b>Road construction</b>								
401	approach road subgrade	m2	117	0.84	3.23	70	30	
402	approach road lower subbase	m3	1324	9.6	36.6	70	30	
403	approach road upper subbase	m3	1484	10.7	41	70	30	
404	approach road asphalt pavement	m3	14242	103	394	70	30	
405	temporary construction road	m3	1329	9.6	36.7	70	30	

**Table 7-13: Unit Prices for Construction Cost Estimation (2)**

No	item	unit	Unit Price			Ratio		Remarks
			Foreign	Local	Total	Foreign	Local	
			yen	TND	TND	%	%	
<b>Main body works</b>								
501	Scaffolding	m2	147	19	22	70	30	
502	Support	m3	147	20	23	70	30	
503	φ500 Concrete pile L=10m	pile	76660	554	2118	70	30	
504	φ500 Concrete pile L=25m	pile	191650	1385	5296	70	30	
<b>Gate works</b>								
601	Service bridge	m2	34300	300	1000	70	30	
602	Electric works	set	686000	6000	20000	70	30	
<b>Contorol house works</b>								
701	RC House	m2	51450	450	1500	70	30	
<b>Appurtenant works</b>								
801	Foundation work	m	3209.16	23.171	88.7	70	30	
802	Step works	m2	4096.8	29.58	113	70	30	
<b>Concrete</b>								
901	floor slab concrete c=400kg	m3	7498	54.2	207	70	30	
902	abutment/pier base concrete c=350kg	m3	6828	49.3	189	70	30	
903	blinding concrete c=200kg	m3	5361	38.7	148	70	30	
904	break concrete	m3	6661	48.1	184	70	30	
905	train bridge demolish work	t	2843	20.5	78.5	70	30	
<b>Form</b>								
1001	form C1	m2	1223	8.84	33.8	70	30	
1002	form C2	m2	1550	11.2	42.8	70	30	
1003	form C3	m2	2058	14.9	56.9	70	30	
1004	curb form adding fee	m2	465	3.36	12.8	70	30	
<b>Rebar</b>								
209	reinforcement	kg	104	0.76	2.88	70	30	

**Table 7-14: Unit Prices for Construction Cost Estimation (3)**

No	item	unit	Unit Price			Ratio		Remarks
			Foreign	Local	Total	Foreign	Local	
			yen	TND	TND	%	%	
<b>Concrete constructure</b>								
1101	Centrifugal reinforced concrete pipe 0.4m< $\phi$ <0.8m	ml	7917	57.2	219	70	30	
1102	PC lbeam(L=35m)	unit	4051211	29274	111952	70	30	
1103	PC lbeam(L=29.8m)	unit	3424242	24745	94627	70	30	
1104	PC lbeam(L=30m)	unit	3448419	24918	95294	70	30	
1105	PC lbeam(L=28.85m)	unit	3309763	23916	91462	70	30	
1106	PC lbeam(L=25.85m)	unit	2948076	21303	81468	70	30	
1107	PC lbeam(L=25m)	unit	2845566	20562	78635	70	30	
1108	PC lbeam(L=23.05m)	unit	2610505	18863	72139	70	30	
1109	PC lbeam(L=22.50m)	unit	2544140	18385	70306	70	30	
1110	PC lbeam(L=22.45m)	unit	2538156	18341	70140	70	30	
1111	PC lbeam(L=22.10m)	unit	2495967	18036	68974	70	30	
1112	PC lbeam(L=22.05m)	unit	2489922	17992	68807	70	30	
1113	prestressed concrete floor slab	m2	16696	121	462	70	30	
1114	Cast in place concrete pile	m	29921	216	827	70	30	
<b>Electrical equipment and hydraulic equipment</b>								
1201	manual(W<1.5m,H<1.5m)	kg	344	2.49	9.5	70	30	
1202	side gate larger than 2.0m×2.0m	kg	247	1.79	6.83	70	30	
1203	other metal works	kg	247	1.79	6.83	70	30	
<b>Each work</b>								
1301	train bridge upgradingH=1.1m	unit	2221470	16052	61388	70	30	
1302	installation of anchor	unit	27827	202	770	70	30	
1303	Chipping	m2	7372	53.3	204	70	30	
1304	Cast in micro pile $\phi$ 20cm L=25m	m	23159	167	640	70	30	
1305	rubber dam 50m×2.9m	unit	41071754	296790	1134989	70	30	
<b>Temporary</b>								
1401	temporary coffering	unit	2561	18.5	70.8	70	30	
1402	sheet pile working	ml	112743	815	3116	70	30	
1403	temporary bridge with H beam	m2	11604	83.8	321	70	30	
1404	river section road working	m2	4860	35.1	134	70	30	
1405	temporary rail way	m	16451	119.5	455.4	70	30	

The consultant service (M/M) shall be as follows:

- |  |
|--|
| <ol style="list-style-type: none"> <li>1) Professional A: 2,562,000 yen (52,286 TND)</li> <li>2) Professional B: 735,000 yen (15,000 TND)</li> <li>3) Supporting Staff : 220,500 yen ( 4,500 TND)</li> </ol> |
|--|

### 7.3.3 Project Cost Estimation

The total project cost is shown in the table below. The total cost is 13.34 billion JPY (272 million TND). Details of project cost of main construction zones follow the total cost.

**Table 7-15: Total Project Cost**

	FC	LC	Total	
	Yen	TND	Yen	TND
<b>A. ELIGIBLE PORTION</b>				
(1) Procurement / Construction	<b>6,959,082,828</b>	<b>43,748,261</b>	<b>9,102,747,622</b>	<b>185,770,360</b>
River Improvement Section I	2,590,668,000	18,830,000	3,513,338,000	71,700,776
River Improvement Section II	1,858,556,000	13,672,000	2,528,484,000	51,601,714
River Improvement Section III	1,118,462,000	8,111,000	1,515,901,000	30,936,755
Gate Work	51,337,000	397,000	70,790,000	1,444,694
Base cost for JICA financing	5,619,023,000	41,010,000	7,628,513,000	155,683,939
Price escalation	1,008,674,931	655,011	1,040,770,449	21,240,213
Physical contingency	331,384,897	2,083,251	433,464,172	8,846,208
(2) Consulting services	<b>455,249,037</b>	<b>13,797,808</b>	<b>1,131,341,623</b>	<b>23,088,605</b>
Base cost	381,432,000	12,970,480	1,016,985,519	20,754,807
Price escalation	52,138,512	170,289	60,482,694	1,234,341
Physical contingency	21,678,526	657,038	53,873,411	1,099,457
<b>ELIGIBLE PORTION Grand Total</b>	<b>7,414,331,865</b>	<b>57,546,069</b>	<b>10,234,089,245</b>	<b>208,858,964</b>
<b>B. NON ELIGIBLE PORTION</b>				
(1) Procurement / Construction	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
Base cost for JICA financing	0	0	0	0
Price escalation	0	0	0	0
Physical contingency	0	0	0	0
(2) Land Acquisition	<b>0</b>	<b>34,959,785</b>	<b>1,713,029,488</b>	<b>34,959,785</b>
Base cost	0	33,000,000	1,617,000,000	33,000,000
Price escalation	0	295,034	14,456,655	295,034
Physical contingency	0	1,664,752	81,572,833	1,664,752
(3) Administration cost	<b>0</b>	<b>12,190,937</b>	<b>597,355,937</b>	<b>12,190,937</b>
(4) VAT	<b>0</b>	<b>43,887,375</b>	<b>2,150,481,372</b>	<b>43,887,375</b>
(5) Import Tax	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>NON ELIGIBLE PORTION Grand Total</b>	<b>0</b>	<b>91,038,098</b>	<b>4,460,866,796</b>	<b>91,038,098</b>
<b>TOTAL (A+B)</b>	<b>7,414,331,865</b>	<b>148,584,167</b>	<b>14,694,956,042</b>	<b>299,897,062</b>
<b>C. Interest during Construction</b>	<b>482,283,643</b>	<b>0</b>	<b>482,283,643</b>	<b>9,842,523</b>
Interest during Construction (Const.)	481,763,397	0	481,763,397	9,831,906
Interest during Construction (Consul.)	520,246	0	520,246	10,617
<b>D. Commitment Charge</b>	<b>107,163,729</b>	<b>0</b>	<b>107,163,729</b>	<b>2,187,015</b>
<b>GRAND TOTAL (A+B+C+D)</b>	<b>8,003,779,237</b>	<b>148,584,167</b>	<b>15,284,403,413</b>	<b>311,926,600</b>
<b>E. JICA finance portion incl. IDC (A + C + D)</b>	<b>8,003,779,237</b>	<b>57,546,069</b>	<b>10,823,536,617</b>	<b>220,888,502</b>

Source: JICA Survey Team (Based on the Cost Estimate Kit prepared by JICA)

**Table 7-16: Project Cost by Construction Zone (River Improvement Section I)**

item	unit	Quantity	Unit Price		Cost		Total yen
			Foreign	Local	Foreign	Local	
			yen	TND	yen	TND	
Earth works	set	1			1,876,926,000	13,607,000	2,543,669,000
Main body works	set	1			48,686,000	405,000	68,531,000
Contorol house works	set	1			3,098,000	28,000	4,470,000
Appurtenant works	set	1			32,176,000	233,000	43,593,000
Service road works	set	1			247,719,000	1,791,000	335,478,000
Temporary construction road works	set	1			82,477,000	596,000	111,681,000
No 3 old bridge Demolish	set	1			5,064,000	37,000	6,877,000
No 4 new bridge construction	set	1			182,016,000	1,318,000	246,598,000
No 4 old bridge Demolish	set	1			4,915,000	36,000	6,679,000
No 8 old railway bridge Demolish	set	1			3,601,000	26,000	4,875,000
No 9 railwaybridge extension	set	1			103,990,000	753,000	140,887,000
Total					2,590,668,000	18,830,000	3,513,338,000

**Table 7-17: Project Cost by Construction Zone (River Improvement Section II)**

item	unit	Quantity	Unit Price		Cost		Total yen
			Foreign	Local	Foreign	Local	
			yen	TND	yen	TND	
Earth works	set	1			914,264,000	6,634,000	1,239,330,000
Main body works	set	1			307,251,000	2,416,000	425,635,000
Contorol house works	set	1			2,902,000	26,000	4,176,000
Appurtenant works	set	1			62,348,000	451,000	84,447,000
Service road works	set	1			194,942,000	1,409,000	263,983,000
Temporary construction road works	set	1			26,410,000	191,000	35,769,000
No 18 new bridge construction	set	1			122,267,000	885,000	165,632,000
No 18 old bridge Demolish	set	1			422,000	4,000	618,000
No 19 new bridge construction	set	1			5,954,000	44,000	8,110,000
No 19 old bridge Demolish	set	1			422,000	4,000	618,000
No 20 new bridge construction	set	1			5,912,000	43,000	8,019,000
No 20 old bridge Demolish	set	1			422,000	4,000	618,000
No 21 new bridge construction	set	1			6,066,000	45,000	8,271,000
No 21 old bridge Demolish	set	1			529,000	4,000	725,000
No 22 new bridge construction	set	1			125,670,000	910,000	170,260,000
No 22 old bridge Demolish	set	1			2,833,000	21,000	3,862,000
No 27 new bridge construction	set	1			58,516,000	424,000	79,292,000
No 27 old bridge Demolish	set	1			2,076,000	15,000	2,811,000
No 30 new bridge construction	set	1			6,608,000	48,000	8,960,000
No 31 new bridge construction	set	1			6,367,000	47,000	8,670,000
No 32 new bridge construction	set	1			6,375,000	47,000	8,678,000
Total					1,858,556,000	13,672,000	2,528,484,000



**Table 7-18: Project Cost by Construction Zone (River Improvement Section III)**

item	unit	Quantity	Unit Price		Cost		Total yen
			Foreign	Local	Foreign	Local	
			yen	TND	yen	TND	
Earth works	set	1			674,320,000	4,889,000	913,881,000
Main body works	set	1			14,513,000	113,000	20,050,000
Appurtenant works	set	1			19,447,000	141,000	26,356,000
Service road works	set	1			186,255,000	1,347,000	252,258,000
Temporary construction road works	set	1			62,012,000	448,000	83,964,000
No 12 Bridge Reinforcement of the existing pier	set	1			39,807,000	288,000	53,919,000
No 15 new bridge construction	set	1			106,604,000	772,000	144,432,000
No 15 old bridge Demolish	set	1			2,478,000	18,000	3,360,000
No 16 old bridge Demolish	set	1			4,408,000	32,000	5,976,000
No 17 new bridge construction	set	1			7,258,000	53,000	9,855,000
No 17 old bridge Demolish	set	1			1,360,000	10,000	1,850,000
Total					1,118,462,000	8,111,000	1,515,901,000

**Table 7-19: Project Cost by Construction Zone (Gate Works)**

item	unit	Quantity	Unit Price		Cost		Total yen
			Foreign	Local	Foreign	Local	
			yen	TND	yen	TND	
Gate works	set	1			51,337,000	397,000	70,790,000
Total					51,337,000	397,000	70,790,000

**Table 7-20: Land Acquisition Cost**

item	Local	Total
	TND	yen
<b>Land Acquisition Cost</b>	3,000,000	147,000,000

**Table 7-21: Consulting Service Fee**

	Unit	Qty.	Foreign Portion		Local Portion		Combined
			(Yen)		TND		Total
			Rate	Amount ('000)	Rate	Amount ('000)	('000) Yen
<b>A Remuneration</b>							
1 Professional (A)	M/M	136	2,562,000	348,432	0	0	348,432
2 Professional (B)	M/M	351	0	0	15,000	5,265	257,985
3 Supporting Staffs	M/M	759	0	0	4,500	3,416	167,360
Subtotal of A				348,432		8,681	773,777
<b>B Direct Cost</b>							
1 International Airfare		60	550,000	33,000		0	33,000
2 Domestic Airfare		0		0		0	0
3 Domestic Travel		0		0		0	0
4 Accommodation Allowance	M/M	136		0	7,500	1,020	49,980
5 Vehicle Rental (4WD)	Car/M	122		0	9,000	1,098	53,802
6 Office Rental	M/M	69		0	2,000	138	6,762
7 International Communications	M/M	69		0	500	35	1,691
8 Domestic Communications	M/M	69		0	599	41	2,025
9 Office Supply	M/M	69		0	100	7	338
10 Office Furniture and Equipment	M/M	69		0	1,000	69	3,381
11 Report Preparation	Month	69			200	14	676
12 Topographic Survey	Set	1				673	33,000
13 Geotechnical Survey	Set	1				449	22,000
14 Social Environment Monitoring Survey	Set	1				150	7,350
15 Environment Monitoring Survey	Set	1				596	29,204
Subtotal of B				33,000		4,290	243,209
Total				381,432		12,970	1,016,986

Note) The M/M bar chart for consulting service fee calculation is explained in Chapter 10.

## 7.4 Employing Japanese Techniques

### 7.4.1 Bridges

Below are two Japanese techniques that can be employed in the course of improving bridges:

- 1) Construction Beneath Roads/Railways in Use
- 2) Temporary Construction to Shorten Construction Schedules

#### (1) Technique for Construction Beneath Roads/Railways in Use

##### 1) Construction Method Overview

This technique is for building structures beneath roads and railways in use without inhibiting their passability.

Below are schematic diagram :



**Figure 7-2: Technique Schematic Diagram**

##### 2) Results

Employing this technique delivers the following results:

- The construction schedule is shortened because replacements for the roads or railways in use are not necessary.
- There is no need to acquire sites for replacement roads or railways.
- Smooth passage can be ensured because roadways can continue to be used in their current state.
- High-precision work is possible with little impact on roads, railways and the rest of the surrounding environment since the elements are inserted using the pulling method.
- Elements are fitted together with joints and their insides filled with concrete, so they can double as the main structure, which shortens the construction schedule. The process does not have to result in a box shape; multi-span boxes, rings and many other shapes can be built.
- Since protection work from the pipe roof method and other methods is not necessary and earth covering can be minimized, structure construction foundations can be raised, which shortens approaches compared to other construction methods used beneath roads and railways.

### 3) Applicability to the Project

Employing this technique would raise the construction cost of jacking up railway bridges 50% over conventional construction methods, but it is effective when changing management conditions during construction stages or problems acquiring work sites preclude building replacement roadways.

**Table 7-22: Comparison between Conventional and Proposed Construction Methods**

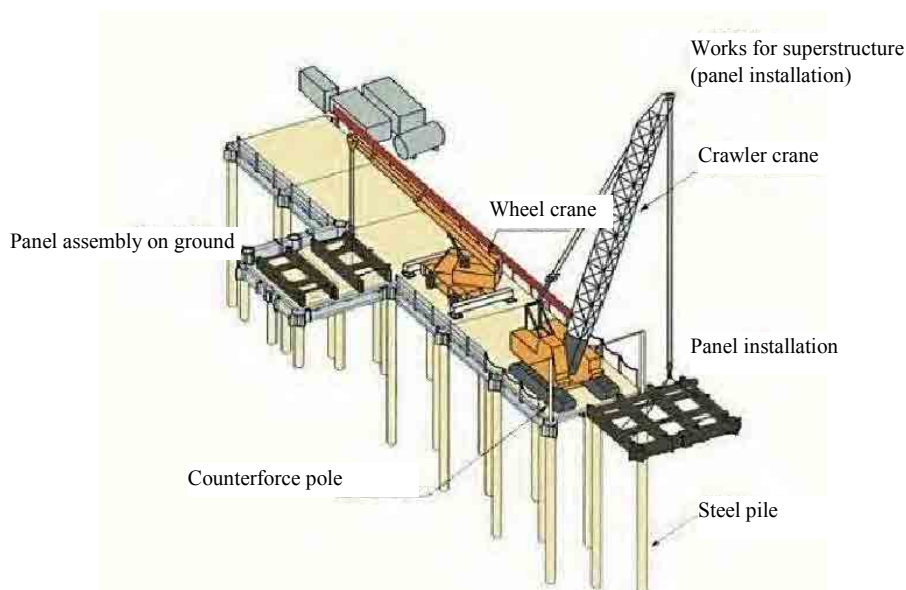
Method	Conventional Method	Proposed Method
Items & Cost	Cost (TND)	Cost (TND)
	No.9	No.9
1)Substructure	788,000	2,862,000
2)Superstructure	1,366,000	1,366,000
3)Temporary	721,000	
Total	2,875,000 (1.00)	4,228,000 (1.47)
Evaluation	○	△

## (2) Temporary Construction to Shorten Construction Schedules

### 1) Construction Method Overview

Under this technique, cable-stayed structures are used in the course of building temporary bridges and docks and superstructures are built in advance.

Below is a schematic diagram:



**Figure 7-3: Technique Schematic Diagram**

## 2) Results

Employing this technique delivers the following results:

- Installing superstructures first eliminates the need to have work done in high places to build scaffolding at bridge sites, shortening the construction schedule and improving economic efficiency and safety.
- New panels can function as guides and separate the construction into panel units, and they are connected by pins, so work can be done on superstructures and substructures simultaneously, improving the ability to perform work.
- Installing superstructures assembled on flat ground and using them as guides for driving/casting piles minimizes ground excavation by removing the need to set up guides on the ground, which can restrict impact to the natural environment.
- Steel pipe piles perform well for their cross sections; substructures can be made smaller with steel pipe piles than with steel H-piles. They are extremely safe because they decrease flow resistance.
- This technique is very safe because it reduces the amount of manual labor performed atop unstable scaffolding in high places, on slopes or on the water.

## 3) Applicability to the Project

As shown below, employing this technique would raise the cost of building temporary bridges 10% over the conventional construction method, but it can shorten the construction schedule for the five temporary bridges required in the river improvement by about one-third.

