

## 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

Laws and regulations related to the environment in Tunisia are as follows:

- 1) Environmental Impact Assessment (EIA) Decree: Decree No. 2005-1991 (July 11, 2005, see table below) establishes the targets for EIAs and specification documents
- 2) Forest Act and enforcement law
- 3) National Land Maintenance/City Planning Law and enforcement law

Of these, the categories of facilities and projects that must be assessed for environmental impact or have specifications submitted will be stipulated by the EIA Decree. Guidelines for conducting the EIA will also be created by the National Environmental Protection Agency (ANPE). The EIA survey will be conducted based on these guidelines while consulting with the ANPE.

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

After consulting with ANPE regarding project implementation, we have confirmed that an EIA must be performed and a report written based on Tunisia environmental law due to the reasons stated below. Approval for project implementation will be based on the EIA report.

- 1) New construction or repair of bridges that accompany the widening of rivers and drainage waterways is a relevant project that falls under Category B according to the 2005 government ordinance.
- 2) A section near the mouth of the Mejerda River is registered under the Ramsar Convention, and environmental consideration is required although it does not fall under the scope of project implementation.

##### (2) Details of EIA Decree

The details of EIA Decree No. 2005-1991 are shown in the table below. The Terms of Reference (TOR) by Sector created by the ANPE stated in Article 6 was drafted before the 2005 government ordinance was promulgated, and does not include the environmental management plan. Therefore, the ANPE is currently drafting a TOR that includes the environmental management plan.

**Table 8-1 EIA Decree No. 2005-1991**

<b>Categories in the EIA regulated by Decree No. 2005-1991 established on July 11, 2005 for facilities and projects that must undergo assessment or submit specification documents</b>
<p><b>Article 1:</b> The following terms used in this decree will be defined as follows:</p> <ol style="list-style-type: none"> <li>1. <b>Facilities and Projects:</b> Refers to various facilities and industrial, agricultural, commercial, or other businesses whose activities pollute or degrade the environment.</li> <li>2. <b>Environmental Impact Assessment (EIA):</b> A survey to examine, evaluate, and measure the effects that facilities and projects have on the environment in a direct or indirect manner over a short, medium or long term. <b>Facilities and projects</b> must submit a report to the ANPE and attain a decision by the ANPE before</li> </ol>

acquiring various licenses to operate.

3. **Terms of Reference (TOR) by Sector:** General TORs (TOR for EIA?) affected by the sectors in Annex 1 of this decree will be created by the ANPE in the preparation phase of an EIA to consider the client or demandant.

**Article 2:** An EIA must be performed for **facilities and projects** listed in Annex 1 of this decree. EIA must be performed by a consultant or field specialist.

**Article 3:** **Facilities and projects** listed in Annex 2 of this decree must submit **specification documents** to acquire approval from the ministry (ministerial ordinance) that governs the environment. Ministries (ministerial ordinances) establish environmental measures that clients and demandants must comply to.

**Article 4:** **Facilities and projects** that are subject to an EIA or submit specification documents must conform to the aptitude and improvement project of settlement areas or environmental protection standards.

**Article 5:** A license to operate will not be issued to the concerned authorities until a legally authorized specification document has been received for **facilities and projects** that must undergo an EIA. This document must confirm that the ANPE has no objections to implementation or must be signed by the minister of the ministry that governs the environment.

Clients or demandants cannot use a license that does not conform to these regulations.

The operation license for each **facility and project** that must undergo an EIA and submit specifications must include all compliance and implementation measures shown on the EIA and specification document.

**Article 6:** Details of the EIA must reflect foreseeable incidents of **facilities and projects** toward the environment, and include the following items at the bare minimum:

1. A detailed description of **facilities and projects**.
2. An analysis of the initial condition of the site or an environmental analysis of site especially for **facilities and projects** that may impact sites during implementation and sites with natural resources.
3. An analysis of the foreseeable direct and indirect impact of **facilities and projects** on districts whose environments are protected by law, especially areas protected for their natural resources, fauna, flora, forests, nature, history, landscape, vulnerable regions, protected species, national parks, and urban parks.
4. Measures and an estimate of required costs that clients or demandants are considering for **facilities and projects** to remove or reduce damage to the environment, as well as compensation if possible.
5. A detailed **Environmental Management Plan of facilities and projects**.

The necessary components will be stipulated in the **TOR by Sector drafted by the ANPE**.

**Article 7:** The client or demandant must draft an EIA report of their **facility and project** based on the **TOR by Sector mentioned in the last section in Article 6** of this decree. Costs for carrying out the EIA will be borne by the client or demandant.

**Article 8:** The client or demandant must submit three signed copies of the EIA report, one copy of the legally authorized specification document to the ANPE, and one copy of the report and specification document to the relevant ministries to obtain a license.

**Article 9:** The ANPE will decide on a petition of objection regarding the implementation of **facilities and projects** within 21 working days of receiving the EIA report of **facilities and projects** listed under Category A in Annex 1 of this decree, and three working months after receiving the EIA report of **facilities and projects** listed under Category B in Annex 1 of this decree. If a petition of objection is not made by the ANPE within these periods, it will be considered as an implicit approval of implementation.

If **facilities and projects** under Category A in Annex 1 of this decree may impact districts whose environments are protected by law, especially forests, natural, historical, landscape, or vulnerable regions, protected species, national parks, or urban parks, the 21 working day period will be extended to three working months.

**Article 10:** If **facilities and projects** may impact districts whose environments are protected by law, especially forests, natural, historical, landscape, or vulnerable regions, protected species, national parks, urban parks, fauna, or flora, they must request the opinion about the implementation of **facilities and projects** from the ANPE for relevant districts or the supervisor for protected species.

The opinion from districts or supervisors of these species must be reported to the ANPE within 15 days of receiving such notification.

If a statement is not received from the supervisor within this period (15 days), it will be considered as an implicit approval of implementation.

**Article 11:** Concerned authorities or government offices will revoke licenses if the measures stated on the EIA report and specification document are not followed.

**Article 12:** The articles and items in this decree apply to new facilities, industrial, agricultural and commercial projects, expansions, modifications to facilities, or changes to production methods for existing facilities, industrial, agricultural, and commercial projects listed in Annex 1 and 2 of this decree.

**Article 13:** The articles and items of EIA Decree No. 91-362 from March 13, 1991 are void.

**Article 14:** The Minister of Environment and Sustainable Development, Minister of National Defense,

Minister of Trade and Handicrafts, Minister of Regional and Local Development, Minister of Agriculture and Hydraulic Resources, Minister of State Property and Land Affairs, Ministry of Social Affairs, Solidarity and Tunisians Abroad, Ministry of Culture and Safeguard of Patrimony, Minister of Tourism, Minister of Health, and Minister of Industry, Energy, and Small Enterprises are responsible for enforcing this decree for their respective fields as published in the Official Journal of the Tunisian Republic (JORT).

Established: July 11, 2005, Tunis

### **Annex 1: Facilities and projects that must undergo an EIA**

**Category A:** The ANPE will decide on a petition of objection regarding the implementation of facilities and projects within 21 working days of receiving an EIA report of **facilities and projects**. If a petition of objection is not made by the ANPE within this period, it will be considered as an implicit approval of implementation.

- 01) **Facilities and projects** involved in the management of household solid waste or food waste at a capacity of 20 tons/day or less
- 02) **Facilities and projects** involved in the treatment and manufacture of construction material, porcelain, and glass
- 03) **Facilities and projects** involved in the manufacture of pharmaceutical products
- 04) **Facilities and projects** involved in the manufacture of nonferrous metals
- 05) **Facilities and projects** involved in metalworking and surface treatment
- 06) **Facilities and projects** involved in the mining of oil and natural gas
- 07) Industrial quarries of aggregates or sand, clay pits, and marble quarries with a production output of 300,000 tons/year or less
- 08) **Facilities and projects** involved in the manufacture of sugar or baking powder
- 09) **Facilities and projects** involved in the coloring of fabrics, threads, and clothes as well as the production and fading of jeans
- 10) Renovation projects of agricultural districts with an area of five hectares or less
- 11) Urban housing plans with an area between five and 20 hectares
- 12) Renovation projects of tourist districts with an area between 10-30 hectares
- 13) **Facilities and projects** involved in the manufacture of mineral fiber
- 14) **Facilities and projects** involved in the production, processing, packaging, and preservation of food products
- 15) Slaughterhouses
- 16) **Facilities and projects** involved in the production or assembly of automobiles, trucks, or motorbikes
- 17) Shipyard projects
- 18) **Facilities and projects** involved in the production, operation and maintenance of aircrafts
- 19) **Facilities and projects** involved in the aquaculture of shellfish for consumption
- 20) **Facilities and projects** involved in the desalination of industrial or tourist facilities
- 21) **Facilities and projects** involved in thalassotherapy and the use of mineral springs
- 22) **Facilities and projects** involved in lodgings with 300 beds or more
- 23) **Facilities and projects** involved in the production of paper and cardboard
- 24) **Facilities and projects** involved in manufacture of elastomer (synthetic rubber) or peroxide

**Category B:** The ANPE will decide on a petition of objection regarding the implementation of facilities and projects within three working months of receiving an EIA report of **facilities and projects**. If a petition of objection is not made by the ANPE within this period, it will be considered as an implicit approval of implementation.

- 01) **Facilities or projects** involved in oil refining and facilities that liquefy or gasify at least 500 tons/day of carbon or oil shale
- 02) **Facilities and projects** that generate electricity of at least 300 MW/day
- 03) **Facilities and projects** involved in the management of household solid waste or food waste at a capacity of at least 20 tons/day
- 04) **Facilities and projects** involved in the management of dangerous solid waste
- 05) **Facilities and projects** involved in the production of cement, lime, or plaster
- 06) **Facilities and projects** involved in the manufacture of chemicals, pesticides, paint, wax, and bleaching agents classified under Category 2 in the dangerous, unsanitary or hazardous building list
- 07) **Facilities and projects** involved in the iron industry
- 08) Industrial aggregate and sand quarries as well as mining projects of mineral resources that produce over 300,000 tons/year
- 09) **Facilities and projects** involved in the manufacture of paper pulp and cellulose

<ul style="list-style-type: none"> <li>10) Construction projects of railways, motorways, expressways, bridges, and interchanges</li> <li>11) Construction projects of airport runways that exceed 2,100 meters</li> <li>12) Construction projects of commercial ports, fishing harbors, or leisure ports</li> <li>13) Construction projects of industrial districts that exceed an area of five hectares</li> <li>14) Urban housing plans that exceed an area of 20 hectares</li> <li>15) Renovation projects of tourist districts that exceeds an area of 30 hectares</li> <li>16) Transport facilities of crude oil or gas</li> <li>17) <b>Facilities and projects</b> involved in urban sewage treatment</li> <li>18) Industrial water treatment <b>facilities and projects</b></li> <li>19) <b>Facilities and projects</b> involved in the leather or white leather industry</li> <li>20) Irrigation and cultivated land projects that use recycled wastewater for agriculture</li> <li>21) Large dam projects</li> <li>22) Aquaculture projects that are not included in Category A in Annex 1</li> <li>23) <b>Facilities and projects</b> involved in desalination for supplying drinking water to urban areas</li> <li>24) Resort projects that exceed 1,000 beds</li> <li>25) <b>Facilities and projects</b> involved in the mining, treatment, and cleaning of minerals and non-minerals</li> <li>26) <b>Facilities and projects</b> involved in the manufacture of phosphate ore and secondary products</li> </ul>
<b>Annex 2: Facilities and projects that must submit specification documentation</b>
<ul style="list-style-type: none"> <li>01) Urban housing plans that do not exceed an area of five hectares and renovation projects of tourist districts that do not exceed an area of 10 hectares</li> <li>02) Renovation projects of educational institutions</li> <li>03) Aqueduct construction projects</li> <li>04) Nature districts and vulnerable regions (areas protected by law) not included in Annex 1 that are not supplied with electricity</li> <li>05) Renovation projects of coasts that are not included in Annex 1</li> <li>06) <b>Facilities and projects</b> involved in olive pulverization (oil extraction plants)</li> <li>07) <b>Facilities and projects</b> involved in the extraction of plant or animal oils</li> <li>08) <b>Facilities and projects</b> classified as animal production operations</li> <li>09) <b>Facilities and projects</b> involved in textile industry not included in Annex 1</li> <li>10) <b>Facilities and projects</b> involved in the pressing and cutting of large metal pieces</li> <li>11) <b>Facilities and projects</b> involved in the storage and logistics of hydrocarbons as well as gasoline stands that wash automobiles and perform oil changes</li> <li>12) <b>Facilities and projects</b> involved in the manufacture of starch</li> <li>13) Conventional quarries</li> <li>14) <b>Facilities and projects</b> involved in the storage of gas and chemicals</li> <li>15) Manufacturing of metal containers, construction of water storage facilities, and manufacturing of steel sheets</li> <li>16) Washing areas that use water to wash clothes and blankets</li> <li>17) Hill dams</li> <li>18) <b>Facilities and projects</b> involved in the manufacture of medical support products</li> </ul>

### **(3) Approaches on Environmental Considerations Surrounding the Forest Act and National Land Maintenance/City Planning Law**

An overview of the approach for environmental considerations surrounding the Forest Act and National Land Maintenance/City Planning Law is shown in the table below:

**Table 8-2 Overview of approach for environmental considerations surrounding the Forest Act and National Land Maintenance/City Planning Law**

Law	Environmental Consideration Conditions
1. Forest Act Division III Chapter 1: Nature Conservation/Article 208	If a project may potentially impact the environment due to its scale or the effect it has on nature, the project is subject to a preliminary EIA.
2. Forest Act Division III Chapter 2: Conservation of Wild Fauna and Flora /Article 209	Activities that may potentially harm wild fauna and flora that are endangered and rare are prohibited. A list of wild fauna and flora that are endangered and rare is established by a ministerial ordinance.
3. Forest Act Division III Chapter 4: Wetland Conservation/Article 225	Protects wild fauna and flora in wetlands.
4. National Land Maintenance/City Planning Law Article 11	If equipment, facilities, or established structures may potentially harm the environment due to their scale and impact, the plan or project is subject to a preliminary EIA.
5. February 22, 1989 Mines and Quarries Regulation Act No. 89-20	Small scale quarries (less than 70,000 tons/year or for clay, less than 5,000 tons/year) must provide an environmental impact summary. Industrial quarries (whose quarrying exceeds small scale quarries) are subject to an EIA.

### 8.1.2 Environmental Social Consideration Procedure and Flow

The procedure and flow from the start of the EIA process to the approval of this project, which has been confirmed by the ANPE, is shown as follows.

- (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.

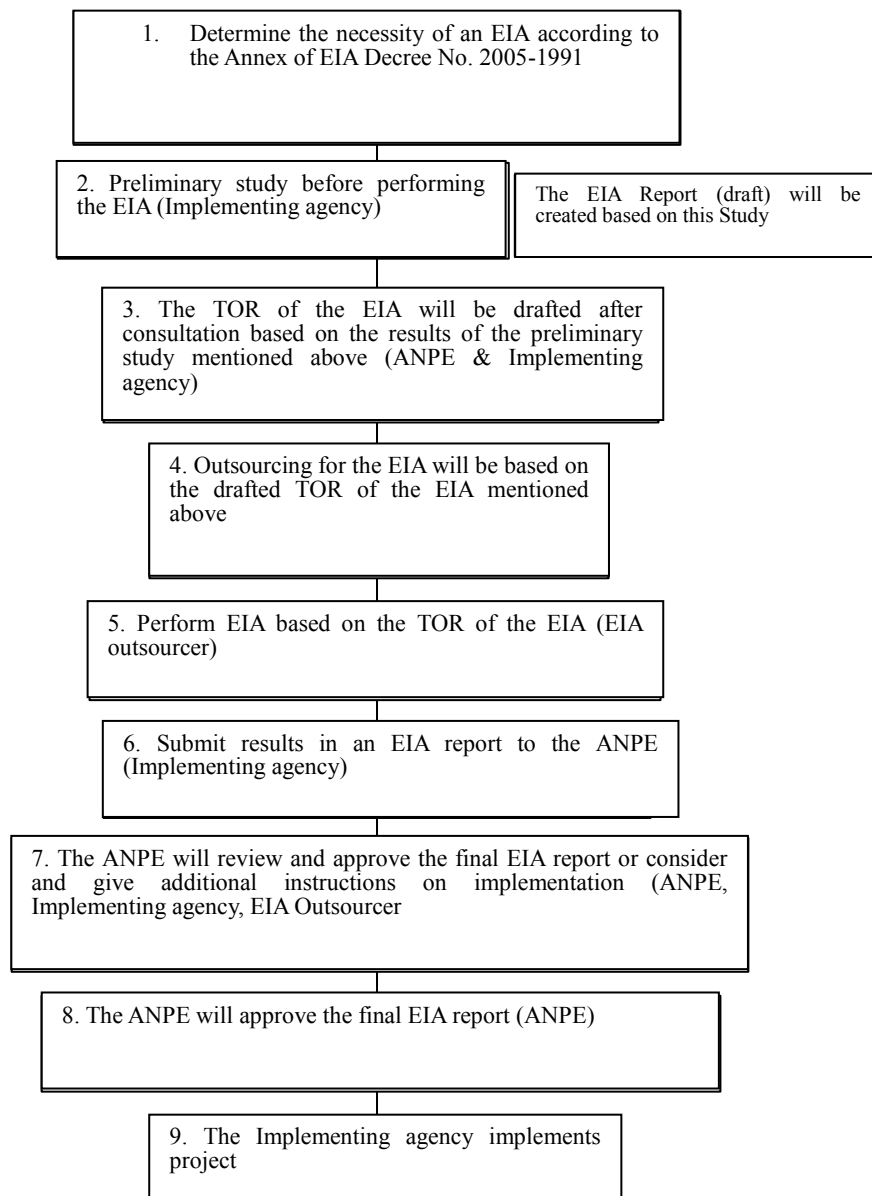
- (2) A preliminary study will be conducted before the EIA is performed. The purpose of the preliminary study is to scope basic information in order to draft the TOR for the EIA after the ANPE and implementing agency consult regarding (3) and impact to the natural and social environment. The EIA draft 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.

Against the backdrop described above, 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.

An EIA has already been performed by the Tunisian-side implementing agency (National Water Distribution Utility: SONEDE) for the existing JICA project Desalination of Southern Ben Gardane in the Medenine Governorate. SONEDE has been recognized for performing the EIA efficiently and in a relatively short period. SONEDE has been recognized because: 1) They performed a scoping because of the preliminary study performed in order to draft a TOR for the EIA, and 2) when they performed the EIA, SONEDE consulted closely with the ANPE and the consultants of the EIA.

The EIA Draft Report created during this Study includes scoping, impact assessments, easing measures, an environmental management plan, and monitoring based on the results of this Study, and we believe Tunisia can use this study and final considerations effectively to draft a TOR.



**Figure 8-1 Flow from start of the EIA procedure to the implementation of the project**

According to the ANPE, scoping the environment in Step 2 is insufficient, and there have been cases where the ANPE did not approve of projects over several years even though an EIA was performed in Step 5.

### **8.1.3 International Conventions and Tunisian Law Regarding the Environment**

#### **(1) Details of International Conventions and Tunisian Law**

International conventions and Tunisian laws regarding the environment are as follows. For the project to be implemented, an EIA must be performed which accounts for the items on environmental protection in these international conventions and Tunisian law.

**Table 8-3 International Conventions and Tunisian Law Regarding the Environment**

	Official Title	Common/ Abbrev. Title	Description
1	Environmental Sensitive Areas of the Management Plan for National Environmental Sensitive Regions		The Ministry of Environment has designated 38 areas in Tunisia as sensitive areas in the National Environment Management Plan
2	Wildlife Protection Areas		Ministerial ordinance instated on August 14, 2010 (Ministry of Environment). Wildlife protection areas were established in the 2010-2011 hunting season.
3	Important Bird Areas in Tunisia	ZICO	A list of 46 Important Bird Areas established by the Ministry of Environment (Zone Importante pour la Conservation des Oiseaux)
4	Ministerial ordinances that establish endangered and rare flora and fauna		TBA by the Ministry of Environment
5	Convention on Wetland of International Importance, Especially as Waterfowl Habitat	Ramsar Convention	Established to protect the ecosystem of wetlands, where waterfowl are at the top of the food chain. Enacted in 1975 with 158 contracting parties.
6	Convention on International Trade in Endangered Species of Wild Fauna and Flora	CITES Washington Convention	Established to regulate the international trade of rare wild fauna and flora. Enacted in 1975 with 172 contracting parties.
7	Barcelona Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean	Barcelona Convention	Aims to protect the marine environment, ecological equilibrium, resources, and lawful use thereof by specifying protected areas and enhancing equipment. Appropriate measures have also been put in place in order to protect and conserve important natural and cultural heritages of the ocean and coastline. Signed in 1995 as the Convention for the Protection of the Marine Environment and the Coastal Region of the Mediterranean. Enacted in 1978 with 21 contracting parties.
8	Red List by International Union for Conservation of Nature and Natural Resources	IUCN	The IUCN, created a Red List for wildlife (fauna and flora) on the verge of extinction, categorizes them according to how endangered they are. The 2001 version (Ver. 3.1) uses the following categories: Evaluated Adequate data Extinct (EX) Extinct in the Wild (EW) Threatened Critically Endangered (CR) Endangered (EN) Vulnerable (VU) Near Threatened (NT) Least Concern (LC) Data Deficient (DD) Not Evaluated (NE) *IUCN: Organization established in 1948 to conserve nature internationally. Consists of both state agencies and NGOs.
9	International Bird Area	IBA	A list by BirdLife International that establishes wildfowls and their habitats on a global scale. Endangered species are ranked by priority from categories A1-A4. *BirdLife International: A global environmental NGO



		that strives to conserve bird species. Created in June 1922 as the International Council for Bird Preservation (ICBP). It currently has a global partnership of conservation organizations which include a network of partners that strives to protect birds such as the Royal Society for the Protection of Birds, totaling up to over 2.5 million members.
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## 8.2 Current Status of Social Environment of Project Regions

### 8.2.1 Current Status of Social Conditions

#### (1) Outline of Social Condition Survey

The socio-economic study subcontracted to and performed by local consultants is outlined below.

##### 1) Purpose

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.

##### 2) Survey Regions and Residents

The target districts and sectors of this survey are shown in the table below. Survey regions were selected based on the following criteria:

- (1) Sectors on the administrative boundary line that at least border the Mejerda River or part of the El Mabtouh Wetlands
- (2) Sectors that suffered damages from floods in 2003 and/or 2009

Sector Chiefs coordinated with the leaders of agricultural extension cells (CTV) and irrigation regions to select survey households. The social condition study was conducted on residents of the Mejerda River and the El Mabtouh Wetland, with a survey sample of 294 households. Residents surveyed belonged to 18 of 47 sectors in seven districts. The districts and sectors in this study are shown in the following table.

**Table 8-4 Study Area and Division List by Reference/Sector**

Governorate	District	Sector	Mej.	Mab.	03	09
Bizerte	Utique	Utique (Zana)	•	•	•	
		Utique Nouvelle			•	
		Besbassia		•		
		El Houidh				
		El Mabtouh		•	•	•
		Ain Gehlal		•		
		Sidi Othmène		•	•	
		Bach Hamba	•	•	•	•
	Ghar El Melh	Ghar El Melh				
		Bajou				
		Ousja			•	
		Zouaouine			•	
Ariana	Sidi Thabet	Sidi Thabet	•			
		Bejaoua	•		•	•
		Mongi Slim	•			
		Cebalet Ben Ammar				
		Chorfech	•		•	•
	Kalâat el-Andalous	Kalaat	•			
		En Andalous Est	•			
		Kalaat Andalous Ouest				
		Pont de Bizerte	•		•	
		Bou Hanach				
		El Hessiane				
		Ennahli				
Manouba	Oued Ellil	Oued Ellil				
		Essaida	•		•	•
		Er Riadh				
		Cité El Ouerd				
		Ennajet				
		San Haja				
		El Kobbâa				
	Jedeida	Jedeida	•		•	•
		Jedeida Rached	•		•	•
		Chaouat	•		•	•
		El Mansoura				
		Es Zahra				
		El Habibia				
	Tebourba	Tebourba	•		•	
		El Ansarine				
		Edkhila				
		El Mellaha				
		Banlieue Tebourba				
		Er Raja				
		Ech Chouigui				
	El Bataan	El Battan	•		•	
		Borj Ettoumi				
		Mehrine				
		El Aroussia				

Note) Mej. - Sectors that border the Mejerda River

Mab. - Sectors that border the El Mabtouh Wetland

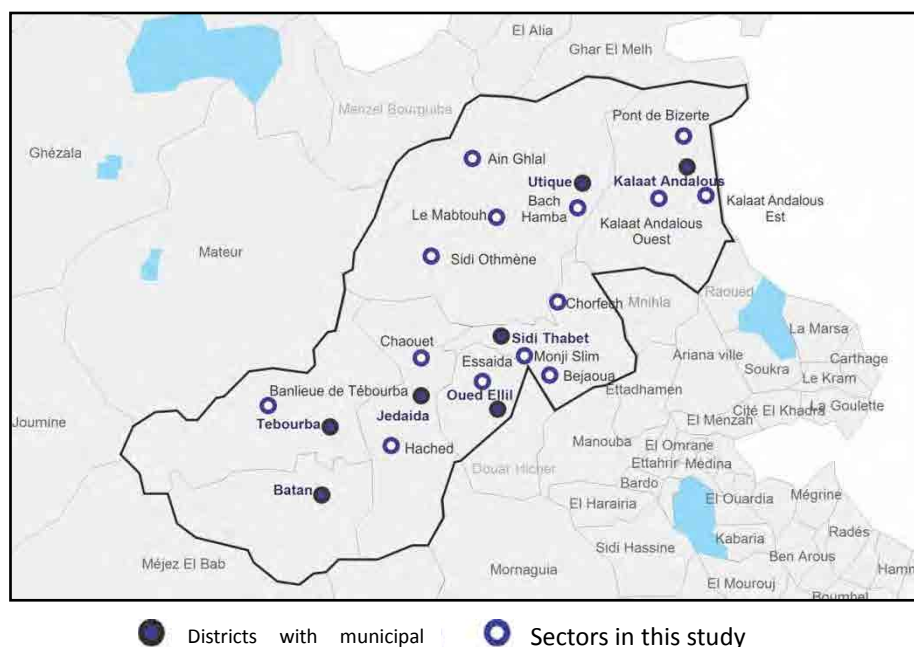
03 – Sectors affected by the 2003 floods

09 – Sectors affected by the 2009 floods

**Table 8-5 Geographical distribution of surveyed households by sector and representative percentage**

Area	Sector	Surveyed Households	Percentage of surveyed households from total in 2010 estimate census (%)
Utique	Ain Ghlal	4	0.7
	Bach Hamba	20	3.7
	El Mabtough	23	6.9
	Sidi Othmene	13	7.1
	Utique	6	1.0
Sidi Thabet	Bejaoua	20	3.2
	Chorfesh	22	3.5
	Monji Slim	8	0.8
Kalaât Andalous	Kalaât Andalous Est	8	0.6
	Kalaât Andalous Ouest	28	1.3
	Pont de Bizerte	12	2.1
Oued Ellil	Essaida	4	0.3
Jedeida	Chaouet	15	1.7
	Jedeida	23	2.2
	Jedeida-Hached	23	1.4
Tebourba	Banlieue de Tebourba	19	0.6
	Medina, Tebourba	12	1.2
El Bataan	El Bataan	34	1.7
Total		294	1.5

Source: 2004 General census of the population and habitat (RGPH 2004), National Institute of Statistics (INS)



**Figure 8-2 Location Map of Target Districts/Sectors for Socio-Economic Survey**

### 3) Survey Items

Items in the socio-economic survey are shown in the table below.

**Table 8-6 Social Condition Survey Items**

Item	Sub-Item	Item Description
(1) Evaluate Socio-Economic Conditions	1) Population/Gender	
	2) Income/Livelihood	
	3) Standard of Living	
	4) Livestock	
	5) Agriculture	
	6) Available services	
	7) Usage of local resources	
(2) Site occupation, site usage	1) Site possession	
	2) Residence	
	3) Agricultural land	
	4) Site occupation	a) Residential areas b) Grazing path areas c) State owned grazing paths in El Mabtouh Wetland
(3) Flood situation/damage	Flood damage	

#### 4) Field Survey Period

The field survey was conducted from December 10, 2010 to January 10, 2011. Before the survey, the DGBGTH held a stakeholders meeting in November 2010, where directives of the survey were given for the districts, sectors, and CRDAs.

#### 8.2.2 Social Condition Survey Results

The survey results have been tallied by district and sector for replies from survey participants and households. The results of the socio-economic survey are as shown below.

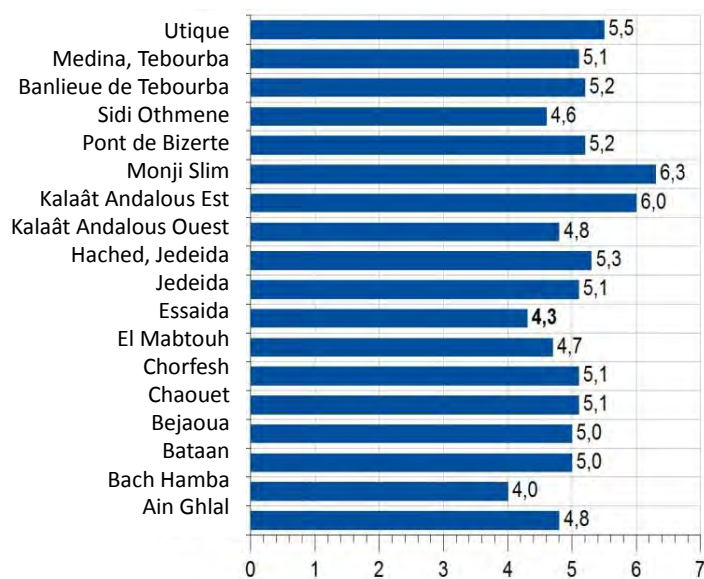
##### (1) Current Socio-Economic Conditions

##### 1) Population & Gender

##### a) Population

The survey covered the coast of the Mejerda River, home to 18,980 households and 88,118 people in 18 sectors. 55,776 people (12,170 households) from the total live in urban sectors according to the 2004 census.

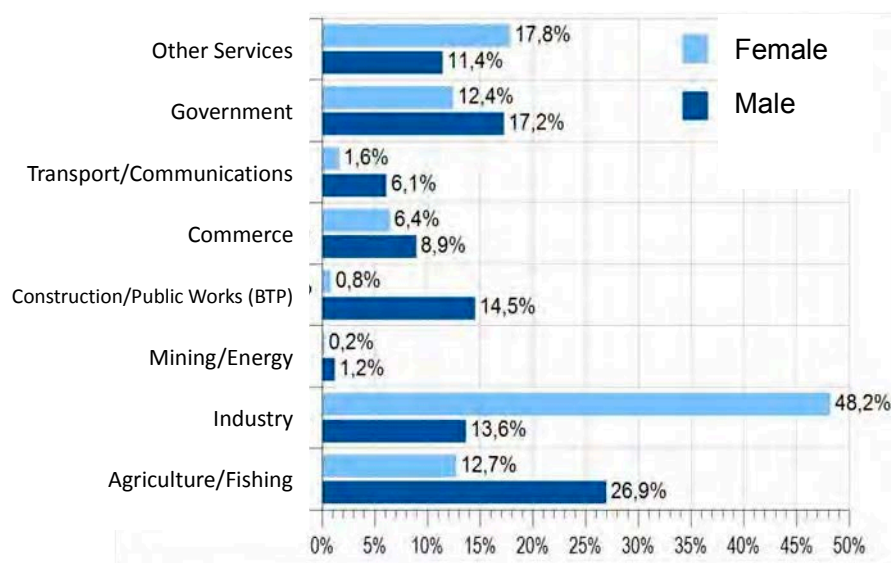
Based on the fact that the population increased an average of 1% per year between 2004–2010, we estimate the population of surveyed regions to exceed 100,000 people. The figure below shows the average household size (number of members per household) in each district based on the survey.



**Figure 8-3 Average Household Size (No. of Members) by Sector**

**b) Gender**

The figure below utilizes 2004 data from the INS and shows the industries the working population belonged to split by gender for surveyed regions.



**Figure 8-4 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**

The table below shows major sources of income by sector and the percentage (%) of working people in households. Agriculture has a high percentage as the major source of income.

The figure below compares the average income of households to the guaranteed minimum wage (SMIG, 250 TND/month) and splits up those averages into three categories per district. Approximately 37% of these districts have a monthly income equal to or under the SMIG. More than 50% of those in the Jedeida, Oued Ellil and El Bataan Districts earn the equivalent of SMIG or less.

**Table 8-7 Source of Household Income by District (percentage (%) of the working population with income)**

District	Salary	Pension	Social Aid	Family Aid	Agriculture	Day Work	Other
Utique	18.7	-	1.4	-	73.2	4.0	2.7
Sidi Thabet	11.5	1.9	1.9	-	80.8	3.9	-
Kalaât Andalous	8.1	-	-	2.1	87.7	-	2.1
Oued Ellil	50.0	-	-	-	50.0	-	-
Jedeida	37.3	1.2	1.2	1.2	43.3	15.7	-
Tebourba	16.7	-	3.3	3.3	66.7	3.3	6.7
El Bataan	37.3	2.3	-	-	53.4	4.7	2.3

	Under SMIG	SMIG Equivalent	Over SMIG
Battan	6,9%	44,8%	48,3%
Jedeida	22,6%	34,0%	43,4%
Kalaat Andalous		17,4%	82,6%
Oued Ellil		50,0%	50,0%
Sidi Thabet	14,3%	22,4%	63,3%
Tébourba	3,7%	29,6%	66,7%
Utique	3,2%	24,2%	72,6%
<b>Total</b>	<b>9,0%</b>	<b>27,6%</b>	<b>63,4%</b>

**Figure 8-5 Classification of Average Household Income by District (Surveyed Household %)**

### 3) Livestock

Approximately half of the households that were surveyed said they raised livestock. Results are shown in the table below. The average number of livestock owned by households in each sector is 35 sheep and 8.4 cows. There are many farmers in Utique that own a high number of livestock. Other districts generally had a lower average amount.

Ain Ghlal, El Mabtough, Kalaât Andalous, Utique and other districts located on the left bank between El Mabtough and the river mouth raise many sheep. Sectors that have over 50 sheep are concentrated in sectors with vast wetlands such as El Mabtough and Kalaât Andalous.

Sectors with an extremely large amount of cows include Bach Hamba and Utique. Essaida, Chorfish, and Kalaât Andalous Ouest also have a large amount of cows, and many of these household also own many sheep.

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

**Table 8-8 Number of Livestock of Households in Each Sector**

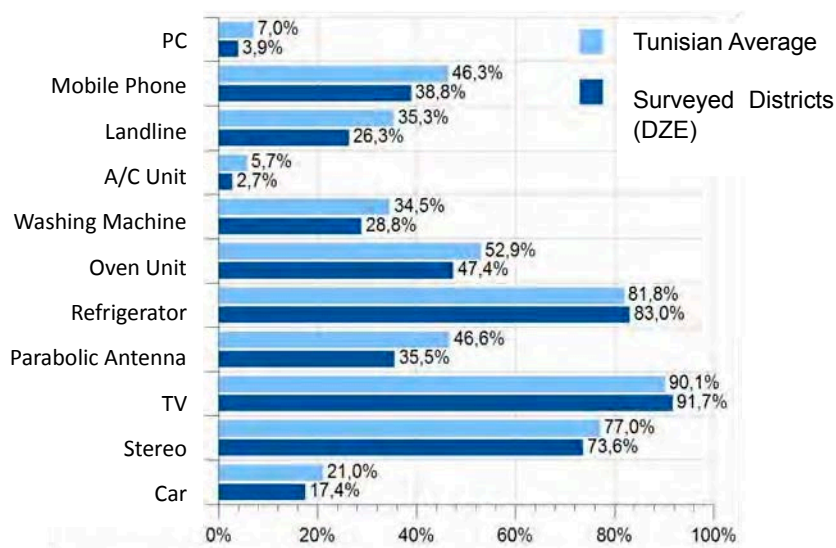
Area	Sector	Sheep			Cows		
		Min	Max	Avg	Min	Max	Avg
Utique	Ain Ghlal	250	250	250	1	10	5.5
	Bach Hamba	4	100	18.1	1	235	21.3
	El Mabtouh	2	400	104.3	1	10	4.1
	Sidi Othmene	3	50	15.7	1	12	5.3
	Utique	3	200	57.0	10	40	21.3
Sidi Thabet	Bejaoua	3	3	3.0	1	12	4.8
	Chorfesh	10	100	41.7	5	20	10.9
	Monji Slim	2	2	2.0	2	8	5.8
Kalaât Andalous	Kalaât Andalous Est	6	70	45.3	1	10	4.8
	Kalaât Andalous Ouest	1	120	29.4	2	70	10.3
	Pont de Bizerte	2	60	14.4	3	12	6.7
Oued Ellil	Essaïda	2	2	2.0	11	11	11.0
Jedeïda	Chaouet	3	40	16.3	2	6	3.8
	Jedeïda	1	15	8.7	1	6	4.0
	Jedeïda-Hached	4	15	7.0	1	1	1.0
Tebourba	Banlieue de Tebourba	6	8	7.0	1	6	3.2
	Medina, Tebourba	7	7	7.0	-	-	-
El Bataan	El Bataan	4	20	7.4	1	10	3.3
Average		1	400	35	1	235	8.4

#### 4) Agriculture

Of surveyed households that said they farmed, 70% grow vegetables and use private irrigation. Some agricultural districts, such as El Mabtouh and Sidi Othmene, cultivate produce without irrigation like trees (El Mabtouh) and grains (El Mabtouh, Sidi Othmene). Irrigation farming in this project concentrates the most on the Bach Hamba and Kalaât Andalous Ouest regions.

#### 5) Standard of Living

Indicators for the standard of living include household fittings (telephone, PC, washing machine, etc.), the supply of water, gas, and electricity, and household conveniences such as a sewerage system for urban areas and garbage collection. These indicators were used by the INS in the 2004 General Census conducted for all districts. The figure below compares 11 items in household fittings between the national average and surveyed districts in this study.



**Figure 8-6 Comparison of household fittings for surveyed districts (DZE) and the national average in 2004**

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

According to the 2004 General Census, we saw that the surveyed districts in this study have a higher rate of water and electricity supply as well as sewerage systems than the national average. The table below shows how each sector is supplied with drinking water and the availability of electricity. Areas with the least supply of electricity are Jedeida-Hached and the districts of Utique. Approximately 50% of drinking water is supplied by SONEDE while the remaining half gets their water mainly from local water management associations who are also in charge of the water supply from irrigation channels.

**Table 8-9 Supply Methods of Drinking Water and Availability of Electricity (%) in Each District and Sector**

District	Sector	Supply Method of Drinking Water			Avail. of Electricity (%)
		SONEDE	Well	Other Water Resource	
Utique	Ain Ghlal	25	0	75	50.0
	Bach Hamba	81	0	19	90.5
	El Mabtouh	50	0	50	60.9
	Sidi Othmene	0	0	100	84.6
	Utique	0	0	100	16.7
Sidi Thabet	Bejaoua	95	0	5	95.0
	Chorfesh	36	5	59	50.0
	Monji Slim	13	0	87	37.5
Kalaât Andalous	Kalaât Andalous Est	0	0	100	-
	Kalaât Andalous Ouest	0	0	100	-
	Pont de Bizerte	83	0	17	66.7
Oued Ellil	Essaida	-	-	-	-
Jedeida	Chaouet	-	-	-	-
	Jedeida	92	0	8	48.0
	Jedeida-Hached	80	0	20	16.7



Tebourba	Banlieue de Tebourba	21	11	68	78.9
	Medina, Tebourba	-	-	-	-
El Bataan	El Bataan	92	0	8	73.5
Average		49.1	1.4	49.5	48

## 6) Availability of Transportation Services

The major findings from this study are as follows.

- (1) Most survey participants in Sidi Thabet and Kalaât Andalous feel they have a difficult time accessing the main road and utilizing schools and medical services. Many survey participants in Jedeida also responded they had trouble utilizing either schools (73.4%) or medical services (76.6%).
- (2) Participants in the three districts mentioned above mentioned problems commuting to work.
- (3) Sectors where it is critically difficult to commute to work are Monji Slim, Kalaât Andalous Est and Ouest, Chaouet, as well as Bejaoua and Chorfresh.
- (4) Very few use cars, so walking is the main method of transportation for commuting to work and receiving services.
- (5) The majority (98% of participants) said it was not necessary to cross the Mejerda River to commute to work and receive services.

## 7) Use of Local Resources

The largest natural resource the local community utilizes is river water from the Mejerda River. Many people privately pump the water to use for irrigation. In particular, the Kalaât Andalous, Sidi Thabet, Tebourba, and El Bataan Districts use the Mejerda River as their main water source for private irrigation water. Irrigation water can be privately pumped from the Mejerda River by placing a small pump directly into the river terrace or setting up a small pump shack and installing a small pump inside. Either option only requires the installation of a simple pump and does not require a large scale facility. In addition, most residents along the Mejerda River do not collect wood, fish, or hunt.

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

#### 1) Ownership of Land

We confirmed the following options with regard to the ownership of land on the coast of the Mejerda River.

- (1) Ownership of land with a certificate of rights
- (2) Ownership of land without a certificate of rights
- (3) Occupation
- (4) Renting
- (5) Other

Of the 209 households that answered our question, 37.8% owned land with a certificate of rights while 14.8% owned land without a certificate of rights.

The table below shows the number of households in each district and the manner of land ownership as

classified from (1) to (5). Jedeida and Bejaoua have a particularly high number of land owners who do not have a certificate of rights. An extremely high number of households in each sector in Kalaât Andalous Est and Ouest, El Mabtough, Bach Hamba, and El Bataan held occupational rights.

In addition, 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.

**Table 8-10 Land Ownership of Agricultural Land in Sectors along the Mejerda River (Survey Participant Households)**

Area	Sector	(1) Propr. aTF	(2) Propr. sTF	(3) Occ.	(4) Loc.	(5) Other	Total
Utique	Ain Ghlal	2	1	1	0	0	4
	Bach Hamba	9	0	10	2	0	21
	El Mabtough	2	1	8	0	0	11
	Sidi Othmene	7	1	0	0	1	9
	Utique	4		1		1	6
Sidi Thabet	Bejaoua	3	7	1	2	0	13
	Chorfesh	13	2	2	5	0	22
	Monji Slim	2	1	2	0	0	5
Kalaât Andalous	Kalaât Andalous Est	1	0	7	0	0	8
	Kalaât Andalous Ouest	3	0	15	8	0	26
	Pont de Bizerte	9		0	2	0	11
Oued Ellil	Essaïda	2	0	0	0	0	2
Jedeida	Chaouet	9	2	1	0	0	12
	Jedeida	1	5	2	1	0	9
	Jedeida-Hached	2	0	2	2	0	6
Tebourba	Banlieue de Tebourba	5	5	7	1	0	18
	Medina, Tebourba	3	1	1	0	0	5
El Bataan	El Bataan	2	5	10	4	0	21
Total		79	31	70	27	2	209

- ① Propr. aTF : Land owners with a certificate of rights
- ② Propr. sTF : Land owners without a certificate of rights
- ③ Occ. : Occupiers/Land possessors
- ④ Loc. : Renters

## 2) Residence

81% of households own homes, and the disparity between the average of sectors is big (see figure below). The rate of home ownership is low in El Mabtough (52%) and Kalaât Andalous Ouest (50%).

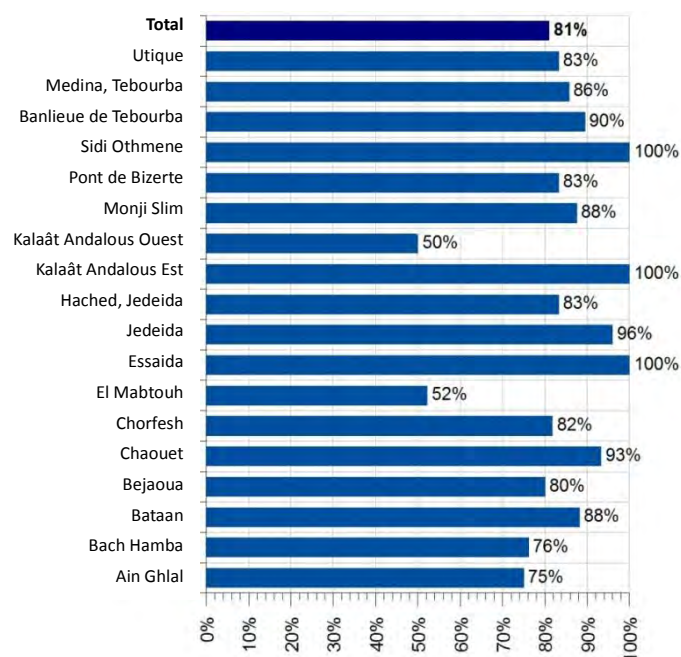


Figure 8-7 Rate of Home Owning Households (% by Sector)

### 3) Agricultural Land

The table below shows respondent households by sector who said they farmed in flood plains and near the Mejerda River. These numbers indicate that some parts of Utique, Kalaât Andalous, Jedeida, and other sectors particularly have agricultural land in the flood plains of the Mejerda River.

Table 8-11 Households that farm in the flood plains of the Mejerda River or nearby areas

District	Sector	Respondent Households	Agriculture near the Mejerda River	Agriculture in Flood Plain
Utique	Ain Ghlal	4	0	0
	Bach Hamba	19	19	10
	El Mabtouh	12	1	1
	Sidi Othmene	12	0	0
	Utique	6	4	1
Sidi Thabet	Bejaoua	12	12	4
	Chorfesh	22	21	9
	Monji Slim	4	4	1
Kalaât Andalous	Kalaât Andalous Est	8	8	2
	Kalaât Andalous Ouest	27	27	16
	Pont de Bizerte	11	11	2
Oued Ellil	Essaida	2	2	0
Jedeida	Chaouet	12	12	0
	Jedeida	9	4	5
	Jedeida-Hached	5	5	0
Tebourba	Banlieue de Tebourba	18	17	3
	Medina, Tebourba	5	5	0
El Bataan	El Bataan	21	21	2
Total				

### 4) Site Possession

### a) Residential Area

The distance between the river and residences is at least 10 to 20 meters for most sectors, but it was two meters in the Jedeida sector. Of a total 25 households, 14 had homes within 60 meters of the river bed in the Jedeida sector. The figures were 10 out of 23 households in the Jedeida-Hached sector, and 6 out of 15 households in Chaouet. Other sectors had a lower percentage than the aforementioned numbers. The table below shows the distribution of residences located within 150 meters of the river bed.

**Table 8-12 Distribution of Residences (Number of Households) Located within 150 meters of the River Bed**

District	Sector	Households with Residences within 150m of River Bed (Classified by distance)				Total Households who replied
		< 10	10-19	20-59	60-149	
Utique	Ain Ghlal	-	-	-	-	3
	Bach Hamba	-	1	2	1	21
	El Mabtouh	-	-	-	-	18
	Sidi Othmene	-	-	-	-	12
	Utique	-	-	-	-	5
Sidi Thabet	Bejaoua	-	-	1	4	20
	Chorfesh	-	3	-	4	22
	Monji Slim	-	-	1	3	8
Kalaât Andalous	Kalaât Andalous Est	-	-	2	-	8
	Kalaât Andalous Ouest	-	1	4	4	27
	Pont de Bizerte	-	-	1	2	11
Oued Ellil	Essaida	-	-	-	-	4
Jedeida	Chaouet	-	-	6	6	15
	Jedeida	2	1	11	5	25
	Jedeida-Hached	-	-	8	9	23
Tebourba	Banlieue de Tebourba	-	-	1	2	18
	Medina, Tebourba	-	-	1	-	14
El Bataan	El Bataan	-	-	4	6	33
Total		2	6	42	46	287

(-): No applicable households

### b) Grazing Regions

Approximately 75% of households that answered questions about stock farming said they use grazing regions near the Mejerda River while the remaining 25% replied they used the El Mabtouh Wetland or other places.

The Mejerda River is the major grazing region for all sectors besides El Mabtouh, Sidi Othmene, and Ain Ghlal. The El Mabtouh Wetland is the major grazing region for surveyed households in both the El Mabtouh and Sidi Othmene sectors and is used as a secondary grazing region for households in Ain Ghlal and Utique.

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

The state-owned El Mabtouh Wetland grazing region has an area of 3,365 hectares. Management of grazing regions was officially transferred from the Department of Livestock to the Directorate General of Forests (DGF) due to the change in administration on March 4, 2004. However, the DGF did not actually start

managing grazing regions until 2008. The DGF enforced the grazing region management project from 2009 to 2010, but did not enforce it from 2010 to 2011 because of the unstable state of affairs in Tunisia due to the Jasmine Revolution. The Office of Livestock and Pastures (OEP) currently manages them.

The figure below shows the official map of the state owned El Mabtouh Wetland grazing region. They are currently addressing the issue of unlawful occupation in the southern and northeastern regions and are in the final stages of deciding the grazing region.

From 2009 to 2010, 54 nomadic pastoralist shepherds moved a flock of sheep and used this grazing region. The grazing region is also used by 152 shepherds who are permanently settled nearby (see picture below). The number of corresponding sheep for nomadic pastoralists was 15,880 sheep, and the permanent settlers had a flock of approximately 10,000 sheep. The grazing season is from February to April. Other government land besides grazing regions fall under forest precincts<sup>1</sup> managed by the Department of Forestry. Most of the nomadic pastoralists in the forest precincts of El Mabtouh are originally from the Sidi Bouzid and Kairouan Governorates. Grazing fees for forest precincts cost 0.2 TND per livestock per month. However, grazing fees for forest precincts have never been paid by the people who used the grazing region.

Mobile pastoralism has always been conducted in the El Mabtouh Wetland. In the 1980s, it was conducted in wetlands without feed production and grazing issues, and the El Mabtouh Wetland became an important grazing region for nomadic pastoralists in Tunisia. The stagnation of water from floods in either January or February never lasted more than one month a year because the sewerage system was well managed at the time.

However, feed production has been decreasing every year mainly because the operations of the agricultural cooperative have gotten worse, causing perpetual overgrazing, and leading to the decrease of sheep's fescue, a plant used as feed. According to the Office of Livestock and Pastures (OEP), another reason for the deterioration of grazing is due to the construction of the Tunis–Bizerte motorway. Embankment in the motorway construction blocked flood water from draining, causing water to stagnate in wetlands over a long period of time during the rainy season. Saline buildup on the road also negatively influences the growth of feed.

According to the Office of Livestock and Pastures (OEP), the condition of the grazing land in El Mabtouh Wetland is extremely bad and cannot even be considered a grazing region. The forest precincts are in a similar situation, and the outlook for feed production at the current stage is not good.

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<sup>1</sup>Forest management structure for each CRDA



**Figure 8-8 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



**Figure 8-9 Grazing Conditions of State-Owned El Mabtouh Wetland (November 2010)**

### (3) Flood Damage

Of the 292 households that answered questions about the location of residences relative to the Mejerda River, 206 households, or approximately 70%, said they lived in areas where flooding may occur. Approximately 66% of respondents experienced the 1973 flood, and 98% said they experienced the floods in 2003, 2004, and 2009.

The majority of respondents (approx. 86%) said that the 2003 flood caused the most damage. When residents talk about floods, they always compare damage to the 2003 flood. Responses regarding the 2003 flood are as follows:

- 1) Submerged houses due to the 2003 flood

The percentage of submerged houses in each district: Jedeida (89%), El Bataan (88%), Tebourba (76%), Oued Ellil (75%).

- 2) Submerged depth and time due to the 2003 flood

The submerged depth was the highest in each sector of Banlieue de Tebourba, Utique, Jedeida, El Bataan, and Chaouet at the peak of the flood, and the average flood time was longest in the Utique, Jedeida, and Chaouet Sectors.

**Table 8-13 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%

According to the table below, the Bach Hamba, El Mabtouh, Bejaoua, Chorfesh, Kalaât Andalous Ouest, Jedeida, Jedeida-Hached, Tebourba, and El Bataan Sectors had many flooded regions.

The average amount in damages of surveyed households exceeded 10,000 TND/household. The average in damages for the seven districts of Bach Hamba, El Bataan, Chaouet, Chorfesh, El Mabtouh, Kalaât Andalous Ouest, and Utique is even higher. Of surveyed households, 96 households, or over one third, received reparation from this department. 79% of reparations came in the form of financial aid while 31% was distributed through goods and items.

**Table 8-14 Distribution of Residences (Households) in Flooded & Serviced Regions by Sector**

District	Sector	Flooded Regions	Serviced Region		Total No. of Households
			Public Water Area	Backland	
Utique	Ain Ghlal	0	0	0	4
	Bach Hamba	16	0	0	21
	El Mabtouh	19	0	4	23
	Sidi Othmene	0	0	0	13
	Utique	5	0	0	6
Sidi Thabet	Bejaoua	16	1	1	20
	Chorfesh	22	0	0	22
	Monji Slim	4	1	1	8
Kalaât Andalous	Kalaât Andalous Est	8	0	0	8
	Kalaât Andalous Ouest	24	2	0	26
	Pont de Bizerte	2	1	0	11
Oued Ellil	Essaida	4	0	0	4
Jedeida	Chaouet	5	0	9	14
	Jedeida	12	1	11	24
	Jedeida-Hached	16	0	7	23
Tebourba	Banlieue de Tebourba	17	0	0	19
	Medina, Tebourba	13	0	1	14
El Bataan	El Bataan	23	1	2	32
Total		206	7	36	292

**Table 8-15 Estimate in Damages and Number of Households that Received Aid from 2003 Flood**

District	Sector	Damage Estimate (TND/Household)			Households that Received Aid
		Min	Max	Avg	
Utique	Ain Ghlal	500	1,500	1,000	0
	Bach Hamba	400	150,000	25,386	2
	El Mabtouh	800	210,000	17,000	11
	Sidi Othmene	1,200	12,500	3746	0
	Utique	2,000	60,000	14,500	3
Sidi Thabet	Bejaoua	1,000	80,000	8,700	1
	Chorfesh	500	80,000	11,068	0
	Monji Slim	500	500	83	0
Kalaât Andalous	Kalaât Andalous Est	4,000	10,000	7,214	1
	Kalaât Andalous Ouest	1,000	60,000	10,844	1
	Pont de Bizerte	2,000	20,000	4,250	0
Oued Ellil	Essaida	1,000	10,000	3,667	1
Jedeida	Chaouet	200	100,000	13,938	7
	Jedeida	2,000	40,000	7,563	13
	Jedeida-Hached	1,500	22,000	5,652	19
Tebourba	Banlieue de Tebourba	800	20,000	8,000	14
	Medina, Tebourba	1,000	35,000	4,536	6



District	Sector	Damage Estimate (TND/Household)			Households that Received Aid
		Min	Max	Avg	
El Bataan	El Bataan	1,000	150,000	12,015	17
Minimum Damage Estimate		200			Households that received aid: 96 total
Maximum Damage Estimate			210,000		
Average Damage Estimate				10,014	

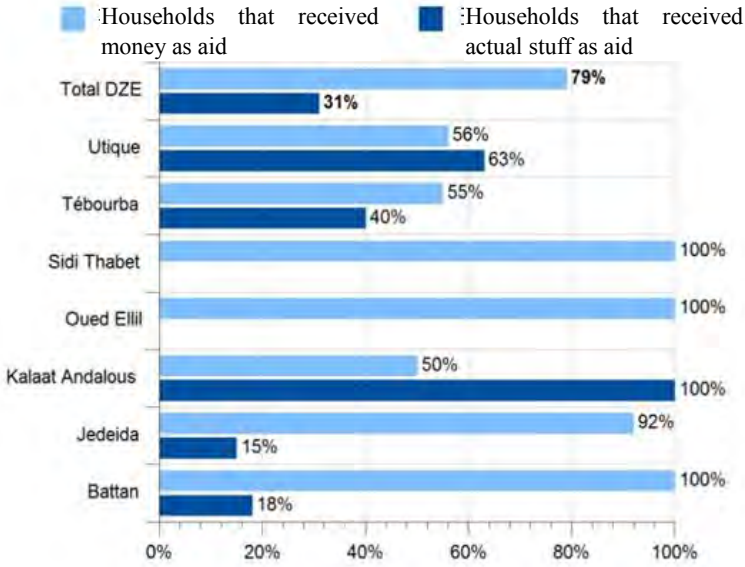


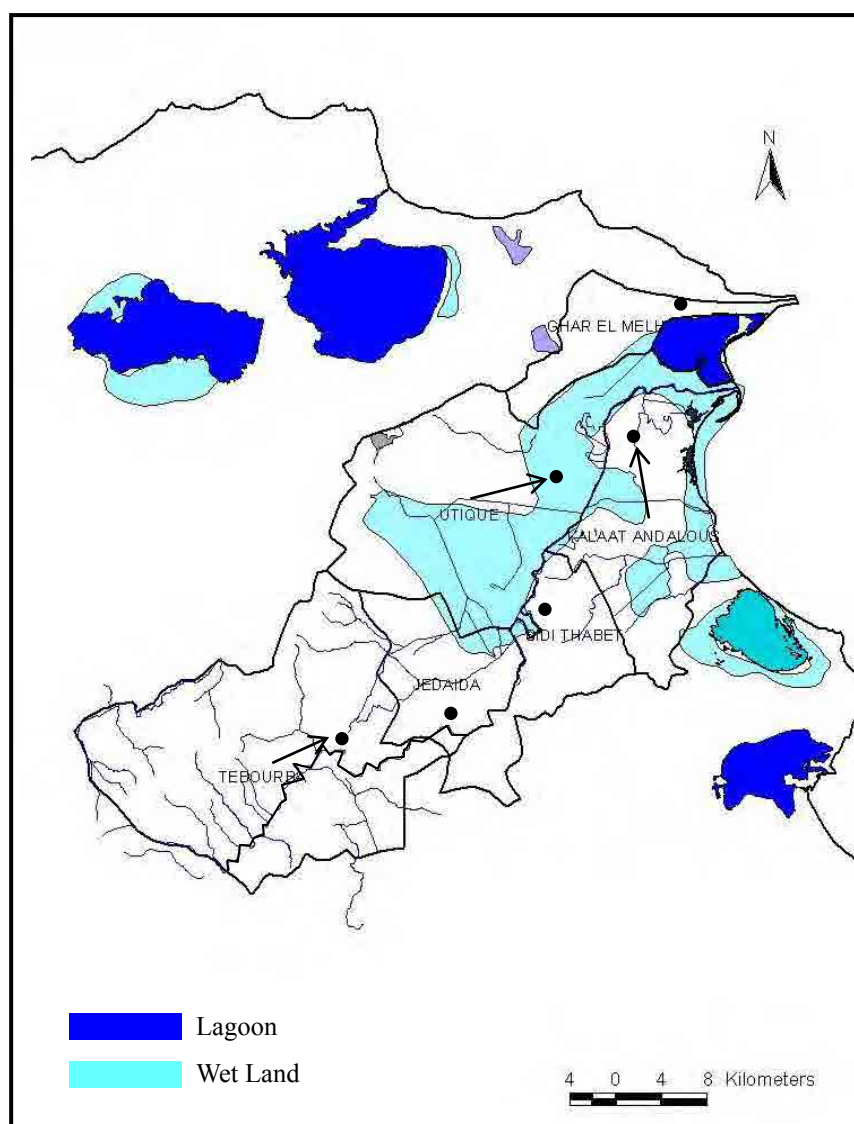
Figure 8-10 Distribution of Aid for Households that Suffered Damages in 2003 Flood

8.2.3 Environment Conditions

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

1) Overview

The wetland in Zone D2 can be generally classified into two major areas: the El Mabtouh Wetlands and the Ghar El Melh Lagoon - Mejerda River delta, which includes Goulette and Kalâat el-Andalous.