**Table 7-23: Comparison between Conventional and Proposed Construction Methods**

(1) Quantity

Item	No.4	No.12	No.18	No.22	No.27
Material	852	480	84	150	270
Erection	852	480	84	150	270
Removal	852	480	84	150	270

(2) Cost and Construction Period

Method	Conventional Method							Proposed Method						
	Unit price	Cost (TND)						Unit price	Cost (TND)					
		No.4	No.12	No.18	No.22	No.27	Total		No.4	No.12	No.18	No.22	No.27	Total
Material	730	622,000	350,000	61,000	110,000	197,000	1,340,000	1480	1,261,000	710,000	124,000	222,000	400,000	2,717,000
Erection	1270	1,082,000	610,000	107,000	191,000	343,000	2,333,000	700	596,000	336,000	59,000	105,000	189,000	1,285,000
Removal	220	187,000	106,000	18,000	33,000	59,000	403,000	260	222,000	125,000	22,000	39,000	70,000	478,000
Total		1,891,000 (1.00)	1,066,000 (1.00)	186,000 (1.00)	334,000 (1.00)	599,000 (1.00)	4,076,000 (1.00)		2,079,000 (1.10)	1,171,000 (1.10)	205,000 (1.10)	366,000 (1.10)	659,000 (1.10)	4,480,000 (1.10)
	Amount par day	Construction days						Amount par day	Construction days					
		No.4	No.12	No.18	No.22	No.27	Total		No.4	No.12	No.18	No.22	No.27	Total
Preparation	5.00	5	5	5	5	5	25	5.00	5	5	5	5	5	25
Erection	6.99	122	69	13	22	39	265	30.77	28	16	3	5	9	61
Removal	20.83	41	24	5	8	13	91	54.55	16	9	2	3	5	35
Finishing	4.00	4	4	4	4	4	20	4.00	4	4	4	4	4	20
Total		172 (1.00)	102 (1.00)	27 (1.00)	39 (1.00)	61 (1.00)	401 (1.00)		53 (0.31)	34 (0.33)	14 (0.52)	17 (0.44)	23 (0.38)	141 (0.35)
Evaluation		○							△					

## 7.4.2 Dam Flood Management Operation

### (1) Purpose of Employing Japanese Techniques

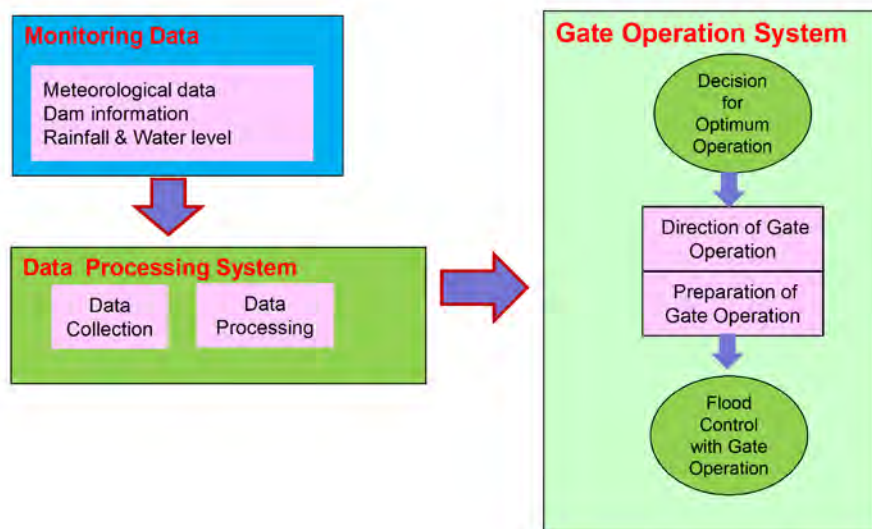
Dam management is one area where Japanese techniques can be employed. Dam management includes dam operation, dam facility management and reservoir management. Within dam operation are flood operation and water supply operation. There are many issues with diversion operation during floods on the Mejerda River, and Japanese techniques will be employed for flood operation.

As of 2010, there are a total of five dams on the Mejerda River with a flood control capacity of 518 million m<sup>3</sup>: Sidi Salem Dam on the main river and Mellegue, Silliana, Bou Huertma and Sara Dams on tributaries. Sidi Salem Dam is located farthest downstream and has a flood control capacity of 285 million m<sup>3</sup>, which is 55% of the capacity of all the dams, with a basin area of 18,150 km<sup>2</sup>, which is 78% of the total. It is no exaggeration to say that Sidi Salem Dam controls flooding on the Mejerda River.

Sidi Salem Dam's optimal, effective control of the many floods in the 23,400-km<sup>2</sup> Mejerda River Basin serves to minimize flood damage downstream of the dam.

### (2) Employing Flood Management Operation at Sidi Salem Dam

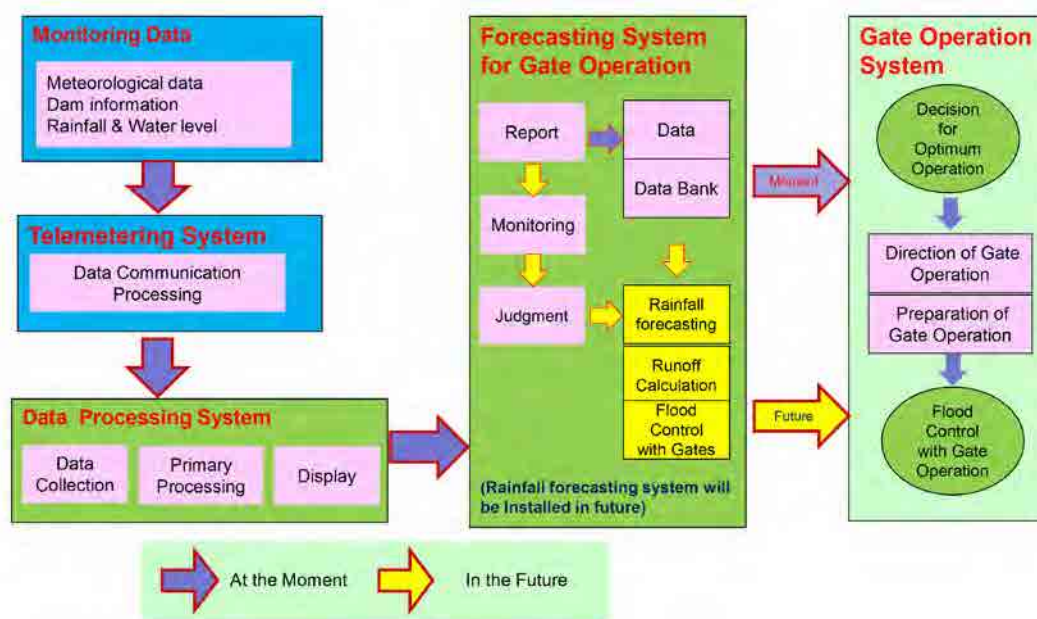
Currently, information is gathered by telephone and fax at Sidi Salem Dam during floods, and gate operation is determined and water discharged based on that information. Below is a conceptual diagram of gate operation:



**Figure 7-4: Current Sidi Salem Dam Flood Management (Gate Operation) Conceptual Diagram**

There are issues with the amount of time it currently takes to gather and process hydrological information (rainfall, river levels, and dam data); these issues need to be resolved as soon as possible.

DGRE has a telemeter (SYCOHTRAC) improvement plan and a management plan to be integrated with the dam management system when the GPRS communication system is introduced. If the introduction of the telemeter and data processing systems resolves the issues, the faster processing speed should ensure enough time for operation related to dam operation and, initially, operate via the dam management system by processing and analyzing telemeter information. (See the blue arrows on the flowchart below)



**Figure 7-5: Sidi Salem Dam Flood Management System (Current Improvement Plan and Future System)**

As indicated in the figure above, five flood control systems are required for effective dam flood management: monitoring data, telemetering, data processing, and forecasting and gate operation. The future system is expected to expand to include gate operation simulation that includes rainfall prediction (yellow arrows on the flowchart). Warnings to downstream areas are crucial when discharging water from dams, and sirens or audio warning facilities need to be introduced.

### (3) Features of Dam Management Techniques in Japan

In Japan, dams are managed in response to long periods of sustained rainfall during the early summer rainy season and short periods of heavy rainfall during typhoon season, and dam operation methods that make full use of this experience have been established. The dam alarm system plan and design guideline for prevention of human damage are formulated partly because of the experience of dam water discharge having resulted in rapid increase of water level in lower stream and caused such damage in the past. The device and facility for the plan have been developed.

A system capable of estimating the entire process from rainfall, discharge, dam operation (inflow, outflow and water levels) to the water level in the lower stream has been developed for the gate operation in floods and it is used integrally with the dam discharge alarm system.

Working manuals and guidelines for dam flood management, gate operation and treatment facility include Dam Management Practice and Guidelines for Design of Dam Management Control and Treatment Facility and procedures and methodologies of swift and accurate dam management (gate operation) have been established.

Employing the established techniques above can prevent flood damage from occurring downstream of dams. They can be also used when the current individual dam operation management is shifted to the integrated Mejerda River dam management in the future.

**(4) Cost Estimation**

The Japanese specifications are unable to be applied directly to the sites because management level of dam management system and familiarization level to system is different between Tunisia and Japan.

The software introduction cost for a dam management system (including distance observation other than dam management office) for a relatively small dam (height: 55m, catchment area: 10km<sup>2</sup> or less, one rain gauge, and one water gauge) in Japan is shown below. The software for distance observation is planned to be installed at a point five kilometers away from the dam.

**Table 7-24: Dam Flood System Software Cost for Small Dam in Japan**

Name of Software	Cost (1,000*JPN)	Cost (1,000*TND)
1) Reservoir Gate Control System	75,000	1,530
2) Remote Monitoring System	18,000	370
Total	93,000	1,900

Note: PC Personal Computer, UPS Uninterruptable Power Supply

Source: JICA Survey Team (Based on the cost for dam control system applied for the small scaled dam in Japan, Basin catchment area is below 10 km<sup>2</sup>)

Partly because the Sidi Salem Dam is bigger in the catchment area and reservoir than the dam described above, additional telemeter systems are needed. Language translation is also needed. However, it is fair to say that the cost for hydrological information gathering system, hydrological analysis, prediction calculation, gate operation calculation and other software is not necessarily proportionate to the scale of the dams. The approximate cost is assumed to be 2,300 ~ 2,500 TND by the additional 20 ~ 30% increasing calculation of the above amount.

Whether to develop and introduce a dam management system for floods should be examined in comparison with the improved system of SYCOHTRAC the Water Resources Bureau is planning to introduce.



## Chapter 8. Environmental Social Considerations

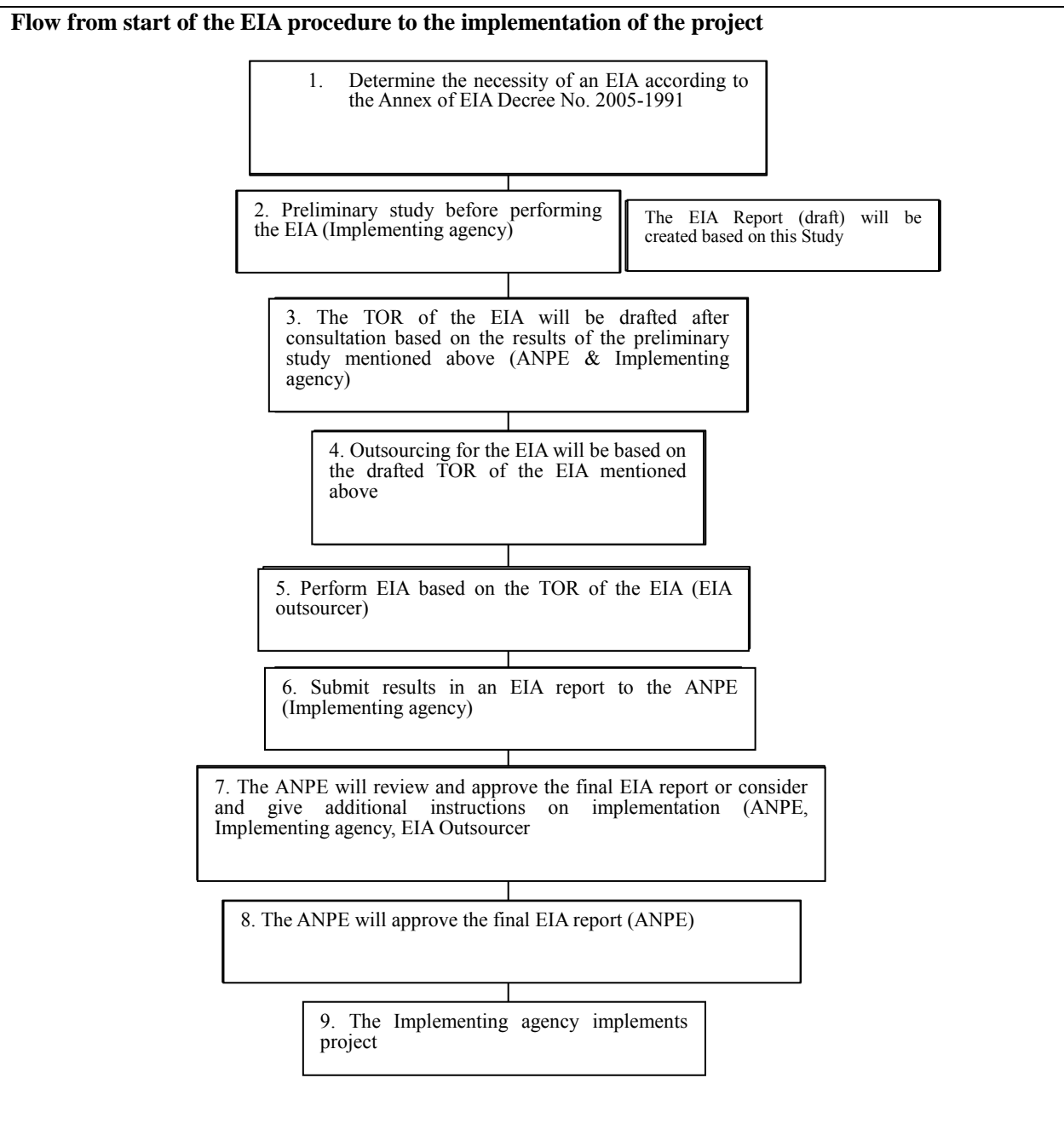
### 8.1 Legislative system and international treaties surrounding environmental social considerations in Tunisia

#### 8.1.1 Laws and regulations related to the environment in Tunisia

##### (1) Legislative system

Before project implementation, an EIA must be performed and a report is to be written.

The EIA procedure in Tunisia will ultimately depend on ANPE approval of projects. The National Environmental Protection Agency (ANPE) may approve the Environmental Impact Assessment (EIA) report assuming the relevant project is implemented by the implementing agency (DGBGTH for the Project).



Procedure and flow from the start of the EIA process to the approval of this project, which has been confirmed by the ANPE

- (1) The project implementing agency (DGBGTH, Ministry of Agriculture) will determine if an EIA is necessary for the construction of facilities and implementing of projects that fall under Lists A and B in Annex 1 of EIA Decree No. 2005-1991. The implementing agency must also submit project specification documents to the ANPE for the construction of facilities and implementing of projects that fall under Annex 2. After consulting the ANPE regarding this study, this project includes the new construction or repair of bridges, and the implementing agency has confirmed that an EIA is required as it fall under List B in Annex 1 of the 2005 ordinance.
- (2) A preliminary study will be conducted before the EIA is performed. The purpose of the preliminary study is to scope basic information in order to draft the TOR for the EIA after the ANPE and implementing agency consult regarding (3) and impact to the natural and social environment. The EIA draft report will be created based on this study.
- (3) The implementing agency will consult the ANPE to draft a TOR for the EIA based on (2) in order to select and hire consultants to perform the EIA.
- (4) Once the TOR has been prepared, the implementing agency will announce the TOR and then select, contract, and hire consultants or specialists to perform the EIA.
- (5) Consultants or specialists hired for the EIA will perform the EIA based on the TOR drafted in (2).
- (6) The implementing agency will submit the EIA report to the ANPE.
- (7) The ANPE will evaluate the relevance of the EIA report.
- (8) If the ANPE has no objections, the EIA report will be approved within 21 days for List A and within three months for List B.
- (9) The implementing agency can begin implementing the facilities and projects covered by the EIA after the EIA report has been approved.

The Ministry of Agriculture (DGBGTH) needs to perform EIA in accordance with the 2005 government ordinance for EIAs in Tunisia to have the Project approval. The Ministry of Agriculture (DGBGTH) also needs to create a TOR for placing an order for EIA survey with consultants through consultation with ANPE. The EIA draft created based on the survey is regarded as a TOR summary based on the results of survey that has been conducted.

## 8.2 Current Status of Social Environment of Project Regions

### 8.2.1 Current Status of Social Conditions

Socioeconomic data was collected and analyzed to gain a clear understanding of the social environment of the regions in the project plan. The three main details covered by this survey are as given below:

- (1) To confirm and grasp the socio-economic condition of communities along the Mejerda River and the El Mabtouh Wetlands coast
- (2) To access damage sustained by local residents due to recent floods in 2003 and 2009
- (3) To determine ownership of the houses, agricultural facilities and other sites along the Mejerda River, especially areas in public water districts and retreat areas (construction lines and easements).

This survey was conducted using the following methods:

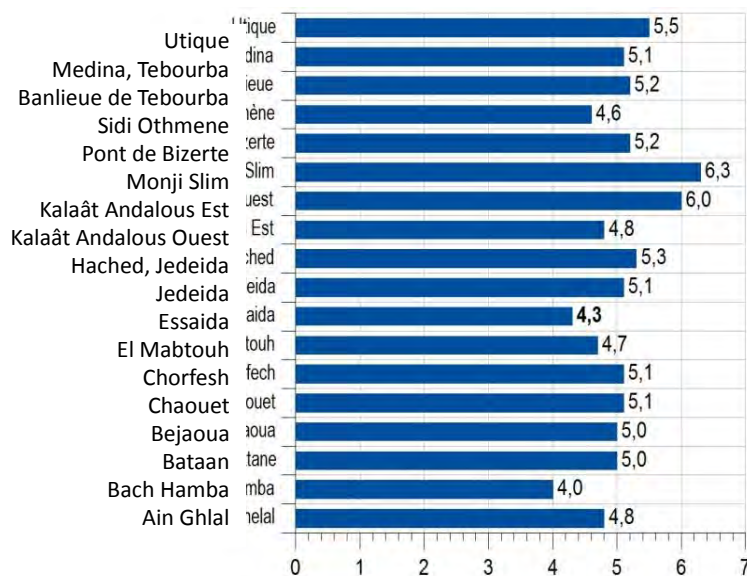
- (1) We collected data at the area/sector level where possible in order to compare the data of survey areas/sectors (Imadas: smallest administrative unit). Sector is the unit used to analyze results of the survey.
- (2) A questionnaire given to households along the Mejerda River and the El Mabtouh Wetland coast as well as production facilities that suffered damages from increased water levels of the Mejerda River in the past.

### 8.2.2 Social Condition Survey Results

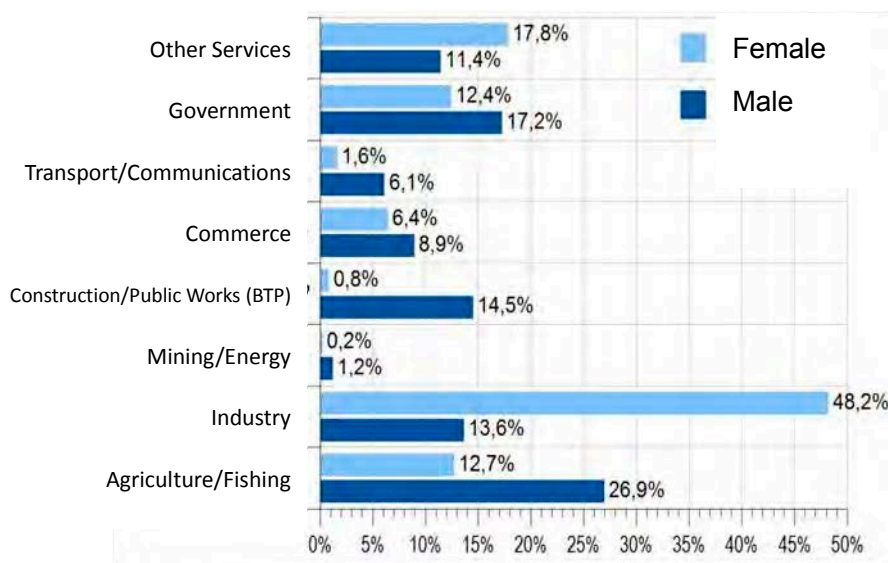
#### (1) Current Socio-Economic Conditions

##### 1) Population & Gender

##### a) Population



##### b) Gender (Classification of Working Population in Surveyed Districts by Gender and Industry in 2004)



Source: 2004 General Census (RGPH), National Institute of Statistics (INS)

**2) Income/Livelihood**

Agriculture has a high percentage as the major source of income.

Approximately 37% of these districts have a monthly income equal to or under the SMIG (Guaranteed minimum wage, 250 TND/month).

**3) Livestock**

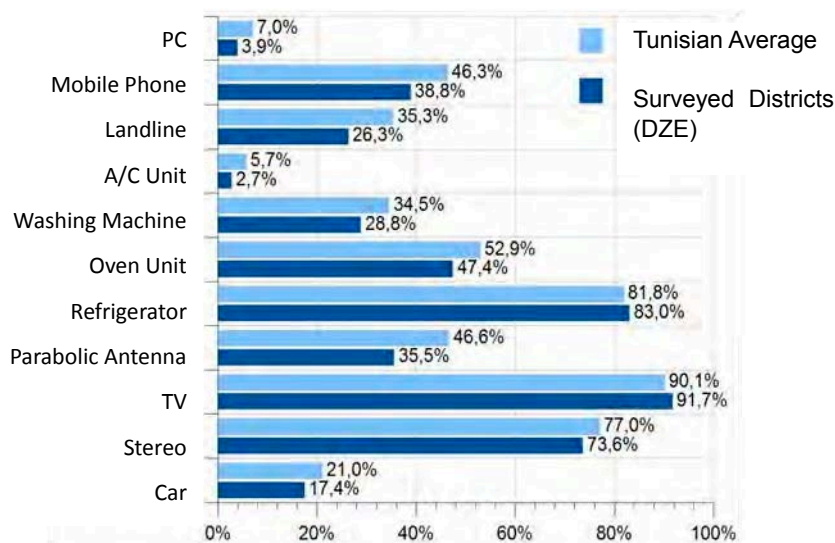
The average number of livestock owned by households in each sector is 35 sheep and 8.4 cows.

Some households (9%) pay a fee for grazing rights, which costs 910 TND annually for an average 153 days of grazing.

**4) Agriculture**

Of surveyed households that said they farmed, 70% grow vegetables by private irrigation. Some agricultural districts cultivate produce without irrigation like trees (El Mabtouh) and grains (El Mabtouh, Sidi Othmene).

**5) Standard of Living**



### Comparison of household fittings for surveyed districts (DZE) and the national average in 2004

Source: 2004 General Census (RGPH), National Institute of Statistics (INS)

#### 6) Use of Local Resources

The largest natural resource the local community utilizes is river water from the Mejerda River, and many people privately pump the water to use for irrigation.

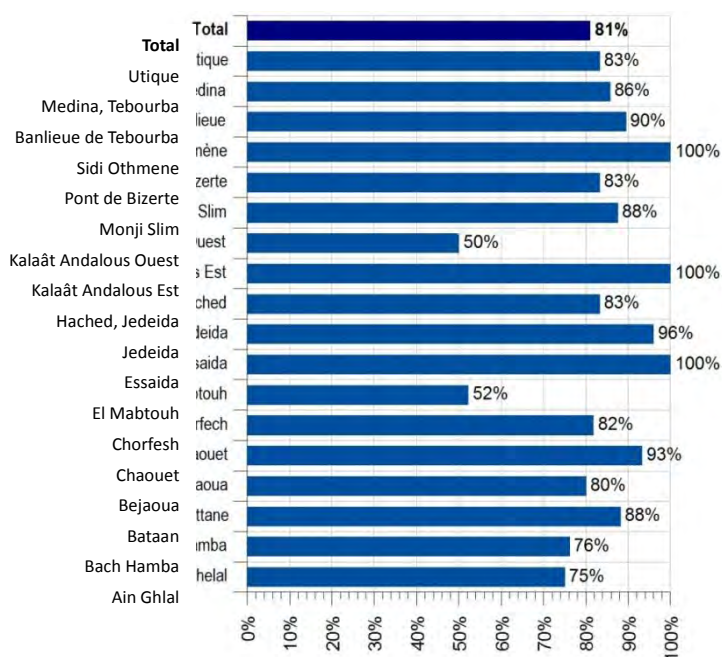
#### (2) Land Ownership/Residence/Land Use

##### 1) Ownership of Land

37.8% owned land with a certificate of rights while 14.8% owned land without a certificate of rights.

Compensation is owed to land owners who have a certificate of rights as well as owners that possess land without a certificate based on Tunisian land ownership law.

##### 2) Residence



**Rate of Home Owning Households (% by Sector)**

##### 3) Agricultural Land

Some parts of Utique, Kalaât Andalous, Jedeida, and other sectors particularly have agricultural land in the flood plains of the Mejerda River.

##### 4) Site Possession

##### State Owned El Mabtouh Wetland Grazing Region

The state-owned El Mabtouh Wetland grazing region has an area of 3,365 hectares.



**Area Map/Official Map of State Owned El Mabtouh Wetland Grazing Region as proposed by the DGF to the Ministry of State Properties (Final Draft)**

*Source: Bizerte Forest Precinct*

**(3) Flood Damage**

Responses regarding the 2003 flood are as follows:

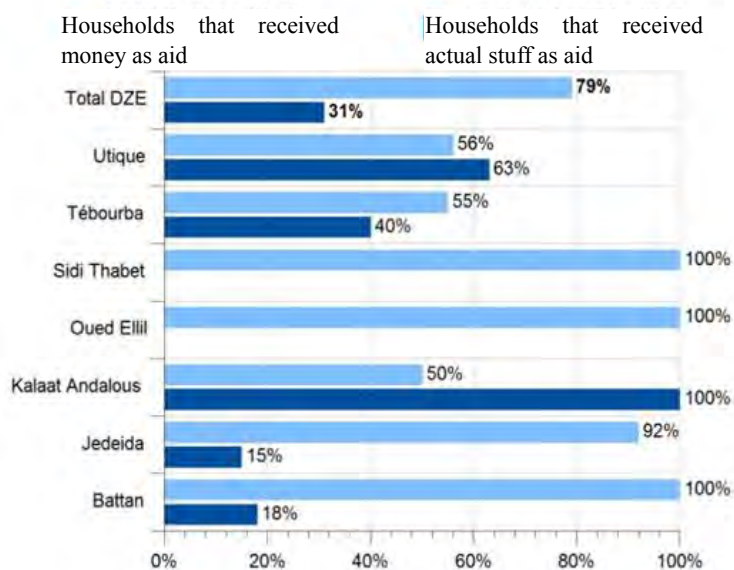
- 1) Submerged depth and time due to the 2003 flood
- a) Submerged depth and Flood duration

**Submersion and Duration of 2003 Flood**

Sector Name	Peak Submersion Depth of Flood	Flood Duration	Submerged Houses
Medina, Tebourba			76%
Banlieue de Tebourba	142cm		76%
Utique	130 cm	48hr	
Jedeida	105 cm	43 hr	89%
El Bataan	97 cm		88%
Chaouet	92 cm	34 hr	
Oued Ellil			75%

- b) Flooded regions/Amount in damages/Compensation

The average amount in damages of surveyed households exceeded 10,000 TND/household.



Distribution of Aid for Households that Suffered Damages in 2003 Flood

### 8.2.3 Environment Conditions

#### (1) Wetland at the Lowest Basin of the Mejerda River

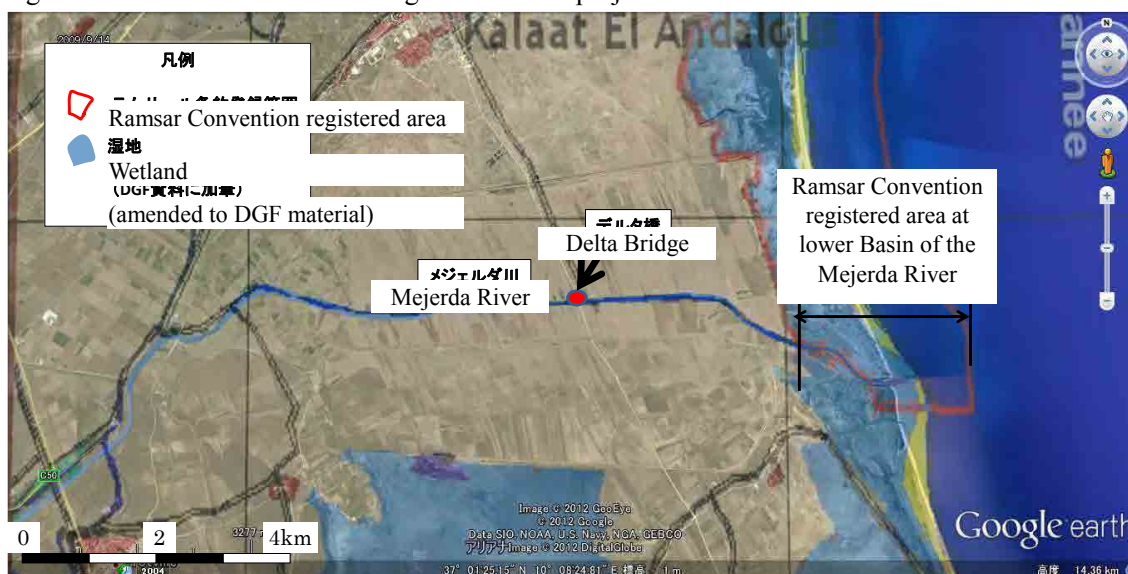
##### 1) Ghar El Melh Lagoon and the Mejerda River Delta

###### a) Characteristics of Ghar El Melh Lagoon and Mejerda River Delta

- (1) One section of the same region is registered under the wetland list of the Ramsar Convention.
- (2) The same region is listed as an Environmentally Sensitive Areas in the Management Plan of Environmentally Sensitive Areas in Tunisia (Ministry of Environment).

###### b) Relation between registered areas of the Ghar El Melh Lagoon and Mejerda River delta under the Ramsar Convention, and construction area.

The registered area of the lower basin of the Mejerda River is 3.2 kilometers towards the ocean from the delta bridge furthest to the east from the target area in this project.

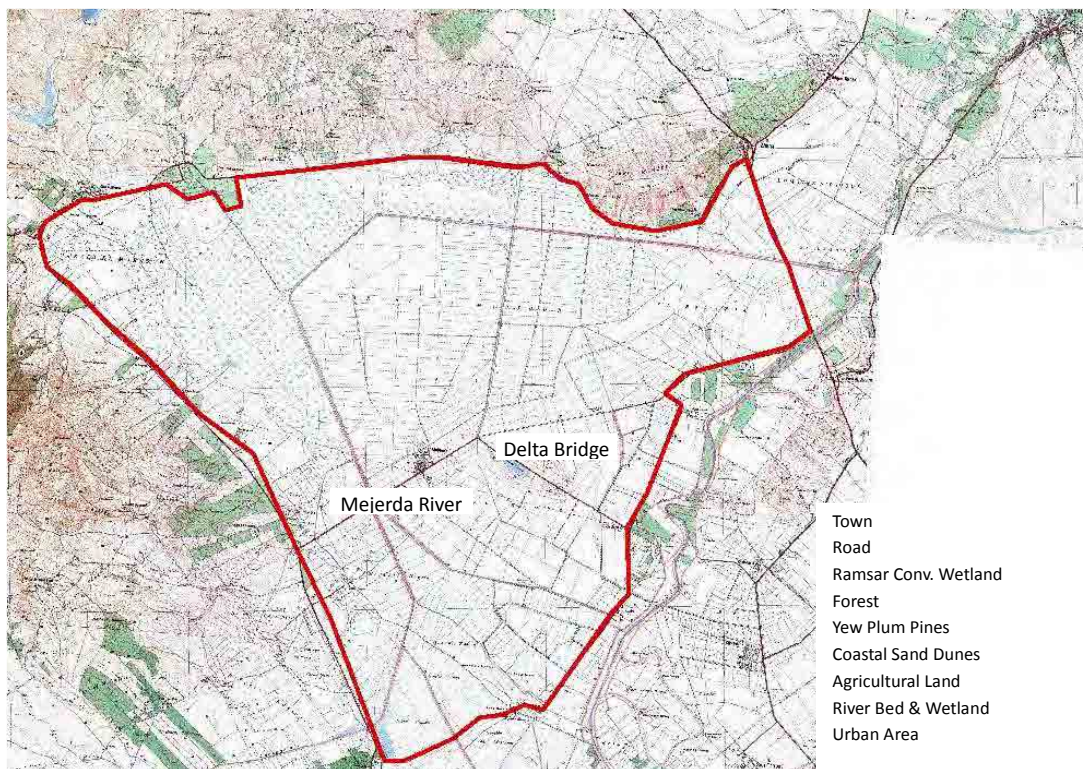


(Source: Partially revised from DGF data)

## 2) El Mabtough Wetland

### a) Outline

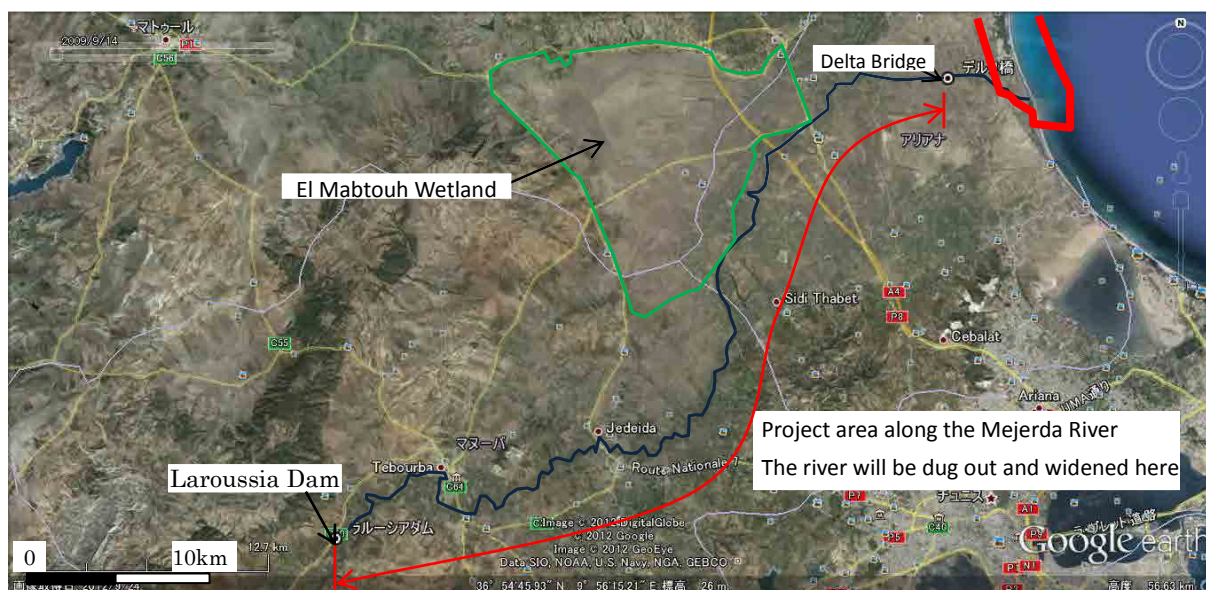
El Mabtough Wetland is included in Tunisia's list of 46 Important Bird Areas (ZICO) (Code No. TN005).



Source: Bizerte Forest Precinct

### Boundary Map of El Mabtough Wetland

### b) Project Implementation Area and Registered Areas in the Ramsar Convention: El Mabtough Wetland & Lower Basin of Mejerda River





## (2) Animals

### 1) Wildfowl

Scientific Name	Common Name	(1)CITES (Washingt on Conventio n)	(2) IBA (Importa nt Bird Area)	(3) IUCN	Tunisia	
					(4) Hunting Ordinanc es	(5) Endangered Wildlife Ordinance
<i>Glareola pratincola</i>	Collared Pratincole	○	●	○	●	●
<i>Himantopus himantopus</i>	Black-winged Stilt	○	○	○	●	○
<i>Pluvialis apricaria</i>	European Golden Plover	○	○	○	●	○
<i>Vanellus vanellus</i>	Northern Lapwing	○	○	○	○	○
<i>Anas clypeata</i>	Shoveler	○	●	○	○	○
<i>Anas Penelope</i>	Eurasian Wigeon	○	○	○	○	○
<i>Anas crecca</i>	Eurasian Teal	○	○	○	○	○
<i>Ardea cinerea</i>	Grey Heron	○	○	○	●	○
<i>Grus grus</i>	Eurasian Crane	●	○	○	●	●
<i>Circus aeruginosus</i>	Western Marsh-harrier	○	○	○	●	○
<i>Fulica atra</i>	Eurasian Coot	○	○	○	○	○
<i>Pluvialis squatarola</i>	Grey Plover	○	○	○	●	○
<i>Ciconia ciconia</i>	White Stork	○	○	○	●	●
<i>Bubulcus ibis</i>	Cattle Egret	○	○	○	●	○
<i>Ardea alba</i>	Great Egret	○	○	○	●	○
<i>Egretta garzetta</i>	Little Egret	○	○	○	●	●
<i>Burhinus oedicephalus</i>	Stone Curlew	○	○	○	●	○
<i>Calidris alpina</i>	Dunlin	○	○	○	●	●

●Applies to the wildfowl species/○Does not apply to wildfowl species

(1) CITES (Washington Convention) Annex II

(2) According to the A4i standard for IBA (Important Bird Area), pp. 953-973 "Important Bird Areas in Africa and Associated Islands: Priority sites for conservation", L.D.C. Fishpool and M.I.Evans eds., written by Murad AmariHichem Azafzaf, Tunisia 2001. Newbury & Cambridge, UK: Pisces Publications & BirdLife International—BirdLife Conservation Series No. 11

(3) IUCN Red List, Endangered Species standard

(4) August 14, 2010 Regulation regarding hunting in the 2010-2011 season

(5) Ordinance List that designates endangered and rare fauna and flora (TBA)

### 2) Fish Species

#### a) Outline

The digging and expansion of the Mejerda River in this project will only be done to flood plains and will not be implemented for low water channels (riverbed). As such, the impact on the European eel and other fish species is considered low.

#### Introduced Fish Species in the Mejerda River and Biological Significance

Scientific Name	Common Name	(1) Washington Convention	(2) Barcelona Convention	(3) IUCN	(4) Endangered Wildlife Ordinance
<i>Anguilla anguilla</i>	European eel	●	○	●	○
<i>Aphanius fasciatus</i>	Mediterranean killifish	○	●	○	○
<i>Barbus barbus callensis</i>	Barbel	○	○	○	○
<i>Pseudophoxinus callensis</i>	Phoxinelle De la Calle	○	○	○	○
<i>Pseudophoxinus chaignoni</i>	Phoxinelle de Chaignon	○	○	○	○

●Applies to fish species/○Does not apply to fish species

(1) CITES (Washington Convention) Annex II

(2) Barcelona Convention/Protocol

(3) IUCN Red List, Threatened Species Standard

(4) Ordinance List of Endangered and Rare Fauna & Flora

### 3) Plant Species

In the flood plain of the Mejerda River, there is a dense population of tamarisk, also known as farash (*Tamarix articulata*), which is a natural species to central Tunisia, thought to be introduced as a result of tree-planting to affix the riverbank.

### (3) Soil Pollution and Illegal Solid Waste

#### 1) Sand Production

Excavated sand and soil is used on agricultural land, orchards, and grazing lands along the river or other places with similar characteristics. Therefore, we believe that the potential of pollution from toxic substances is low.