**Figure 8-11 Location of Wetlands near the Mejerda River**

Source: APAL (Coastal Protection and Planning Agency) —Coastal Observatory

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

The Ghar El Melh Lagoon and Mejerda River Delta have the following characteristics:

- (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).
- (3) Kalaât Andalous Wetland (Ariana Governorate) and the river basin between Ghar El Melh Lake - El Mabtough Wetland was registered as a wildlife protection area in 2010-2011.

The registered areas of the Ghar El Melh Lagoon and Mejerda River delta under the Ramsar Convention are shown in the figure below. 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

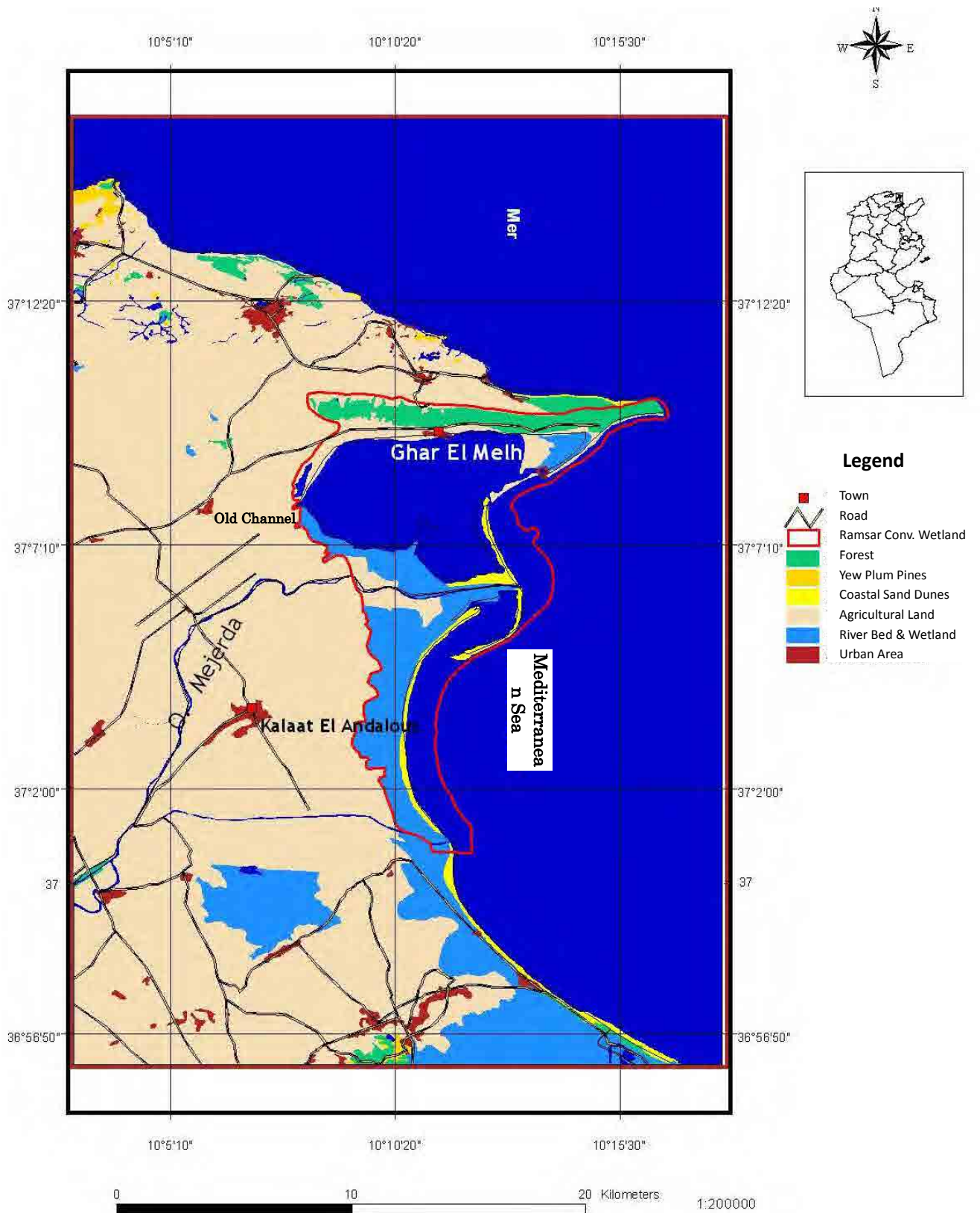
project.

The Ghar El Melh Lagoon and the Mejerda River delta district have an area of 10,373 hectares, with 7,057 hectares in the Bizerte Governorate and 3,316 hectares in the Ariana Governorate. The following factors are the standards for designating a wetland under the Ramsar Convention:

- (1) The body is a typical delta of the southern Mediterranean Sea and wetland. (Standard 1)
- (2) There is great number of fishes in the final stage of the life cycle (13 of 45 inhabitant species permanently settled in the lagoon), and is a habitat for wildfowls (Standard 4)
- (3) In the nest building season, the population of collared pratincole crosses the 1% mark. (Standard 6)
- (4) During the winter season, it becomes a source of food for migratory fish. (Standard 8)

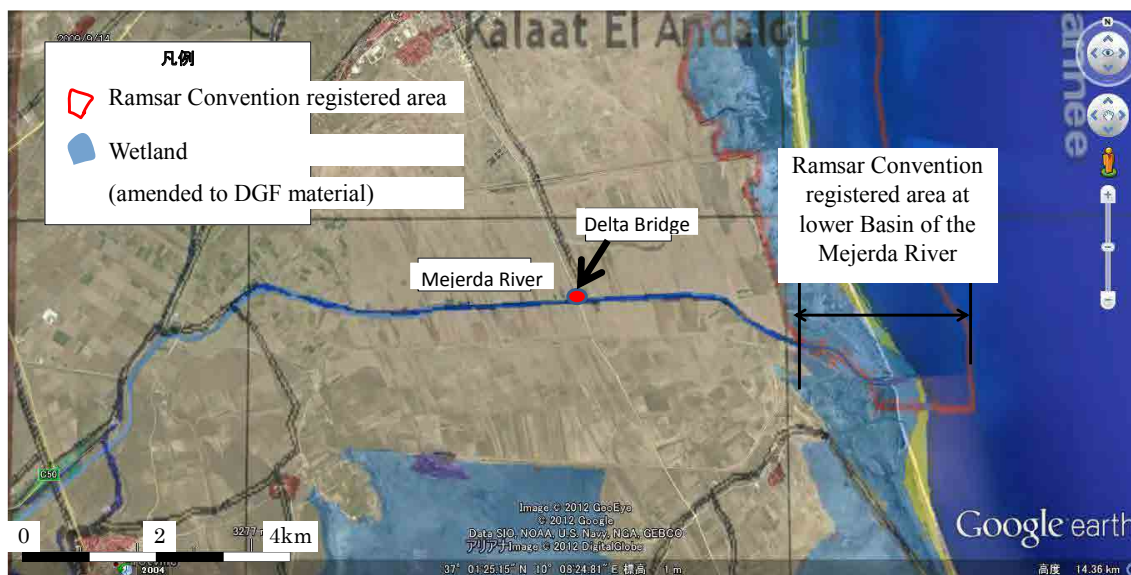
The southern part of the wetland registered under the Ramsar Convention is made of up flood plains and a saline lake, and plant life includes halophilous plants such as plant species glasswort and Parish's glasswort (*Arthrocnemum*). The same region becomes a wetland in the winter. The fields of halophilous plants become the nesting grounds for collared pratincoles. However, this region is not included as an Important Bird Area (ZICO).

This region is designated under the Ramsar Convention and as an Environmental Sensitive Area in the Management Plan of Environmental Sensitive Areas in Tunisia.



Source: DGF

**Figure 8-12 Registered Area of the Ghar El Melh Lagoon & Mejerda River Delta under the Ramsar Convention**



(Source: Partially revised from DGF data)

**Figure 8-13 Lower Basin of the Mejerda River registered in the Ramsar Convention**



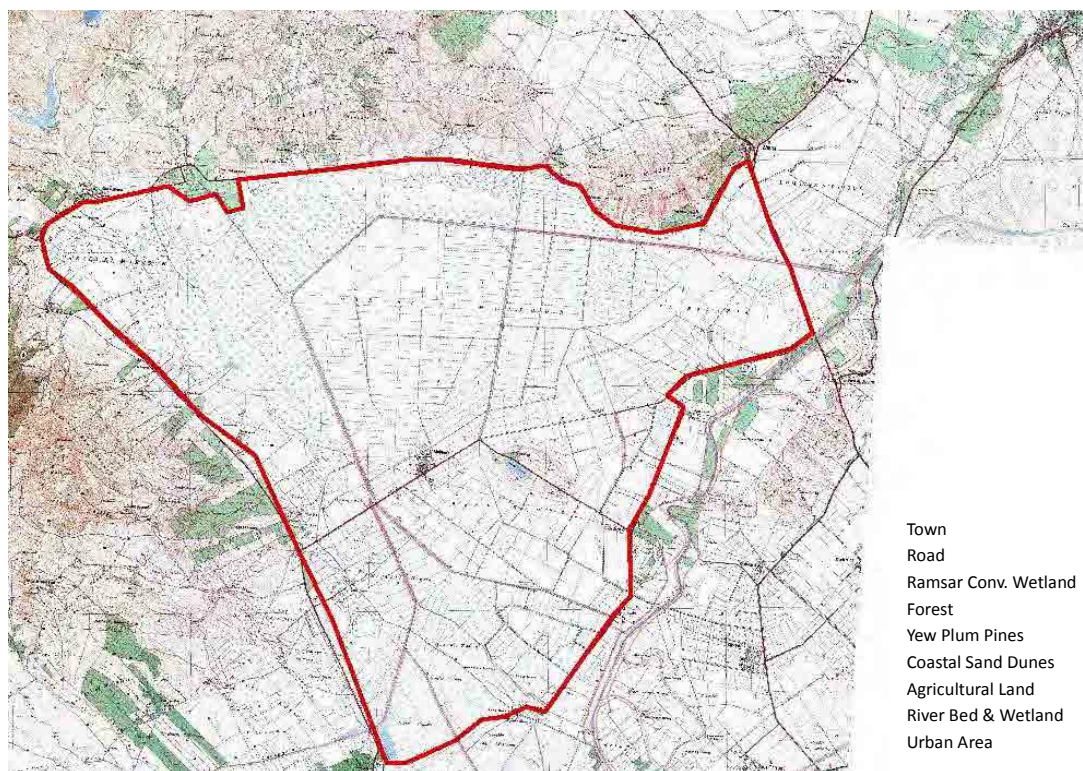
**Figure 8-14: Project Implementation Area**

**Registered Areas in the Ramsar Convention: El Mabtouh Wetland & Lower Basin of Mejerda River**

### 3) El Mabtouh Wetland

El Mabtouh Wetland is included in Tunisia's list of 46 Important Bird Areas (ZICO) (Code No. TN005). This wetland is where frail wildfowl species like the collared pratincole (*Glareola pratincola*) and shoveler (*Anas clypeata*) gather together periodically, and this designated colony corresponds to an Important Bird Area under the A4i standard. The A4i standard says that if the waterfowl population forms a colony of at

least 1% in the same season or if 5% of the population inhabits a region for an entire season, it is an IBA. Other wildfowls hibernate in the El Mabtouh Wetland during rainy winters. We can see that the wildfowl population in this wetland resembles the population at Ichkeul Lake located north. The El Mabtouh Wetland also became a wildlife protection area in the 2010-2011 seasons due to a government ordinance regarding hunting.



Source: Bizerte Forest Precinct

**Figure 8-15 Boundary Map of El Mabtouh Wetland**



**Figure 8-16 Scenery of the North Side of the El Mabtouh Wetland (left: May 2011, right: November 2010)**

## (2) Animals

### 1) Wildfowls

The table below organizes the biological significance of the wetlands in the target region, especially wildfowls in the Mejerda River delta and the El Mabtough Wetland based on the Washington Convention, IBA, IUCN Red List, ordinances about hunting, and ordinances that list endangered and rare species. 11 of the 18 species shown in the table are AAO ("Friends of Birds", NGO), and the remaining seven species are designated by the Bizerte Forest Precinct.

**Table 8-16 Wildfowls that Inhabit Assessed Regions and Biological Significance**

Scientific Name	Common Name	(1)CITES (Washingt on Conventio n)	(2) IBA (Importa nt Bird Area)	(3) IUCN	Tunisia	
					(4) Hunting Ordinance s	(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

The table below shows the native species that have biological significance based on the Washington Convention, Barcelona Convention, IUCN, and ordinance that designates endangered and rare fauna and flora.

Fairly old biological data for fish species in the lower basin of the delta is the only data that exists for fish species in the Mejerda River. Principal information came from interviews with the INAT (National

Institute of Agronomy of Tunisia), INSTM (National Institute of Sciences and Technologies of the Sea), and DGPA (Directorate General for Agricultural Production).

The most endangered fish species in the Mejerda River is the European eel (*Anguilla anguilla*). The Mejerda River is an important habitat for the life cycle of the European eel. This eel is also covered by Annex II of the Washington Convention as an endangered fish species. It is also classified as a critically endangered species in the IUCN classification system (Category CR). The DGPA set a goal in 2010 to promote the export of eels to Europe, and established an internal document labeled the Tunisian Eel Management Plan in November 2010. The European Commission has not approved of import from Tunisia since 2011. The seasonal migration of Japanese eel from the sea to the river upstream generally occurs between October and January.

The *Aphanius fasciatus* (Mediterranean killifish) has no value as a commercial product, but its habitat is a protected area in the Mediterranean in the Barcelona Convention and a protected area in the protocol (Annex II) regarding biological diversity. It is an important fish species for the biodiversity of the Mejerda River.

Pseudophoxinus fish of the Cyprinidae family and barbels are endemic species to the northeastern part of Maglev region and northern African region. *Pseudophoxinus callensis* is thought to be an endemic species that inhabits the small tributary upstream in the Mejerda River.

Other fish species introduced to the Mejerda River because of their commercial value are carp, roach, minnow, yellowfish, percidae, and catfish. These fish species can mostly be found in the reservoir located upstream. The mosquitofish (*Gambusia affinis holbrookii*) was introduced to exterminate wigglers, and has acclimated to Tunisian rivers.

In addition, 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.

**Table 8-17 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) Mammals

The only confirmed mammal is the wild boar, but it does not fall under any protection measures. The



Mejerda River is not considered a good hunting spot by hunters, but boars are hunted on some occasions by the authorities to prevent damage to crops.

The scientific observation of otters in the lower basin of the Mejerda River goes back to 1983 (survey site of McDonald and Masson). According to the DGF (Directorate General of Forests), these animal species do not inhabit the region. According to the Preparatory Study of Tunisia's Wetlands (conducted in 1996 by the University of London for the DGF), plants that grow at the waterfront of the Mejerda River are provide refuge for the otters (*Lutra lutra linnaeus*). At the time, plants that grew at the waterfront composed mainly of nerium (*Nerium oleander*), willow (*Salix sp.*), cattail (*Thypha sp.*) and reed (*Phragmites communis*).

#### 4) Other Animal Species

Amphibians, mollusks, and invertebrates were not covered in the study. However, mussels must be covered in the EIA according to the INSTM.

#### 5) Plant Species

In the flood plain of the Mejerda River, there is a dense population of tamarisk, also known as farash (*Tamarix articulata*; see figure below), which is a natural species to central Tunisia, thought to be introduced as a result of tree-planting to affix the riverbank. The tamarisk is a shrub to medium-tall tree with a height of two to 10 meters. Along the Mejerda River, they branch magnificently to become medium-height trees. The tamarisk germinates from its seeds, roots, and branches, allowing it to multiply quickly.

According to Article 3 in the Forest Act, a forest is defined as naturally or artificially grown plants constituted of one or more tree or shrub species or uniform/mixed woodland. The trees along the Mejerda River are legally a forest according to this definition. This forest is not a national forest, but is a public water territory. However, the rights to the lumbering of tamarisks and the transport or use of any produce from cultivating new land belong to the DGF as they fall under forest products according to the Forest Act.



**Figure 8-18 Tamarisks (Farash) in the flood plains of the Mejerda River**

#### **(4) Soil Pollution and Illegal Solid Waste**

##### **1) Sand Production**

ONAS (national sanitation utility of Tunisia) and ANGED (National Waste Management Agency) do not have any information about pollution from hazardous materials like industrial waste deposited in the lower Mejerda River and therefore do not recognize a specified pollutant source along the river. 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.

The INSTM is engaged in research on ocean sediment pollution from old metal ore deposits with a focus on researching suspended solids in the Mejerda River and the existence of heavy metals carried to the riverbank by the Mejerda River. Pollutants covered in the study include lead, zinc, arsenic, and cadmium. According to the results of this study, the coastal zones near the delta show a higher concentration of lead and zinc than other parts of the Mediterranean. This project will not involve or repair any bridges further downstream than Kalaât Andalous, so the possibility of working in dense metal zones is low.

##### **2) Illegal Solid Waste Grounds**

The state of illegal solid waste is as follows.

a) **Illegal dumping of industrial solid waste and municipal solid waste into the river or waterways**

ANGED says there has never been a problem with illegal dumping along the Mejerda River in the past nor the present. However, the possibility of the illegal dumping of industrial solid waste and municipal solid waste exists for the river and waterways in the region of this Project. Therefore, appropriate measures need to be taken if illegal solid waste dumping is discovered while the project constructs a cross-section of the river channel and works on embankment.

b) **Disposal of animal skins in the El Mabtouh Wetland**

Animal skins are being illegally disposed in the El Mabtouh Wetland. According to an interview with the AGED, that solid waste is brought in from the industrial area of Utique. This solid waste must be properly disposed of as hazardous waste in the construction process according to Category 0602 in the list of hazardous waste in Decree No. 2000-2339 enacted on October 10, 2000. The location of illegal dumping as captured in 2011 is shown in the figure below.

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



**Figure 8-18 Illegal Industrial Waste Dumping Grounds in the El Mabtouh Wetland within the Project Site**

c) Other

Unauthorized dumping of other waste such as personal waste is also a problem along the roads, river, and water channels. However, the amount of waste disposed is small.

### 8.3 Environmental Impact of the Project

#### 8.3.1 Verification of the Contingency Plan

##### (1) Zero Option

The contingency plan for this project in the case that this project does not proceed (zero option) will be discussed here. If this project does not take place, the region will be subject to damage caused by floods as is the case now. Floods will continue to damage resident properties, including buildings and farmland, and along with floods, domestic waste water will remain in the region and unsanitary conditions will occur. Furthermore, as urbanization grows in the lower basin of the Mejerda River, injuries to residents and damage to property caused by 10th-year floods.

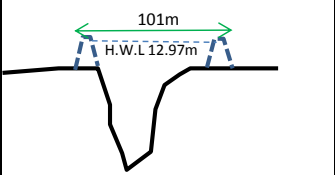
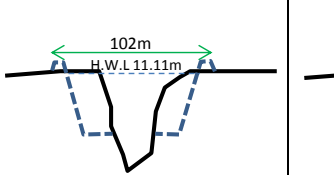
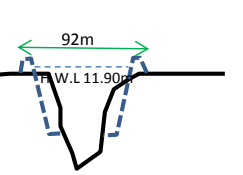
The negative impacts caused by this project discussed in the previous section can be mitigated mainly by environmental management planning during construction. Therefore, the positive effects of this project will outweigh the negative impacts.

##### (2) Verification of Alternative Plans

Three plans of the cross-section of river channels shown in the table below were examined for selecting the river channel plan of the Project.

Although all plans have minimum impacts on natural environment, they require resettlement of residents and land acquisition. In consideration of impacts on historical structures, plan ② (excavation + expansion) was chosen as most appropriate.

Table 8-18 Verification of Alternative Plans

Types of Alternative Plans	Comparison of River Channels		
	② Embankment Plan	③ Excavation Plan (excavation + expansion)	④ 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 and H.W.L	② Compared with the excavation plan, H.W.L is 2.4 meters higher on average, and the embankment height becomes higher accordingly.	H.W.L is around the surrounding ground level and embankment of allowance height becomes necessary.	Embankment height and H.W.L can be lower than ① thanks to the effect of excavation of river channel.
Land Use	Residential land and farmland	Residential land and ,	Residential land and

<b>Environmental Social Considerations</b>	<b>Impact on natural environment</b>	It may have minimum impact.	farmland It may have minimum impact. The excavation and expansion is carried out in flood channels.	farmland 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 TOR for Scoping, Environmental and Social Considerations

#### (1) Scoping Results

Clarify environmental and social issues to be considered through scoping as well as items that should be taken into account and survey methods for the EIA.

The chart below shows the scoping results for the environment and social impacts. Scoping was conducted as per JICA guidelines.

**Table 8-19 Scoping Results for Environmental and Social Considerations**

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
<b>Physical Environment and Pollution</b>			
Air Pollution/Dust	B-	D	<p>Before and During Construction:                      Chapter 8: There is a possibility that trucks and heavy machinery may produce air pollution and dust during construction. However, this can be prevented by performing such actions as selecting suitable traffic routes, regular maintenance of heavy machinery, and watering while excavating.</p> <p>After Construction:                      There is no possibility of negative impacts to the surrounding atmosphere.</p>
Water Pollution	B-	D	<p>Before and During Construction:                      Chapter 9: Although there is the possibility of water pollution from engine oil leaked from heavy machinery, this impact is extremely small. As excavation work will only be conducted in flood channels and will not be done in water, there should be no turbidity degradation.</p> <p>After Construction:                      There is no possibility of negative impacts to water quality.</p>
Ground Pollution	B-	D	<p>Before and During Construction:                      Chapter 10: Although there is the possibility of ground pollution from engine oil leaked from heavy machinery and dump trucks, impact should be minor. This risk can be reduced by enforcing inspections of construction machinery. When excavating in flood channels, contaminated sediment may also be accidentally excavated. If this occurs, the contaminated sediment will be dealt with in the appropriate manner.</p> <p>The excavation and expansion of the Mejerda River is planned to be carried out for sand and soil used as farmland and residential land accumulated along the river and thus there is little possibility of containing harmful substances. Thus, there is very little possibility of ground pollution in the target area. It can be used for embankment as it does not contain harmful substances.</p> <p>After Construction:                      There is no possibility of negative impacts to the soil.</p>
Solid Waste	B-	D	<p>Before and During Construction:                      This project will generate a large amount of solid waste from excavated earth, and removed</p>

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
			<p>and cleared tamarisk forests. This waste needs to be taken care of appropriately from an environmental impact standpoint. Furthermore, solid waste from non-approved animal skin disposal sites near the El Mabtouh wetlands impacts the Mejerda River. It is necessary to clarify the scope of disposal sites (scope of solid waste which can be disposed of) and take dangerous materials/waste to appropriate disposal sites when within the excavation scope in order to avoid impacting the retarding basin and Mejerda River.</p> <p>As described in "Ground Pollution," there is very little possibility of the soil to be excavated along the riverbed containing harmful substances; excavated soil can be used for embankment. This enables generation of less waste of soil.</p> <p>After Construction:                      There is no possibility that solid waste will be created.</p>
Noise	B-	D	<p>Before and During Construction:                      River Excavation                      River excavation and river structure construction will generate noise. It is possible to minimize noise impact by using low-noise heavy machinery and restricting work hours.</p> <p>After Construction:                      There is no possibility that noise will be generated.</p>
Odors	B	D	<p>Before and During Construction:                      Section expansion along the Mejerda River targets the flood channel and we do not expect that substances that produce foul odors are buried. Furthermore, we have not confirmed that there are places where massive amounts of solid waste have accumulated at the river section. However, if solid waste that produces a foul odor is found as construction proceeds, it is necessary to carefully remove the waste and take it to the appropriate disposal site.</p> <p>After Construction:                      There is no impact from this project.</p>
Ground Subsidence	D	D	<p>Before and During Construction:                      There is no cause for ground subsidence.</p> <p>After Construction:                      There is no cause for ground subsidence.</p>
Risks to the Environment			

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
Nature Reserves	B-	D	<p>Before and During Construction:                      The downstream and gulf area of the Mejerda River is listed under the Ramsar Convention. However, construction will not take place within the area registered with the Ramsar Convention. El Mabtouh wetlands are a nature reserve under ZICO but the construction that will be conducted in the wetlands is only along the channel so any impact to birdlife from construction will be limited.</p> <p>After Construction:                      The flood analysis results in Chapter 4 shows no significant change in the scope of flood in the downstream and gulf area of the Mejerda River listed under the Ramsar Convention. Thus, the impact after construction is likely to be the minimum. There is likely to be no impact on the El Mabtouh wetlands after the completion of construction.</p>
Natural Habitats	B-	D	<p>Before and During Construction:                      The downstream and gulf area of the Mejerda River is listed under the Ramsar Convention. However, construction will not take place within the area registered with the Ramsar Convention. The low flow channel will not be excavated, and only the flood channel will be excavated and expanded. As a certain amount of trees are planned to be left, it is possible to minimize the impact on birds and fish. El Mabtouh wetlands are a nature reserve under ZICO, but the construction area is limited and the frequency of flooding will not change so we expect that there will not be a large impact on natural habitat. Therefore, there will be almost no direct impact to natural habitat from this project.</p> <p>After Construction:                      As explained above, there will be no impact on the Mejerda River and the El Mabtouh wetlands. The Project is not likely to cause any significant change in the scope of flood in the wetland listed under the Ramsar Convention and will have little impact after construction.</p>
Biodiversity	B-	D	<p>Before and During Construction:                      As only the flood channel at the Mejerda River will be excavated and expanded in this project, the current situation of the low flow channel (river bed) where fish live will remain as it is and therefore there will be no major impact on fish and birds. Furthermore, it is possible to leave a certain number of trees on the riverside to secure the birds' habitat. Therefore, it is possible to minimize the impact on birds and fish, and the impact on biodiversity will be limited.</p> <p>After Construction:</p>



Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
			The Project is not likely to cause any significant change in the scope of flood in the wetland listed under the Ramsar Convention and it will have little impact. There will be almost no impact to natural habitat from this project.
Ground Stability and Erosion Risk	B-	D	Before and During Construction: Construction in the river may destabilize the river bank. After Construction: Slope gradient is planned for stability, which also reduces the risk of erosion.
Topography and Geology	B-	D	Before and During Construction: Excavation of the flood channel may destabilize the river bank and change the terrain of the river channel. By sufficiently easing the slope gradient during excavation, it is possible to avoid any impact caused by topographic change. After Construction: There is no possibility of any negative impact.
Hydrological Phenomena	D	A+	Before and During Construction: This project is mainly for the excavation and expansion of the flood channel of the Mejerda River and no construction will be conducted at the low flow channel of the river bank. Therefore, the impact will be negligible. After Construction: The Project is expected to have positive impacts on residents along the river as the floods in the rainy season decrease. There will be no bank protection in the zone of excavation and expansion. 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 to the farmland will continue as flood exceeding the project scale will occur.
Flood Risk	D	A+	Before and During Construction: There is no effect on the risk of floods. After Construction: Flood control structures are designed for 10th-year rains. These structures protect residences, buildings, infrastructure, and cultivated lands in regions that flood easily. By improving bridges, it becomes possible to secure access during flood season.