#### 2) Illegal Solid Waste Grounds

- i) Disposal of animal skins in the El Mabtouh Wetland

After confirming waste disposal before construction, hazardous waste will be brought to disposal sites as necessary when discovered on constructions grounds.

## 8.3 Environmental Impact of the Project

### 8.3.1 Verification of the Contingency Plan

#### (1) Zero Option

The positive effects of this project will outweigh the negative impacts.

#### (2) Verification of Alternative Plans

Comparison of River Channels			
Types of Alternative Plans	② Embankment Plan	(1) Excavation Plan (excavation + expansion)	(3) Excavation + Embankment Plan
Diagram			
Summary of Alternative Plan	In consideration of 1.0 meter allowance height of current cross section + embankment, the embankment has gradient of 1:2 and levee crown width of 4.0m. No excavation is conducted in principle.	The river channel is excavated to the deepest possible with 1.0 meter of allowance height, 1:2 of embankment gradient, and the lower excavation limit of 2.0 to 5.0m from the riverbed. (not reaching the low-flow channel)	Based on the excavation plan, embankment is built with allowance height (1.0m) to reduce the amount of excavation.
Embankment Height	②Compared with the	H.W.L is around the	Embankment height and

<b>and H.W.L</b>		excavation plan, H.W.L is 2.4 meters higher on average, and the embankment height becomes higher accordingly.	surrounding ground level and embankment of allowance height becomes necessary.	H.W.L can be lower than ① thanks to the effect of excavation of river channel.
<b>Land Use</b>		Residential land and farmland	Residential land and farmland	Residential land and farmland
<b>Environmental Social Considerations</b>	<b>Impact on natural environment</b>	It may have minimum impact.	It may have minimum impact. The excavation and expansion is carried out in flood channels.	It may have minimum impact. The excavation and expansion is carried out in flood channels.
	<b>Scope of necessary land (scope of land acquisition)</b>	Large	Large	Small
	<b>Impact on historical structures</b>	Removal or relocation of the ancient bridge of Jedeida is necessary.	No impact	Removal or relocation of the ancient bridge of Jedeida is necessary.
	<b>Resettlement of residents and land acquisition</b>	Impact: significant Construction of embankment along the river in the city requires resettlement of residents.	Impact: significant Excavation and expansion requires resettlement of residents and land acquisition along the river.	Impact: minor Although the embankment can be lower than ① thank to excavation, excavation and embankment requires land acquisition and resettlement of residents.
	<b>Other social impacts</b>	No significant impact	Same as left	Same as left
<b>Recommended Most Appropriate Plan and Reasons</b>		This plan is not recommended. There is major impact of resettlement of residents and land acquisition and it also affects historical structures.	This is most recommended. There is no impact on historical structures.	This plan is not recommended. Although the impact of resettlement of residents and land acquisition is minor, it has major impact on historical structures.

### 8.3.2 Results of impact assessment

#### (1) Results of environmental impact assessment

#### Summary of project environmental impact assessment

Impact item		Impact assessment during at time of scoping		Impact assessment based on the results of the current survey	
		Pre-construction/during construction	Post-construction	Pre-construction/during construction	Post-construction
<b>Physical environment and pollution</b>					
1	Air pollution/dust	B-	D	B-	D
2	Water pollution	B-	D	B-	D
3	Ground pollution	B-	D	B-	D
4	Waste	B-	D	B-	D
5	Noise	B-	D	B-	D
6	Topography and geology	B-	D	B-	D
7	Hydrosphere	D	A+	B-	D
8	Soil stability and erosion risk	B-	D	B-	B-
<b>Environment and risk</b>					
9	Natural habitats, biologically important areas	B-	D	D	D
10	Protected species and	B-	D	B-	B+

Impact item	Impact assessment during at time of scoping		Impact assessment based on the results of the current survey	
	Pre-construction/during construction	Post-construction	Pre-construction/during construction	Post-construction
biodiversity				
11 Flood risk	D	A+	A+	B+
<b>Social conditions</b>				
12 Involuntary resettlement of residents	B-	D	B-	D
13 Damage to non-residential structures and involuntary resettlement of residents	B-	D	B-	D
14 Loss of vegetation and cultivated produce	B-	D	B-	D
15 Use of on-site and regional resources	B-	D	B-	D
16 Water resources	B-	D	B-	D
17 On-site resources	B-	D	B-	D
18 Regional economy/employment/livelihood	B+	B+	B+	B+
19 Poverty and vulnerability	C	A+	D	B+
20 Regional interest and opposition	C	D	B-	D
21 Profit sharing, fairness	C	A+	D	D
22 Minority peoples	D	D	D	D
23 Gender/children's rights	C	B+	D	D
24 Public infrastructure and social services	B-	D	B-	D
25 Traffic congestion, traffic accidents	B-	C	B-	D
26 History/cultural heritage	D	D	D	D
27 Scenery	C	D	B-	D

Source: JICA Study Team

An explanation of impact can be found in Table 20.

Impact classification:

A+/- : Significantly positive or negative impact

B+/- : Insignificant positive or negative impact

C+/- : Unconfirmed impact (additional study required)

D : No impact

**(2) Items that are considered to have a Comparatively Large Impact**

**1) Impact to Aquatic Habitat of the Mejerda River**

**2) Impact on Wetlands**

a) Impact on the use of the El Mabtouh wetlands as a retarding basin

b) Impact on the wetlands listed under the Ramsar Convention in the lower stream of the Mejerda River

The Project will have almost no impact on the wetlands listed under the convention and their biota.

**3) Impact on Forest Cover at the Flood Channel and Embankment**

**4) Impact on Land Animals**

Impact on the wildfowl

The impact on the wildfowl by this Project will be the minimum thanks to the following measures.

**5) Impact Caused by Excavated Soil Waste**

**6) Impact Caused by Large Amounts of Plant Waste**

**7) Impact on Cultural Heritage**

Consideration is given to the historical structures of El Battan Weir Bridge and the ancient bridge of Jedeida in the formulation of the river channel plan not to cause any impact on them. The construction plan is also formulated not to cause any impact during the construction. Thus, there is no impact on such structures.

**8.3.3 Verification of Mitigation Measures**

**(1) Overview of Mitigation Measures**

**1) Measures to Protect Aquatic Organism and Birds**

**2) Impact Mitigation Measures for Tamarisk Tree Trimming**

**3) Procedure for Removal and Effective Reuse of Excavated Soil Waste**

**4) Effective Use of Plant Waste**

**5) Excavated Waste Control at Unmanaged Waste Disposal Sites**

**(2) Required Costs for Mitigation Measures**

As it is possible to handle mitigation measures as normal construction and administrative activity, there is no need to plan a special budget.

**8.4 Environment Management and Monitoring Plan**

**8.4.1 Environment Management Plan**

**(1) Issues to be considered in the Environment Management Plan**

- 1) Management plan for excavated soil at the Mejerda River bed
  - a) Management Plan for Excavated Soil
  - b) Reusing Land
  - c) Soil Disposal Sites
- 2) Protection plan for habitat environment in the Mejerda River
- 3) Planting plan at the Mejerda River bed
- 4) Plans for resident relocation to alternative sites and compensation

**Environmental Management Plan**

Class	Impacts		Assessment	Proposed Mitigation Measures and Environment Management Plans	Related Agencies	Project Stage	Overview
Pollution Countermeasures	1	Air Pollution/Dust	B-	<p>Prioritize leveling of excavated soil to reduce the amount to be transported</p> <p>Cover the soil and waste when transporting to soil disposal sites or reusing sites</p> <p>Regular, suitable inspections and maintenance for heavy machinery and trucks.</p>	<p>Construction companies to conduct</p> <p>ANPE to manage</p> <p>CRDAs and DHER to monitor</p>	<b>During Construction</b>	Consultant is responsible for preparing a monitoring study report
	2	Water Pollution	B-	<p>Regular, suitable inspections and maintenance for heavy machinery and trucks.</p> <p>Collect and dispose of engine oil or prevent oil leaks by installing an oil fence</p> <p>Prevent flow of excess soil with a silt trap and an excavation slope to protect from erosion.</p> <p>Pretreatment of contaminated water through natural filtering when preparing concrete made structures</p> <p>Review construction methods to reduce water pollution</p>	<p>Construction companies to conduct</p> <p>ANPE to manage</p> <p>CRDAs and DHER to monitor</p>	<b>During Construction</b>	Consultant is responsible for preparing a monitoring study report
	3	Ground Pollution	B-	<p>Regular, suitable inspections and maintenance for heavy machinery and trucks.</p> <p>Collect and dispose of engine oil</p> <p>Advance analysis of excavated soil to decide how to handle the soil</p>	<p>Construction companies to conduct</p> <p>ANGED to coordinate and decide</p> <p>ANPE to manage</p>	<b>During Construction</b>	Consultant is responsible for preparing a monitoring study report

				Appropriate disposal and management of existing solid waste that was accidentally excavated during construction	CRDAs and DHER to monitor		
	4	Solid Waste	B-	Appropriate disposal and management of inert waste generated by plant waste and excavation  Confirm the extent of disposal at illegal animal skin disposal sites and handle appropriately as necessary	Construction companies to conduct  ANGED to coordinate and decide  ANPE to manage CRDAs and DHER to monitor	<b>During Construction</b>	Consultant is responsible for preparing a monitoring study report
	5	Noise	B-	Prevention of noise pollution in areas that noise impacts. Set and adhere to the management standard and time limit	Construction companies to conduct ANPE to manage CRDAs/DHER to monitor	<b>During Construction</b>	Consultant is responsible for preparing a monitoring study report
Environment	6	Natural Habitat	B-	Excavate at the river flood channel where it is higher than the drought water level in the dry season  Protection plan for trees planted at the low flow channel along the river bank line (leave the original shady area on one side of the river for at least 100 meters per kilometer, which is about 5% of the total by straight line)  Plant trees or plants at the lower dammed area of the river bank crest and the flood channel slope  Look after plants on the river bed	Construction companies to conduct ANPE to coordinate and decide CRDAs/DHER and DGF to monitor	During and after construction	Consultant is responsible for preparing a monitoring study report
	7	Biodiversity	B-	River flood channel excavation	Construction companies to conduct applicable excavation at the river flood channel	Before, during and after construction	Confirm eel migration routes and habitat based on EIA research  Seek help from INAT and

					ANPE to manage CRDAs/DHER in cooperation with INAT and INSTM to monitor		INSTM for monitoring research of species that are sensitive to environmental changes (before and after construction)  Consultant is responsible for preparing a monitoring study report
	8	Ground Stability and Erosion Risk	B-	Plant trees or plants at the low dammed area of the river bank crest and the flood channel slope to protect the slope Manage plants on the river bed	Construction companies to conduct ANPE to manage CRDA/DHER and CRDA/CES to monitor	During and after construction	Consultant is responsible for preparing a monitoring study report
Social Conditions	9	Involuntary Relocation of Residents	B-	Follow JICA guidelines and plan compensation and relocation for land acquisition and compensation within the framework of legal procedures	Land Acquisition Section of DGBGTH, which is the responsible agency for monitoring research, expropriating organizations, and local committees for evaluation and operation  Ministry of State Properties and Real Estate Affairs to decide CRDAs/DHER to monitor relocation support Public hearing for preparation of pre-procedure under the DGBGTH (public hearing within the stakeholder discussion and impact	Before and During Construction	Create a relocation plan for local residents and conduct land acquisition, compensation, and relocation based on the plan  The fundamental documents are the monitoring study cards sited in the chapter describing land acquisition  Land Acquisition Section of DGBGTH and expropriating organizations can manage the monitoring study together with assistance from consultants



				assessment framework)  The representativeness of Omdas at the stakeholder is currently being re-evaluated. It is preferable that a public hearing is held directly for the local residents.		
10	Accidental Loss or Destruction of Structures other than Residences	C	Same status as item 9	Same status as item 9	Before and During Construction	Same status as item 9
11	Loss of farm land, unharvest crops, and shrub land	B-	Same status as item 9	Same status as item 9	Before and During Construction	Same status as item 9
12	Means of Living, Poverty, and Vulnerability	C	Same status as item 9 because the land acquisition conditions possibly affects livelihood	Same status as item 9	Before and During Construction	Same status as item 9
13	Minorities	D	Consider requests from nomads at the final technical design for the flood control basin functions  Public hearing to take opinions from nomadic people into consideration to design the flood control basin (public hearing within the impact assessment framework)	DBGGTH within the impact assessment framework CRDA/DHER and DGF to coordinate and monitor ANPE to manage	Before and During Construction	Public hearing within the impact assessment framework will be held when nomads are in El Mabtouh
14	Water Resources	B-	Prior confirmation on the irrigation pump facility when any impact is anticipated  When a countermeasure is required during construction, relocate pumps and hoses. Also consider providing alternative irrigation water when necessary	Construction companies to conduct  CRDA/DHER and DGRE to decide and monitor  CRDA/DGRE to manage	<b>During Construction</b>	Identify the number of pump facilities that are authorized based on the EIA
15	Public	B-	Public hearing to listen to the	Construction companies to	Before and	Consultant is responsible

	Infrastructure and Social Projects		opinions of the surrounding residents (public hearing within the stakeholder discussion and impact assessment framework) Traffic management during the period of construction	conduct DGBGTH and CRDA/DHER to coordinate surrounding residents and police Ministry of Works and Department of Interior to decide and manage  CRDA/DHER to monitor measures	During Construction	for preparing a monitoring study report
16	Localized Conflicts	C	Same condition as item 9 because the land acquisition conditions possibly causes localized conflicts	Same status as item 9	Before and During Construction	Same status as item 9
17	Distribution of Profits and Social Equality	C				
18	Historical and Cultural Heritage	C	Consider during design stage  Provide thorough safety management during construction in areas where injury can be anticipated	Construction companies to conduct applicable construction  Cooperation with cultural heritage organizations to conduct appropriate construction close to the El Bataan historical buildings	<b>During Construction</b>	Consultant is responsible for preparing a monitoring study report
19	Scenery	C	Implement considerations made at design stage	Construction companies to conduct DGF to coordinate and decide	<b>Before Construction</b>	

## **8.5 Comprehensive assessment**

### **8.5.1 Environmental categories and proposals based on JICA guidelines**

This project earns a grade of B from the environmental category of the JICA guidelines.

### **8.5.2 Environmental checklist**

An environmental checklist based on this survey and the results of surveys conducted up until now are shown in the following table.

### Environmental Checklist

Classification	Environmental item	Main check items	Confirmation of environmental considerations (basis, mitigation)
1 Approval/authorization	(1) EIA and environmental approval	(a) Has the EIA report been prepared? (b) Has the EIA report been approved by the country's government? (c) Is approval of the EIA report, etc. accompanied by supplementary conditions? In the event that there are supplementary conditions, have they been fulfilled? (d) In addition to the above, has environmental approval been received from local authorities if necessary?	(a) It has not be prepared for this project DGBGTH plans to prepare the EIA report after the final draft of this report is approved in November 2012. (b) Unapproved (c) With the EIA report presently unprepared, the processes involved in approval have not been undertaken. Whether there are supplementary conditions currently remains unknown. (d) Because this project has been identified as the subject of the EIA, preparation of the EIA is a prerequisite for environmental approval from the ANPE. Environmental approval has not been received, because the EIA report has not been prepared.
	(2) Explanation to local stakeholders	(a) Have the details and impact of the project, including information disclosure, been adequately explained to and understood by local stakeholders? (b) Have comments by residents, etc. been applied to the details of the project?	(a) Tunisia has no laws/standards relating to public disclosure. Up to this point, three conferences have been held with stakeholders. Explanations for local residents have been held for the Omdas (clan leaders) of each governorate, but no explanations have been made to the residents who will be directly impacted by this project. DGBGTH plans to hold a conference for stockholders and concerned residents. (b) The opinions of Omdas (clan leaders) who have participated in stakeholder-held conferences held up until now and the opinions of households interviewed as part of a social survey held in 2010 must reflect the contents of the project. Furthermore, there is room for Omdas representation at conferences. This is being re-examined now with the Jasmine Revolution at an end. It is hoped that local residents will participate in stakeholder conferences so that their voices can be heard.
	(3) Consideration of alternatives	(a) Have a number of different alternatives (including environmental/social items) to this project's plan been examined?	(a) Alternative plans (zero option) that will ultimately not be used for this project have been examined. Three river channel plans: excavation (excavation + expansion), embankment, and combination of the two plans, are compared and availability of shortcut plan is also studied. . The excavation plan ((excavation + expansion) is chosen as most appropriate for the Project.

2  Pollution measures	(1) Water quality	<p>(a) Do changes (primarily drops in water level) in flow rate downstream due to the implementation of this project result in certain sections no longer conforming to environmental standards?</p>	<p>(a) The implementation of this project will not change the river's flow rate. As opposed to the riverbed excavations of the project leading to lower than normal water levels, they will instead lead to reduced water levels in times of flooding.</p> <p>Tunisia is currently developing standards for the quality of surface water and groundwater. Tunisian water quality standards do not yet exist at this time.</p> <p>Present conditions will be confirmed in the upcoming EIA, while WHO and other international standards will be referenced when creating values for the management standards of environmental management plans and environmental monitoring.</p> <p>Though there is believed to be a risk of water pollution from oil spills that may occur during the construction phase of the project, an appropriate on-site management of construction machinery should be able to prevent deterioration in water quality due to oil spills.</p> <p>This project will not impact water quality after construction is complete (after it is put in service).</p>
	(2) Waste	<p>(a) Is treatment/disposal handled properly and in accordance with the concerned country's regulations in the event that large quantities of excavated soil/dredged sediment are generated?</p>	<p>(a) Tunisia standard NT 41-96 addresses the disposal of waste. It will be necessary to properly dispose of waste in a way that is both based on these standards and takes the following points into consideration.</p> <p>The disposal of excavated soil, etc. generated during the implementation (riverbed excavations, widening, and bridge establishment) of this project and their management thereof is to be handled appropriately.</p> <ul style="list-style-type: none"> <li>• The following disposal methods will be considered. Using it as material for embankments and other dikes that are part of the project</li> <li>• Scattering it on cultivated land</li> <li>• Reusing it in local development projects that require materials for public works</li> <li>• Disposing of it at old quarries</li> </ul> <p>DGBGTH will help mediate the drafting of management plans for excavated soil, etc. between quarrying offices, ANGED, managers of development projects that could potentially reuse the excavated soil, and other concerned parties.</p> <p>Additionally, vegetative waste generated from construction will be reused or disposed of properly. Also, unknown El Mabtouh wetland animal waste that is accidentally excavated or excavated at present will be transported to a disposal site and disposed of properly.</p>

	(3) Land subsidence	(a) Is there a risk that excavations will lead to a decline in groundwater levels or the occurrence of land subsidence? Have the necessary measures been taken?	(a) There is no possibility of impact. This project will not involve a mass intake of groundwater or any other triggers associated with the occurrence of land subsidence.
3 Environment	(1) Protected areas	(a) Is the site located in an area protected by the concerned country's laws, international treaties, or by other means? Will the project impact protected areas?	(a) This project will not impact protected areas The Mejerda flows adjacent to Ramsar sites. However, none of this project's construction will occur within any of those sites. The scope of flood of the wetlands listed under the Ramsar Convention does not change much after the Project implementation and thus it will have little impact on the Project implementation.
	(2) Ecosystems	(a) Does the site include old-growth forests, tropical old-growth forests, or ecologically important habitats (coral reefs, mangrove forests, tidal flats, etc.)? (b) Does the site include habitats for endangered species that require protection under the concerned country's laws/international treaties? (c) Are measures taken to reduce impact on ecosystems in cases where major impact on an ecosystem is of concern? (d) Does flow rate reduction or saltwater intrusion have a negative impact on the organisms, fauna and flora, and habitats of the lower reaches of the river? (e) Does the project cause changes to the river that negatively impact the aquatic environment? Are measures taken to reduce impact on aquatic life, etc.?	(a) Not included (b) They have not been designated as habitats of endangered species. There are no protected areas designated as habitats of endangered species, but species subject to protection under international treaties exist in the area. The European eel cited in the supplementary notes of the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) and the red list (category CR) of the International Union for Conservation of Nature (IUCN), as well as the fish and Mediterranean Paulownia ( <i>Aphanius fasciatus</i> ) cited in the Barcelona Convention's Protocol concerning Specially Protected Areas and Biological Diversity in the Mediterranean, exist in the area. Nevertheless, this project focuses on excavations/widening of flood channels along the Mejerda. Because construction on the low flow channel of the current river will be unnecessary, the impact on these endangered species is deemed to be low. Furthermore, impact on the habitats of birds will be minimized by avoiding construction on the low flow channels that serve as their feeding grounds and maintaining a fixed amount of vegetation along the river. (c) There is no risk that the implementation of this project will greatly impact ecosystems. The Tunisian side will create an appropriate Environmental Management/Monitoring Plan as part of their EIA report in response to the impact on the environment that is expected to occur during the construction phase of this project. Environmental management/monitoring will then be performed in accord with said