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
<b>Social Environment</b>			
Involuntary Relocation of Residents	B-	D	<p>Before and During Construction:                      Currently there is one house that needs to be relocated due to the Mejerda River expansion. Residential relocation will be confirmed based on the final schedule, but there will be no major relocation.</p> <p>After Construction:                      There is no negative impact.</p>
Accidental Loss or Destruction of Structures other than Residences	B-	D	<p>Before and During Construction:                      As stated previously, the number and kinds of structures other than residential buildings for this project will be researched later. However, no major loss or destruction will occur. The stated compensation by the Ministry of State Properties and Real Estate Affairs will be paid for land, fixed structures, planting, and all structures used to maintain lives of owners and occupants. If the value of original residence was low and the compensation amount was also low, the local government will offer compensation to relocate to an alternative site. However, the relocating resident will be responsible for construction in the suggested alternative site. For residents who live on land, land-based compensation will have priority over compensation by cash. The compensation amount will be based on the land possession regulations and JICA environmental society guidelines (announced in April, 2010). The loss of livelihood of the recipient may also be considered for the compensation amount.</p> <p>After Construction:                      There is no impact.</p>
Loss of farm land, unharvest crops, and shrub land	B-	D	<p>Before and During Construction:                      Area within three meters of the river bank will be public land. In urban areas, easement designated land will be within 25 meters from the river bank on the left and right sides, and in rural areas, it will be within 100 meters on the left and right sides. The river channel width will be planned within this range so basically construction will be conducted within state-owned land or easement designated land. However, farm land will be lost.</p> <p>After Construction:                      There is no impact.</p>

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
Means of Living, Poverty, and Vulnerability	D	A+	<p>Before and During Construction:                      The loss of farm land and unharvest crops can be one factor of the impoverishment of a family. The scale of impoverishment depends upon the living environment of the family and the living environment data will be locally researched and collected. With the already obtained data, it is not possible to fully analyze the vulnerability of the local community against this project and possible factors that could cause poverty.</p> <p>After Construction:                      The burden of the weakest family against the damage risk from flood will be reduced. Naturally, the impact of this project on the poorest families will be positive.</p>
Minorities	D	D	<p>Before and During Construction:                      It is necessary to clarify the existence of minority races in the area this project will be conducted in order to define the impact caused by this project on minority races. The El Mabtouh wetlands are government-owned pastures and it is possible that the minority races are nomadic. In this case, the flood period is limited and the impact on minority races will be small.</p> <p>After Construction:                      Dependent on the existence of minorities in the El Mabtouh wetlands and their characteristics.</p>
Local Economy/Employment	B+	B+	<p>Before and During Construction:                      By conducting this project, day laborer employment opportunities can be offered to those who are unemployed.</p> <p>After Construction:                      The removal of deposited sand at the river and diversion channel and on-going maintenance, such as trimming tamarisk trees, will be employment opportunities for the local residents.</p>
Land and Regional Resource Usage	B-	D	<p>Before and During Construction:                      Regional resources are limited to water resources of the Mejerda River. The impact on water resources is described in the section below, Water Resources.</p> <p>As for land use, the earth fill of the access road becomes higher in accordance with the bridge height increase and the land for it is needed. It is in small amount and thus the impact is likely to be the minimum.</p> <p>After Construction:                      Because there are few floods in the El Mabtouh retarding basin in the scale that operates and</p>

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
			they are submerged less than for 20 days, it has little impact on land use in the wetlands.
Water Resources	B-	D	<p>Before and During Construction:                      The Mejerda River is an important water resource for irrigation for local residents. These facilities pump water from the Mejerda River by using small pumps. The construction work might impact irrigation pumping, but it is possible to minimize the impact on facilities by conducting appropriate support (temporary relocation of pumps and water supply pipes) during construction.</p> <p>After Construction:                      There is no impact on water resources.</p>
Public Infrastructure and Social Projects	B-	D	<p>Before and During Construction:                      Construction work may greatly affect traffic in the surrounding area without adequate controls. Soil disposal after excavation and transporting it to disposal sites might cause traffic congestion and become a factor in traffic accidents. There is also a possibility that bridge construction may cause traffic jams, but adequate planning can minimize this impact.</p> <p>After Construction:                      There is no negative impact.</p>
Local Community Organizations	B+	B+	<p>Before and During Construction:                      To implement new O&amp;M activity for the river and channels during and after this project is complete, it will be necessary to adjust existing systems and organizations. This may also be an opportunity for new local communities to become active.</p> <p>After Construction:                      For river and channel operation and maintenance, the alignment of local level systems and organizations may be necessary.</p>
Distribution of Profits and Social Equality	C	A+	<p>Before and During Construction:                      Local employment and commercial activities can be anticipated during construction.</p> <p>After Construction:                      The benefits from flood control measures will be equally distributed and there will be no negative impact on the project.</p>
Localized Conflicts	C	D	<p>Before and During Construction:                      There is a possibility that localized conflicts may occur due to employment for construction or road construction and an increase in traffic.</p>

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
			After Construction: The benefits of relief from flood damage will be equally distributed.
Historical and Cultural Heritage	D	D	Before and During Construction: The known heritage listed sites in the project construction region are the El Bataan Weir Bridge and Old Jedeida Bridge. These sites were designated for protection as cultural heritage sites on January 15, 2012. Because the river channel plan (H.W.L and cross section of river channel are set not to cause impact) and construction plan are formulated with consideration given to the cultural heritage, it does not have impact on it. After Construction: Because the river channel plan (H.W.L and cross section of river channel are set not to cause impact) and construction plan are formulated with consideration given to the cultural heritage, it does not have impact on it.
Scenery	C	D	Before and During Construction: As the shape of the river bank changes and the plant coverage on the flood channel will be completely removed, the flood channel excavation on the Mejerda River and river structure construction will directly impact the scenery. However, the value of the Mejerda River scenery to local communities and the government is not yet clear. This project may cause the scenery to change. By analyzing the awareness of the local people of this project, it would be possible to evaluate the impact of the plan. After Construction: There is no possibility that there will be any impact on scenery after construction is completed.
Gender and Children's Rights	C	B+	Before and During Construction: It is necessary to clarify the impact this project may have on gender equality and respect for children's rights through consultation with stakeholders. After Construction: As flood damage will decrease, safety for women and children, who are vulnerable, will increase.
AIDS, Sexually Transmitted Diseases,	D	D	Before and During Construction: There is no chance the construction environment of this project will become a factor in the

Impacts	Impact Assessment		Expected Impact / Assessment
	Before and During Construction	After Construction	
and Sanitation			worsening of AIDS and spreading of sexually transmitted diseases. This project also will not impact the sanitation or health of the residents. After construction: There is no possibility that there will be any impact.
Occupational Health And Sanitation/ Workplace Safety	D	D	Before and During Construction: The current law concerning the work environment and on-site safety management will be applied, but this project will not pose any particular risks to worker health or safety management. After construction: There is no possibility that there will be any impact.

Source: JICA Study Team

Impact Rating

A+/- : It is possible that the project might largely give positive/negative effects. B+/- : It is possible that the project might slightly give positive/negative effects. C+/- : It is unclear whether the project will give a positive or negative impact (supplemental research is necessary and a more adequate evaluation of the effect of the project can be performed as the research continues).

D: The project will have no positive or negative impact on the environment.

## 2) TOR for Study of Environmental Considerations (Study Items)

The chart below shows the study items for the environmental consideration study based on JICA guidelines.

**Chart 8-20 Study Items for Environmental Society Considerations (TOR)**

Environment	Study Purposes and Targets	Study Method
<b>Physical Environment and Pollution</b>		
Air Pollution/Dust	<ul style="list-style-type: none"> <li>• Appropriate method to dispose of plant waste to avoid incineration.</li> <li>• Method to prevent circulation of dust</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with related organizations such as ANGED, INRGREF, DGF, and CRDAs</li> <li>• Evaluation of similar cases</li> </ul>
Water Pollution	<ul style="list-style-type: none"> <li>• Measures to prevent suspended matter in the river</li> <li>• Measures to prevent accidental engine oil leaks</li> </ul>	<ul style="list-style-type: none"> <li>• Technical methods for river expansion and excavation</li> </ul>
Ground Pollution	<ul style="list-style-type: none"> <li>• Measures to prevent accidental engine oil leaks</li> <li>• Identifying previous waste disposal sites that are dangerous along the Mejerda River</li> <li>• Appropriate disposal of solid waste that was accidentally excavated</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with related organizations such as ANGED and ONAS</li> <li>• Evaluation of similar cases</li> <li>• Confirmation of scheduled construction and planned technical methods</li> <li>• On-site inspections</li> <li>• Analysis of Google Earth images</li> </ul>
Solid Waste	<ul style="list-style-type: none"> <li>• Specifying disposal methods of plant waste, excavated soil, and construction waste</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with ANGED, INRGREF, DGF, the CRDAs, the Department of Quarries and Explosives, Ministry of State Properties and Real Estate Affairs, Real Estate Housing Agency (AFH), Industrial Land Agency (AFI), Tunisian Electricity and Gas Company (STEG), Society for the Study and Promotion of South Tunis (SEPTS), and other organizations</li> </ul>
Noise	<ul style="list-style-type: none"> <li>• Applying current legal standards</li> <li>• Prevention of noise pollution in areas that noise impacts</li> </ul>	<ul style="list-style-type: none"> <li>• Check regulations</li> </ul>
<b>Risks to the Environment</b>		
Nature Reserves	<ul style="list-style-type: none"> <li>• Deciding geographical boundaries of existing wetlands listed under the Ramsar Convention, which are Ghar El Melh Lagoon and the Mejerda River delta</li> <li>• A report concerning the progress status of feasibility analysis documents for listing the El Mabtouh basin under the above convention</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with related organizations such as DGF, World Wide Fund for Nature (WWF), and Coastal Protection and Planning Agency (APAL)</li> <li>• Collect maps and documents related to the area listed under the Ramsar Convention</li> </ul>
Natural Habitat	<ul style="list-style-type: none"> <li>• Identify natural habitat and swamps in the project area</li> <li>• Methods for protecting natural habitat that is sensitive to</li> </ul>	<ul style="list-style-type: none"> <li>• Collect data related to the Mejerda River and swamps in the project area</li> <li>• Consultation with related organizations such as DGF, the CRDAs, WWF, and APAL</li> </ul>

Environment	Study Purposes and Targets	Study Method
	environmental changes	• On-site inspections
Biodiversity	<ul style="list-style-type: none"> <li>• Identify species living in the study area</li> <li>• Analyze the importance of the identified species and the sensitivity to any impact from this project</li> <li>• Measures to protect endangered species</li> </ul>	<ul style="list-style-type: none"> <li>• Collect data related to wildlife living in the project area</li> <li>• Establish standard for biological importance of wildlife</li> <li>• Consultation with and collect information from related organizations such as DGF, DGPA, INSTM, INAT, WWF, AAO, and a local hunting group in Manouba</li> </ul>
Ground Stability and Erosion Risk	<ul style="list-style-type: none"> <li>• Measures for preventing river bank erosion</li> </ul>	<ul style="list-style-type: none"> <li>• Consultation with related organizations such as DGF, Economic and Social Council (CES), and the CRDAs</li> <li>• Confirmation of scheduled construction and planned technical methods</li> </ul>
Topography and Geology	<ul style="list-style-type: none"> <li>• Confirm design for river expansion/excavation and bridge construction and rebuilding</li> </ul>	<ul style="list-style-type: none"> <li>• Confirmation from the implementing agency</li> </ul>
Hydrological Phenomena	<ul style="list-style-type: none"> <li>• Same as above and confirm construction methods</li> </ul>	<ul style="list-style-type: none"> <li>• Confirmation from the implementing agency</li> </ul>
Social Conditions		
Involuntary Relocation of Residents	<ul style="list-style-type: none"> <li>• Confirm design for river expansion/excavation and bridge construction and rebuilding</li> <li>• Clarification of the number of families impacted by this project</li> <li>• Confirmation of procedure for land acquisition and compensation</li> <li>• Associated measures for relocation of land and properties</li> <li>• Simultaneously consider Tunisian customs and obligations as well as JICA guidelines to make a framework for relocation to alternative sites and compensation in advance (create a basic relocation plan)</li> </ul>	<ul style="list-style-type: none"> <li>• Confirmation from the implementing agency</li> <li>• Clarify land and ownership status to be affected by the river extension and excavation, and building and construction work for new bridges operated by related agencies, such as DGBGTH for land acquisition, expropriation and compensation, Office of Topography and Cadastre (OTC), Detailed Survey of Water Resources Agency (BIRH), and DGRE</li> <li>• Conduct supplemental study for the social survey performed by JICA</li> <li>• On-site inspections</li> <li>• Possibly compare Tunisian procedures for relocation to alternative sites and compensation with JICA procedural guidelines in order to clarify any existing differences</li> </ul>
Accidental Loss or Destruction of Structures other than Residences	Same as above	Same as above
Loss of farm land, unharvest crops, and shrub land	<ul style="list-style-type: none"> <li>• Confirm design for river expansion/excavation and bridge construction and rebuilding</li> <li>• Clarification of the borders of government-owned land in the El Mabtouh wetlands</li> </ul>	<ul style="list-style-type: none"> <li>• Confirmation from the implementing agency</li> <li>• Discussion with related agencies, such as DGF, forest district (especially Bizerte district in regard to El Mabtouh), OTC, BIRH, and DGRE</li> <li>• Collect maps and documents related to land sections and boundaries</li> </ul>
Means of Living, Poverty, and	<ul style="list-style-type: none"> <li>• Evaluation of the socioeconomic attributes of the surrounding</li> </ul>	Conduct supplemental study for the social survey performed by JICA



Environment	Study Purposes and Targets	Study Method
Vulnerability	households <ul style="list-style-type: none"> <li>Measures to prevent any impact on vulnerable residents</li> </ul>	
Minorities	<ul style="list-style-type: none"> <li>Characterization of the nomadic people in the El Mabtouh basin (the number, where they are from, the importance of migration to maintain household income)</li> <li>Impact risk evaluation</li> <li>Measures to alleviate impact</li> </ul>	Conduct supplemental study for the social survey performed by JICA Discuss with related agencies, such as the Office and Livestock and Pasture (OEP), DGF, the related forest districts (Bizerte and Ras Jebel), CTV permeation organizations and the CRDAs
Local Economy/Employment	<ul style="list-style-type: none"> <li>Confirm labor requirements for construction</li> </ul>	<ul style="list-style-type: none"> <li>Confirmation and review from the implementing agency</li> </ul>
Land and Regional Resource Usage	<ul style="list-style-type: none"> <li>Evaluate the impact risks from the usage of regional resources and this project</li> </ul>	Conduct supplemental study for the social survey performed by JICA
Water Resources	<ul style="list-style-type: none"> <li>Evaluate the impact risks from surrounding residents' water usage and this project</li> <li>Mitigation measures</li> </ul>	<ul style="list-style-type: none"> <li>Confirm with farmers who get their irrigation water from the Mejerda River</li> </ul>
Public Infrastructure and Social Projects	<ul style="list-style-type: none"> <li>Identify community organizations that are sensitive to any impact caused by this project</li> <li>Evaluate status of access to various organizations</li> <li>Guarantee continuity of access and take measures to mitigate any impact on traffic congestion</li> </ul>	<ul style="list-style-type: none"> <li>Supplement the social survey conducted by JICA</li> <li>On-site observation of study</li> </ul>
Distribution of Profits and Social Equality	<ul style="list-style-type: none"> <li>Evaluation of the socioeconomic attributes of the surrounding households</li> <li>Measures to prevent uneven distribution of benefits created by this project</li> </ul>	<ul style="list-style-type: none"> <li>Supplement the social survey conducted by JICA</li> </ul>
Localized Conflicts	<ul style="list-style-type: none"> <li>Evaluation of the socioeconomic attributes of the surrounding households</li> <li>Measures to prevent uneven distribution of benefits created by this project</li> </ul>	<ul style="list-style-type: none"> <li>Supplement the social survey conducted by JICA</li> </ul>
Historical and Cultural Heritage	<ul style="list-style-type: none"> <li>Identify places of national and regional historical/cultural heritage in the project areas</li> <li>Confirm conservation status for historical buildings and procedure to follow if an archaeological discovery occurs during construction</li> <li>Measures to prevent damage to heritage sites</li> </ul>	<ul style="list-style-type: none"> <li>Consultation with related organizations such as The National Institute of Heritage (INP), Heritage Development/Agency for Cultural Affairs, National Development Bureau, engineers, and mayors</li> <li>Collect data related to important heritage sites in the project area</li> <li>Confirmation of contents of river channel plan examination</li> </ul>
Scenery	<ul style="list-style-type: none"> <li>Evaluate the importance of the Mejerda River scenery for surrounding residents and</li> </ul>	<ul style="list-style-type: none"> <li>Consultation with related organizations such as INP, Heritage Development/Agency for Cultural Affairs, National Development</li> </ul>

Environment	Study Purposes and Targets	Study Method
	authorities • Protection of the Mejerda River scenery	Bureau, the engineers, mayors, and APAL • Collect data related to important scenic areas
Gender and Children's Rights	• Evaluate the risks of any impact to the lifestyle of women and children from this project and preventive measures for any gender gap created as the result of this project • Consider the opinion of women about this project	• Supplement the social survey conducted by JICA • Conduct hearings with residents through stakeholder consultations

### 8.3.3 Impact Assessment Result

The chart below shows the results of the survey on environmental social considerations. The impact on physical, natural, and social environments is divided into before and during construction. Possible mitigation methods are also described. Details are listed for items that are considered to have a comparatively large impact. See the diagram at the beginning of this chapter for the geographical composition of this project.

**Chart 8-21 Results of Impact Assessment on the Environment and Society**

Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
<b>Physical Environment and Pollution</b>						
Air Pollution/Dust	<b>During Construction</b> When construction is close to a residential area, the air may be polluted by truck and machinery exhaust, and dust kicked up by trucks driving through the area may have a negative impact to the surrounding houses. Construction crews need to manage this during construction.	B-	B-	D	B-	B-
Water Pollution	<b>During Construction</b> While it normally it does not happen, there is a possibility that oil may accidentally leak from the engines of heavy machinery and other construction machinery and pollute the water. It is therefore necessary to adequately maintain machinery. It will also be necessary to manage construction so turbidity does not worsen due to excavation and expansion of the flood channel.	B-	B-	B-	D	D

Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
Ground Pollution	<p><b>During Construction</b>                      The excavation and expansion of the Mejerda River is planned to be carried out for sand and soil used as farmland and residential land accumulated along the river and thus there is little possibility of containing harmful substances. While the project itself will not pollute the ground, there is a possibility of ground pollution if polluted soil is accidentally excavated and transported to a different location. It is impossible to eliminate the possibility of excavating buried waste or old, small-scale dangerous waste disposal sites along the Mejerda River.</p> <p>If polluted soil is found during excavation and expansion operations, it will be taken to a disposal site and disposed of in an appropriate manner. Furthermore, polluted soil will not be used in construction materials.</p>	B-	B-	D	B-	B-
Solid Waste	<p><b>During Construction</b>                      A large amount of soil waste will be excavated. As described in Ground Pollution above, there is little possibility of excavated soil along the river bed containing harmful substances. Thus, it can be used for embankment. Surplus soil, if any, shall be transported to the disposal site and disposed of surely.</p> <p>Due to the trimming and removal of tamarisk trees, there will be a large amount of plant waste that will be difficult to use effectively. This waste will be handled appropriately and its reuse will be investigated.</p> <p>With regards to the illegal animal skin disposal site near the proposed embankment construction site in the El Mabtouh wetlands, if the site is related to the tanning industry, it will be necessary to dispose of it as designated dangerous waste (stipulated as Class 0602, Edict 2000-2339, October 10, 2010 in the Dangerous Waste List). The scope of construction and waste disposal will be confirmed before the start of construction, and if waste is found in the scope of construction, it will be transported to a disposal site and handled accordingly. This procedure can minimize the impact on the environment.</p>	B-	B-	D	B-	B-
Noise	<p><b>During Construction</b>                      When construction is close to a residential area, the noise from trucks and machinery may affect the surrounding houses.</p> <p>It is necessary to confirm that the environmental standard is satisfied by regularly monitoring the noise level at construction sites and considering the transport routes of trucks.</p>	B-	B-	D	B-	B-
Topography and Geology	<p><b>During Construction</b>                      River topography will change, in particular by river expansion and excavation. It is necessary to consider slope gradient and scenery in the design.</p>	B-	B-	D	B-	B-
Hydrological Phenomena	<p><b>During Construction</b>                      This project is mainly for the excavation and expansion of the flood channel of the Mejerda River and no construction will be conducted at the low flow channel of the river bank. Therefore, we believe the impact will be negligible.</p>	B-	B-	D	B-	B-

Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
	<p><b>After construction</b>                      The Project is expected to have positive impacts on residents along the river as the floods in the rainy season decrease. Although the frequency of soil transfer and accumulation on surrounding farmland to be caused by floods decreases, soil supply to the area will continue as the flood exceeding the project scale will occur.                      There will be no bank protection in the zone of excavation and expansion. 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.</p>					
Soil Stability and Erosion Risk	<p><b>During Construction</b>                      During the construction period, the risk of the erosion to the gradient soil may increase temporarily.                      It is necessary to consider an appropriate slope gradient to avoid surface erosion. It is also necessary to reduce soil erosion through silt traps during construction.                      Construction crews need to manage this.</p>	B-	B-	D	B-	B-
	<p><b>After construction</b>                      It is necessary to consider an appropriate slope gradient and vegetation at the design phase to avoid surface erosion. Periodical monitoring and maintenance are necessary.</p>	B-	B-	D	B-	B-
<b>Risks to the Environment</b>						
Biologically Important Areas for Natural Habitat	<p><b>During Construction</b>                      The main purpose for this project is flood channel excavation and expansion. As no construction will be conducted at the low flow channel and a certain number of trees will remain, no major impact is expected to water and bird life habitat. There is likely to be no direct impact on the wetlands listed under the Ramsar Convention because of no improvement work of river channel from the Delta bridge to the lower stream to the mouth of the Mejerda River. The flood analysis results in the wetland area before and after the Project also show no significant change in the scope of flood. Because excavation and expansion work in the upper stream does not include excavation in waters, no turbid water is caused. Thus, there will be very little impact on the wetlands.                      The construction area in the El Mabtouh wetlands is limited and the frequency of flooding will not change so we expect that there will not be a large impact on natural habitat.                      Based on the above, impacts on biologically important areas for natural habitats are believed to be the minimum.</p>	B-	B-	B-	D	D
Biodiversity of Protected Species	<p><b>During Construction</b>                      There are 2 kinds of endangered species living in the Mejerda River: the European eel and the Mediterranean killifish (<i>Aphanius fasciatus</i>). As the project construction is excavation and expanding only at the flood channel and not at the low flow channel (riverbed) where the European eel and the Mediterranean killifish live, the impact on these important species will be small. The impact on feeding ground of birds in the low-flow channel will be also the minimum.                      The impact on birds living in tree shades will be also the minimum by securing a certain volume of trees along the river where they live.</p>	B-	D	D	D	D

Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
	<p><b>After construction</b>                      It is possible to contribute to the development of biodiversity of native habitat, in particular birds, along the Mejerda River by permanently maintaining riverbed vegetation after construction is complete. Continuing maintenance after construction is crucial for maintenance of the environment.                      The flood analysis results in the wetlands listed under the Ramsar Convention show little change in the scope of flood between before and after the Project and there will be no impact on biodiversity there.</p>	B+	D	D	D	D
Possible Flooding	<p><b>Before Construction</b>                      Structural design for flood controls is based on the risk of 10th-year floods caused by rainfall amounts that occur once a decade. These structures protect houses, buildings, infrastructure, and crops in expected areas of flooding. The benefits brought by this project will be especially important to each sector of Tebourba, El Bataan, Jedeida, and Oued Ellil, as well as Kalaat Andalous, El Bataana, and Utica where most of houses lost their livelihoods to flooding. Improving bridges will allow residents to pass through flooded areas.</p>	A+	A+	D	A+	A+
	<p><b>After construction</b>                      It is essential to maintain the riverbed to keep the benefits of the river improvement project in the long term and avoid the increase of woody plants and silt. For river vegetation, tracking and maintenance methods of vegetation need to be defined. It is necessary to select and plant the trees that are suitable for maintenance.</p>	B+	D	D	D	D
<b>Social Conditions</b>						
Involuntary Relocation of Residents	<p><b>Before Construction</b>                      Currently there is one house that needs to be relocated due to the Mejerda River expansion. Residential relocation will be confirmed based on the final schedule, but there will be no major relocation.                      The stated compensation by the Ministry of State Properties and Real Estate Affairs will be paid for land, fixed structures, planting and all structures used to maintain lives of owners and occupants. If the value of original residence was low and the compensation amount was also low, the government will offer compensation to relocate to an alternative site. However, the resident relocating will be responsible for construction on the suggested alternative site.                      The compensation amount will be based on the land possession regulations and JICA environmental society guidelines (announced in April, 2010). The loss of livelihood of the recipient may also be considered for in the compensation amount.</p>	B-	D	D	D	D

Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
Loss or Involuntary Relocation of Structures Other than Residences	<p><b>Before Construction</b>                      There are several civilian facilities in the area this project takes place. They are storage rooms for tools, barns, abandoned houses, storage facilities for river water pumps, facilities for protecting electronic devices for pumps, and so on.                      As stated previously, the number and kinds of structures besides residences for this project will be researched later. However, no major loss or destruction will occur.                      The stated compensation by the Ministry of State Properties and Real Estate Affairs will be paid for land, fixed structures, planting, and all structures used to maintain lives of owners and occupants. If the compensation amount was low, the government will offer compensation to relocate to an alternative site. However, the resident relocating will be responsible for construction on the suggested alternative site. For residents who live on land, land-based compensation will have priority over compensation by cash. The compensation amount will be based on the land possession regulations and JICA environmental society guidelines (announced in April, 2010). The loss of livelihood of the recipient may also be considered for the compensation amount.</p>	B-	D	D	D	D
Crops and Trees being Cultivated	<p><b>Before Construction</b>                      Crops and fruit currently being cultivated as well as trees will be lost under land acquisition for this project. However, considering the number of related households and the expected loss of income, the impact is not enormous. However, the impact on livelihoods in Jedeida and El Bataan from the loss of cash income is greater than rural areas. The owners and occupants will receive compensation through the compensation procedure for land acquisition and property.</p>	B-	B-	D	B-	B-
Land Use	<p><b>Before Construction</b>                      There is no particular impact.</p>	D	D	D	D	D
	<p><b>During Construction</b>                      As bridges already exist, bridge improvements will have no impact on land usage. However, when jacking bridges, the embankment of the attached roads will also be raised and therefore the width of the road will need to be increased. Thus, it will be necessary to acquire new land and change land usage. However, as the dimensions of the banked area are about **m2 for each point of the bridge, there will be no major impact on land usage. For any change in land usage, the stated compensation by the Ministry of State Properties and Real Estate Affairs will be paid for land, fixed structures, planting, and all structures used to maintain lives of owners and occupants. For residents who live on land, land-based compensation will have priority over compensation by cash. The compensation amount will be based on the land possession regulations and JICA environmental society guidelines (announced in April, 2010). The loss of livelihood of the recipient may also be considered for the compensation amount.</p>	B-	B-	D	D	B-

Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
	<p><b>After construction</b>                      Because there are few floods in the El Mabtough retarding basin in the scale that operates and they are submerged less than for 20 days, it has little impact on land use in the retarding basin.</p>	B-	B-	B-	B-	B-
Water Resources	<p><b>During Construction</b>                      The Mejerda River is the main water resource for individual irrigation in Kalaat Andalous, Sidi Thabet, Tebourba, and El Bataan areas. Local Resources below shows the impact on and evaluation for individual irrigation. As residents in the Mejerda River construction area are supplied with drinking water either publicly or privately, there will be no impact on water resources in the construction area. As no underwater excavation or damming will be conducted during construction, the water quality should not change and there will be no impact on irrigation and drinking water.</p>	B-	D	D	D	D
	<p><b>After construction</b>                      Drinking water will be supplied either publicly or privately to the residents around the Mejerda River. Therefore, this project will not impact the water supply.</p>	D	D	D	D	D
Local Resources/ Regional Resources	<p><b>During Construction</b>                      The residents in communities along the Mejerda River rarely trim trees, fish, or hunt. The only natural/regional resource that has any value in the region is the water from the Mejerda River. The water can only be gathered by placing a small pump directly into the Mejerda River or by using a small pump in a pump storage room. If such equipment exists in the construction area, it is necessary to consult with the equipment owners to temporarily relocate the pumps and hoses so there will be no problems associated with intake of water for irrigation. Furthermore, construction will not use structures that stop water and excavation work will only be done in the flood channel along the river. Therefore, there will be no change in the low flow channel (river bed) and hence there will be no major impact on local resource usage.</p>	B-	D	D	D	D
	<p><b>After construction</b>                      Because there are few floods in the El Mabtough retarding basin in the scale that operates and they are submerged less than for 20 days, it has little impact on land use in the retarding basin.</p>	D	D	D	D	D
Local Economy, Employment, and Livelihood	<p><b>During Construction</b>                      Through this project, daily employment opportunities can be offered to the local residents during construction. Priority should be given to employment for local labor.</p>	B+	B+	D	B+	B+
	<p><b>After construction</b>                      Employment opportunities will be created for local residents to maintain the river by trimming vegetation.</p>	B+	B+	D	B+	B+

Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
Poverty and Vulnerability	<b>After construction</b> According to a study about income standard, the ratio for poor or vulnerable residents is high in Jedeida, Sidi Thabet, and El Bataan. These households are greatly affected by any impact on real estate or agricultural livelihood. It is possible to minimize any impact through compensation. On the other hand, this project reduces the damage caused by floods to households that are easily affected. More than half of the houses and properties of households in Jedeida and El Bataan were severely damaged by floods, and they will benefit greatly from this project. Overall, this project is positive for the poorest households.	B+	D	D	D	D
Localized Conflicts	<b>Before Construction</b> Localized conflicts appear to be complaints about land. According to the land plan, about half of the surveyed households are either owners that do not possess land title certificates or occupants. Therefore, it appears that conflicts among people will be about differences in the amount of compensation during the land acquisition procedure.	B-	B-	D	B-	C
Profit Distribution and Equality	<b>Before Construction</b> There will be no negative impact on the principle of socioeconomic equality. With an equal land acquisition compensation system for this project, unequal and negative impacts will be reduced.	D	D	D	D	D
Minorities	<b>Before Construction</b> Regarding the conditions for free travel rights in El Mabtouh for semi-nomadic people, it is necessary to consider their characteristics (number of domestic animals for seasonal migration, their origins, travel frequency, and the importance of maintaining household income by migration) in the EIA.	D	D	D	D	D
Gender and Children's Rights	<b>During Construction/After construction</b> It is mainly men who get water for irrigation or do farm work. This project does not negatively affect gender equality or children's rights.	D	D	D	D	D
Access for Schools, Medical Services, and other Social Welfare Services	<b>Before Construction</b> <b>During Construction</b> There is a possibility that traffic could be affected during construction by river expansion, excavation work, and bridge improvement.	B-	D	D	D	D
Traffic Jams and Accidents	<b>During Construction</b> There is a possibility that traffic could be affected during construction by river expansion, excavation work, and bridge improvement. For this reason, school access, health organizations, and other social organizations will be affected. Traffic congestion is expected due to the transportation of excavated soil. If it is transported on arterial highways or in residential areas, the impact may be great. These possibilities will be clarified by impact assessments.	B-	B-	D	B-	B-



Impacts	Reasons for Assessment	Geographical composition of this project				
		Me	El	DL	Ch	Pt
Historical and Cultural Heritage	<b>Before Construction/During Construction</b> There will be no impact on the historical and cultural heritage of El Battan weir bridge and the ancient bridge of Jedeida as the river channel is planned not to affect them.	B-	D	D	D	D
Scenery	<b>During Construction</b> Greenery will be lost from trimming the tamarisk trees on the river bank and therefore the scenery along the Mejerda River will change. However, it is possible to reduce this impact by planting greenery along the managed roads.	B-	D	D	D	D

Source: JICA Study Team 2011

Project Components

Me : Mejerda River (The range of the excavation and expansion work conducted by this project is shown between the Laroussia Dam and Delta Bridge. See image below)

El : El Mabtouh wetlands

DL: Delta Bridge – Delta Region of Mejerda River

Ch: Channel/diversion channel

Pt: Bridge

Impact Classification

A+/-: Significantly positive or negative impact

B+/-: Insignificant positive or negative impact

C+/-: Areas of unconfirmed impact (supplemental studies required)

D: No impact



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

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

Because the natural landscape is likely to change due to construction to secure the cross-sectional flow of the river bed and embankment construction, it will cause adverse effect on the aquatic habitat environment at the low-flow channel. Taking the following measures, it will be possible to minimize the impact on the European eels and other aquatic habitats and birds with the feeding ground in the low-flow channel:

- Excavation and expansion only in the flood channel.