			<p>plan.</p> <p>(d) The implementation of this project is not expected to result in flow rate reduction or saltwater intrusion. There is no possibility that either of these phenomena will occur.</p> <p>(e) As mentioned above in (b), this project focuses on excavations/widening of flood channels along the Mejerda. Because construction on the low flow channels of the current river will be unnecessary, there is no chance that the aquatic environment will be negatively impacted.</p>
	(3) Hydrosphere	<p>(a) Does the project change the water system in a way that negatively affects the flow of surface water/groundwater?</p>	<p>(a) There is no chance of negative impact.</p> <p>This project focuses on excavations/widening of flood channels along the Mejerda. Construction on the low flow channels of the current river will not be necessary. Additionally, tributaries that flow into the Mejerda will continue to flow as they do now. For that reason, the impact on the hydrosphere is deemed to be low in the absence of changes to the water system.</p> <p>Because the impact of floods on local residents decreases as the number of floods in the rainy season decline as a result of the Project implementation, it has a positive impact.</p> <p>No bank protection of carried out in the excavation and expansion zone. Thus, erosion, transfer and accumulation of sand and soil in the river channel will be as same as before the Project, causing no impact on its transfer. Although the frequency of soil transfer and accumulation on surrounding farmland to be caused by floods decreases, soil supply will continue as flood exceeding the project scale will occur.</p>
	(4) Topography/geology	<p>(a) Do the river and waterway excavations cause large changes to the topographical/geological structure of the planned project area?</p>	<p>(a) River widening and excavations will cause topographical changes, but they will not be large in scale.</p> <p>There will be no changes in terms of geological structure.</p> <p>There will be an impact on the river's scenery, but greening slopes has the potential to reduce this impact.</p>
4 Social conditions	(1) Resettlement	<p>(a) Does the implementation of the project lead to involuntary resettlement? Are efforts taken to reduce the impact of resettlement in the event that it does occur?</p> <p>(b) Are measures dealing with compensation/life</p>	<p>(a) Bypass plans and river widening will force involuntary resettlement. To minimize these effects, the extent of river widening and planar designs for bypass deployment will be taken into consideration.</p> <p>The final number of resettlements and extent of land acquisition will need to decide based on these.</p>

		<p>reconstruction properly explained to residents to be resettled prior to resettlement?</p> <p>(c) This is a resettlement survey conducted and a resettlement plan established to include recovery of livelihood following resettlement and compensation in accordance with replacement costs?</p> <p>(d) Is compensation paid prior to resettlement?</p> <p>(e) Has agreement been received from residents to be resettled prior to resettlement?</p> <p>(f) Is a system put in place to properly relocate residents?</p> <p>Are measures taken to ensure sufficient implementation capacity and budget?</p> <p>(g) Has environmental monitoring of the impact of resettlement been planned?</p>	<p>(b) In the future, land expropriation laws for land expropriation procedures in Tunisia will be properly explained on the basis of detailed designs. The Tunisian side will conduct surveys of land acquisition/resettlement and the compensation thereof for the required land on the basis of detailed designs. After these surveys, direct explanations will need to occur during the procedural stages of impact assessment and land expropriation. Resettlement assistance is the responsibility of the government, and it will be monitored at an office level by DGBGTH based on this project's managing units.</p> <p>(c) Full compensation will be required in accordance with the expropriation/compensation procedures of Tunisia. This will be based on the evaluation report of a land expropriation committee and the results of expert surveys conducted by government ministries responsible for land and infrastructure. It will include all expenses required for resettlement and restoration of livelihood/standard of living. In the future, the compensation/resettlement plan will be considered up until the middle stage of the detailed design. In order to establish and implement a Resettlement Plan that the Tunisian side has based on JICA's Simple Resettlement Blueprint on that occasion, the JICA Study Team made proposals to the Tunisia side to which they were to consent.</p> <p>d) As a general rule in terms of land expropriation laws, a land expropriation committee calculates costs and compensation for resettlement and preparations for payments are made before resettlement occurs.</p> <p>e) Conferences held by land expropriation committees are based on the idea of coming to a consensus. In the event that consensus cannot be reached, the conflict will proceed to the legal phase of land expropriation. Compensation can also be contested in court.</p> <p>(f) A compensation system has been established within the range of land expropriation procedures. However, a similar system for resettlement has not been developed. Social support for vulnerable residents has not been included within resettlement procedures. On the other hand, in the event that small-scale resettlements are necessary, institutional measures that support/facilitate resettlement do exist. Land owners or occupants can, for example, request the allotment of state land in place of the land that is to be accommodated.</p> <p>(g) Requests will be made as a means of monitoring.</p>
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(2) Living/livelihood	<p>(a) Does the project negatively impact the lives of residents? Has thought been put into the alleviation of impact in the event it becomes necessary?</p> <p>(b) Does the intake of water for use (surface water, groundwater) in this project negatively impact water use or fishing industries in either the vicinity of the project or further downstream?</p> <p>(c) Will there be an occurrence of diseases caused by or related to water (schistosomiasis, malaria, filariasis, etc.)?</p>	<p>(a) The possibility is basically non-existent. However, earnings are low in the agricultural belt of Jedeida, El Bataan, and Sidi Thabet. This project could have a serious impact if it were to result in the loss of agricultural land. A socio-economic survey of residents concerned with land acquisition will be conducted in order to study and assess the impact of project implementation. As necessary, land expropriation procedures and compensation/resettlement plans will be implemented as relief measures. It may be possible to deal with losses of existing vegetation/cultivated land and circumstances affecting the most vulnerable residents.</p> <p>(b) This project is focused on the excavation/widening of flood channels along the Mejerda and that water will not be taken. As separate water intake facilities for irrigation will impact the already limited construction period, changes to the arrangement of irrigation pumps and hoses will need to be made in order to minimize project impact on irrigation intake.</p> <p>(c) No occurrence.</p>	
(3) Cultural heritage	<p>(a) Is there a risk that this project will cause damage to valuable archaeological, historical, cultural, or religious heritage/landmarks/etc.? Additionally, are measures stipulated in the domestic laws of the concerned country being taken into consideration?</p>	<p>(a) The Project implementation will have no impact on historical structures of El Bataan Weir bridge and Jedeida Old Bridge because consideration is given to them in the Project design.</p>	
(4) Scenery	<p>(a) Does this project negatively impact scenery that requires special attention in the event that such scenery exists? Are the necessary measures taken if an impact does exist?</p>	<p>(a) It was thought that sloping along the river caused by river widening/excavation will have a bit of an impact on scenery. Measures like greening will need to be taken to minimize impact on scenery.</p>	
(5) Ethnic minorities/indigenous peoples	<p>(a) Has consideration been given to reducing impact on the culture and lifestyles of ethnic minorities and indigenous peoples?</p> <p>(b) Are the rights of ethnic minorities and indigenous peoples being respected in terms of land and resources?</p>	<p>(a) Though it has been given consideration, this particular project will have no impact on ethnic groups.</p> <p>(b) They've been respected.</p>	

	(6) Working environment	<p>(a) Are the concerned country's laws relating to working environment being observed in this project?</p> <p>(b) Have safety considerations for project staff been made in the physical realm in terms of the installation of safety equipment designed to prevent work-related injury/death, management of toxic substances, etc.?</p> <p>(c) Has support for project staff been planned and implemented in the nonphysical realm in terms of the implementation of health and safety planning, safety training for workers (including traffic safety and public health), etc.?</p> <p>(d) Have appropriate measures been taken to ensure that security personnel involved in the project do encroach on the safety of project staff/local residents?</p>	<p>(a) They are being complied with. Anything requested in the impact assessment will be followed in the terms and working conditions established with contractors.</p> <p>(b) Same as above</p> <p>(c) Same as above (particularly with regard to traffic safety)</p> <p>(d) Same as above</p>
5 Other	(1) Impact during construction	<p>(a) Are adequate pollution relief measures being prepared with respect to pollution generated during the construction stage (noise, vibration, turbidity, dust, gaseous exhaust, waste, etc.)?</p> <p>(b) Will construction result in a negative impact on the environment (ecosystems)? Additionally, have relief measures been prepared in response to said impact?</p> <p>(c) Will construction result in a negative impact on social conditions? Additionally, have relief measures been prepared in response to said impact?</p>	<p>(a) Environmental management plans/environmental monitoring take pollution from construction into consideration.</p> <p>(b) The impact of the excavation/widening of this project on ecosystems are judged to be minor and will be limited to the flood channels. Maintaining a fixed amount of vegetation on their riverside habitats should minimize the impact on birds that live in the shape of trees like tamarisk. Relief measures for potential negative impacts have been examined in environmental management plans/environmental monitoring plans.</p> <p>(c) Same as above.</p>
	(2) Monitoring	<p>(a) Has project staff monitoring been planned and implemented for items thought to have an impact from among the environmental items mentioned above?</p> <p>(b) How were the items, methods, frequency, etc. established in the concerned plan?</p> <p>(c) Has a project staff monitoring system</p>	<p>a) In the EIA report, which is indispensable to the implementation of this project, the project staff will draw up monitoring plans for items thought to have impact, and upon evaluation by ANPE, an appropriate monitoring plan will be drafted and implemented. The project implementing agency will need to consult with the private sector on the implementation of these plans.</p> <p>(b) The necessary items, methods, and frequency of reporting will be</p>

		(organization, personnel, equipment, budget, etc., and the continuity thereof) been established? (d) Have provisions been made for the method and frequency of reporting from project staff to competent authorities?	established in the EIA report following discussions with the ANPE. Additionally, monitoring for land expropriation/compensation has also been developed. (c) It has not yet been established. It will be further clarified in the EIA report. (d) They have not yet been specified, but the method/frequency of monitoring reporting for environmental management plans will be examined in the monitoring plan of the EIA report.
6 Notes	Additional environmental checklist references	(a) If necessary, checklist items applicable to forests will be added and evaluated.	(a) These have been confirmed.
	Notes on environmental checklist usage	(a) If necessary, cross-border or worldwide impact on environmental issues will be confirmed (in the event that certain elements are thought to contribute to the problems of cross-border waste disposal, acid rain, ozone depletion, and/or global warming).	(a) The implementation of this project will not have the level of impact described above.

## 8.6 Assistance with the creation of the EIA draft report

### 8.6.1 Creation of the environmental impact assessment draft report

The table of contents of the above-mentioned report is as follows.

Report table of contents
1. Background of the project
2. Overview of the project
3. Evaluation of project validity
4. Current environmental/social state of the project area
5. Examination of project environmental impact
6. Relief measures and counter-measures
7. Environmental management plans
8. Stakeholder conferences (public consultation)

### 8.6.2 Assumed schedule for the Tunisian side's EIA

#### General Schedule from the start of the EIA to approval

Step	Duration: 15 Months	Duration (Month)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Preparation of TOR of EIA Study	2	2															
Public tender offer and submission of bids by applicants	3	3															
Analysis of tenders and preparation of tender analysis report, submission to the Securities Commission	1	1															
Opinion by the Securities Commission and market preparation	6	6															
Carrying out of EIA Study by a contracted consultant company/ Submission of EIA Report to ANPE	2	2															
Stakeholder Meeting	3	3															
Duration of Evaluation and Approval of EIA Report by ANPE																	

## 8.7 Stakeholder conference support

### 8.7.1 Current implementation status and conference overview

Current implementation status

DGBGTH has already held three stakeholder conferences.

#### (1) First conference

##### 1) Schedule

Target governorate	Date and time	Notes
Bizerte	Nov. 18, 2010	At the time of the JICA Study Team's first dispatch
Ariana	Nov. 25, 2010	Same as above
Manouba	Nov. 27, 2010	Same as above

##### 2) Attendees

Participant	Bizerte	Ariana	Manouba
Omdas (clan leaders)	6	2	6

Local authorities		x	1	1
CRDA	DMER	–	–	1
	DVPPA	–	–	1
	CTV	1	3	5
	Forest authority	1	–	1
	CES	–	2	2
	Other	1	4	1
Other	ANPE	–	–	1
	DGBGTH	1	1	1
	JICA	2	2	3
Total		12	15	23

## (2) Second conference

The Jasmine Revolution occurred right before the conference.

### 1) Schedule

Conferences with the steering committee held at the MARHP in September 28, 2011 had already been held.

### 2) Attendees

Authorities from ANPE and CRDA were in attendance.

## (3) Third conference

### 1) Schedule

The conference was held on January 31, 2012.

### 2) Attendees

Participant		No. of people
Omdas		4
Citizen representatives		2
CRDA	DMER	1
	Ressources Eau	1
	CTV	3
	Forest authority	1
	CES	1
DGF		1
AAO		1
DGBGTH		3
Total		18

## 8.7.2 The necessity of a conference for new stakeholders

Stakeholder conferences aimed at public disclosure will need to be held for stakeholders such as residents that are expected to be impacted by project implementation and their communities. Additionally, on this occasion, female participation needs to be urged upon careful consideration of Tunisia social customs.

## 8.7.3 Overview and schedules of new stakeholder conferences

### 1) Holding period

- After the EIA and during the resettlement planning stage

### 2) Most desired participants

- Residents and local authorities that are expected to be impacted

**3) Contents of the meeting**

**4) Other**

- In preparing a simple resettlement plan, sufficient information must be prepared in advance and followed by a conference with residents and local authorities.

## **Chapter 9. Land Acquisition and Resident Relocation**

### **9.1 Legal system and implementation conditions regarding land acquisition and resident resettlement in Tunisia**

#### **9.1.1 Legal system and implementation conditions regarding the demarcation of water zones in Tunisia**

##### **(1) Legal system regarding the demarcation of water zones**

The following government decrees have been established as the legal system pertaining to water zone demarcation and land use for public projects.

- Decree No. 75 of 16 March 1975 promulgating the Water Code (Amended by Decree No. 24 of 15 March 2004.)
- Decree No. 20 of 13 April 1988 promulgating the Forest Code (Amended by Decree No. 13 of 26 January 2004.)
- Decree No. 122 of 28 November 1994 promulgating the Land Development and Urban Planning Law (Created by integrating Decree No. 34 of 4 February 1976 on construction permits and Decree No. 43 of 15 August 1979 for promulgating the Urban Development Law.)

Within these legal systems, government-owned public water zones (public hydraulic domain) are set by the Water Code. Land use is set by the Forest Code, and easement is set by the Land Development and Urban Planning Law. “Easement” broadly refers to the right of a person to use land owned by another to easily access his own land. Easement in Tunisia is regarded, in particular, as the right to secure land for the benefit of the state within the scope of the law.

The demarcation of boundaries related to public projects is defined depending on the type of public hydraulic domain or established land easement, as shown in the table below.

As an effect of the demarcation of water areas targeted for the Project, the El Mabtouh wetlands will legally become public hydraulic domain as a retarding basin. Also, the land set for easement of access and building lines alongside the Mejerda River and discharge channels will be expanded. The regions targeted for urban development planning, and thus having land set for easement of building lines placed at 25m, will include 2 cities in the Ariana Governorate (Sidi Thabet and Kalâat el-Andalous), 3 cities in the Manouba Governorate (Tebourba, Jedeida, El Battan), and 1 region in the Bizerte Governorate (El Mabtouh wetlands). Each of these target areas are shown in Urban Development Plans. Four of the locations are shown as examples in the figures below.

##### **(2) Implementation conditions regarding the demarcation of water zones**

The borders of the public hydraulic domain are determined by the BIRH (Office of Hydraulic Inventories and Research) within the DGRE. Following this, the borders are adopted by the Higher Committee for Public Hydraulic Domain of the Ministry of Agriculture, and then decreed into law. For the public hydraulic domain for the Project area (Manouba Governorate and Ariana Governorate), it is recommended that site registry maps planned for completion in 2013 be used.

#### **9.1.2 Legal system regarding land acquisition and resident resettlement in Tunisia**

Land acquisition procedures are conducted based on Decree No. 85 of 11 August 1976 regarding promulgation of the Land Ownership Law on land acquisition for public utility works (hereinafter called “Land Ownership Law”). When land is expropriated for public utility projects, agreements reached through consultations are given priority. If it is impossible to reach an agreement through discussion, land expropriation procedures will be used as a final means.

#### **9.1.3 Implementation system for land acquisition and resident resettlement in Tunisia**

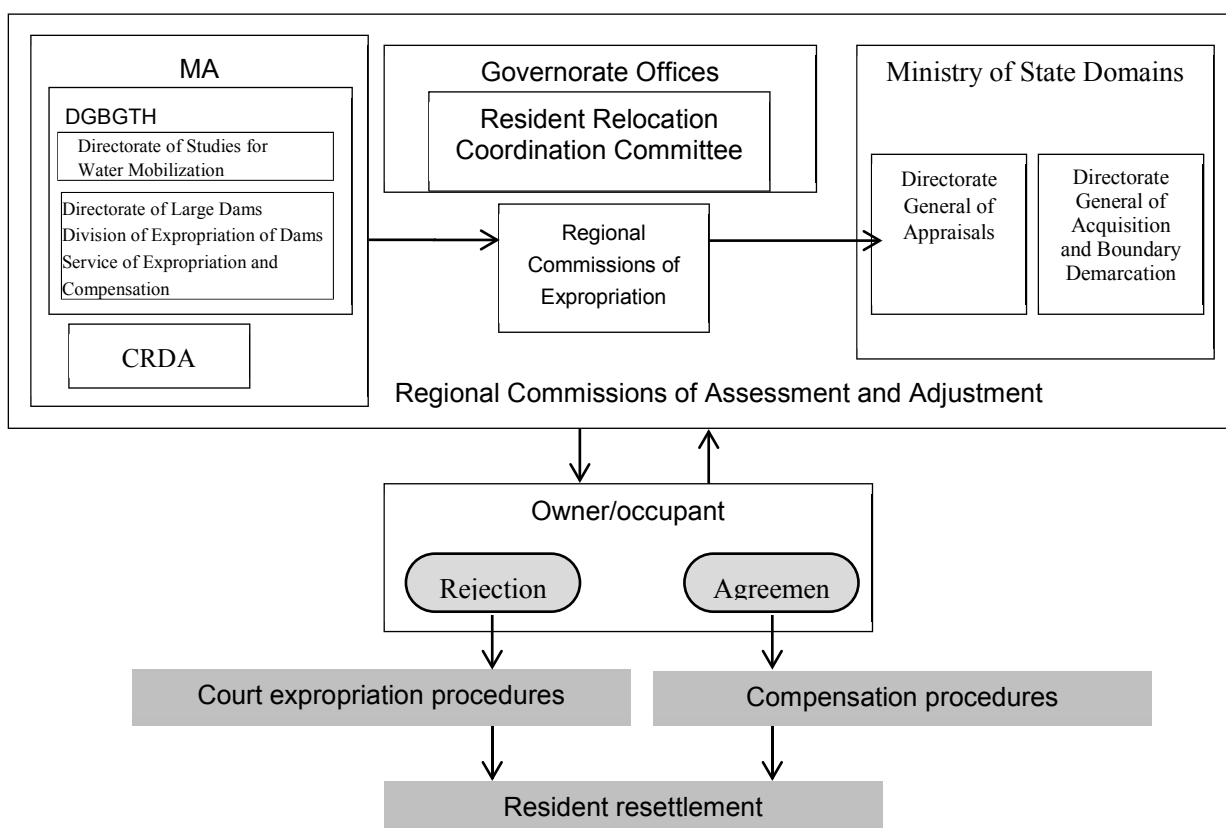
##### **(1) Organizations related to land acquisition and resident resettlement**

The legal land expropriators are the Division of Expropriation of Dams and Services of Expropriation and Compensations within the Directorate of Large Dams of the DGBGTH. From this position, they are responsible for land acquisition procedures in cooperation with the following relevant organizations.

- The Directorate General of Acquisition and Boundary Demarcation and the Directorate General for Appraisals within the Ministry of State Domains and Land Affairs (hereinafter called “Ministry of State Domains”)
- Governorate branches of the Ministry of State Domains

- Office of Rural Land Conservation
- CRDA
- Governorates and relevant districts
- Regional Commissions of Expropriation
- Regional Commissions of Assessment and Adjustment
- Court of justice
- Central Committee on Land Use Planning and Development
- Central Steering Committee

The relationships between the above organizations related to land acquisition and resident resettlement are shown in the figure below.



Source: JICA Survey Team

**Figure 9-1: Relevant agencies for land acquisition and resident resettlement**

## (2) Various stages in land acquisition and resident resettlement procedures

### 1) Classifications of land ownership

There are three major classifications of land ownership: state-owned, privatized state-owned, and privately-owned. Land acquisition and compensation procedures vary depending on land ownership status as shown in the table below.

Land acquisition and compensation procedures are necessary in cases of: 1. Unlawful occupation of state-owned land, 2. Privately-owned land that has been registered in the land registry or is in the process of becoming registered, and 3. Privately-owned land that is not registered. For other land ownership types cases such as 4. State-owned land with no unlawful occupation and 5. Privatized state-owned land, procedures will be conducted to change land-use classification by coordinating with the Ministry of State Domains.



**2) Main procedures related to land acquisition and resident resettlement**

Land that is subject to acquisition through consultations or expropriation is individually-owned land with a registration certificate, shared registered land, and unregistered land. However, caution is necessary as unlawfully occupied state-owned land is also eligible for compensation. In addition, above-ground properties on the land planned for expropriation within the Project site are eligible for compensation procedures by the Division of Expropriation of Dams.

Based on the Land Ownership Law, the main procedures related to land acquisition and resident resettlement are conducted through the following steps.

**1. Identification of lots, owners, and occupants through a Preliminary Social and Land Survey.**

« Relevant organizations »

Division of Expropriation of Dams, Directorate of Studies for Water Mobilization, Directorate General of Acquisitions and Boundary Demarcation, OTC

**2. Assessment of above-ground property and bare land through appraisal reports**

« Relevant organizations »

Regional Commissions of Expropriation

**3. Assessment and approval of appraisal forms**

« Relevant organizations »

Directorate General of Appraisals of the Ministry of State Domains, CRDA, MEq governorate branches

**4. Consultations with owners/occupants and acquisition of land.**

« Relevant organizations »

General of Acquisitions and Boundary Demarcation and Directorate General of Appraisals of the Ministry of State Domains, Regional Commissions of Expropriation, Regional Commissions of Assessment and Adjustment, Division of Expropriation of Dams

**5. Compensation for above-ground properties**

« Relevant organizations »

Regional Commissions of Expropriation, Governorate Office, Division of Expropriation of Dams

**6. Change of land use**

« Relevant organizations »

Service of Expropriation and Compensation, Ministry of State Domains

**7. Promulgation of decree on public utility declaration, land expropriation**

« Relevant organizations »

Ministry of State Domains, Court of justice

**8. Resettlement to alternative land**

« Relevant organizations »

Regional Commissions of Expropriation, Division of Expropriation of Dams, Governorate Office, District Government

#### 9.1.4 Comparison of resident resettlement regulations in Tunisia and JICA guidelines

A table comparing resident resettlement regulations in Tunisia and JICA guidelines is shown below.

**Table 9-1: Comparison between Tunisian law on compensation/resettlement with JICA guidelines**

	JICA guidelines	Resident resettlement regulations in Tunisia	Gaps between Tunisian law and JICA guidelines	Resettlement policy for the Project
1	Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives. (JICA GL)	-	This principle has not been expressly stipulated in Tunisian law. However, since all relevant government agencies have adopted policies to avoid the unfair loss of rights of citizens after the Jasmine Revolution, it is clear that this principle is honored.	A process of land acquisition and compensation following the Land Ownership Law will be applied.
2	When population displacement is unavoidable, effective measures to minimize impact and to compensate for losses should be taken. (JICA GL)	Land Ownership Law (Decree No. 26 of 14 April 2003)	Common to both Tunisian land ownership law and JICA guidelines.	A process of land acquisition and compensation following the Land Ownership Law will be applied.
3	People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels. (JICA GL)	Land Ownership Law (Decree No. 26 of 14 April 2003)	Same as above	A process of land acquisition and compensation following the Land Ownership Law will be applied.
4	Compensation must be based on the full replacement cost as much as possible. (JICA GL)	Land Ownership Law (Decree No. 26 of 14 April 2003)	Same as above	A process of land acquisition and compensation following the Land Ownership Law will be applied.
5	Compensation and other kinds of assistance must be provided prior to displacement. (JICA GL)	Land Ownership Law (Decree No. 26 of 14 April 2003)	Following the Land Ownership Law, compensation is conducted prior to resettlement	A process of land acquisition and compensation following the Land Ownership Law will be applied.

6	For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. (JICA GL)	-	Preparatory policy for resettlement plans for large-scale dam projects is applied by the Division of Planning and Construction. Consultations with residents are not held with residents regarding the plan.	For the current Project draft, there will be no large-scale involuntary resettlement. (Current no. of households to be resettled: 1 HH) However, the resettlement plan drafted as a part of the Impact Assessment by the DGBGTH will be made available to the public.
7	In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance. (JICA GL)	-	For compensation procedures following the Land Ownership Law, negotiations cannot be conducted with affected residents in advance.	For the current Project draft, there will be no large-scale involuntary resettlement. However, in the unlikely event of an occurrence of such, the DGBGTH should consult with residents regarding the resettlement process while concealing specific compensation amounts prior to the responsible ministry's decision.
8	When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people. (JICA GL)	-	Since the language used by affected residents is Arabic, there are no problems.	For the current Project draft, there will be no large-scale involuntary resettlement.
9	Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans. (JICA GL)	-	There are no participation system for affected residents within involuntary resettlement procedures in Tunisia.	More consultations should be held with residents as a part of the Impact Assessment. Through this, affected residents can participate in planning.
10	Appropriate and accessible grievance mechanisms must be established for the affected people and their communities. (JICA GL)	-	There is no particular system for processing grievances apart from filing a lawsuit.	A system for processing grievances as a part of the land acquisition and compensation process will be proposed.

11	Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits. (WB OP4.12 Para.6)	-	Social, land, and initial construction surveys are stipulated as land acquisition procedures, but there are no regulations regarding cut-off dates for obtaining eligibility for loss compensation.	Following JICA guidelines, the DGBGTH will announce via the governorate offices of Ariana, Bizerte, and Manouba that the cut-off date for obtaining eligibility for loss compensation will be start date of the population census.
12	Eligibility of benefits includes, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying. (WB OP4.12 Para.15)	Land Ownership Law (Decree No. 26 of 14 April 2003)	Unless there are claims by other land owners, rules related to the cut-off date for obtaining eligibility for loss compensation for residents without legal rights to land will also be set to match Tunisian law.	A process of land acquisition and compensation following the Land Ownership Law will be applied.
13	Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based. (WB OP4.12 Para.11)	-	DGBGTH policy states that preference will be given to exchanging land with that having the same or larger surface area than the owned land within a 20km radius.	The DGBGTH already has experience with this type of compensation in rural districts. This method will be preferentially applied for this Project as well.
14	Provide support for the transition period (between displacement and livelihood restoration). (WB OP4.12 Para.6)	-	Although this principle is not clearly stated in law, the DGBGTH applies it for resident resettlement due to large projects.	Although the number of residents to be resettled is small, it is possible to adapt this principle.
15	Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP4.12 Para.8)	-	If the amount of compensation is insufficient for the need, this principle can be adapted in the form of subsidies from the governorates.	This will be handled in the same manner through a support system as the governorate or Regional Commissions of Expropriation level.

16	For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared. (WB OP4.12 Para.25)	-	The population targeted for resettlement in this project is less than 200. Therefore, DGBGTH will make a plan based on the simplified resettlement plan (draft) prepared by the study team.	-
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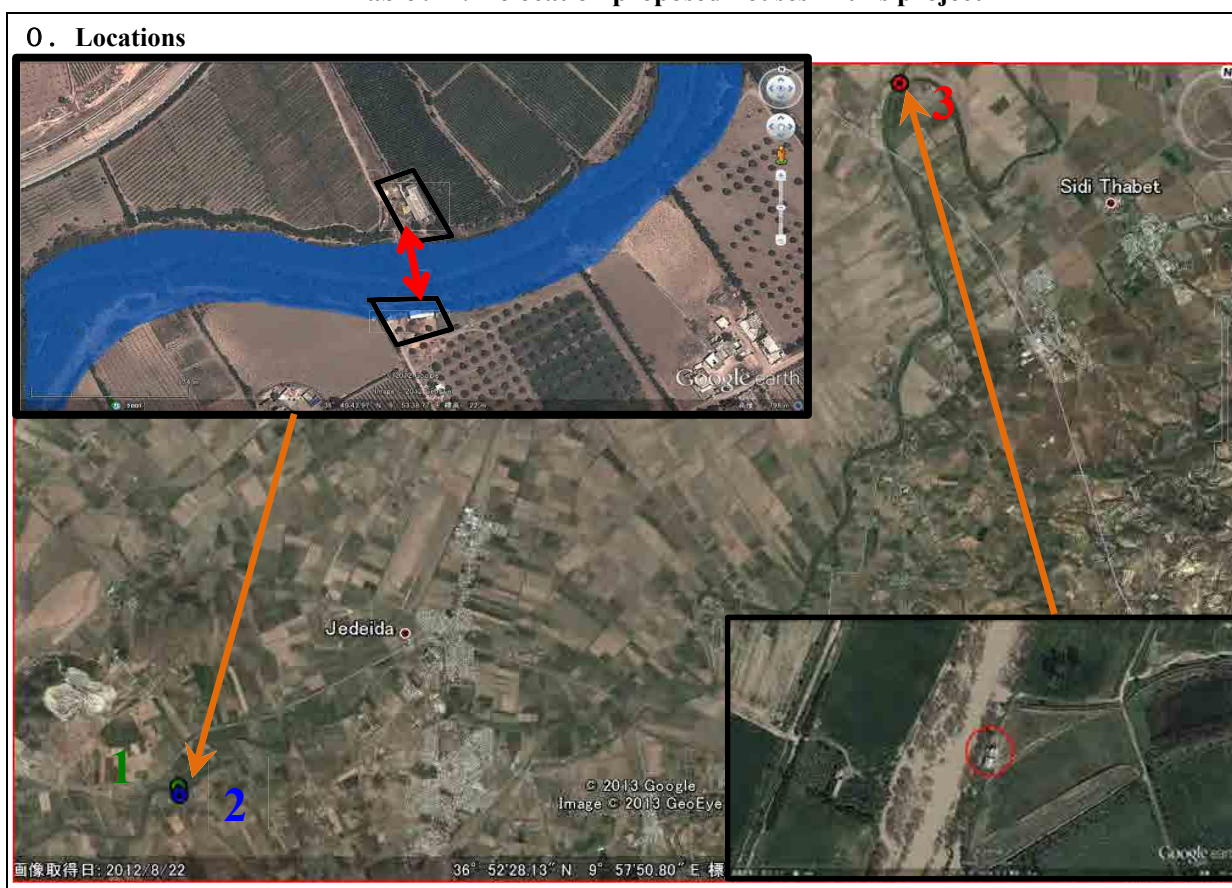
Source: JICA guidelines

### 9.2 Necessity and scale of land acquisition and resident resettlement for the Project

Although impacting homes has been avoided to the greatest extent possible in this Project, the target area has agricultural land (623,230m<sup>2</sup> including 3,630 m<sup>2</sup> for road widening for bridge construction) in Job Division I, 1,256,710m<sup>2</sup> in Job Division II (including 1,910 m<sup>2</sup> for road widening for bridge construction), and 444,910m<sup>2</sup> (including 1,110 m<sup>2</sup> for road widening for bridge construction) in Job Division III), unharvest crops/fruit trees/forests, structures such as storehouses or pump sheds, and two households (approx. 36 people). Since land ledger map by the previously mentioned DGRE and local boundary settlement committee will be prepared in 2013, the area of government-owned and private lands are tentative, however, based on the household land area and estimated loss of income, the impact is not considered serious. The Job Division II consists with national land and private land (Figure 8-8), the above-mentioned compensation is not performed for the national land.

Two houses to be relocated are shown in the following table. Those houses 1 and 2 in the table are located opposite bank and either of the two houses will be relocated.

**Table 9-2: Relocation proposed houses in this project**



Source: JICA Survey Team

Results of field surveys conducted by the Survey Team show that the residential districts that will be impacted the most by acquisition of agricultural land are Jedeida and Jedeida Rachid, which have a high dependency rate on farming income. Residents of the El Battan district are also highly dependent on farming income, but since grazing livestock is more important than crops in this district, it is thought that the loss of land will have a negligible impact on their livelihoods.

In addition, since approximately half of the households along the Mejerda River are owners without land registry certificates or are occupants/tenants, it was discovered that there is a risk for conflict between owners/occupants regarding ownership of lots. Therefore, during land acquisition procedures, the DGBGTH, the Regional Commissions of Assessment and Adjustments, and other related agencies should conduct procedures as amicably as possible, placing importance on prompt land acquisition.

For cut-off date in land acquisition procedures, although it is desirable to adopt the start date of the population census to be implemented by the DGBGTH in 2014<sup>1</sup> which comes after our investigation of detailed design, there is no system of cut-off date in Tunisia. According to the hearing from the Land Acquisition Division, however, taking into consideration the domestic legal system in Tunisia and the past results of land acquisition and resettlement, it might be possible to prevent influx of non-regular residents and to determine the person who is the subject of compensation.

### **9.2.1 Residents within the Project region**

According to the population census of 2004, the total population within the survey region is 88,118 people (18,980 households). Within this population, 55,776 (12,170 households) fall into the urban development area. Using 1% as the average population growth rate (annual) for 2004~2010, the total population of the region is more than 100,000 people (19,636 households), with the average population of one household at 5.1 people.

The results of a survey on livelihoods conducted by the survey team in 2010 is described in the previous chapter on environmental and social considerations in Section 7.2.2 Social and Environmental Survey Results. It includes basic information regarding the average characteristic and livelihoods of the households to be compensated in the region (production system, employment, composition of household, income derived from official and unofficial economic activities, standard of living, social and cultural characteristics, etc.). The results of population census and survey on property and land are shown in the following sections.

### **9.2.2 Population census**

A population census was conducted for all land occupants affected by the Project. The number of affected persons is organized by category and shown in the table below.

Population census data will be updated at the time of formulating the detailed plan.<sup>2</sup>

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<sup>1</sup> This census corresponds to “1. Preliminary Social and Land Survey” mentioned in the section 2) Main procedures related to land acquisition and resident resettlement, (2) Various stages in land acquisition and resident resettlement procedures, 9.1.3 Implementation system for land acquisition and resident resettlement in Tunisia.

<sup>2</sup> World Bank OP4.12 states that in general, if land acquisition is not conducted within 2 years of a census, data shall be updated.

**Table 9-3: Number of Project Affected Units (PAUs) and Affected Persons (APs)**

Type of loss	No of PAUs			No of APs		
	Legal	Illegal	Total	Legal	Illegal	Total
Required for displacement	2	0	2	36	0	36
1 HH <sup>3</sup> (Structure owner on Gov. land)	2	0	2	36	0	36
2 HH (Structure on Private land)	0	0	0	0	0	0
3 HH (Tenants)	0	0	0	0	0	0
4 CBEs <sup>4</sup> (Structure owner Gov. land)	0	0	0	0	0	0
5 CBEs (Structure owner on Private land)	0	0	0	0	0	0
6 CBEs (Tenants)	0	0	0	0	0	0
7 Community owned structures including physical cultural resources	0	0	0	0	0	0
Not required for displacement	0	0	0	0	0	0
8 Land owners	0	0	0	0	0	0
9 Wage earners	0	0	0	0	0	0
Grand Total (1-9)	2	0	2	36	0	36

Source: JICA Survey Team

### 9.2.3 Survey on property and land

Through a survey on property and land conducted on land targeted for the Project, all assets that are physically and economically affected<sup>5</sup>, and their quantities are shown in the tables below.

#### i) Land

**Table 9-4: Affected land**

No.	Area	Land Type	Affected (m2)	Affected (m2)	Total (m2)
			Broaden Channel	Road attached to bridge	
1	Job Division-I	Farm Land (Private land)	619,600	3,630	623,230
2	Job Division-II	Farm Land (Gov. land)	693,900	180	694,080
		Farm Land (Private land)	1,254,800	1,910	1,256,710
		Total	1,948,700	2,090	1,950,790
3	Job Division-III	Farm Land (Private land)	443,800	1,110	444,910
Total		Farm Land (Gov. land)	693,900	180	694,080
		Farm Land (Private land)	2,318,200	6,650	2,324,850
		Total	3,012,100	6,830	3,018,930

\* Actually, it will be settled after the completion of land ledger map.

Source: JICA Survey Team

<sup>3</sup> HH: House Hold

<sup>4</sup> CBEs: Commercial and Business Enterprises

<sup>5</sup>It is generally not necessary to consider movable assets such as livestock as eligible for compensation. However, if it became evident that the affected residents' employment or other means of livelihood will change due to resettlement, it will be necessary to make these assets eligible for compensation.

ii) Buildings

**Table 9-5: Affected buildings**

No.	Area	Type of Building	Sub-Total	Total
Residential Building				
1	Job Division-I	single story, brick	2	2

\* **Actually, it will be settled after the completion of land ledger map.**

Source: JICA Survey Team

### **9.3 Support for creating an Abbreviated Resident Resettlement Plan (draft)**

An Abbreviated Resident Resettlement Plan (draft) for compensation and resident resettlement to alternative land will be used. This plan will clearly show the compensation given to residents directly affected by the Project, as well as policies, measures, activities, and placement of responsibility for the smooth implementation of resettlement. The Abbreviated Resident Resettlement Plan (draft) is attached to the Appendix of this report. This Abbreviated Resident Resettlement Plan (draft) is in the provisional stage for this Draft Final Report, but a finalized version will be attached to the Final Report.

The finalized Abbreviated Resident Resettlement Plan will be formulated by the DGBGTH during the Preliminary Social and Land Survey stage during land acquisition procedures based on the Abbreviated Resident Resettlement Plan (draft) proposed in the Project.

#### **9.3.1 Specific measures for compensation and support**

##### **(1) Compensation for loss**

For land acquisition and compensation procedures for the Project, just and fair compensation will be provided for owners/occupants of the target land based on the Tunisian Land Ownership Law, regardless of the legality/illegality of land ownership. Compensation cost prescribed by domestic law of Tunisia is calculated based on the findings of DGBGTH and Regional Commissions of Expropriation as well as on the results of land appraisal by Ministry of State Domains, with compensation to the owner in each case. It covers all the contents of compensation described in the JICA guidelines, except for the life reconstruction cost. Specific compensation items are as follows:

- Compensation cost (Compensation money for structures, cost for public infrastructure reconstruction, etc.)
- Compensation cost for private land (land compensation to legal residents. There is no compensation for land to illegal residents according to the national legislation of Tunisia as with the JICA guidelines.)
- Relocation expenses (Transportation costs and moving expenses to new address, taxes/administrative costs, agent's fee for new land and house, construction costs for makeshift residence, etc.)
- Operating costs (personnel expenses, monitoring costs, etc.)
- Indirect costs (compensation pertaining to emotional loss)

As recommended in the JICA guidelines, consultations will be conducted with the relevant parties, and forcible land expropriation procedures will be kept to a minimum, in accordance with existing Tunisian law regarding land acquisition and compensation. Mutual agreement reached through discussions between the acquirer and persons whose land is expropriated will be used as the fundamental principle. In order to ensure conformance with JICA guidelines, this Project will propose to the DGBGTH that matters not clearly defined by Tunisian law such as public hearings, public assistance for resettling socially vulnerable persons, and monitoring for land acquisition, compensation, and resident resettlement procedures be treated as important items.