- No excavation that causes turbid water in the river channel (low-flow channel)

## **2) Impact on Wetlands**

The use of the El Mabtough wetlands as a retarding basin is not considered a factor in the degradation of the physical and biological environment that birds need. As the flooding period of the El Mabtough wetland is short, we anticipate that the impact is the same as usual as a result.

On the other hand, there is no direct impact as no excavation or expansion work is conducted along the Mejerda River in the lower stream of the wetlands listed under the Ramsar Convention. Flood analysis results of the wetlands are shown in Charts 4-32 to 4-36 for the current river channel and Charts 4-37 to 4-41 for planned river channel each in terms of 1/5, 1/10, 1/20, 1/50, and 1/100. Comparison of the scope of floods of the current and planned river channels in terms of probable annual flood occurrence shows no significant difference. There is no difference in the frequency of flood between before and after the Project implementation. Because the excavation and expansion work is carried out in water in the upper stream in the scope of registered wetlands of the Mejerda River, no turbid water is caused and thus it will have no impact on the wetlands. Therefore, 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**

Dense tamarisk trees will disappear and the natural scenery of the river will change because of the river expansion and embankment construction. Meanwhile, the Ministry of Agriculture and residents living near the river have a negative opinion of the forest cover at the flood channel. The former thinks that the forest cover prevents water flow during floods and the latter thinks that tamarisk trees are useless as a forestry product. Furthermore, farmers complain that wild pigs hide in the tamarisk trees and damage crops along the river, and therefore trimming the tamarisk trees can be an effective method in reducing damage from wild pigs.

## **4) Impact on Land Animals**

The impact from tree trimming on wild pigs that use tamarisk trees to hide is great, but we do not anticipate that it will directly impact wild pig groups greatly. Furthermore, wild pigs are not protected species.

Although birds live in trees along the river, the impact on them can be minimized by securing a certain amount of trees. The impact on the feeding ground along the low-flow channel will be also the minimum as there is no construction work to be carried out there.

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

A large amount of excavated soil waste will be generated by this project from excavation and expansion work at the flood channel along the Mejerda River. When the excavated soil can be reused as material for banking, it will be given priority and used effectively, and when soil waste needs to be disposed of, it will be taken to a soil disposal site.

The excavation and expansion of the Mejerda River is planned to be carried out for sand and soil used as

farmland and residential land accumulated along the river and thus there is little possibility of containing harmful substances. Thus, there is very little possibility of ground pollution in the target area. It can be used for embankment as it does not contain harmful substances.

Traffic congestion can be anticipated when transporting soil for reuse or to a disposal site. If it is transported on arterial highways or in residential areas, the impact may be great. Considering the negative impact to surrounding residents from transporting excavated waste soil, it is necessary to take specific action, such as selecting routes for environmental management.

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

During river bed construction, a large amount of plant waste will be generated from trimming tamarisk plants on the flood channel. The law regarding solid waste, Article 7 of Act No. 96-41 dated June 10<sup>th</sup>, 1996, states that it is prohibited to burn waste outside, except for plant waste, or use waste as fuel. Burning plant waste is the most common method to dispose of it, but this generates pollution and greenhouse gases. As this project takes place in rural areas, the impact from pollution is not significant, but reuse of materials should be prioritized to enable control of greenhouse gas emissions.

#### **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.

### **8.3.4 Verification of Mitigation Measures**

#### **(1) Overview of Mitigation Measures**

The table below shows the results of the study of the environmental management plan to mitigate the impact based on the scoping and impact assessment results shown earlier. The environmental management plan (impact mitigation measures) on main points is summarized.

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

The measures described below are advised in order to protect aquatic organisms living in the Mejerda River.

- (1) Plant trees to assure an area with shade. For example, on one side of the river, areas three to five meters wide and 100 meters long per kilometer, which is about 5% of the total length, can be preserved. This would enable the physical environment to protect creatures with shade at several areas of the river.

- (2) As excavation and expansion work will be limited to the flood channel, the impact to aquatic organisms, such as eels, is expected to be small.
- (3) The DGBGTH will coordinate so that organizations such as INSTM, INAT, DGPA, WWF<sup>2</sup>, and AAO<sup>3</sup> can contribute to the impact assessment as necessary.

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

To mitigate the impact of trimming tamarisk trees, alternative trees will be used to cover the flood channel and embankment in order to control erosion. Therefore, it is necessary to select the appropriate types of trees to plant. Furthermore, a certain number of trees will be left on the riverside to secure bird habitat.

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

The following conditions must be fulfilled for excavated soil waste removal and reuse.

- (1) Soil waste is inert waste that is free of pollution.
- (2) If there is a special disposal site for inert waste, this site should be used, but if there is no disposal site for inert waste, soil waste needs to be reused. According to Article 29 of Act No. 96-41 dated June 10, 1996, reuse has to be considered when disposing of solid waste.

It is necessary to select the excavated soil waste disposal and reuse methods from the following options. Options below are shown in order of priority.

- (1) Embankment material
- (2) Disposal at former quarries
- (3) Use as covering materials for Jebel Shakeel waste control
- (4) Reuse in other construction projects
- (5) Disseminate to farm land

The excavation and expansion work is planned to be conducted in the zone currently used as farmland and residential land along the Mejerda River and it is formed as a result of erosion and accumulation of soil on the river bank, which is unlikely that the excavated soil will contain harmful substances. However, in order to process evacuated surplus soil properly, it is necessary to review in details for corresponding surplus soil by EIA survey which will be performed by the government of Tunisia in future.

## **4) Effective Use of Plant Waste**

The following list shows the possibilities for effective use of plant waste generated from trimming tamarisk trees.

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<sup>2</sup> World Wildlife Fund

The world's largest international NGO for the environment. Their policy is to maintain biodiversity and reduce the ecological footprint for life on earth.

<sup>3</sup> Association 'Les Amis Des Oiseaux'

Tunisian environmental NGO for the protection of birds. AAO is one of the NGOs in partnership with Bird Life International (above note 5) with 18 African countries. The activity consists mainly of donations from supporters and commissions from studies for international organizations and international NGOs.

1. Composting branches
2. Carbonization of tree trunks to produce charcoal
3. Crush wood to produce wood particles
4. Other uses

Good quality of compost cannot be obtained from tamarisk trees and the charcoal is also poor quality. INRGREF proposed the possibility of molded charcoal products with higher calorific power, but this has not yet been achieved. Other effective uses have not been proposed yet. Trunks can be used as charcoal if they are offered free of charge to agencies that want them.

On the other hand, using trunks and branches in protective dikes and consolidated foundations is an effective use of materials as proposed in the master plan. The following are challenges for using trees as materials for protective dikes and consolidated foundation:

1. It is preferable that trunks do not have knots, are well dried, and are more than 10 centimeters in diameter (recommendations from the DGF). Trunk length of about one meter is also necessary so that it can be secured to the ground. In reality, it is difficult to obtain trunks with this length without knots due to the branch conditions of tamarisk plants on the Mejerda River.
2. As there is no evidence that this method has been done before in Tunisia, empirical research is necessary.

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

It is necessary to remove waste expected to be generated from unmanaged waste disposal sites during river bed construction to authorized managed waste disposal sites. The closest site is the Jebel Shakeel managed waste disposal site (general waste). Industrial waste that is categorized as hazardous (such as animal skins near El Mabtouh wetlands) has to follow transport and removal regulations. If a new waste disposal site is established or an old disposal site is discovered during construction, the obligations of construction contractors have to be clearly stated in the tender documents and contract conditions.

### **(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. Cost of individual environmental monitoring to be conducted as a mitigation measure is shown in Table 7-25 in 7.4.

### **(3) Summary of Mitigation Measures for Negative Impacts of the Project**

The following chart shows the reasons and explanations for mitigation measures for negative impacts on the environment caused by this project.

**Table 8-22 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 INSTM for monitoring

					ANPE to manage CRDAs/DHER in cooperation with INAT and INSTM to monitor		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	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
					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 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	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	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	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 Infrastructure and Social Projects	B-	Public hearing to listen to the opinions of the surrounding residents (public hearing within	Construction companies to conduct DGBGTH and CRDA/DHER to		Before and During Construction	Consultant is responsible for preparing a monitoring study report

			the stakeholder discussion and impact assessment framework) Traffic management during the period of construction	coordinate surrounding residents and police Ministry of Works and Department of Interior to decide and manage  CRDA/DHER to monitor measures		
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>	

## **8.4 Environment Management and Monitoring Plan**

### **8.4.1 Environment Management Plan**

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

The environment management plan, which includes the environment monitoring plan, needs to be discussed in the Environmental Impact Assessment (EIA) that Tunisia creates to approve the project.

The following issues need to be discussed in the EIA.

- 1) Management plan for excavated soil at the Mejerda River bed
- 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
- 5) Environment monitoring plan

#### **1) Issues to be Considered on the Management Plan for Excavated Soil at the Mejerda River Bed**

##### **a) Management Plan for Excavated Soil**

In the Management Plan for Excavated Soil at the Mejerda River Bed, the fact that this project will reduce the impact on the physical, natural and human environments in the project area as well the purposes, methods, activities, and responsibilities to be developed will be clarified so that this project can be accepted. The targets are described below.

1. Reuse the excavated soil as much as possible.
2. Inert waste that cannot be reused will be disposed at a specialty created soil disposal site.
3. In order to reduce traffic congestion and the risks of traffic accidents, transportation of excavated soil to reuse sites or soil disposal sites will be managed.

When reusing excavated soil, ANGED and ANPE will match the material and methods of use. When landfill is being performed during construction work, the standard will be established with the project officer and the project needs to be confirmed to comply with the standard. If the materials are not compatible with reuse or categorized as inorganic waste, the appropriate disposal method needs to be defined with ANGED, and the category for the waste and the transporting and waste disposal methods need to be established by contractors approved by the Ministry of Environment.

##### **b) Reusing Land**

In the Management Plan for Excavated Soil, reuse and disposal procedures will be proposed. The possibility for reuse became clear after consulting concerned parties who could possibly accept excavated soil in the area of the project or close to the project site. The chart below shows the consultation summary. As the most of this construction will finish in 2013, they are not the subject to disposal of excavated soil generated by this project. Therefore, it is necessary to discuss soil reuse with the related agencies again after the project starts.

**c) Soil Disposal Sites**

Old quarries will be considered for the disposing of soil (soil disposal sites). Old quarries that were closed before Act No. 89-20, which controls quarry development, dated February 22, 1989, and have not been redeveloped since, are up for consideration.

As a result of interview with DGBGTH, three former government-owned quarries below are suggested as possible soil disposal sites.

- 1) Ariana Nali
- 2) Maiana (Manouba Governate)
- 3) Jebel Turki (Ariana Governate)

DGBGTH has not created the site selection list at this stage. The inert waste disposal plan at quarries will be created as a technical proposal for the redevelopment of quarries together with the quarry agency. In this technical proposal, the initial conditions, the scheduled redevelopment construction, and the estimated amount of waste will be described. The main points of the redevelopment are security to prevent accidents, stability of slope and face, and the recovery of scenery. The recovery of scenery refers to topography recovery and there is no obligation to plant vegetation.

A fact to be noted when burying excavated soil in old quarries is that the excavation site may have been an illegal waste disposal site and the waste may cause pollution during construction. In order to assure environmental approval, it is important to take measures when planning construction for proper handling and management in case such waste is generated.

**d) Disposal Affiliated with the Ministry of Environment Redevelopment Plan**

In the Study on Environment for Utilization and Redevelopment of Quarries: First Stage – Analysis and Evaluation of Quarry Impact on the Environmental Plan, the Ministry of Environment planned the study based on the redevelopment of 100 quarries in Tunisia. This study targets 12 local governments, including Manouba, Ariana, the great Tunis bloc and Bizerte. In this project area, several quarries in the Manouba government, especially quarries in Maiana and Kelidia, can be prioritized.

**Table 8-23 Review of Civil Engineering Plans with Possible Reuse of Excavated Soil**

Planning Agencies	Consultation Date	Title of Agency Representative	Plan Name and Location	Area (ha)	Required Amount of Soil	Scheduled Construction Period	Possibility of Reuse
AFH/Ground and Residence Agency	2011/5/12	Director of Research and Planning Office	Between Zana (Utica Government) and highway	400	-	-	Not clear
AFH Ariana Local Agency	2011/6/9	Local Office Director	Tunis garden in Aguba (Manouba Government)	300	0	Summer 2012	No
STEG/Tunisia Power Gas Public Corporation	2011/6/9	Director of Adjustment/Production, Director of Technology Office	Kalaat El Andaluis	88	1,320,000	At the end of 2012	No
AFI/Industrial Ground Office	2011/6/13	Director of Ground Issue Office, Deputy Director of Research	Utica Industrial Area	50	-	June 2011	No
			Utica/Ejidida	-	-	2012 - 2016	Not clear
			Chafrou Raoued	53	53,000	June 2012	No
SEPTS/Tunis Sud Assessment and Development Company	2011/6/16	General Director, Director of Technology Office	Tunis/ Sud lake	127 (practically 50)	750,000	2013	Yes
Tunis Gulf Development Company	2011/6/20	Assistant for General Director	Financial support between Kalaat Andalous and Raoued	520	-	-	Yes

## 2) Issues to be Considered for the Protection and Recovery Plans for Aquatic Habitat Environment in Mejerda River

It is necessary that the aquatic habitat protection and recovery plan for the Mejerda River minimizes any impact to the environment of the Mejerda River caused by this project.

1. As the excavation and expansion work along the Mejerda River will only be conducted at the flood channel and not at the low flow channel (river bed), the impact to European eels and other fish that live in or migrate to the river will be minimized.
2. For birds living in trees along the river, a certain number of trees will be kept as described in 3), and by limiting the loss of forest at the Mejerda River flood channel, the impact will be minimized.

## 3) Issues to be considered for the Mejerda River Bed Planting Plan

In the Mejerda River bed planting plan, the targets, methods, and activities for the following issues will be clarified in order to reduce the impact on the Mejerda River's environment from this project.

1. The loss of forest at the Mejerda River flood channel will be limited by assuring that a certain number of trees are kept along the river. This conservation activity considers both the natural scenery and biology (a potential biological corridor and evacuation site).
2. Create alternative vegetation at the highest part of the river bed to compose a linear natural habitat.
3. Reinforce the ground by planting appropriate trees to curb the erosion risk at the river bed.
4. Precisely plan the planting period and work, and planting requests with the DGF or the Forestry Department.
5. Clearly define the responsibility and methods to maintain planting at the river bed in the long run.

The existing study, through discussions with the DGF and the Forestry Department, show the most appropriate kinds of trees for planting. The following trees were proposed to be planted on the other side of the dike and the upper side of repaired slope.

- Acacia, especially *Acacia cyclops*, *Acacia aurida*
- Oleander
- Caper
- *Robinia pseudoacacia*

The following is a reference of plants to be planted at the lower part of river bed.

- *Sesuvium portulacastrum*
- Atriples

## 4) Plans for Compensation and Resident Relocation to Alternative Sites

The status of involuntary resident relocation and land acquisition will be described in Chapter 8 (Land Acquisition and Residents Relocation). The resident relocation and compensation plan also needs to be created as The Resident Relocation Plan, which also includes the monitoring plan, by Tunisia. Furthermore, relocation, compensation, and monitoring must be conducted based on the created plan.

In Chapter 8 of this report, The Simple Relocation Plan for Residents (Projection) is introduced as reference material for The Resident Relocation Plan that Tunisia composed for smooth land acquisition and resident relocation.

#### **8.4.2 Environmental Monitoring Plan**

##### **(1) Items that should be taken into consideration in the environmental monitoring plan**

The environmental monitoring survey plan needs to be structured to include the pre-construction design stage (the stage during which the monitoring plan is established) and monitoring activities that are to occur both during and after construction is complete.

##### **1) Pre-construction (monitoring)**

The environmental management of this project is to be based on an appropriate management plan. Upon the formulation of an excavated soil management plan, cooperation will be required from the Department of Quarries and Explosives, the Ministry of State Properties and Real Estate Affairs, and individuals involved in the planning of civil engineering works related to the disposal of excavated soil. Cooperation with the Ministry of the Environment will be required in terms of quarry redevelopment plans and the disposal of soil waste. Because the selection of disposal sites is to be included, a pre-construction monitoring survey will also be necessary.

##### **2) During construction (management and monitoring)**

Contracts with general contractors and the environmental management incorporated into the environmental management plan of this project are the responsibility of DGBTH, which will report the results of management activities to ANPE.

- a) Disposal of hazardous substances, on-site waste, and excavated waste of waste collection sites that conforms to laws regulations
- b) Repair or construction of bridges across the Mejerda that will allow for an unobstructed flow of traffic while construction is taking place
- c) Provision of support and alternative water supplies to farmers authorized to take water from the Mejerda for irrigation
- d) Implementation of the following items, which are directed toward management activities and place particular focus on site environmental management.
  - i. Status of the transport, effective use, and disposal of excavated soil
  - ii. Status of steps taken to preserve or restore underwater habitats
  - iii. Status of cultivation plans for riverside vegetation
- e) Periodic inspection and maintenance of dump trucks and other vehicles used to transport the heavy machinery, raw materials, and soil to be used in construction
- f) Observation of the water quality (particularly turbidity) at the Ramsar site located at the lowest reaches of the Mejerda during construction

### **3) Monitoring activities at the project implementation stage (monitoring)**

Monitoring of the environmental status of the project site during project implementation will be conducted based on a combination of visual inspection and samples collected for comparative analyses between present state and initial state values. The following points have been mentioned as preferential items in terms of the implementation of monitoring in this project.

- a) Living creatures (fish, amphibians, mollusks, and birds)
- b) Status of flood channel and riverside plant coverage
- c) Visual observation of accumulation phenomena and riverside erosion
- d) Visual observation of the flood channel and riverside occupation of human activities (cultivated lands, buildings)

In the event that problems are confirmed via comparisons against the initial state in the monitoring of project implementation, the DGBGTH will take corrective measures to solve them. Because ANPE confirmation is to be received with regard to measures proposed at the EIA and the implementation of environmental management plans, monitoring reports are to be submitted to ANPE.

The environmental monitoring plan is shown below. Table 7-25 shows the environmental and water quality monitoring form and standard values. Referential standard values are shown when available and the implementation costs are the referential price in existing reports.



**Table 8-24 Environment Monitoring Plan**

Classification	Environmental Items	Parameters	Monitoring Methods and Frequency	Monitored Sites	Implementing Agencies
Pollution measures	1 Air pollution/dust	PM-10	Method: Air pollution survey: dust inspection and analysis Frequency: 1/month	Around plant sites Around public facilities	Inspection and analysis performed by consultant DGBGTH compiles the results and reports it to ANPE.
	2 Water pollution	Water quality analysis: Suspended matters Turbidity Biological oxygen demand (BOD) Chemical oxygen demand (COD) Visual observation: Installation check of silt traps, etc. Engine oil management on site (storage, collection, incidental leakage) Maintenance records: Inspection and maintenance of heavy machines and dump trucks and their records	Method: Water quality analysis Visual monitoring Confirmation of maintenance records Frequency: 1/month	One location in the lower stream of construction zone and one location on the contrast site in the upper stream for water quality	inspection and analysis performed by consultant Maintenance records and installation check performed by implementing agency and reported regularly to DGBGTH DGBGTH compiles the results and reports it to ANPE.
	3 Ground pollution	Visual observation: Visual monitoring of incidental engine oil leakage, etc., on site Confirmation of maintenance records: Confirmation of inspection and maintenance records of heavy machines and dump trucks in routine inspection Confirmation of transportation records: Transportation records to disposal site if there is any polluted soil	Method: Visual monitoring Confirmation of maintenance records Confirmation of transportation records Frequency: Routine monitoring	Vehicle management at vehicle base Engine oil management on site Transportation records created on site	Visual observation and recording performed by construction company and reported to DGBGTH regularly. DGBGTH visits the construction site as necessary for confirmation. DGBGTH compiles the results and reports it to ANPE.
	4 Waste	Confirmation of waste list: Generation volume measurement records, and	Method: Confirmation of waste list	Excavation site and land for structure	Visual observation and recording performed by

Classification	Environmental Items	Parameters	Monitoring Methods and Frequency	Monitored Sites	Implementing Agencies	
		list confirmation of inactive waste (excavated soil), construction waste, plant waste, and waste left on the site before project implementation (types of waste: municipal waste, industrial waste and hazardous waste based on the list provided under law) Confirmation of transportation records: Confirmation of list of transportation of waste above to disposal site Visual monitoring: Confirmation and monitoring of reuse of excavated soil Confirmation and monitoring of disposal of surplus soil	Confirmation of transportation records Visual monitoring Frequency: Routine monitoring	construction	construction company and reported to DGBGTH regularly. DGBGTH visits the construction site as necessary for confirmation. DGBGTH compiles the results and reports it to ANPE.	
	5	Noise	Noise measurement with noise meter: Noise Compliance with noise standard by measuring noise when construction is carried out near residences and school and other public facilities Setup working hours and compliance with them Compliance with noise standards when nighttime work is needed Proper handling of complaints	Method: Noise measurement with noise meter Frequency: Conducted through working hours once a week Each time when nighttime work is needed	Near residences and school and other public facilities	Noise measurement performed by consultant DGBGTH compiles the results and reports it to ANPE. When the construction company receives a complaint, it reports it to DGBGTH and the two parties discuss measures to be taken.
Environment	6.	Natural habitats	Visual monitoring: Monitoring of no impact of flood channel work on low-flow channel (riverbed area) Confirmation that certain volume of trees in certain zone in flood channel is secured	Method: Visual monitoring Frequency: Routine monitoring	Points in the Mejerda where the project is implemented	Visual monitoring performed by construction company and reported to DGBGTH regularly. DGBGTH visits the construction site as necessary for confirmation. DGBGTH compiles the

Classification	Environmental Items	Parameters	Monitoring Methods and Frequency	Monitored Sites	Implementing Agencies
					results and reports it to ANPE.
	7 Biodiversity	Visual monitoring: same as 6 Inhabitation survey: Regularly observe fish living in several chosen points along the Mejerda River Inhabitation survey: Regularly observe fish living in several chosen points along the Mejerda River	Method: Visual monitoring Inhabitation survey Frequency: Same as 6 for visual monitoring Once in dry season (mid dry season) and twice in rainy season (early and mid-rainy season) for inhabitation survey	Along the Mejerda River	Performed by INAT or INSTM
Social conditions	8 Loss or destruction contrary to the intention of non-residential structures	Field survey: Confirmation of situation of structures that are likely to be affected by the Project implementation Hearing survey: Hearing with residents that have impact of land acquisition and compensation for loss of structure	Method: Field survey Hearing survey Frequency: Field survey before construction Hearing survey once at compensation for loss	Site of structures that are likely to be affected by the Project implementation	Field survey and hearing survey conducted by consultant Consultant submits record cards to DGBGTH and its expropriation and compensation section confirms them.
	9 Living means, poverty and vulnerability	Field survey: Confirmation of situation of residents on which land acquisition for the Project implementation is likely to have impact on their means of living Hearing survey: Hearing with residents who are affected by land acquisition and compensation for it Confirmation of gap between residents' relocation plan and compensation plan	Method: Field survey Hearing survey Frequency: Field survey before construction Hearing survey once at compensation for loss	Area where land acquisition for the Project is likely to have impact on the means of living	Field survey and hearing survey performed by consultant Consultant submits record cards to DGBGTH and its expropriation and compensation section confirms them.
	10 Water resources	Field survey: Confirmation of use of water resources of the Mejerda River (irrigation use of river water)	Method: Field survey Visual monitoring	Along the Mejerda River Points where pumps	Visual monitoring performed by construction company and reported to DGBGTH

Classification	Environmental Items	Parameters	Monitoring Methods and Frequency	Monitored Sites	Implementing Agencies
		Confirmation of number of holders of water pumping permits for the Mejerda and the current circumstances in terms of water pumping via pumps and hoses Visual monitoring: Confirmation of points where pump relocation is needed: Confirmation of relocation of pumps during construction and return of them after construction	Frequency: Field survey once before construction Visual monitoring conducted when pumps and hoses for pumping are needed	and hoses for water pumping needs to be relocated during construction	regularly. DGBGTH visits the construction site as necessary for confirmation.
11	Public infrastructure and social services	Visual monitoring: Confirmation of traffic congestion Residents' hearing: Complaints about traffic congestion, etc.	Method: Visual monitoring Residents' hearing Frequency: Once every half year for residences and infrastructure that are likely to be affected during construction Once during construction period for residences and infrastructure that are likely to be affected only during construction of the zone	Around individual construction site or residential area and infrastructure where traffic is affected by the Project	Performed by construction company and reported to DGBGTH regularly DGBGTH visits the construction site as necessary for confirmation.

Note: Table 7-25 has referential standard values are shown when available and the implementation costs are the referential price in existing reports.

## (2) Environmental monitoring standards

### 1) Environment and water standards in Tunisia

According to the ANPE, Tunisian environmental management standards are in compliance with WHO guidelines and European standards. Under Pollution Indices described in JICA's environmental guidelines, the results confirmed by ANPE in terms of Tunisia's chosen management standards are shown in the diagram below. In Tunisia, there are standards for air (NT 106-04), standards for wastewater (NT 106-02), and standards for waste (NT-41-96). Water quality standards (surface water/groundwater) are currently being prepared at ANPE. In the event that impact is observed due to complaints from residents over water turbidity, measures have been taken to reduce turbidity as much as possible.

**Table 8-25 Comparison of environmental management items included among JICA guidelines and the current indices in place in Tunisia**

Classification	Item	Tunisian management indices
1. Pollution index	Air standards	○ (NT-106-04)
	Water quality standards	Surface water/groundwater standards currently under development
	Wastewater	○ (NT-106-02)
	Waste	○ (NT-41-96)
	Ground pollution	×
	Noise/vibration	×
	Land subsidence	×
	Odor	×
	Sediment	×

### 2) International standards that should be considered

The table below shows Tunisia's environmental standards (provisional values) and international standards. On the other hand, discussions with ANPE have revealed that baseline surveys on water quality, noise, and vibrations are fundamentally performed at the time of the EIA that precedes a project. Water quality and other monitoring indices that will come into play during project implementation are established based on the results of the assessment. In terms of items without national management indices, baseline surveys for water quality, noise, and vibrations will be performed during the EIA. Appropriate management values will need to be established following a review of both the assessment results and international standards.

### 3) Tunisia's existing water quality monitoring observation sites/data utilization

Water quality monitoring for the Mejerda river basin is conducted at the observation stations shown in the figure below. Once a year, these observation stations observe water temperature, pH, electrical conductivity, salinity, BOD, COD, and turbidity. It may be possible to use the data and observation facilities of these observation stations to help establish standard monitoring values during project implementation and to monitor water quality throughout construction.



Figure 8-19 Location of water quality monitoring stations in the Mejerda river basin

### 8.4.3 Budget, funding, and organizations responsible for environmental management and monitoring

#### (1) Responsible organizations

Organizations responsible for the environmental monitoring of this project include the companies commissioned for construction (during construction) and the DGBGTH/MOA after the improvements are in use (construction is complete).

#### (2) Budget and funding for environmental management and monitoring

The General Direction of Dams and Large Hydraulic Works of the Ministry of Agriculture (DGBGTH, / MA), the ordering party, needs to secure the budget for the environmental management and monitoring. The implementation budget for each monitoring item also needs to be clarified. The costs are to be confirmed based on interview with C/P in DFR explanation, although the table below show the referential price in existing reports of the implementation costs. The monitoring execution cost based on the estimation by the local consultant is shown on the Table below.

**Table 8-26 Environmental/water quality monitoring form, standard values and monitoring cost**

Item	SubItem	Average measurement	Maximum measurement	Tunisian standards <sup>(1)</sup>	International standards (reference)		Observation point, frequency, and method	Implementation costs (TD/year)
					International standard name: standard	Japan		
Air quality	Suspended particulate matter			Guide value PM-10 Average: 40-60µg/m <sup>3</sup> 24 hours: 120µg/m <sup>3</sup>	WHO Guideline: PM <sub>2.5</sub> : 10µg/m <sup>3</sup> annual mean 25µg/m <sup>3</sup> 24-hour mean PM <sub>10</sub> : 20µg/m <sup>3</sup> annual mean 50µg/m <sup>3</sup> 24-hour mean	SPM (Lower than PM10): One day per-hour average: 0.10mg/ m <sup>3</sup> One hour value: 0.20mg/ m <sup>3</sup> PM2.5 : Annual average value: 15µg/m <sup>3</sup>	The vicinity of the construction site Every month Inspection/analysis of dust (PM10)	10,000TND
Water quality	MSE (SS)			50mg/l	EHS Guideline for treated sanitary sewage discharges(IFC) 50mg/l	25mg/l or less (rivers)		14,000TND
	DBO5 (BOD5)			6mg/l O <sub>2</sub>	EHS Guideline for treated sanitary sewage discharges(IFC) 30mg/l(BOD)	1mg/l or less (rivers)		
	DCO (COD)			30mg/l O <sub>2</sub>	EHS Guideline for treated sanitary sewage discharges(IFC) 125mg/l	1mg/l or less (lakes/marshes)		
	Dissolv			6mg/l O <sub>2</sub>	WHO: no standard	7.5mg/l or less (rivers)		

	ed oxygen (DO)				USEPA: no standard EU: no standard																	
	pH			6-9	WHO : No standard USEPA : 6.5-8.5 EU : 6.5-9.5	6.5 or more 8.5 or less (rivers)																
	Temperature			24-25.5°C	WHO: no standard USEPA: no standard EU: no standard	None																
Waste	—			NT-41-96	—	—	Construction site Every week Project waste	100,000TND														
Noise	Noise level			None	<b>WHO Guideline :</b> <b>Residential, Institutional, Educational :</b> Daytime(07 :00-22 :00) 55dBA Nighttime(22 :00-07 :00) 45dBA <b>Industrial, commercial</b> Daytime(07 :00-22 :00) 70dBA Nighttime(22 :00-07 :00) 70dBA	<table border="1"> <thead> <tr> <th rowspan="2">Type of area</th> <th colspan="2">Standard values</th> </tr> <tr> <th>Daytime</th> <th>Nighttime</th> </tr> </thead> <tbody> <tr> <td>AA</td> <td>Under 50dB</td> <td>Under 40dB</td> </tr> <tr> <td>A and B</td> <td>Under 55dB</td> <td>Under 45dB</td> </tr> <tr> <td>C</td> <td>Under 60dB</td> <td>Under 50dB</td> </tr> </tbody> </table> <p>otes) 1 In terms of time of day, daytime refers to the period from 6AM until 10PM, while nighttime refers to the period between 10PM and 6AM.</p> <p>Areas with a grade of AA usually</p>	Type of area	Standard values		Daytime	Nighttime	AA	Under 50dB	Under 40dB	A and B	Under 55dB	Under 45dB	C	Under 60dB	Under 50dB	Public facilities and residences near the construction site  Once a week during working hours  Acoustic measurements via sound level meter	25,000TND
Type of area	Standard values																					
	Daytime	Nighttime																				
AA	Under 50dB	Under 40dB																				
A and B	Under 55dB	Under 45dB																				
C	Under 60dB	Under 50dB																				



						<p>have a number of social welfare facilities like medical treatment centers that require an especially tranquil setting.</p> <p>Areas with a grade of A are almost exclusively residential.</p> <p>Areas with grade of B are mainly residential.</p> <p>Areas with a grade of C are a mix of residential, commercial, and industrial.</p>		
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Notes (1): MSE, DBO5, DCO, DO, pH, and temperature are provisional figures are based on water quality standards (surface water/groundwater) that are currently being developed by ANPE

## 8.5 Comprehensive assessment

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

The implementation of this project is not expected to have a major impact on the environment. Additionally, in terms of social impact, the implementation of this project is not expected to cause any large-scale migrations.

Furthermore, with a major environmental impact thought unlikely, and in addition to the information above, this project earns a grade of B from the environmental category of the JICA guidelines.

On the other hand, in order to keep environmental impact to a minimum, environmental management and environmental monitoring plans will need to be established both during and after construction is complete. Implementation of any and all environmental management/monitoring will need to be based on these plans. These will then need to be compiled in Tunisia's EIA report. When the Tunisian side prepares a TOR for the EIA, the contents and results of this report and the EIA draft report will need to be utilized to the fullest.

### 8.5.2 Comprehensive impact assessment

A summary of the results of surveys conducted up until now and the EIA of project implementation is summarized in the table below.

**Table 8-27 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 biodiversity	B-	D	B-	B+
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	B-	D	B-	D

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
resources				
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

### 8.5.3 Environmental checklist

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

**Table 8-28: Environmental Checklist**

Classification	Environmental item	Main check items	Confirmation of environmental considerations (basis, mitigation)
1 Approval/authorization	(1) EIA and environmental approval	<p>(a) Has the EIA report been prepared?</p> <p>(b) Has the EIA report been approved by the country's government?</p> <p>(c) Is approval of the EIA report, etc. accompanied by supplementary conditions?</p> <p>In the event that there are supplementary conditions, have they been fulfilled?</p> <p>(d) In addition to the above, has environmental approval been received from local authorities if necessary?</p>	<p>(a) It has not been prepared for this project. DGBGTH plans to prepare the EIA report after the final draft of this report is approved in November 2012.</p> <p>(b) Unapproved</p> <p>(c) With the EIA report presently unprepared, the processes involved in approval have not been undertaken. Whether there are supplementary conditions currently remains unknown.</p> <p>(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.</p>
	(2) Explanation to local stakeholders	<p>(a) Have the details and impact of the project, including information disclosure, been adequately explained to and understood by local stakeholders?</p> <p>(b) Have comments by residents, etc. been applied to the details of the project?</p>	<p>(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.</p> <p>(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.</p>
	(3) Consideration of alternatives	<p>(a) Have a number of different alternatives (including environmental/social items) to this project's plan been examined?</p>	<p>(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.</p>

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<p>2</p> <p>Pollution measures</p>	<p>(1) Water quality</p>	<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>
	<p>(2) Waste</p>	<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. 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 accorded with said plan.

			<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 reconstruction properly explained to residents to be resettled prior to resettlement?</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. The final number of resettlements and extent of land acquisition will need to decide based on these.</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.</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>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? (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. (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 (organization, personnel, equipment, budget,</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 established in the EIA report following discussions with the ANPE.</p>

		<p>etc., and the continuity thereof) been established?</p> <p>(d) Have provisions been made for the method and frequency of reporting from project staff to competent authorities?</p>	<p>Additionally, monitoring for land expropriation/compensation has also been developed.</p> <p>(c) It has not yet been established. It will be further clarified in the EIA report.</p> <p>(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.</p>
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**

#### **(1) EIA report assistance**

To assist with the creation of the EIA report to be created and implemented on the Tunisian side, an EIA draft report based on the results of this survey and the results of surveys conducted up until now has been created and included in the attached data. The main findings described in the EIA draft report are as follows.

- a) Confirmation of the environmental and social circumstances that serve as the basis of the report (land use, environment, living areas of indigenous peoples, economic system, etc.)
- (b) Confirmation of partner country's environmentally and socially concerned systems and organizations
  - 1) Laws and standards concerned with environmental consideration (environmental impact assessment, information disclosure)
  - 2) Deviation from JICA environmental guidelines
  - 3) The role of relevant organizations
- (c) Scoping (clarification of the environmental and social items that should be considered during project implementation and their methods of evaluation)
- (d) Impact estimates
- (e) Examination of impact assessments and alternative plans (including zero option)
- (f) Examination of relief measures (avoidance/minimization/compensation)
- (g) Examination of environmental managing plans/monitoring plans (implementation system/method/cost)
- (h) Clarification of budget, finances, and implementation system
- (i) Stakeholder conference assistance (implementation objectives, participants, conference contents, etc.)

#### **(2) Overview of EIA report of the current Tunisia project**

For the purpose of confirming an overview of the environmental management plans and monitoring plans that have been made for development projects in Tunisia up until now, a March 2005 EIA report for the Project for Desalination of Southern Ben Gardane in the Medenine Governorate was acquired from SONEDE. This project was implemented with assistance from JICA. The EIA for this project has also been implemented with reference to EIA guidelines.

To this point, SONEDO has had a lot of experience creating EIA reports. Though time limits have been received from the JICA side in terms of the EIA implementation period, the implementation of

prior scoping revealed that the creation of a TOR pertaining to the implementation of the EIA went well and that SONEDO's responsible departments were able to create the report quickly by making adjustments to it as they conducted EIA consulting and detailed conferences with ANPE, both during EIA implementation and report creation.

Because DGBGTH, the implementing agency of this project, has not implemented an EIA since the EIA decree was issued in 2005, we hope that they will use the above EIA report draft, consult closely with ANPE, and create a TOR that pertains to the implementation of their EIA. JICA Study Team and DGBGTH consulted with each other during the field study conducted between July and September 2012, at which time DGBGTH agreed to these terms.

### 1) Make-up of EIA reports

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

<b>Report table of contents</b>
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)

### 2) Overview of environmental management/monitoring plans in EIA reports

The composition of the table of contents related to environmental management plans and environmental monitoring plans described in Chapter 7 of the above-mentioned report is as follows.

<b>Chapter 7: Composition of the table of contents for environmental management/monitoring plans</b>
7.1 Examination of relief measures for negative environmental impact
7.2 Water and waste management plans
7.3 Monitoring plans for environmental and social concerns
7.4 Organizational and capacitive enhancement
7.5 Total cost of environmental management plans
7.6 Environmental management/monitoring reports

Furthermore, a law-compliant environmental management plan is described in Chapter 2 of the above-mentioned report. The frequency of water quality inspections in environmental monitoring is

also described, while water quality standards reference Tunisian water quality standards (NT0914: drinking water).

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

The flow of EIA implementation is as described in 8.1.2.

The general schedule from the start of the EIA to approval was confirmed during conferences with the ANPE and is as shown in the table below.

Implementation of the EIA is based on JICA's EIA Report (draft) for this survey. A quick start will be necessary after the TOR for the order of consultants for the EIA has been created. Additionally, close consultation with the ANPE during this stage will be important.

**Table 8-29 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	■														
Public tender offer and submission of bids by applicants		3		■													
Analysis of tenders and preparation of tender analysis report, submission to the Securities Commission					■	■											
Opinion by the Securities Commission and market preparation		1					■										
Carrying out of EIA Study by a contracted consultant company/ Submission of EIA Report to ANPE		6						■	■	■	■	■	■				
Stake Holder Meeting		2								■			■				
Duration of Evaluation and Approval of EIA Report by ANPE		3												■	■	■	

## 8.7 Stakeholder conference support

### 8.7.1 Current implementation status and conference overview

Current environmental impact assessment procedures in Tunisia do not include legally mandated stakeholder consultation procedures. Nevertheless, DGBGTH has already held three stakeholder conferences regarding the implementation of this project.

#### (1) First conference

##### 1) Schedule

DGBGTH, with the assistance of each CRDA and the DHER Director, held a conference with authorities under the following schedule.

**Table 8-30: Schedule of the First Conferences**

Target governorate	Date and time	Notes
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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

The limited number of participants was from the following concerned organizations.

- (1) Representation (various areas = delegation = mutanadiyat = a government division between governorate and sector)
- (2) Engineers of local authorities
- (3) Omdas (clan leaders) (sector/Imadas)
- (4) Several organizations, including DHER, CTV (Cellule de Territoriale de Vulgalisation), CES, and the CRDA which has jurisdiction over forests.

A list of conference participants is shown in the table below. ANPE representatives participated in a conference in Manouba governorate. Local residents are represented by Omdas. The selection of the authorities that participated is thought to have represented the various concerned parties. There exists room for debate over Omdas representation and is being re-examined in the wake of the Jasmine Revolution. Due to a variety of organizational reasons, the state of progress of this project was not at a point that would allow for an expanded conference. For that reason, the number of authorities at the first conference was limited.

However, as show in the table below, the representation of each of the organizations at the conference was not necessarily thought to be sufficient. In Ariana for example, a lack of communication at the local level led to only two of the expected six Omdas participating, despite DGBGTH preparations. Those with jurisdiction over forests are top-level authorities concerned with the sections of the project related to the environment. However, they had no representatives in attendance at the conferences in Bizerte and Ariana.

**Table 8-31 First conference participants**

Participant		Bizerte	Ariana	Manouba
Omdas (clan leaders)		6	2	6
Local authorities		x	1	1
CRDA	DHER	–	–	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

### 3) Objectives

The main purpose of conferences with authorities is to get them to participate in discussions about the project. The purpose of conferences with authorities is to gain a shared understanding of this project's objective and its components, confirm what form that this project will take in terms of how it will affect the local community, and to discuss the environmental problems that could possibly occur as a result of the project.

Additionally, the re-commissioning performed by local consultants when carrying out social surveys was explained, providing a valuable chance to receive assistance from authorities in terms of its implementation. In actuality, Omdas and CRDA support is necessary when it comes to identifying households and interviewing them for the social survey. A secondary goal of the conferences is to collect data on the social conditions (particularly land use/occupation) of the each Imadas based on materials prepared by JICA Study Team.

### 4) Results

Coordinating between Omdas and the various participating organizations when the conference was held was accompanied by difficulties. DHER's strong participation allowed the conference to progress.

As a result, this conference led to successful debate among authorities over the advantages of this project (flood damage reduction) and the disadvantages (land seizure).

The first conference allowed participants to understand the project from various angles as well as to understand the necessity of plan. Additionally, this first conference was thought to have helped ease the organization of the second conference, which was scheduled for September 2011.

#### (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) Objectives

Environmental and social considerations were explained and discussed based on the progress of the



survey.

#### 4) Results

The contents of the progress report were explained. Additionally, the land occupation of the project, the necessity of resettlement (2 households), and the impact on the environment was also explained.

#### (3) Third conference

##### 1) Schedule

The conference was held on January 31, 2012. Participation was expanded to include NGOs. Following the Jasmine revolution, participation of the Omdas who are no longer viewed as representatives of the citizens was substituted by the participation of local residents from the Mejerda river area.

##### 2) Attendees

Individuals and organizations that participated in the third stakeholders' conference are shown in the table below. DGBGTH invited UTAP (Union of Agriculture and Fisheries), representatives from local environmental protection agencies, WWF representatives, and INAT, but none of them decided to attend. In actuality, Omdas sufficiently represented local residents from around the Mejerda River, and as a result, DGBGTH decided that it was not necessary to place the burden of participation on the residents themselves.

**Table 8-32 Third conference participants**

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

#### 3) Objectives

The object of the conference was to explain the progress of the survey, seek participation from a wide variety of residents from around the Mejerda and organized involved in the management of environmental protection, and obtain the opinions of beneficiaries.

#### 4) Results

DGBGTH presented an overview of the project (work contents, objectives) and explained that the participation of beneficiaries was important for the success of the project in the long-term. Additionally, the need for local residents and farmers to participate in the project's development was emphasized. To that end, participants were encouraged to participate in the steering committee held in March 2012 so that they would be able to contact DGBGTH and receive a copy of the master plan and feasibility report via CD or email.

Environmental conditions of this project discussed at the conference included the desired method of reuse for the timber waste of tamarisk trees and agricultural reuse of the soil generated by flood channel excavations. DGBGTH explained project follow-up surveys and long-term facility maintenance and management methods. Additionally, the NGO Association of the Friends of Birds (AAO) mentioned that they would like to be involved in the project's impact assessment. DGBGTH explained their interest in working on the impact assessment with benefitting organizations, relevant organizations, and CRDAs.

In terms of land seizure, DGBGTH, after confirming that residents preferred receiving alternative land to compensation, placed the land to be expropriated at a radius of 20 kilometers and proposed offering a greater expanse of land as compensation. Participants also recognized the necessity of minimizing the impact of agricultural land expropriation in the basin.

Additional topics of discussion included existing bridges in need of alterations and flood risk.

### **8.7.2 The necessity of a conference for new stakeholders**

The JICA Guidelines for Environmental and Social Considerations (April 2010) presumes that environmental and social considerations are the responsibility of the host country. Seeking stakeholder participation one of the four items of importance in the Basic Policy on Environmental and Social Considerations is described below as it is described in 2.4 Consultation with Local Stakeholders.

<p>In order to implement environmental and social considerations that better conform to the site and contribute to appropriate consensus building, the partner country is generally responsible for holding conferences with local stakeholders in as wide of a range as is reasonably possible. JICA will assist the partner country as needed.</p>
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From this perspective, residents that are expected to be impacted by project implementation and their communities are important as local stakeholders. Of the conferences with stakeholders held up until now, Omdas have participated in the first and third as representatives of communities expected to be impacted by the implementation of this project. In order to promote understanding among

residents and communities in terms of the effect and impact of the project, stakeholder conferences aimed at public disclosure will need to be held early in the process. Additionally, on this occasion, female participation needs to be urged upon careful consideration of Tunisia social customs. The inclusion of female authorities among the DGBGTH has been considered and an examination sought in terms of how disasters like floods differently impact people according to gender and what kinds of measures are needed to mitigate these differences.

### **8.7.3 Overview and schedules of new stakeholder conferences**

At the time of this survey, DGBGTH confirmed that they were planning new stakeholder conferences with residents. However, at the time of this study's field study, which is the plan formulation stage, the Tunisia side was unable to get a plan from DGBGTH. This meant that they were unable to hold a conference according to their conference plan and schedule, and consequently, were unable to reach agreement.

For that reason, this chapter suggests that the study team consult with the counterpart and have them describe the contents of the future stakeholder conferences that have been acknowledged.

#### **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**

- Explanation and overview (components, objectives, land targeted for acquisition, etc.) of the project.
- Explanation of the results of the first through third stakeholder conferences.
- Explanation of the procedures involved from land acquisition to resettlement as well as the compensation to residences and local authorities that are impacted.
- Confirmation of the demands of the residents/local authorities to be impacted.

#### **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.
- The explanation at the conference should be meaningful for the residents/local authorities to be impacted.
- It is hoped that the resettlement plan will conform to attachment A's World Bank safeguard policy OP 4.12.

## **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.)

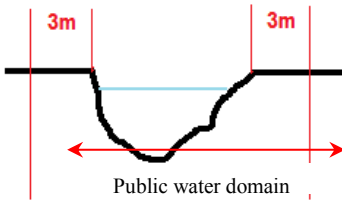
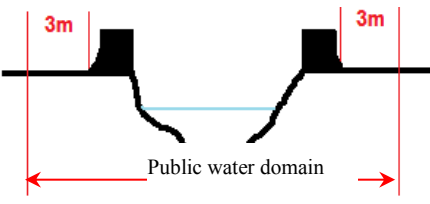
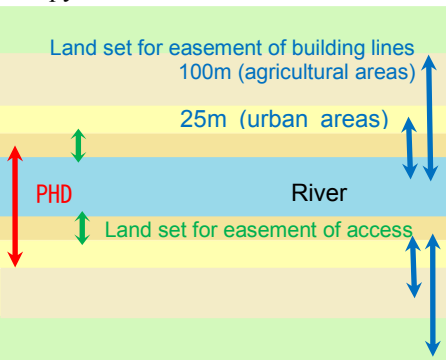
Within these legal systems, government-owned public water zones (public hydraulic domain) are set by the Water Code. Land use is set by the Forest Code, and easement is set by the Land Development and Urban Planning Law. “Easement” broadly refers to the right of a person to use land owned by another 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.

In Tunisia, public water zones (or public hydraulic domain (PHD)) have been established as follows in accordance with Chapter 1 of the Water Code.

- i) All natural and man-made rivers
- ii) Water tanks installed on rivers
- iii) All types of water sources
- iv) All types of groundwater zones
- v) Lakes, marshes, and *sebkhats* (wetlands that are submerged only during the winter rainy season)
- vi) Public aqueducts, ship channels, irrigations canals, wells, watering places, as well as the land and ancillary facilities included in the facilities to the right.

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.

**Table 9-1 Definitions for public hydraulic domain and land set for easement**

Water zone definition		Related laws	Stipulated content
Public hydraulic domain		Chapter 1 and Chapter 4 of Water Code	<p>For natural rivers such as the Mejerda River, the area shall be 3m from the high-water line of the riverbank floodplain.</p>  <p>If a levee is present, the area shall be 3m from border of the outer side of the levee.</p> 
		Article 10 of Forest Code	<p>It is prohibited to use the land within a public hydraulic domain for agricultural activities, tree planting, and building constructions, etc. (No particular provisions are made regarding grazing.) The existence and maintenance of building structures that were present prior to the time the Forest Code came into force is allowed under the condition that absolutely no changes are made to the size of the building or the building materials used.</p>
Land set for easement	Land set for easement of access	Chapter 4 of Water Code	<p>Nearby residents (limited to within 3m of the riverbank) of rivers, lakes, marshes, and <i>sebkhats</i> must agree to easement rights so that people and goods from the government side may pass through freely. This easement is not eligible for rights to compensation.</p> <p>The public hydraulic domain encompasses the land set for easement of access. A passageway area of 3m from both banks in the public hydraulic domain shall be set as land for easement of access.</p>
	Land set for easement of building lines (hinterland)	Article 25 of Land Development and Urban Planning Law	<p>If there is no approved urban development plan, this area shall occupy a width of 100m alongside the public hydraulic domain. If there is an urban development plan, this area will occupy a width of 25m within the zone.</p> 

Source: Water Code, Forest Code, Land Development and Urban Planning Law

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. The scope of areas is surrounded by a dotted line in the maps.



Source: Ariana Governorate Office, Ministry of Equipment

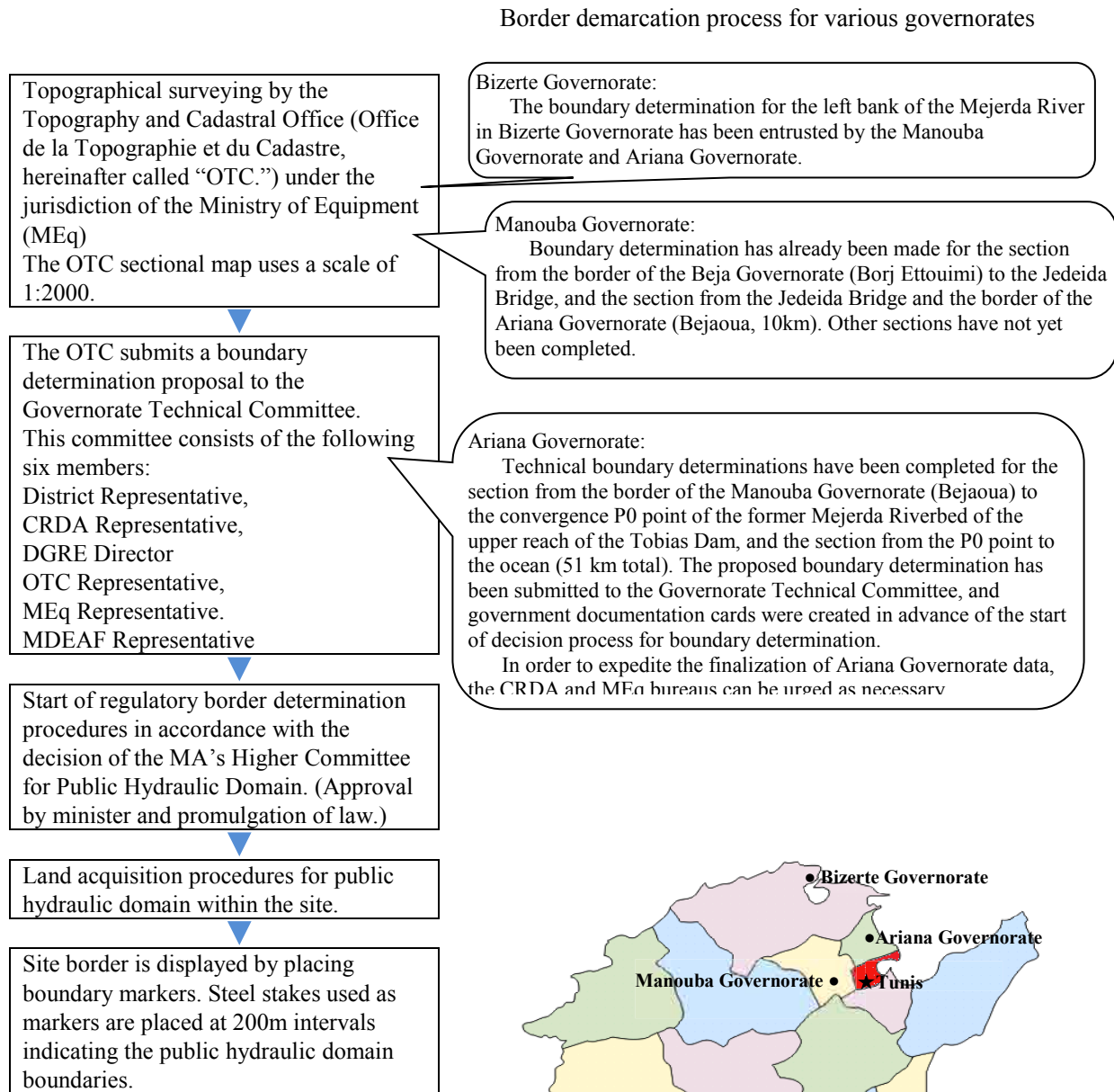
**Figure 9-1 Maps of areas targeted for urban development planning in various cities**

Using these Urban Development Plan maps, it had been determined that since the lower reaches of Tobias Dam is outside of the urban development planning scope for Kalaat el-Andalous city in the Ariana Governorate, 100m of agricultural area will be designated as land set for building easement.

**(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. The process for determining borders is as shown in the following figure.