Preparations for consultation will be conducted as a duty of the Regional Commissions of Assessment and Adjustment. Other related parties may not conduct discussions in the place of the Regional Commission of



Assessment and Adjustment. Therefore, the land acquisition schedule may be greatly affected based on whether mutual consultations with this Commission are sufficiently and smoothly conducted.

When the land boundaries are set and the decree for public utility declaration has been promulgated, the DGBGTH will begin preparing the plan for acquisition, compensation, and resettlement. Compensation for all eligible structures pertaining to sustaining the livelihoods of the owners/occupants such as land, immovable facilities, planted land, etc. will be paid the compensatory amount stipulated by the Ministry of State Domains. If the amount of compensation is low due to the value of the original residence being low, the governorate may provide supplementary funds to assist with relocation to alternative land. However, the relocated person will be responsible for construction of the housing, etc. on the provided alternative land himself. For residents whose livelihoods are based on the land, compensation in the form of a land base will be preferentially provided instead of just financial compensation. The compensatory amounts will conform to JICA guidelines, with some cases taking into consideration the loss of livelihoods means of the eligible person.

### **(2) Reconstruction of livelihoods**

Although costs for life reconstruction measures are not to be compensated specifically in the Tunisian law, one of the options such as “to prepare a new land”, “to provide financial support for recovery” and “to provide opportunities for vocational training (Tuition is free in all public schools in Tunisia)” can be determined based on the will of residents after due discussion, respecting the opinions of the residents concerned.

First of all, if the reduction in income is expected or the life reconstruction is deemed difficult by Regional Commissions of Assessment and Adjustment (for example, in case illegal residents receive no compensation for sites but are compensated only for structures.), opinions of the population concerned about the compensation will be duly reflected through discussion.

Secondly, the increase factor is recorded on the evaluation sheet by the experts of the Ministry of State Domains based on the number of years of settlement, and on the basis of this expert evidence or result of appraisal, the contents of compensation will be examined in the Regional Commissions of Assessment and Adjustment through discussion among members such as the population concerned, experts of Ministry of State Domains and those of the private sector.

### **(3) Procedures for developing resettled land**

There have been no regulations or guidelines established regarding the development of resettled land in Tunisia. Therefore, procedures regarding resettled land development will be based on existing laws related to land acquisition, compensation, and resettlement to alternative land.

For this Project, if the owner requests to be relocated to a neighboring area or another region, he has the right to be provided with housing, etc. The resettled land will be land that has the same location conditions and productivity of the land prior to resettlement.

If the resettled land is to be developed: a) the regulating government authority will develop a special housing district on state-owned land or, b) the necessity of relocating owners/occupants to alternative land based on their submitted petition of demands during land acquisition procedures will be studied. The DGBGTH will decide which of these choices to apply.

Resident Resettlement Coordination Committees specially established at the governorate level will manage resident resettlement and provide coordination between relevant agencies and residents. In addition, this committee will ensure that among the residents who were provided with housing, those who are socially vulnerable (including the poor, elderly, women, and children) are especially considered and accommodated when providing public assistance.

Resettlement will begin when necessary infrastructure (electricity, water, housing, schools, etc.) is secured at the resettlement site. In order to prevent a further population influx to the resettlement site after these conditions are secured, it is advisable for the DGBGTH to systematically disseminate resettlement site information to citizens via the governorate offices.

### **(4) Entitlement matrix**

Land ownership transfer conditions such as type of loss, compensation and assistance beneficiaries, compensation package, and responsible organizations as based on JICA guidelines are shown in the table below.

**Table 9-6: Entitlement matrix (JICA Guidelines)**

Type of loss	Entitled Persons (Beneficiaries)	Entitlement (Compensation Package)	Implementation issues/Guidelines	Organization Responsible
Loss of agricultural land, orchards, gardens Loss of residential or commercial land	<ul style="list-style-type: none"> <li>• Legal owner of land,</li> <li>• Occupant with legal rights,</li> <li>• Occupant without legal rights but recognized after 6-month public announcement</li> </ul>	Replacement value of land (cash compensation or land based compensation according to the wish and to cover the market value of land as determined by Ministry of State Domain	i) Assessment of quantity and quality of land by DGBGTH and OTC with support of Regional Commissions of Expropriation	DGBGTH, OTC, Regional Commissions of Expropriation
			ii) Assessment of Market Value by Land Market Survey	Regional Commissions of Expropriation
			iii) Assessment of Cash Compensation under Law	Ministry of State Domain
			iv) Updating of title of the affected persons	DGBGTH, Regional Commissions of Expropriation
			v) Payment of Cash Compensation under Law	DGBGTH, Governorates
Loss of trees and standing crops Loss of built structures including house	<ul style="list-style-type: none"> <li>• Legal owner of land,</li> <li>• Occupant with legal rights,</li> <li>• Occupant without legal rights but recognized after 6-month public announcement</li> </ul>	Replacement value of assets (cash compensation) to cover the market value of assets as determined by Ministry of State Domain	i) Assessment of quantity and quality of assets by DGBGTH and OTC with support of Regional Commissions of Expropriation and CRDA	DGBGTH, OTC, Regional Commissions of Expropriation, CRDA
			ii) Assessment of Market Value by Land Market Survey	Regional Commissions of Expropriation
			iii) Assessment of Cash Compensation under Law	Ministry of State Domain
			iv) Payment of Cash Compensation under Law	DGBGTH, Governorates

Source: JICA Survey Team

### 9.3.2 Grievance mechanism

In Tunisian law related to land acquisition and compensation, objections to the awarded compensatory amount can only be filed through a lawsuit in court at the time of land expropriation. A grievance processing system to support responding to the requests of residents subject to land expropriation has not been established.

For this project, a Project Team within the CRDA of each governorate will accept grievances from residents subject to land acquisition procedures as a method of support for agricultural promotion organizations. This will be spearheaded by the DGBGTH as a means of assisting residents by listening to their grievances and thinking of problem resolutions. The grievances heard will be reported to the governorate or the special Resident Resettlement Coordination Committees established within the governorate. The DGBGTH will cooperate with Service of Water Use and Agricultural Facilities of the CRDA of each governorate to conduct overall monitoring for the Project while taking into account the grievance processing system. Furthermore, in order to provide definite support to socially vulnerable residents, the governor of each governorate will notify the Regional Commissions for Assessment and Adjustment that they are to include a representative from social welfare agencies as a member of the commission.

### 9.3.3 Considerations for socially vulnerable people

Using results of a survey on livelihoods and lifestyles conducted on 300 household in the Project area, the effects on socially vulnerable people (the poor, women, children, ethnic minorities) were also analyzed.

From these survey results, it was determined that the ratio of poor residents with household incomes under the minimum wage, as well as residents in vulnerable positions is particularly high in the Jedeida, Sidi Thabet, and El Battan Districts. It is expected that the loss of cropland and unharvest crops due to land acquisition for the Project

will have a serious impact on the agricultural livelihoods of these households. These impacts can be relieved through land and property compensation procedures. In addition, most of these households have received very serious damage to their houses and property from flooding. Therefore, the losses suffered from flood damage can be mitigated through this project.

In regard to gender rights and children's rights, since farm work and drawing water for irrigation is mainly conducted by men, field surveys showed that women's viewpoints were not largely reflected. However, it was determined that there is no adverse effect on gender equality or the rights/living environment of children caused by this Project. Furthermore, since flood damage will be mitigated due to the Project, an increased level of safety for people vulnerable to disaster (women and children) can be expected.

In regard to ethnic minorities, there is a group of ethnic minority people who engage in grazing activities within the Project region under the free passage rights of state-owned grazing land in El Mabtouh in particular. Although it is necessary to consider their land of origin, number of livestock migrating seasonally, and their cycle of passage, this Project is not considered to affect a specific ethnic minority group.

Although public assistance for socially vulnerable owners/occupants is not specifically written in land acquisition and compensation procedures, for land acquisition procedures for the Project, it is important to make thorough considerations of the vulnerabilities of owners/occupants based on the statement of demands written by the owner/occupants for the Regional Commissions of Assessment and Adjustment.

The DGBGTH will confirm that a representative from social welfare agencies are present during meetings of the Regional Commission of Assessment and Adjustment, and will also designate the CRDA as the responsible party for monitoring social assistance for the most vulnerable residents to facilitate backup in the establishment of a support system for socially vulnerable people.

#### **9.3.4 Implementation schedule**

The implementation schedule (draft) for land acquisition and involuntary resident resettlement is shown in the following table. The timing for beginning procedures is indicated in the table with an arrow. For this Project, it is expected that actual resettlement will begin after compensation for lost assets has been paid.

**Table 9-7: Schedule for land and property acquisition (draft)**

Implementation schedule	Period: 22 months	Period (months)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	Notes	
(1) Confirmation of public benefit of the project and assessment of required land (2) Appraisal by the Regional Commissions of Expropriation (3) Confirmation of land owners and land registration certificates (4) Examination of land owners and compensation amounts by the Ministry of State Domains		6																							Land acquisition through consultations is set as a precondition, but this may be carried over to court trials depending on the situation.	
Consultations pertaining to land acquisition by the Regional Commissions of Assessment and Adjustment, land owners, and the implementing agency of the Project		3																								
From the completion of discussions with the Regional Commissions of Assessment and Adjustment to the finish of resident resettlement		6																								
If there are court procedures		13										Court preparations	1st trial (approx. 6 months)			2nd/3rd trial (approx. 3 months)									If carried over to court trials, this will take more than one year.	
Monitoring																									If carried over to court trials, an interview survey on the compensation for loss will be conducted in the 16th or 22nd month.	

Source: JICA Survey Team

### 9.3.5 Costs and financial resources

As agreed among JICA, JICA Survey Team and DGBGTH through discussion, all the costs for relocation and compensation related to resident resettlement and land acquisition will be borne by the Tunisian side and the DGBGTH will be the implementing body of this procedure. These necessary costs are planned to be calculated based on the findings of DGBGTH and Regional Commissions of Expropriation as well as on the results of land appraisal by Ministry of State Domains, and to be paid through consultation and agreement with affected people. While a draft idea of these costs as well as costs associated with resettlement monitoring is presented in this report, it should be shown more clearly in a resident relocation plan to be drawn up by the DGBGTH.

### 9.3.6 Land acquisition and resident resettlement monitoring

Monitoring associated with resident resettlement procedures are not sufficiently covered by laws related to land acquisition and compensation procedures in Tunisia. Therefore, it will be supplemented by JICA guidelines. Monitoring will be conducted with the purpose of checking plan execution along with the progress of land acquisition and compensation procedures, confirming that the Project land is vacated under appropriate conditions, and ascertaining the status of resettled residents during implementation of the resident resettlement plan.

The DGBGTH Division of Expropriation of Dams or the Service of Expropriation and Compensation will be the implementing agency for monitoring and will organize a monitoring committee for the land acquisition, compensation, and resettlement plan.

The land acquisition and resettlement monitoring plan is shown in the table below. The DGBGTH will make an overall evaluation by conducting monitoring using a monitoring form while receiving advice and support from the Consultant or related agencies, and then proceed with land acquisition. Monitoring forms will be managed by the implementing agency for monitoring. It is recommended that the monitoring form be used for each target sector identified by results of the land registration survey conducted at the time of the Detailed Design Survey of the Project.

**Table 9-8: Land acquisition and resident resettlement monitoring plan**

Purpose	Item	Implementation point	Frequency	Responsible agency
<b>【Before construction】</b>				
Confirm consensus building related to business activities and compensation methods.	Follow stakeholder meetings.	Stakeholder meeting venue or resettlement residence	When stakeholder meetings are held	<b>Evaluation and implementation :</b> DGBGTH (Directorate General for Dams and Major Hydraulic Works) Land Acquisition Division <b>Decision :</b> Ministry of State Domains and Land Affairs <b>Relocation assistance means monitoring :</b> CRDA/DHER
Confirm the progress of land acquisition.	Record the number of land acquisitions.	Resettlement residence	Done once before construction	
Confirm the progress of resettlement.	Record the number of moved people and households.	Resettlement residence	Done once before construction	
Confirm the progress of compensation payment.	Record the number of residents paid compensation.	Resettlement residence	Done once before construction	
<b>【During construction】</b>				
Confirm the living conditions of resettled residents.	Record the number of incidence of complaints and their solutions.	Resettlement destination	Done once before construction	

### 9.3.7 Consultations with residents

As was described in the previous chapter on environmental and social considerations, three stakeholders meetings were held for this Project. Participants were representatives from each relevant agency and Omdas (tribal

leaders). Affected residents did not participate. This was because the DGBGTH decided that there was no need to place a burden on residents by requiring them to attend the meetings since the residents around the Mejerda River were sufficiently represented by the Omdas. However, after the Jasmine Revolution, the Omdas tend not to be seen as a representative of residents. Therefore, for resident consultations conducted in the future, residents including land owners/occupants should also be summoned.

In particular, at the third stakeholders meeting, there was an explanation by participants that it was necessary to minimize the impact created by expropriation of agricultural land in the area surrounding the El Mabtouh wetlands. In addition, the DGBGTH confirmed that it was better for land owners engaging in farming activities to be compensated with alternative land than through compensation in trust. Therefore, they proposed that compensation be made with alternative land located within a 20km radius that has the same or larger land area of the original land.

Although consultations with residents is not stipulated in land acquisition procedures, it was determined that it is necessary to publicize information on the impacts and effects of the Project and hold multiple stakeholders meetings during the implementation of the Environmental and Social Considerations Survey in order to facilitate the understanding of residents regarding the Project. However, the selection of participants will respect the practices and customs of the residents and the communities.

## **Chapter 10. Project Implementing Plan**

### **10.1 Project Overview**

The Project is to improve flood control functions in the basin of the Majerda River, which has been seriously flooded, through infrastructure improvement including river improvement, and thus contribute to the reduction of flood damage and the improvement of the living environment of the local residents. The target area and project overview are as follows.

**Table 10-1: Target Areas of the Mejerda River Flood Control Project**

<b>Category</b>	<b>Major works</b>	<b>Target area/zone</b>
1) Structural measures	River improvement works, retarding basin works	D2 Zone (from Kalaat el Andalous Bridge to Larousia Dam in the upper stream)
2) Nonstructural measures	Dam flood management system, warning information system, flood fighting activities plan, strengthening of organization and capacity development for flood management system	Mejerda River Basin, D2 Zone, organizations involved in river management

### **10.2 Contents of Consulting Services**

Consulting services are for overall project management, detailed design (D/D), assistance in preparation of bidding documents (tender assistance), installation of gates to river structures, construction supervision and planning and design of nonstructural objects for the above-described river improvements and retarding basin works. The following table shows the outline of the staff and man-months required for the consulting services. The total man-months required will be 487 (136 for Professional A and 351 for Professional B).

**Table 10-2: Outline of the Consulting Service Team**

No.	Position for Professional	Required Experiences	Total M/M (Months)
A-1	Team Leader/Civil Engineer (for Design and Bid)	15 years	23
2	Senior River Structure Engineer	15	10
3	River Structure Engineer	10	13
4	Bridge Structure Design Engineer	12	6
5	Railway Bridge Design Engineer	12	5
6	Improvement of Communication System	10	8
7	Flood Inundation Analysis and Forecasting Specialist	10	4
8	Construction Plan and Cost Estimator	10	5
9	Large Dam Operation Planning	10	4
10	Telemetry System Specialist	10	4
11	Environment & Social Environmental Specialist	10	14
12	Community Based Disaster Risk Reduction (DRR) Specialist	10	6
13	Bid Document and Bid Assistance Specialist	10	11
14	Team Leader (Construction Supervision Work)	10	23
	<b>Total M/M for Professional A</b>		<b>72</b>
B-1	Deputy Team Leader/Civil Engineer (for Design and Bid)	10 years	27
2	River Structure Design Engineer (1)	10	9
3	River Structure Design Engineer (2)	10	6
4	River Structure Design Engineer (3)	10	6
5	Bridge Structure Design Engineer	10	6
6	Railway Bridge Design Engineer	10	5
7	Hydrology & Hydraulic Engineer (1)	10	9
8	Hydrology & Hydraulic Engineer (2)	10	9
9	Survey and Geotechnical Engineer	10	5
10	Construction Planner & Cost Estimator (1)	10	7
11	Construction Planner & Cost Estimator (2)	10	4
12	Construction Planner & Cost Estimator (3)	10	7
13	Disaster Education Specialist	10	9
14	Environment Specialist	10	9
15	Social Environmental Specialist	10	9
16	Bid document and Bid Assistance Specialist (2)	10	24
17	Deputy Team Leader (Construction Supervision Work)	10	9
18	Construction Engineer B-1	10	42
19	Construction Engineer B-2	10	42
20	Construction Engineer B-3	10	42
21	Bridge Construction Engineer	10	15
22	Improvement of Communication System	10	6
	<b>Total M/M for Professional B</b>		<b>351</b>
	<b>Grand Total for Professional (A+B)</b>		<b>487</b>

Source: JICA Survey Team

## 10.3 Project Cost and Financial Planning

### 10.3.1 Calculation of Project Cost

The project cost of the Mejerda River Flood Control Project is 15,284M yen (311.9M TND), including a foreign currency portion of 8,004M yen (163.3M TND) and a domestic currency portion of 7,281M yen (148.6M TND). Of the project loan, 10,823M yen is to be covered by a yen loan and the loan ratio is 70.8%.



**Table 10-3: Total Cost of the Mejerda River Flood Control Project**

(FC & Total: Million JPY, LC: Million TND)

Major Works/Major Items	Foreign Currency	Local Currency	Total
<b>A. Eligible Portion</b>			
1. Procurement/Construction	6,959.1	43.7	9,102.7
1) River Improvement I (K.A Bridge-Chafraou)	2,590.7	18.8	3,513.3
2) River Improvement (El Mabtouh RB))	1,858.6	13.7	2,528.5
3) River Improvement III (Chafrou-Laroussia Dam)	1,118.5	8.1	1,515.9
4) Gate Works	51.3	0.4	70.8
5) Base Cost	5,619.0	41.0	7,628.5
6) Price Escalation (FC: 2.1%, LC 0.2%)	1,008.7	0.7	1,040.8
7) Physical Contingency (5%)	331.4	2.1	433.5
2. Consulting Service	455.2	13.8	1,131.3
1) Base Cost	381.4	13.0	1,017.0
2) Price Escalation (FC: 2.1%, LC 0.2%)	52.1	0.2	60.5
3) Physical Contingency (5%)	21.7	0.7	53.9
<b>A. Total (1. + 2.)</b>	<b>7,414.3</b>	<b>57.5</b>	<b>10,234.1</b>
<b>B. Non-Eligible Portion</b>			
1. Land Acquisition	0	35.0	1,713.0
1) Base Cost	0	33.0	1,617.0
2) Price Escalation (FC: 2.1%, LC 0.2%)	0	0.3	14.5
3) Physical Contingency (5%)	0	1.7	81.6
2. Government Administration (5%)	0	12.2	597.4
3. VAT	0	43.9	2,150.5
4. Important Tax	0	0	0
5. Sub-Total (1. + 2. + 3. + 4.)	0	91.0	4,460.9
<b>Total (A+B)</b>	<b>7,414.3</b>	<b>148.6</b>	<b>14,695.0</b>
C. Interest during Construction	482.3	0	482.3
1) For Construction (1.7%)	481.8	0	481.8
2) For Consulting Service (0.01%)	0.5	0	0.5
D. Commitment Charge (0.1%)	107.2	0	107.2
<b>Grand Total (A+B+C+D)</b>	<b>8,003.8</b>	<b>148.6</b>	<b>15,284.4</b>
<b>Portion of FC &amp; LC (%)</b>	52.4	47.6	100
<b>E. JICA Finance Portion including   IDC (A+C+D)</b>	<b>8,003.8</b>	<b>57.5</b>	<b>10,823.5</b>
<b>Portion of JICA Finance (%)</b>	73.9	26.1	100

Source: Calculation Result for Annual Fund Requirement based on the Cost Estimate Kit (JICA Survey Team)

### 10.3.2 Financial Plan

Of the total project cost of 15,284M yen (311.9M TND), 10,823.5M yen (220.9M TND) will be covered by this yen loan and the remaining 4,459M yen (91.0M TND) will be covered by the national budget of Tunisia.