Source: JICA Survey Team

**Figure 9-2 Process for public land boundary demarcation**

### 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

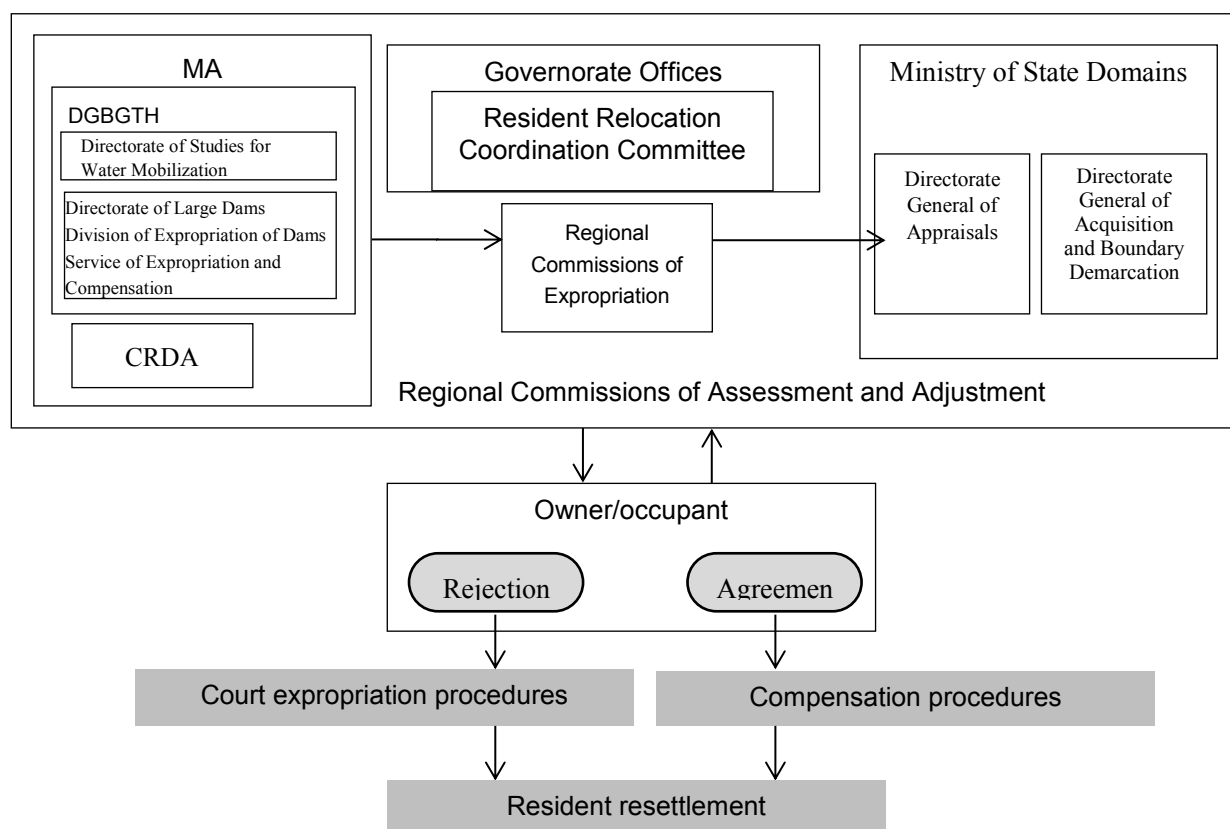
#### (1) Organizations related to land acquisition and resident resettlement

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 (a public companies set up within the Ministry of State Domains to handle registration management)
- CRDA
- Governorates and relevant districts
- Regional Commissions of Expropriation  
With the Governor acting as chairperson, this commission consists of representatives from the DGBGTH, MEq, Ministry of State Domains, CRDA, and relevant districts.
- Regional Commissions of Assessment and Adjustment  
With a government official acting as chairperson, this commission generally consists of about 12 people as standing and temporary members. They include the land expropriator, local representatives of the MEq, experts from the Ministry of State Domains, representatives of regional social welfare agencies, district court representatives, and CRDA representatives.
- Court of justice (involved if there are land expropriation procedures)
- Central Committee on Land Use Planning and Development  
This committee consists of the major relevant directorates, the Ministry of State Domains, and the governors of governorates in Project areas. It is only involved for special cases, such as disputes between owners during land acquisition or the discovery of cultural or archeological artifacts during construction work.
- Central Steering Committee  
Study on the establishment of this committee by the Ministry of State Domains, the MEq, and the ME began following the revolution in order to facilitate land acquisition procedures through government involvement. The timing of establishment and primary activities of the committee are yet undetermined.

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





Source: JICA Survey Team

**Figure 9-3 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.

**Table 9-2 Procedures for land acquisition by type of ownership**

Legal status of land	Ownership/occupation status		Procedures related to land acquisition
State-owned land	Land that has been registered in the land registry	No unlawful occupation (4)	Change of land use procedures are conducted with each relevant government office and the Ministry of State Domains in accordance with the classification of state-owned land including water source, forest, ocean, or industrial-related.

	(Land Use Law of 1 July 1885 and Realty Law of 12 February 1965)	Unlawful occupation (1)	Instead of expropriation procedures, procedures for compensation or settlement on alternative land are conducted. If the occupant rejects the offered compensation, surrender of the land in a short period of time may become difficult.
Privatized state-owned land	Management of state-owned parks and dams, etc. by public corporations or other private sector entities (5)		Change of land use procedures are applied for at the Ministry of State Domains.
Privately-owned land	Land that has been registered in the land registry (Land Use Law of 1 July 1885 and Realty Law of 12 February 1965)	Registered land with an amended land registration certificate (2)	A land registration certificate is issued in accordance with the certificate of ownership rights registered at the Rural Land Conservation Bureau and land registration number on the parcel area map registration with the OTC. Acquisition through consultations or expropriation procedures is then executed. The main difficulties lie in jointly owned land. In this case, it may be necessary to decide lots and properties among multiple transferees of rights.
		Land not registered and without an amended land registration certificate (2)	Amendments are necessary, but may take time.
	Land that is in the process of becoming registered in the land registry (Has applied.)	Occupant has a certificate of registration application (2)	If registration is currently in process, an application number is given to the target lot for application by the Land Court. Acquisition through consultations or expropriation procedures are then executed according to the application results from the Land Court.
	Land that has not been registered in the land registry	Occupant has a certificate of ownership (2)	A certificate of ownership is a government document issued to an agricultural land occupant who has resided on the land for 5 or more years. Purchase rights may be given in the future upon registration in the land registry.
		Occupant has a certificate of ownership right (3)	A certificate of ownership right is a notarized document without a land registration number. In this case, the governor issues an ownership certificate after the period of public notice of expropriation ends.
No documents proving ownership rights exist (3)		Six months after the public announcement, the occupant claiming ownership rights of the unregistered land lots is considered the land owner. If nobody claims ownership rights, that land becomes public land.	

Source: JICA Survey Team

## 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

- i) In accordance with a proposal from the Division of Expropriation of Dams, the Directorate of Studies for Water Mobilization will send technical documents for Project land technical documents consisting of sitemaps, position coordinates of planned building structures, and the outline of this Project.
- ii) The Preliminary Social and Land Survey will be conducted for the purpose of a) investigating residents and immovable property directly affected by the Project, and b) calculating land acquisition costs for the Project and the damage and/or costs (crops, similar assets, etc.) incurred due to loss of land. This survey will be entrusted to a private surveying company or it will be conducted by the OTC. For this Project, the land registry maps for Manouba and Ariana Governorates are currently in the final stages of public land boundary determination by the OTC. By using these maps, the survey period can be shortened. Survey company selection, preparation of specification documents, survey implementation conditions, preparation for invitation of bids, and candidate selection will be conducted by the Service of Expropriation and Compensation, as well as various committees established within the DGBGTH for land-use planning. The main types of land ownership will be condensed into types 1-5 as shown in the table above. The following outputs will be obtained from the Preliminary Social and Land Survey.
  - Lists of land registration documents, lots, owners (registered), and occupants (not registered)
  - Pedological characteristics of the target land lots
  - Resettlement plan
  - Visualization of the planned land through boundary markers
- iii) The Service of Expropriation and Compensation will submit the Preliminary Social and Land Survey Report to the CRDA, governorates, and the Directorate of Boundary Determination and Acquisition within the Ministry of State Domains. Upon receipt of the report, the governor of the governorate will appoint a representative to the Regional Commission of Expropriation.

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

Relevant organizations  
Regional Commissions of Expropriation

- i) The Regional Commissions of Expropriation will prepare an appraisal report for an initial assessment of the assets of the land planned for expropriation. The appraisal report will contain the land registration number, lot number, name of beneficiary, and the estimated value of bare land, planted land, and immovable structures. Since the commission will draft the appraisal report, they are prohibited from discussing estimated values with residents, and any contact with owners/occupants should be for information gathering purposes only. “Planted land” refers to land with forests or crops, while “immovable structures” refers to houses, sheds, barns, and stables, as well as all buildings on the land for the Project. Value will be expressed in units of dinar per hectare for agricultural land, or dinar per m<sup>2</sup> for land and buildings in urban areas. Even within the same lot, different values may be calculated depending on soil quality, topography, geography, or other elements. Land owners/occupants may not see the appraisal report.
- ii) The Regional Commissions of Expropriation will analyze the Preliminary Social and Land Survey Report sent by the Division of Expropriation of Dams to the Directorate General of Land Acquisition of the Ministry of State Domains.

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

Relevant organizations

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



- i) Evaluation and approval of the appraisal report is conducted by the Directorate General of Appraisals of the Ministry of State Domains. The execution period for this is not set. The estimated value of bare land, planted land, and immovable structures is assessed and the amount of financial compensation for the owners/occupants loss of livelihood is calculated. This must take into account other aspects that may affect values including market price, land price at time of owner purchase, agricultural production value, bare land value, and value of properties. Advice will be received from the CRDA regarding agricultural and planted land, and from MEq governorate branches regarding immovable structures.

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

Relevant organizations  
Directorate 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

- i) After completion of the appraisal report evaluation, the Directorate General of Appraisals of the Ministry of State Domains will distribute the results of the Preliminary Social and Land Survey and appraisal work to the Regional Commissions of Assessment and Adjustment of each relevant governorate.
- For owned land and registered land (corresponding to (2) in the table above)
- ii) The Directorate General of Acquisition and Boundary Demarcation will summon land owners/occupants of the target land to listen to their requests regarding the estimated amount of compensation and conditions for land acquisition. These meetings may be held up to three consecutive times, where the land owners/occupants will approve or reject the value of their assets presented by the Regional Commissions of Assessment and Adjustment, as well write their demands regarding compensatory amounts and conditions in a petition. The Regional Commissions of Assessment and Adjustment does not have the authority to modify the amount of compensation offered by the Directorate General of Appraisals of the Ministry of State Domains.
  - iii) The Regional Commissions of Assessment and Adjustment will send the petition of demands to the Directorate of Acquisitions and Boundary Determination, with an additional copy sent to the Service of Land Acquisition
  - iv) The Division of Expropriation of Dams will transfer the compensation payment for the target land to the Ministry of Finance within two months.
  - v) The Regional Commissions of Assessment and Adjustment will draft a final report within two months based on consultations. This period may be conditionally extended for three months.
  - vi) The Ministry of State Domains will make a determination on land acquisition after receiving the report from the Regional Commissions of Assessment and Adjustment. Land owners may file an appeal in the Tribunal d'instance (inferior court) to oppose the decision of the Ministry of State Domains.
  - vii) After land acquisition through consultations, a government purchase contract is concluded between the owner and the Ministry of State Domains. Items included in the contract are size of the target lot, vacant land in the lot, amount of purchase, and transfer of ownership rights.
  - viii) The payment or deposit of compensation will be made within six months of the drafting of the final report by the Regional Commissions of Assessment and Adjustment. If payment is delayed, the land owner or occupant can demand penalty interest. For contracts concluded through consultations, the owner is obliged to offer the land to the acquirer immediately after signing the purchase contract. Land and/or structures located on construction site areas are subject to immediate evacuation. However, land and structures that are outside the site may be occupied for as long as the Project permits.

For occupied land and unregistered land (corresponding to (1) and (3) in the table above)

- ii) In general, unregistered land is that for which a proof of ownership certificate exists, but has not been registered, nor have filing procedures for entering into the land registry been taken. There may be cases where the land owner has no documentation whatsoever. Since the owner is thereby unidentified, acquisition procedures become more difficult.  
The Regional Commission of Assessment and Adjustment will make a public notice containing the intent to acquire land and a map of the lots with a list of presumed owners for six months at the governorates, district offices, municipal offices, and Ministry of State Domain governorate offices. In order for owners to obtain compensation for their properties, they must apply within this period of public notice.
- iii) If no owners come forward after six months has passed, procedures for land use change will be put into effect. If an owner does come forward, the procedures detailed above in item ii) under "For owned land and registered land" will be taken.



5. Compensation for above-ground properties

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

- i) The governorates will summon the owners/occupants by registered mail in order to obtain their signatures on the documents for declaration of intent to provide compensation for above-ground properties. This statement of intent is different from the purchase contract with the Ministry of State Domains. It is instead a document in which the owners/occupants promise to the land acquirer (the DGBGTH) to recognize the river development work of the Project on the compensated land upon exchange of the document for the offered amount of financial compensation, without filing any type of objection.
- ii) For planted land and immovable structures, compensation procedures for above-ground properties may be started based on the appraisal results conveyed from the Directorate General of Land Acquisition of the Ministry of State Domains, without waiting for the results of land acquisition procedures by the Division of Expropriation of Dams. The Division of Expropriation of Dams may not modify the compensatory amount decided by the Ministry of State Domains experts. Payment of compensation will be made by transferring above-ground properties compensation from the DGBGTH to the regulating governorate, who will be the actual payment executors. In general, payment will be made promptly after the owner/occupant signs the statement of intent. The time period between signing the statement of intent and payment of compensation has not been established by law. In contrast, the owner/occupant must present the compensated above-ground properties to the land acquirer within six months of the day compensation was paid.
- iii) If the owner rejects the compensation conditions, legal expropriation procedures will be taken. The Division of Expropriation of Dams will deposit the compensatory amount with the Ministry of Finance within two months. After signing a statement of intent to sue, the owner will file an appeal with the courts based on a new trial evaluation. This may cause the land to be vacated later than planned.



6. Change of land use

Relevant organizations  
Service of Expropriation and Compensation, Ministry of State Domains

- i) Based on the list submitted by the Regional Commissions of Assessment and Adjustments, the Service of Expropriation and Compensation will apply to the Ministry of State Domains for change of land use for the target land.
- ii) “Change of land use” refers to the procedure used to convert regular properties of the state (land previously owned by a land owner) to public properties of the state. In order to release the compensation funds deposited with the Ministry of Finance to pay the land owner, the contract noted above will be sent to the Division of Expropriation of Dams. Although the time period is not stipulated, this procedure is normally conducted promptly. Change of land use procedures are applicable to registration certificates for above-ground properties belonging to private land owners or that are regular properties of the state.

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

Relevant organizations  
Ministry of State Domains, Regional Commissions of Assessment and Adjustment



8. Resident resettlement to alternative land

Relevant organizations  
Regional Commissions of Expropriation, Division of Expropriation of Dams, governorates or districts within the governorates

- i) If the owner/occupant files an appeal at the inferior court regarding the amount and conditions of compensation for above-ground assets, or if multiple persons claim ownership, legal procedures will be taken.  
The Ministry of State Domains will make a public notification of the decree on public utility declaration of the land in an official gazette, and the land will legally become state-owned land. The expropriator can begin construction and/or surveying immediately after the decree is publicly announced. After the public announcement of the decree on public utility declaration, if the owner/occupant does not hand over the target land, legal procedures will be prolonged, with the risk of hindering the process of securing land for the Project.
  - ii) Within the framework of the land acquisition procedures, state-appointed experts will reassess the amount of compensation. At the same time, an appraiser for the plaintiff will also conduct an assessment.
  - iii) The court is obliged to hand down a decision regarding the amount of compensation for land acquisition within three months of the first court hearing.
  - iv) If the plaintiff files a new appeal, the appellate court will hand down a ruling within three months of the first court hearing. In addition, the Cour de cassation (highest court) will hand down a decision within three months after the day the suit was filed.
- 
- i) In Tunisia, no regulations or guidelines have been established regarding resident resettlement. For large river projects that give rise to involuntary resident resettlement on a large scale, there have been cases in which the Division of Expropriation of Dams relocates residents to a specially prepared housing district on state-owned land provided by the regulating authority.<sup>1</sup> If the scale of resident resettlement is small, the necessity of relocating to alternative land will be decided from the statement of demands submitted by the owners/occupants during land acquisition procedures. In Decree No. 23 of 13 February 1995 regarding relocation to state-owned rural land (amended by Decree No. 11 of 10 February 1998), owners may exchange their original land for state-owned alternative agricultural land. By requesting relocation to a neighboring or other region, owners may be provided with housing, etc. 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. The Service of Expropriation and Compensation must examine the possibilities for resettling each owner in accordance with his statement of demands.
  - ii) A special committee will be established at the governorate level to manage resident resettlement, and will provide coordination between the various related agencies and the residents.
  - iii) Although there are no regulations for resettling to alternative land, the governorate or the districts within the governorate (specifically called *délégations* or *mutanadiyah*, which act as the intermediate administrative division between the governorate and sectors) 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.

<sup>1</sup>If there are a large number of people to be relocated to alternative land, the person responsible for planning in the district accepting the resettling residents will draft a plan for construction and development. The most successful example of resident resettlement due to dam construction was the Sidi El Barak Plan of 1999 and 2000. In this case, 1,226 families were given land in eight new communities created as alternative land



An actual example of a decree on public utility declaration that is promulgated for land expropriation is shown in the figure below.

**Décret n° 2009-172 du 26 janvier 2009, portant expropriation pour cause d'utilité publique de parcelles de terre agricole, sises à la délégation de Foussana, gouvernorat de Kasserine, nécessaires à la construction d'un barrage collinaire sur Oued El Battoum.**

Le Président de la République,  
Sur proposition du ministre des domaines de l'Etat et des affaires foncières,  
Vu la loi n° 76-85 du 11 août 1976, portant refonte de la législation relative à l'expropriation pour cause d'utilité publique, modifiée et complétée par la loi n° 2003-26 du 14 avril 2003,  
Vu le décret n° 2003-1551 du 2 juillet 2003, fixant la composition, les attributions et les modalités de fonctionnement de la commission de reconnaissance et de conciliation en matière d'expropriation,  
Vu l'avis des ministres de l'intérieur et du développement local, de l'agriculture et des ressources hydrauliques,  
Vu le rapport de la commission de reconnaissance et de conciliation du gouvernorat de Kasserine,  
Considérant que les dispositions de l'article 11 (nouveau) de la loi n° 76-85 du 11 août 1976, portant refonte de la législation relative à l'expropriation pour cause d'utilité publique, modifiée et complétée par la loi n° 2003-26 du 14 avril 2003, ci-dessus mentionnée, ont été accomplies.

Décète :

Article premier - Sont expropriées pour cause d'utilité publique, au profit de l'Etat, en vue d'être incorporées au domaine public hydraulique, pour être mises à la disposition du ministère de l'agriculture et des ressources hydrauliques, des parcelles de terre agricole, sises à la délégation de Foussana, gouvernorat de Kasserine, nécessaires à la construction d'un barrage collinaire sur Oued El Battoum, entourées d'un liséré rouge sur le plan annexé au présent décret et indiquées au tableau ci-après :

N° d'ordre	N° de la parcelle sur le plan	N° du titre foncier	Superficie totale de l'immeuble	Superficie expropriée	Noms des propriétaires
1.	120 140 150 164 197 du plan TPD n° 32139	21249 Kasserine	26h 15a 28ca	1h 49a 14ca 60a 02ca 1h 78a 81ca 26a 23ca 17a 87ca	1- Ammar 2- Sebti 3- Chedlia 4- Sasia 5- Amor 6- Arbi, les six enfants de Ibrahim Ben Ali Abaldi 7- Rim Bent Mohamed Ben Bougataya Abaldi 8- Aziza Bent Jilani Ben Ammar Abaldi 9- Zéhi 10- Taoufik 11- Lotfi 12- Chahla 13- Sabra 14- Nawara, les six derniers enfants de Mohamed Salah Ben Brahim Abaldi 15- Baghdadadi 16-Salem 17- Ammar 18- Rebeh, les quatre derniers enfants de Ali Ben Ammar Abaldi 19- Lamine Ben Brahim Ben Ali Abaldi
2.	244 247 251 du plan TPD n° 32139	17696 Kasserine	2h 76a 67ca	62a 24ca 68a 32ca 1h 46a 11ca	Zine Ben Ali Ben Chikhar Abaldi
3.	243 du plan TPD n° 32139	17697 Kasserine	1h 22a 20ca	24a 57ca	1- Abdelkarim 2- Afif 3- Hania Fatma 4- Salha, les quatre enfants de Hafsi Ben Mohamed Abaldi 5- Louisa Bent Mohamed Ben Amor Abaldi
4.	114 121 du plan TPD n° 32139	17748 Kasserine	3h 90a 21ca	3h 29a 90ca 60a 31 ca	1- Beji 2- Fatma 3-Amor 4- Tahar 5- Abada, les cinq enfants de Mohamed Ben Abid Smara 5- Zohra Bent Ali Ben Abid Smara
5.	208 du plan TPD n° 32139	16205 Kasserine	3h 71a 97ca	81a 87ca	1- Hedi Ben Houcine Ben Amara Marwani 2- Ahmed Lazher Ben Ayachi Ben Tayeb Smiri

Art. 2 - Sont également expropriés, tous les droits mobiliers et immobiliers qui grèvent ou pourraient grever les dites parcelles.  
Art. 3 - Le ministre de l'intérieur et du développement local, Le ministre de l'agriculture et des ressources hydrauliques et le ministre des domaines de l'Etat et des affaires foncières sont chargés, chacun en ce qui le concerne, de l'exécution du présent décret qui sera publié au Journal Officiel de la République Tunisienne.  
Tunis, le 26 janvier 2009.

**Zine El Abidine Ben Ali**

**Decree No. 2009-172 of 26 January 2009 on expropriation for public utility plots of agricultural land, based in the delegation Foussana, Governorate of Kasserine, for the construction of a dam on Oued El Battoum hill.**

The President of the Republic,  
On the proposal of the Minister of State and the areas of Land Affairs,  
Pursuant to Law No. 76-85 of 11 August 1976, recasting legislation on expropriation for public utility, as amended and supplemented by Law No. 2003-26 of 14 April 2003  
Having regard to Decree No. 2003-1551 of 2 July 2003 laying down the composition, functions and operating procedures of the Committee on recognition and reconciliation in matters of expropriation,  
Regard to the opinion of the Ministers of the Interior and Local Development, Agriculture and Water Resources,  
Having considered the report of the Committee on recognition and reconciliation of the governorate of Kasserine,  
Whereas the provisions of Article 11 (new) of Law No. 76-85 of 11 August 1976, recasting legislation on expropriation for public utility, as amended and supplemented by Law No. 2003-26 of 14 April 2003, the above mentioned have been accomplished.

Decree :

Article 1 - For the benefit of the State, to be incorporated into public water to be made available to the Ministry of Agriculture and Water Resources, the agricultural land plots, based in the delegation Foussana, governorate of Kasserine, are expropriated for public purposes for the construction of a dam on Oued El Battoum hill, surrounded by a red border on the plan attached hereto and listed in the table below:

Order No.	Plot No. in the plan	Number of the land title	Total area of the block	Size of the expropriation area	Name of the land owners
1.	120 140 150 164 197 of the plan No. 32139	21249 Kasserine	26h 15a 28ca	1h 49a 14ca 60a 02ca 1h 78a 81ca 26a 23ca 17a 87ca	1- Ammar 2- Sebti 3- Chedlia 4- Sasia 5- Amor 6- Arbi, the six children of Ibrahim Ben Ali Abaldi 7- Rim Bent Mohamed Ben Bougataya Abaldi 8- Aziza Bent Jilani Ben Ammar Abaldi 9- Zéhi 10- Taoufik 11- Lotfi 12- Chahla 13- Sabra 14- Nawara, the six children of Mohamed Salah Ben Brahim Abaldi 15- Baghdadadi 16-Salem 17- Ammar 18- Rebeh, the last four children of Ali Ben Ammar Abaldi 19- Lamine Ben Brahim Ben Ali Abaldi
2.	244 247 251 of the plan No. 32139	17696 Kasserine	2h 76a 67ca	62a 24ca 68a 32ca 1h 46a 11ca	Zine Ben Ali Ben Chikhar Abaldi
3.	243 of the plan No. 32139	17697 Kasserine	1h 22a 20ca	24a 57ca	1- Abdelkarim 2- Afif 3- Hania Fatma 4- Salha, the four children of Hafsi Ben Mohamed Abaldi 5- Louisa Bent Mohamed Ben Amor Abaldi
4.	114 121 of the plan No. 32139	17748 Kasserine	3h 90a 21ca	3h 29a 90ca 60a 31 ca	1- Beji 2- Fatma 3-Amor 4- Tahar 5- Abada, the five children of Mohamed Ben Abid Smara 5- Zohra Bent Ali Ben Abid Smara
5.	208 of the plan No. 32139	16205 Kasserine	3h 71a 97ca	81a 87ca	1- Hedi Ben Houcine Ben Amara Marwani 2- Ahmed Lazher Ben Ayachi Ben Tayeb Smiri

Art. 2 - All movable and immovable property which disturbs or may disturb the mentioned plots is also expropriated.  
Art. 3 - The Minister of the Interior and Local Development, Minister of Agriculture and Water Resources and the Minister of State and areas of Land Affairs are in charge of the execution of each responsible part in this decree, which shall be published in the Official Journal of the Tunisian Republic.  
Tunis, January 26, 2009.

**Zine El Abidine Ben Ali**

Source: The Ministry of State Domains website (<http://www.mdef.gov.tn/images/pdf/expropriations/D2009-172Fr.pdf>)

**Figure 9-4 Actual example of decree on public utility declaration  
(English translation follows the original French version)**

### 9.1.4 Key principles of JICA policy on involuntary resettlement

The key principles of JICA policy on involuntary resettlement are shown in the figure below.

**The key principle of JICA policies on involuntary resettlement is summarized below.**

- I. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.
- II. When, population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.
- III. 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.
- IV. Compensation must be based on the full replacement cost<sup>2</sup> as much as possible.
- V. Compensation and other kinds of assistance must be provided prior to displacement.
- VI. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public. It is desirable that the resettlement action plan include elements laid out in the World Bank Safeguard Policy, OP 4.12, Annex A.
- VII. 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. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.
- VIII. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.
- IX. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.

Above principles are complemented by World Bank OP 4.12, since it is stated in JICA Guideline that “JICA confirms that projects do not deviate significantly from the World Bank’s Safeguard Policies”. Additional key principle based on World Bank OP 4.12 is as follows.

- X. 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.
- XI. Eligibility of Benefits include, 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.
- XII. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.
- XIII. Provide support for the transition period (between displacement and livelihood restoration).
- XIV. 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.
- XV. For projects that entail land acquisition or involuntary resettlement of fewer than 200 people, abbreviated resettlement plan is to be prepared.

<sup>2</sup>Description of “replacement cost” is as follows.

Land	Agricultural Land	The pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.
	Land in Urban Areas	The pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.
Structure	Houses and Other Structures	The market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes.

**In addition to the above core principles on the JICA policy, it also laid emphasis on a detailed resettlement policy inclusive of all the above points; project specific resettlement plan; institutional framework for implementation; monitoring and evaluation mechanism; time schedule for implementation; and, detailed Financial Plan etc.**

Source: JICA Guidelines

**Figure 9-5 Key principles of JICA policy on involuntary resettlement**

### 9.1.5 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 9-3 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

### **9.1.6 Land acquisition and resident resettlement policy for the Project**

The land acquisition and resident resettlement policy for the Project is shown below.

- I. The Government of Tunisia will use the Project Resettlement Policy (the Project Policy) for the Preparatory Survey on Integrated Basin Management and Flood Control Project for Mejerda River: Development of Flood Prevention Measures specifically because the existing national laws and regulations has not been designed to address involuntary resettlement according to international practice, including JICA's policy. The Project Policy is aimed at filling-in any gaps in what local laws and regulations cannot provide in order to help ensure that PAPs are able to rehabilitate themselves to at least their pre-project condition. This section discusses the principles of the Project Policy and the entitlements of the PAPs based on the type and degree of their losses. Where there are gaps between the Tunisia legal framework for resettlement and JICA's Policy on Involuntary Resettlement, practicable mutually agreeable approaches will be designed consistent with Government practices and JICA's Policy.
- II. Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.
- III. Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.
- IV. Compensation and rehabilitation support will be provided to any PAPs, that is, any person or household or business which on account of project implementation would have his, her or their:
  - Standard of living adversely affected;
  - Right, title or interest in any house, interest in, or right to use, any land (including premises, agricultural and grazing land, commercial properties, tenancy, or right in annual or perennial crops and trees or any other fixed or moveable assets, acquired or possessed, temporarily or permanently);
  - Income earning opportunities, business, occupation, work or place of residence or habitat adversely affected temporarily or permanently; or
  - Social and cultural activities and relationships affected or any other losses that may be identified during the process of resettlement planning.
- V. All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing and any such factors that may discriminate against achievement of the objectives outlined above. Lack of legal rights to the assets lost or adversely affected tenure status and social or economic status will not bar the PAPs from entitlements to such compensation and rehabilitation measures or resettlement objectives. All PAPs residing, working, doing business and/or cultivating land within the project impacted areas as of the date of the latest census and inventory of lost assets(IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost, if available and restoration of incomes and businesses, and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project living standards, income-earning capacity and production levels.
- VI. PAPs that lose only part of their physical assets will not be left with a portion that will be inadequate to sustain their current standard of living. The minimum size of remaining land and structures will be agreed during the resettlement planning process.
- VII. People temporarily affected are to be considered PAPs and resettlement plans address the issue of temporary acquisition.
- VIII. Where a host community is affected by the development of a resettlement site in that community, the host community shall be involved in any resettlement planning and decision-making. All attempts shall be made to minimize the adverse impacts of resettlement upon host communities.
- IX. The resettlement plans will be designed in accordance with the Tunisian system of laws (Decree No. 26 of 14 April 2003 regarding land expropriation (amended from initial issuance as Decree No. 85 of 11 August 1976)) and JICA's Policy on Involuntary Resettlement.
- X. The Resettlement Plan will be translated into local languages and disclosed for the reference of PAPs as well as other interested groups.
- XI. Payment for land and/or non-land assets will be based on the principle of replacement cost.