**Table 10-4: Financial Plan of the Mejerda River Flood Control Project**

Source	Amount (M yen)	Amount (M TND)	Proportion (%)
Yen loan (FC)	10,823.5	220.9	70.8
Tunisian national budget (LC)	4,458.9	91.0	29.2
Total	15,284.4	311.9	100

Note: 1 TND= 49 JP Yen

### 10.4 Project Implementing Schedule

We set the project implementing schedule after considering the major processes listed below. The following table shows processes consisting of loan procedures, planning study, Environmental Impact Assessment (EIA), detailed

design, estimation of accumulation, bidding, supervision, etc, related to project implementation, and time periods required for each process. In addition, we assume the pledge will be made in June 2013 and 25 months will be required for the selection of the consultant.

**Table 10-5: Time Periods Required for Major Processes and their Contents**

No.	Process	Required time period	Contents
1	Yen loan procedures	4 months	Jul 2013 Pledge Sept 2013 Conclusion of E/N Oct 2013 Conclusion of L/A
2	Environment Impact Assessment (EIA)	(15 months)	Selection of consultant: 6 months Local survey: 6 months Report to and examination by the National Environment Protection Agency (ANPE): 2 months Approval from ANPE: 3 months
3	Land acquisition	22 months	After the completion of EIA and detailed design and before the start of construction
4	Selection of consultants	25 months	Creation of RFP and short list and consent of JICA: 12 months Invitation and submittal of proposal: 2 months Evaluation of the proposal and consent of JICA: 5 months Contract negotiation: 2 months Preparation and conclusion of contract: 1 month Consent of JICA on contract and notice to commence: 3 months
5	Detailed design	18 months	Location survey and research: 4 months Detailed design related to river improvement, bridges and river structures: 10 months (including 8 months for design of nonstructural objects) Volume calculation and estimation of accumulation: 4 months Preparation of bidding documents: 3 months
6	Selection of contractors	23 months	Prequalification of bidders, creation of bidding documents and consent of JICA: 8 months Bidding: 3 months Bidding evaluation: 4 months Consent of JICA: 2 months Negotiation and conclusion of contract: 3 months JICA's consent to contract, opening of L/C and issue of L/Com: 3 months
7	Implementation of main construction works and nonstructural measures Gate Installation Gate	48 months  (18 months)	River improvement of River-I, II, III, construction of bridges and a retarding basin River-I (48), River-II (48), River-III (48) Gate (18) Implementation of programs related to nonstructural measures
8	Completion of construction and delivery	-	Completion of facilities and delivery to the irrigation association of each river basin

Note: The time period required for JICA's consent on procurement differs depending on the type (consultant or contractor) and the amount.

Below are the implementation processes of the Mejerda River Flood Control Project under the above-described conditions. The EIA that will be conducted by the Tunisian side has to be started and obtain approval of the National Agency of Environment Protection at an early date. Land acquisition has to be completed before the initiation of the Project.

In addition, the supporting related to land acquisition/ resident relocation prior to construction initiation and land acquisition/ resident relocation and environment monitoring of predefined items during construction work are executed by the consultant.

**Table 10-6: Implementation Processes of the Mejerda River Flood Control Project**

Items / Year	2010		2011		2012		2013		2014		2015		2016		2017		2018		2019		2020		2021		2022		Total Months	
	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12	3	6	9	12	3	6		9
1 Feasibility Study (JICA) (8)																											8	
2 EIA Study & Approval by ANPE (15)																												15
3 Loan Arrangement (4)																												3
1) Pledge for Loan																												
2) Exchange of Note																												
3) Signing of Loan Agreement																												
4 Selection of the Consultant(24)																												24
1) RFP, Preparation of S/L, JICA Concurrence (12)																												
2) Invitation & Submission of Proposal(2)																												
3) Evaluation, JICA Concurrence (5)																												
4) Negotiation for Contract (1)																												
5) Preparation & making Contract (1)																												
6) JICA Concurrence & Notice of Proceed (2)																												24
5 Project Management Unit (PMU) (81)																												81
6 Consulting Services (81)																												81
6.1 Detailed Design (18)																												18
1) Surveys & Investigations (4)																												18
2) River Facilities (10)																												18
3) Non-structural Measures(8)																												18
4) B/Q & Cost Estimate(4)																												18
6.2 Preparation of Bidding Documents (22)																												22
6.3 Construction Supervision (48)																												48
7 Selection of Contractor (22)																												22
1) P/Q, Bidding Documents, JICA Concurrence (8)																												
2) Bidding (3)																												
3) Evaluation (4)																												
4) JICA Concurrence (2)																												
5) Negotiation and making the Contract (2)																												
6) JICA Concurrence for Contract, L/C Open, Issuance of L/com (2)																												
8.1 Land Acquisition (22)																												22
8.2 Guarantee Works (22)																												22
9 River Improvement & Non-structural Measures (48)																												48
1) River Improvement JD-I (48)																												48
2) River Improvement JD-II (48)																												48
3) River Improvement JD-III (48)																												48
4) Non-structural Measures (48)																												48
10 Completion of Works																												

Source: JICA Survey Team

## 10.5 Procurement Method

### 10.5.1 Procurement of Consultants

When the implementing organization employs consultants, they shall take the procedures prescribed by the Guidelines for the Employment of Consultants under JBIC ODA Loans (JICA) in a fair and proper manner.

For consulting services, shortlist method (S/L method) shall be employed so that the most appropriate and high-quality consultants will be selected, and the process of prequalification of bidders shall be conducted. All the bidders who meet the prequalification may participate in bidding.

The Tunisian side shall express interests for the creation of a shortlist.

### 10.5.2 Procurement of Contractors

International competitive bidding (ICB) shall be carried out from the size and contents since estimated project cost exceeds 7 Billion Yen. We shall carry out prequalification (PQ) to examine the ability of candidate bidders to carry out the Project in an satisfactory manner in terms of experience and achievements in similar contracts, capabilities concerning human resources, devices and plants, and recent financial conditions and to select the most appropriate and high-quality contractors. All the bidders who meet the prequalification may participate in bidding.

The Project shall be carried out under contract with construction supervision by consultants. The main construction works shall be separated into the following four (4) procurement packages and the procurement shall be carried out according to the Guidelines for the Employment of Consultants under JBIC ODA Loans (JICA).

**Table 10-7: Procurement Methods for the Main Construction Works of the Mejerda River Flood Control Project**

Package	Target zone	Approximate construction cost	Outline of the construction	Procurement method
Package 1	River Improvement Zone I	3.51B yen	River improvements (levee, excavation, disposal of waste soil), construction and reconstruction of bridges, installation of river structures	International competitive bidding (ICB) with prequalification
Package 2	River Improvement Zone II	2.542B yen	Retarding basin works, installation of river structures, overflow weir facilities	Same as above
Package 3	Ricer Improvement Zone III	1.542B yen	River improvements (levee, excavation, disposal of waste soil), construction and reconstruction of bridges, installation of river structures	Same as above
Package 4	Entire Improvement Zones, I, II and III	0.07B yen	Gate Installation Work	Same as above

## 10.6 Project Implementing Structure

### 10.6.1 Borrower

For the implementation of the Project, the Ministry of Development and International Cooperation shall be the borrower on behalf of the Tunisian government.

### 10.6.2 Project Implementing Organization

The General Direction of Dams and Large Hydraulic Works (DGBGTH) shall be the implementing organization of the Project.

DGBGTH consists of the Direction of Studies for Water Mobilization, the Direction of Large Hydraulic Works, the Direction of Dams Exploitation and the Direction of Huge Dams. It has 819 employees (as of the time of the interview in October 2011). We believe that DGBGTH has sufficient budget and human resources to implement and manage the Project.

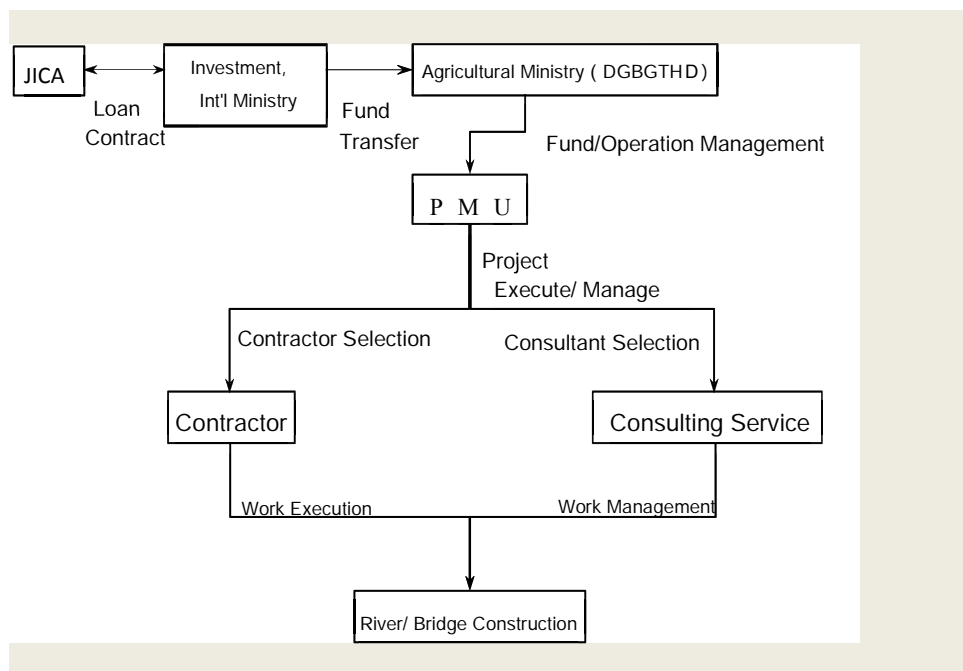
The annual budget of DGBGTH was 84 million TND in FY2008, 110 million TND in FY2009 and 125 million TND in FY2010. As the annual fund requirement of the Project is about 50 million TND, DGBGTH has sufficient ability to implement the budget.

In the past, DGBGTH carried out projects such as dam project and water conducting project which cost about 2 billion yen.

### 10.6.3 Project Management Unit (PMU)

Project Management Unit (PMU) shall be established for the implementation of the Project. PMU shall be an administrative organization under DGBGTH of the Ministry of Agriculture, the implementing organization of the Project.

Organizations and functions of PMU are shown as follows;



**Figure 10-1: PMU Organizations and Functions**

Among the Agricultural Ministry Projects currently implementing with established PMU, the Presidential Decrees obtained for two cases, part of which were translated into English, are attached on the Reference Package. The project names, Presidential Decree Registration Number and effective dates are shown below;

**Table 10-8: PMU Established Recent Project Examples by Ministry of Agriculture**

Project Name	No. of Presidential Decree	Date of Effectuation
Raw Water Transmission Project of El Houareb and Sidi Saad Dams for Kairouan Prefecture Irrigation Development (Project of Interconnection of the Two Dams El Houareb and Sidi Saad for the Development of Irrigation in the Gonerorate Governorate of Kairouan)	2012-1258	Aug. 1, 2012
Raw Water Transmission Project between Sejnane – Joumine – Mejerda (Project of Triple Channel Sejnane – Joumine – Mejerda)	2003-1081	May 5, 2003

(Source: Ministry of Agriculture),

### 10.7 Operation and Maintenance System

Operation and maintenance are currently conducted by the local agriculture development agency (CRDA) of each governorate. The current system shall be maintained after the completion of the Project. After the completion of the Mejerda River project, CRDAs shall maintain river courses, canals and river structures and manage the retarding basin including the overflow weir.

The following CRDAs shall be involved in the Project.

- a. CRDA Ariana: Portions of Mejerda River located in Ariana Governorate
- b. CRDA Manuba: Portions of Mejerda River and the retarding basin located in Manuba Governorate
- c. CRDA Bizerte: Portions of the retarding basin located in Bizerte Governorate

## Chapter 11. Project Economic Evaluation

We will conduct economic evaluation using such evaluation indexes as economic internal rate of return (EIRR), net present value (NPV) and benefit/cost ratio (B/C ratio), based on costs and benefits of the case where the river improvement project is carried out (With Project) and the case where the project is not carried out (Without Project).

### 11.1 Evaluation Period and Calculation of Damage Amount

The project evaluation period is 50 years from 2022 to 2071. The amount of damage is calculated with the following direct and indirect damage items.

**Table11-1 : Damage Items in the Possible Inundation Zone to Be Calculated**

Category of Damage	Damage Item
Direct damage	<ul style="list-style-type: none"><li>• Damage to residential buildings</li><li>• Damage to household effects</li><li>• Damage to assets of business establishments</li><li>• Damage to assets of farmers and fishermen</li><li>• Damage to agricultural crops</li><li>• Damage to infrastructure</li></ul>
Indirect damage	<ul style="list-style-type: none"><li>• Loss from interruption of business</li><li>• Cost for emergency measures in households</li><li>• Cost for emergency measures in business establishments</li></ul>

### 11.2 Expected Amount of Average Annual Damage Reduction

We summed up the annual average damage amount by recurrence interval (the annual damage amount by recurrence interval multiplied by the probability of flood according to the flow volume) and estimated the expected amount of average annual damage reduction. The result was 99,267K TND as shown in the following table.

As for “with project”, the river will be repaired (project scale of 10th year probability), no flood damage is expected up to 10th year.

**Table 11-2: Expected Amount of Average Annual Damage Reduction**

(K TND)

Size of Flow (m <sup>3</sup> /s)	Average Annual Exceedence Probability	Amounts of Damage			Sectional Average Damage	Sectional Probability	Amount of Average Annual Damage	Expected Amount of Average Annual Damage Reduction
		① Without Project	② With Project	③ Damage Reduction ①-②				
140	1/2	0	0	0	193,584	0.300	58,075	58,075
560	1/5	387,169	0	387,169				
800	1/10	436,657	0	436,657	411,913	0.100	41,191	99,267

### 11.3 Economic Evaluation

Below is the summary of the result of economic evaluation based on the above-described costs and benefits. The cost-effectiveness is high and the economic effect has been confirmed.

**Table 11-3: Result of Economic Evaluation**

Economic indicator	Result	Evaluation
Economic internal rate of return (EIRR)	28.6%	As EIRR is well over 12%, the cost-effectiveness is high.
Net present value (NPV)	232M TND	As the benefit substantially exceeds the cost, the cost-effectiveness is high.
Benefit-cost (B/C) ratio	3.3	The B/C ratio is well over 1, the cost-effectiveness is high.

### 11.4 Sensibility Analysis

The sensitivity analysis was conducted on a case study of varying 20% to 40% of the costs and benefits respectively. The result is shown in below table. We can say that the economic effect of the project is substantially high.

EIRR becomes 12% when benefit decreases by 53% and cost increases by 53%.

**Table11-4: Result of Sensibility Analysis**

	Case 1	Case 2	Case 3
Benefit	-20%	-30%	-40%
Cost	+20%	+30%	+40%
EIRR	21.9%	18.8%	15.8%

Source: The Study Team

### 11.5 Selection of Operation and Effect Indicators

Considering the fact that water level observation is continued at many observation points from the upper basin to the lower basin of Mejerda River, we shall select annual maximum water level as an operation indicator and annual maximum inundation area and maximum amount of flooded households by dike break and overflow as effect



indicators.

As below, we have set standard values and target values 2 years after the completion of the project.

**Table11-5: Operation and Effect Indicators of the Project**

Operation and effect indicators		Standard value (10-year flood)	2023 target (2 years after the completion of the project)
Operation indicator	Annual maximum water level (m) *1	EL.21.504 m	EL.20.543 m
Effect indicator	Annual maximum inundation area (km <sup>2</sup> )*2	9,137 ha	4,171 ha*3
	Annual maximum flooded households (households)*2	10,975	0

\*1: 40.5-kilometer point adjacent to an existing water level observation point (MN-LAROUSIAAVAL) near Jedaida

\*2: Caused by dike break and overflow.

\*3: The Tobias Weir will be flooded as it is outside the scope of the project (river improvement).

## **Chapter 12. Discussions concerning Climate Change in the Target Area**

Based on the result of the river runoff analysis conducted by the consultant in charge of “Climate Change Impact Analysis” in consideration of the impact of climate change, we will discuss the environmental and social impacts of future climate change in the target area and the points to consider for river planning in the target area.

### **12.1 Result of River Runoff Analysis in Consideration of the Impact of Climate Change**

The result of the “Tunisia’s Mejerda River Basin Climate Change Impact Analysis” service (for the period from 2045 to 2065), which was separately conducted, climate change will have the following impacts on rainfall amounts in the target area.

#### (1) Impacts on rainfall amounts

- Concerning fluctuation in frequency of torrential rainfall, there is significant uncertainty between models.
- When we look at the average value, intensity of rainfall relative to return period will increase in the northern area and the middle reach and decrease in the upper and lower reaches.
- Monthly precipitation will decrease during the rainy season in all GCMs. The tendency is more pronounced in the northern area and the middle reach, where the rainfall level is higher.
- Special distribution of average values clearly shows larger decrease in the upper reach and smaller decrease in the lower reach.
- Annual precipitation will be on the decrease in all GCMs.
- The number of continuous dry spell days will be on the decrease in all GCM.

#### (2) Impact on flood volume

- As a result of the calculation of the maximum probable flood level of the Sidi Salem Dam and the Laroussia Dam, flood runoff will be on the increase in some GCMs and on the decrease in others. Without consistent tendency, there is a high level of uncertainty.
- Drought will be on the decrease in any method.

### **12.2 Social and Environmental Impact of Climate Change in the Basin**

Based on the above, we summarize as below the social and environmental impact of climate change in the Mejerda river basin, especially in the target area of the Project.

- ① As for flood, although some methods show increase and others show decrease, it will not be very different from the current state on average. Therefore, it seems unlikely that climate change will increase flood flow in the future. The impact of flood damage on the local society and environment is not expected to increase dramatically.
- ② As decrease in annual rainfall is predicted in all the methods, drought is likely to occur more frequently. Therefore, the impact of drought is going to be a major issue for the local society. Considering that water demand is expected to increase especially in the lower basin, where a port plan, a large scale development plan etc. are considered, it is necessary to plan measures including measures to secure water resources.

- ③ Possible measures include securing and increasing service water capacity in such methods as decreasing dead outflow by optimum operation of a group of dams, mainly the Sidi Salem Dam; conserving water by lowering water pressure of water supplies, installing water conservation valves, etc.; and using recycled sewage water.

### **12.3 Points to Consider in Future River Planning in the Target Area**

As below, we summarize the points to consider in future river planning in the target area.

- ① Even if there is some uncertainty, 10-year probable rainfall along the Mejerda River will not be so different from now. Therefore, it is assumed that structural measures planned in this survey will be enough to respond to 10-year probable rainfall, which is the design level.
- ② As the current design level is 10-year probability, it is expected that floods exceeding the design level will not change dramatically in terms of inundation area and depth. We believe that the result of the inundation study conducted in this survey can be referred to for river planning based on 10-year probable rainfall or larger-scale rainfall.
- ③ Lowering of the water level in the Mejerda River during the dry season cannot be avoided. If the water level lowers, fish and other aquatic organisms may be affected. Environmental measures such as installation of a water channel at an even lower level than a low water channel.