- XII. Compensation for PAPs dependent on agricultural activities will be land-based wherever possible. Land-based strategies may include provision of replacement land, ensuring greater security of tenure, and upgrading livelihoods of people without legal land titles. If replacement land is not available, other strategies may be built around opportunities for re-training, skill development, wage employment, or self-employment, including access to credit. Solely cash compensation will be avoided as an option if possible, as this may not address losses that are not easily quantified, such as access to services and traditional rights, and may eventually lead to those populations being worse off than without the project.
- XIII. Replacement lands, if the preferred option of PAPs should be within the immediate vicinity of the affected lands wherever possible and be of comparable productive capacity and potential<sup>3</sup>. As a second option, sites should be identified that minimize the social disruption of those affected; such lands should also have access to services and facilities similar to those available in the lands affected.
- XIV. Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihood and standards of living of PAPs. Such support could take the form of short-term jobs, subsistence support, salary maintenance, or similar arrangements.
- XV. The resettlement plan must consider the needs of those most vulnerable to the adverse impacts of resettlement (including the poor, those without legal title to land, ethnic minorities, ladies and children, elderly and disabled) and ensure they are considered in resettlement planning and mitigation measures identified. Assistance should be provided to help them improve their socio-economic status.
- XVI. PAPs will be involved in the process of developing and implementing resettlement plans.
- XVII. PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to the extent possible be involved in the decisions that are made concerning their resettlement.
- XVIII. Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition (including compensation and income restoration measures) within the agreed implementation period. The funds for all resettlement activities will come from the Government.
- XIX. Displacement does not occur before provision of compensation and of other assistance required for relocation. Sufficient civic infrastructure must be provided in resettlement site prior to relocation. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAPs, will be completed prior to any construction activities, except when a court of law orders so in expropriation cases. (Livelihood restoration measures must also be in place but not necessarily completed prior to construction activities, as these may be ongoing activities.)
- XX. Organization and administrative arrangements for the effective preparation and implementation of the resettlement plan will be identified and in place prior to the commencement of the process; this will include the provision of adequate human resources for supervision, consultation, and monitoring of land acquisition and rehabilitation activities.
- XXI. Appropriate reporting (including auditing and redress functions), monitoring and evaluation mechanisms, will be identified and set in place as part of the resettlement management system. An external monitoring group will be hired by the project and will evaluate the resettlement process and final outcome. Such groups may include qualified NGOs, research institutions or universities. **The monitoring report is to be submitted directly to JICA.**

#### Cut-off-date of Eligibility

The cut-off-date of eligibility refers to the date prior to which the occupation or use of the project area makes residents/users of the same eligible to be categorized as PAPs and be eligible to Project entitlements. In the Project, **the cut-off dates for land title holders will be the date of notification under the Land Acquisition Act (décret de déclaration d'utilité publique / Loi no. 85 du 11 août 1976, modifiée par la Loi no. 26 du 14 avril 2003 relative à l'acquisition de terrains pour les travaux d'intérêt public) and for non-titled holders will be the beginning date of the land study (enquête socio-foncière et travaux préliminaires), planned to be undertaken by the DGBGTH in 2014.**

This date has been disclosed to each affected village by the relevant local governments and the villages have disclosed to their populations. The establishment of the eligibility cut-off date is intended to prevent the influx of ineligible non-residents who might take advantage of Project entitlements.

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<sup>3</sup> Agricultural land for land of equal productive capacity means that the land provided as compensation should be able to produce the same or better yield the AP was producing on his/her land prior to the project. The production should be in the planting season immediately following the land acquisition. It can be for a future period if transitional allowance equal to the household's previous yield is provided to the AP household while waiting for the land to get back to the same productivity as the previous land.



Principle of Replacement Cost

All compensation for land and non-land assets owned by households/shop owners who meet the cut-off date will be based on the principle of replacement cost. Replacement cost is the amount calculated before displacement which is needed to replace an affected asset without depreciation and without deduction for taxes and/or costs of transaction as follows:

- a. Productive land (agriculture, orchards, gardens) based on actual current market prices that reflect recent land sales in the area, and in the absence of such recent sales, based on recent sales in comparable locations with comparable attributes, fees and taxes or in the absence of such sales, based on productive value;
- b. Residential land based on actual current market prices that reflect recent land sales, and in the absence of such recent land sales, based on prices of recent sales in comparable locations with comparable attributes; fees and taxes.
- c. Existing government regulations **under the Land Acquisition Act (Loi no. 85 du 11 août 1976, modifiée par la Loi no. 26 du 14 avril 2003 relative à l'acquisition de terrains pour les travaux d'intérêt public)** for compensation calculations for building, crops and trees will be used where ever available;
- d. Houses and other related structures based on actual current market prices of affected materials;
- e. Annual crops equivalent to current market value of crops at the time of compensation;
- f. For perennial crops, cash compensation at replacement cost that should be in line with local government regulations, if available, is equivalent to current market value given the type and age at the time of compensation.
- g. For timber trees like Eucalyptus or equivalent, cash compensation at replacement cost that should be in line with local government regulations, if available, will be equivalent to current market value for each type, age and relevant productive value at the time of compensation based on the diameter at breast height of each tree.

Source: JICA Guidelines (Items added by the survey team are shown in bold font.)

**Figure 9-6 Land acquisition and resident resettlement policy for the Project**

**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, it is necessary to conduct land acquisition and land/property compensation procedures for the privately-owned portion of land in the Project's target area.

Due to the implementation of this Project, the following will be affected in the target area: 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 9-4 Relocation proposed houses in this project

0. Locations	
<p><b>1. Narrowing the river between El Battan ~ Jedeida • left bank at 46.5km point</b></p>	
	<p>30 people are living. Melon, apple and pear are cultivated in the fields around the house. The barn exists along the river, but is not currently used</p>
<p><b>2. Narrowing the river between El Battan ~ Jedeida • right bank at 46.5km point</b></p>	
	<p>One family, one person is a resident of 10 years ago. Dwelling, barn and warehouse for materials are built on site. Keeping a dozen head of cattle and there is a small olive garden on site. As seen in the photo at right side, the barn is built only about 1m away from the banks.</p>
<p><b>3. The right bank of the old river channel at western Sidi Thabet, 24.7km point.</b></p>	
	<p>6 people per family are resident since 1998. Obtained permission to use the triangle area of the National land in the range of the triangle in the Farmland is cultivated artichokes. House is located very close to the riverbank</p>

Source: JICA Survey Team

The details of impacts on immovable property due to land acquisition for the Project are those identified in the Preliminary Social and Land Survey included in the land acquisition procedures. They include the number affected lots and their land area, and ownership details of land, diversion channels, and discharge channels along the Mejerda River and the El Mabtouh retarding basin. In all target regions, the major impact on immovable property is the loss of agricultural land.

For example, since all areas of the El Mabtouh retarding basin (Job Division II) are state-owned land, land acquisition procedures are completed with just the change of land use procedures for the grazing district. However, it is expected that this will generate a loss of agricultural land and grazing land for area residents on the west and north sides of the retarding basin.

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.

Around the time of the cut-off date for expropriation procedures for land with no proprietary rights, the start date for the population census to be implemented by the DGBGTH in 2014 will be set based on the JICA Category B Project report guidelines for environmental and social considerations.

To prevent an influx of new residents on to the Project land after the cut-off date, the DGBGTH will disseminate information to citizens via the governorate offices of Ariana, Bizerte, and Manouba regarding the areas that were demarcated for the Project. The Survey Team coordinated and consulted with the DGBGTH during the period of this survey so that this dissemination of information may be conducted in an effective manner. In addition, the approval of the DGBGTH was obtained to systematically and continuously publicize this to prevent a further population influx after boundary demarcation.

### **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.).

According to this survey on livelihoods, the Project land located along the river is privately-owned land consisting of agricultural land and building structures. As shown in the map of state-owned grazing land in the previous chapter on environmental and social considerations, only the El Mabtouh retarding basin is state-owned land. According to the same map, the land for the levee planned for construction in the Project lies completely within the scope of state-owned land.

### **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>4</sup>

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<sup>4</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 9-5 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>5</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>6</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 (land, residences, shops, public facilities, trees, etc.)<sup>7</sup>, and their quantities are shown in the tables below.

i) Land

**Table 9-6 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>5</sup> HH: House Hold

<sup>6</sup> CBEs: Commercial and Business Enterprises

<sup>7</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 9-7 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. 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.

The cut-off date for the Project will serve as the notification date, as based on the Land Ownership Law. For acquisition procedures for land with no proprietary rights, the start date for the population census to be implemented by the DGBGTH in 2014 will be set based on the JICA Category B Project report guidelines for environmental and social considerations.

##### (2) Reconstruction of livelihoods

As a measure for the reconstruction of livelihood for resettled residents, it is required that the full cost in the form of subsidies be provided for resettlement and restoration of livelihoods and standards of living.

This amount will be based on existing Tunisian regulations, appraisal reports prepared by the Regional Commissions of Expropriation, and the results of appraisal report evaluation by experts at the Ministry of State Domains.

### (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 of Ariana, Bizerte, and Manouba.

### (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 9-8 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</li> </ul>	Replacement value of assets (cash compensation) to cover the market value of assets as determined by Ministry of	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

	recognized after 6-month public announcement	State Domain	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 the 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 9-9 Schedule for land and property acquisition (draft)**

Implementation schedule	Period: 15 Period (months)	Schedule for land and property acquisition (draft)																						Notes	
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
(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											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

Relocation and compensation costs related to resident resettlement and land acquisition are planned to be calculated based on property and land survey results that can be found within EIA survey items. The DGBGTH will be the implementing body. In addition, it is necessary for these relocation and compensation costs, as well as costs associated with monitoring resident resettlement to be shown clearly in a resident relocation plan to be drafted 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. The form will be created by appropriately referring to the sample monitoring form for land acquisition and involuntary resident resettlement as shown in the following table. 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 9-10 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	

**Table 9-11 Example of land acquisition and resident resettlement monitoring form**  
**Monitoring form for Preparation of Resettlement Sites** **No.**

Explanation of the land (e.g. Location, size of the area, no. of resettlement HH, etc.)	Status (Completed (date) / not completed)	Details (e.g. Site selection, identification of candidate sites, discussion with PAP, Classification of the land (State-owned land / Private land (Cropland / Tree plantation / Plantation planting / Pasture / Residence and adjunct / Other))	Expected Date of Completion

Public Consultation

No.	Date	Place	Contents of the consultation / main comments and answers
1.			
2.			

Resettlement Activities	Planned Total	Unit	Progress in Quantity			Progress in %		Expected Date of Completion	Responsible Organization
			During the Quarter	Till the Last Quarter	Up to the Quarter	Till the Last Quarter	Up to the Quarter		
Preparation of RAP									
Employment of Consultants		Man-month							
Implementation of Census Survey (including Socioeconomic Survey)									
Approval of RAP			Date of Approval:						
Finalization of PAPs List		No. of PAPs							
Progress of filling the request card (if any)		No. of PAPs							
No. of PAPs who need Resettlement support		No. of PAPs							
No. of PAPs who have received Resettlement support		No. of PAPs							
Progress of signing the administrative sales contract based on discussion		No. of HHs							
Progress of Compensation Payment		No. of HHs							
Amount of Compensation for the land in the project site		TND							
Amount of Compensation for the properties in the project site		TND							
Transferred Compensation payment for the land to the Finance Bureau		TND	Date of Approval:						
Transferred Compensation payment for the properties to the Finance Bureau		TND	Date of Approval:						
Progress of Land Acquisition (All Lots)		ha							
Lot 1		ha							
Lot 2		ha							
Lot 3		ha							
Lot 4		ha							
Progress of Asset Replacement (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							
Progress of Relocation of People (All Lots)		No. of HHs							
Lot 1		No. of HHs							
Lot 2		No. of HHs							
Lot 3		No. of HHs							
Lot 4		No. of HHs							

Source: JICA Survey Team

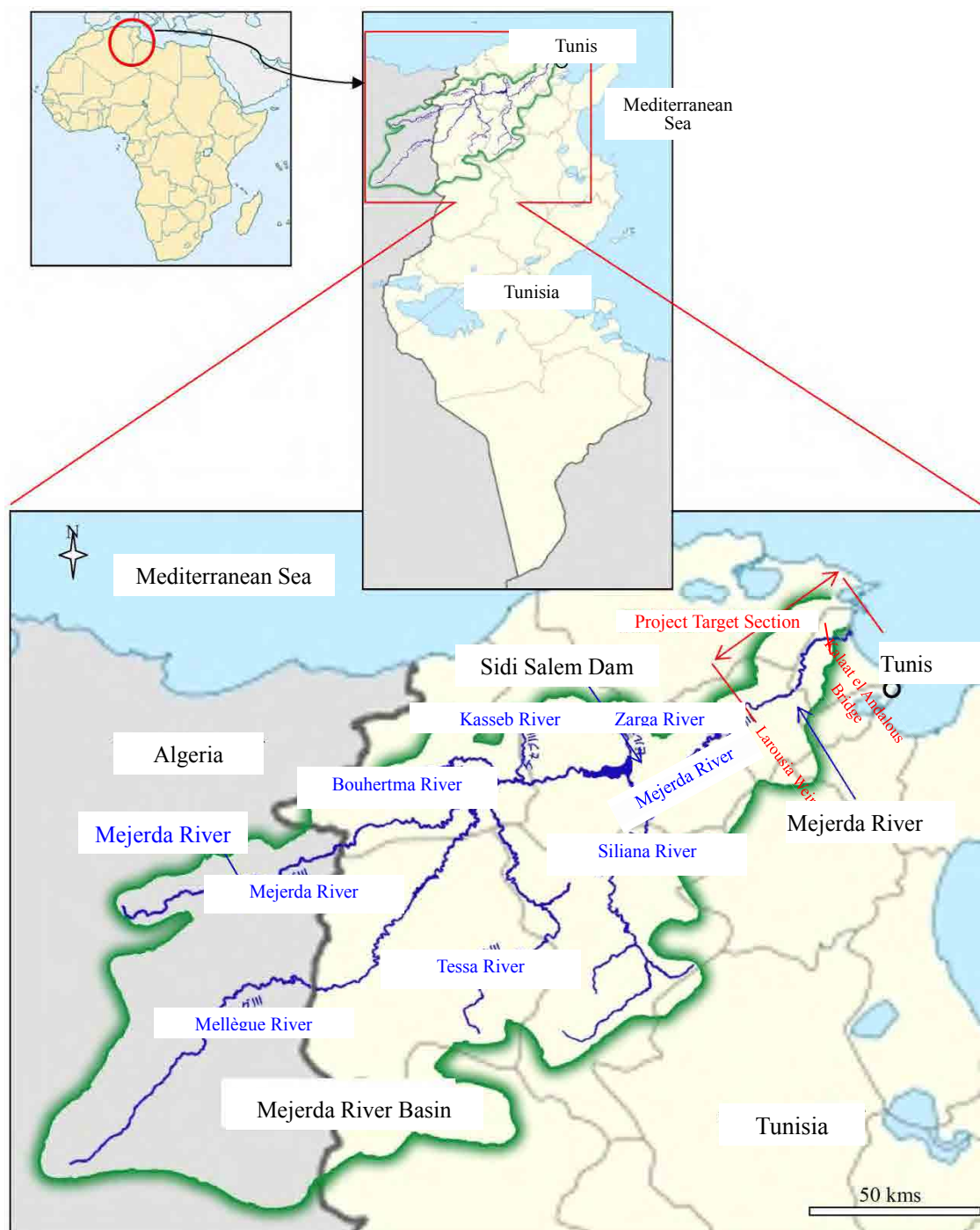
### **9.3.7 Consultations with residents**

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



Location Map of the Mejerda River Flood Control Project

### 10.1 Purpose of the Project

The Project is to improve flood control functions in the basin of the Mejerda 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.

### 10.2 Target Areas

The target area for structural measures shall be a 60.4-kilometer zone (D2 Zone) at the extreme downstream end, from the Kalaat el Andalous Bridge, located 4.6 Kilometers from the river mouth, to the Larousia Dam. The area includes El Mabtouh Retarding Basin, which will store excess water diverted from the main river through an overflow weir when the river is flooded. (See the map in the beginning of this report.)

The target area for nonstructural measures shall be the Mejerda River Basin as the planning and design of the flood forecasting warning system and the dam management system for the Sidi Salem Dam are for the whole basin of the Mejerda River. (See the map in the beginning of this report.)

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

Category	Major works	Target area/zone
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

### 10.3 Project Overview

#### 10.3.3 Overview of the Overall Project Plan

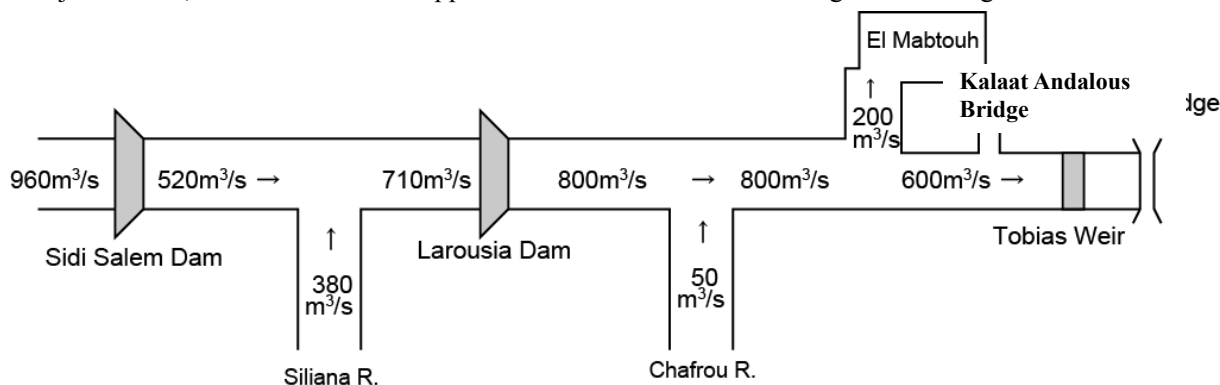
The Mejerda River Flood Control Project is to carry out river improvement works to prevent inundation damage in Jedeida and Tebourba in the downstream and farmland on both sides of the river. The river improvement works will be carried out in a 60.4-kilometer section from the Kalaat el Andalous Bridge to the Larousia Weir in the upstream. At the time of flooding, water will be diverted at a speed of 200 m<sup>3</sup>/s (part of the design flood discharge at a speed of 800m<sup>3</sup>/s) and temporarily stored in the El Mabtouh Retarding Basin. As measures against flood exceeding the designed level and flood caused by global warming, a flood forecasting warning system, a dam management system and a flood fighting and evacuation system shall be established at the same time as structural measures of the river improvement works.

#### 10.3.2 Contents of Construction Works

##### (1) River Improvement and Retarding Basin Works (Structural Measures)

For the Mejerda river projects, sufficient cross section has been secured for the design flow of 600 ~

800m<sup>3</sup>/s with a design scale based on the return period of 10 years. The structural measures of the Mejerda River Flood Control Project are river improvements (levee construction and river-bed excavation) necessary for the design flow, construction of a retarding basin for diversion and storage of design flood discharge, construction of discharge channels to the retarding basin and drainage channels from the basin to the Mejerda River, and construction of appurtenant structures of the discharge and drainage channels.



**Fig. 10-1 Assignment of Design Flood Discharge (D2 Zone: Larousia Dam – Kalaat Andalous Bridge)**

14 bridges over the Mejerda River, 3 bridges over the Chaffrou River, a tributary of the Mejerda River, (in total 17 bridges in Construction Zones I and II) and 15 bridges over discharge channels from the El Mabtouh Retarding Basin will be reconstructed or newly constructed. The following table shows the overview of the target facilities, number of bridges, major river structures etc.

**Table 10-2: Overview of River Improvement and Retarding Basin Works of the Mejerda River Flood Control Project**

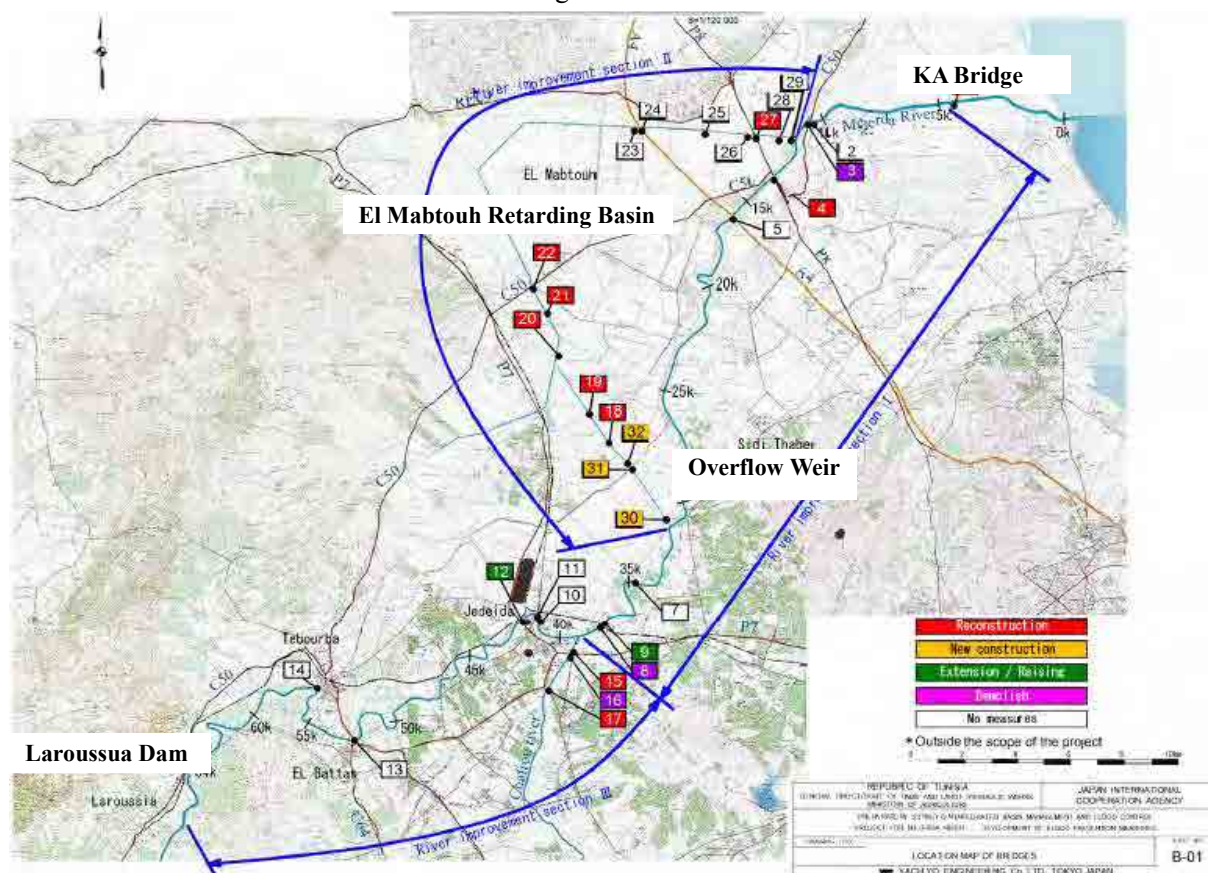
Classification	Works	Unit	River Improvement				Gate Work
			I	II	III	Total	
Design Discharge		m <sup>3</sup> /s	600~800	200	800	-	
Section or Area			Kalaat Andalous Bridge to Shaffrou River	El Mabtouh Retarding Basin	Shaffrou River to Larousia Dam		
River Improvement	(Diversion Channel)		L=34.13 Km	(L=30.5 Km)	L=26.18 Km	L=60.31 Km (Main Course of Mejerda River)	
	Excavation	1000m <sup>3</sup>	5,661	1,719	2,048	9,428	
	Embankment	1000m <sup>3</sup>	508	940	73	1,521	
	Removal	1000m <sup>3</sup>	5,152	804	1,975	7,931	
<b>River Facilities</b>							
<b>El Mabtouh</b>							
	Inflow Weir	Unit	-	1	-	1	-
	Discharge Control	Unit	-	1	-	1	1
	Outflow Gate (Diversion Channel)	Unit	-	1	-	1	1
	Overflow Weir	Unit	-	2	-	2	1
	Sluiceway	Unit	-	28	-	28	28
<b>Mejerda River</b>							
	Sluiceway	Unit	5	0	4	9	9
	Overflow Gate (East-West Channel)	Unit	1				
<b>Bridges</b>							
	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	
<b>Non-structural Measures</b>							
1.Dam Flood Management System (Sidi Salem Dam)		L.S	1				
2.Warning Communication System and Increase community Awareness of Flood Fighting		L.S	1				
3.Recommendation on Organization and Institution and Preparation of Management Standards & Guidelines		L.S	1				

Note 1): Backwater Dike improvement of Shaffrou River (L ≐ 2Km) is included on Construction Section III.

Note 2): Number of construction location of Gate Work should be the same as civil engineering work locations as in Construction Section I through III.

The following map shows the target areas of river improvement and retarding basin works and the

locations of reconstruction and construction of bridges.



**Fig. 10-2 Target Areas of River Improvement and Retarding Basin Work  
 (Construction Zones and Locations of Bridges)**

**(2) Nonstructural Measures**

Nonstructural measures play complementary roles as measures against flood exceeding the design flood level and also as adaptation measures against climate changes with such characteristics as smaller investment cost than structural measures and usefulness as short-term responses and measures. Listed below are the nonstructural measures to be carried out in the Mejerda River Flood Control Project.

**Table 10-3 Contents of the Nonstructural Measures to Be Carried Out in the Mejerda River Flood Control Project**

No.	Envisioned Non-structural Measures	Relative Agencies/Bodies	Project Area
1	Dam Flood Management System	DGBGTH	Sidi Salem Dam
2	Warning Information System and Flood Fighting Activities Plan	MA ONPC CRDA	Mejerda River (D2 Zone)
3	Strengthening of Organization and Capacity Development for Flood Management System	MA (DGRE, DGBGTH) MEq	Mejerda River

Source: JICA Survey Team



### 10.3.3 Contents of Consulting Services

Consulting services are for overall project management, detailed design (D/D), assistance in preparation of bidding documents (tender assistance), construction supervision, environmental/ social monitoring and planning and design of nonstructural objects for the above-described river improvements and retarding basin works. Details of the consulting services are shown in the attached Terms of Reference (TOR) for the consultant services concerning the Mejerda River Flood Control Project. The following table shows the outline of the staff and man-months required for the consulting services (Aug 2015 – Apr 2022). The total man-months required will be 487 (136 for Professional A and 351 for Professional B).

**Table 10-4 Outline of the Consulting Service Team**

No.	Position for Professional	Required Experiences	Expertise for Consulting Service	Total M/M (Months)
A-1	Team Leader/Civil Engineer (for Design and Bid)	10 years	Overall Project Management	23
2	Senior River Structure Engineer	10	D/D of river improvement works	10
3	River Structure Engineer	10	Ditto	13
4	Bridge Structure Design Engineer	10	D/D of bridge works	6
5	Railway Bridge Design Engineer	10	D/D of railway & bridge	5
6	Improvement of Communication System	10	Hydrological & hydraulic analysis for river improvement and prepare manuals for river management	8
7	Flood Inundation Analysis and Forecasting Specialist	10	Hydrological & hydraulic analysis for floods	4
8	Construction Plan and Cost Estimator	10	Construction plan & cost estimate	5
9	Large Dam Operation Planning	10	Design for dam gate operation	4
10	Telemetry System Specialist	10	Telemetry system	4
11	Environment & Social Environmental Specialist	10	Social & environmental consideration	14
12	Community Based Disaster Risk Reduction (DRR) Specialist	10	Plan for CBDP	6
13	Bid Document and Bid Assistance Specialist	10	Preparation of tender document	11
14	Team Leader (Construction Supervision Work)	10	Team leader for supervision works	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	D/D of civil works	27
2	River Structure Design Engineer (1)	10	D/D of river improvement works	9
3	River Structure Design Engineer (2)	10	Ditto	6
4	River Structure Design Engineer (3)	10	Ditto	6
5	Bridge Structure Design Engineer	10	D/D of bridge works	6
6	Railway Bridge Design Engineer	10	D/D of railways and bridge	5
7	Hydrology & Hydraulic Engineer (1)	10	Hydrology & hydraulic analysis	9
8	Hydrology & Hydraulic Engineer (2)	10	Ditto	9
9	Survey and Geotechnical Engineer	10	Survey & geotechnical investigations	5
10	Construction Planner & Cost Estimator (1)	10	D/D, construction plan & cost estimate	7
11	Construction Planner & Cost Estimator (2)	10	Ditto	4
12	Construction Planner & Cost Estimator (3)	10	Ditto	7
13	Disaster Education Specialist	10	Flood disaster education	9
14	Environment Specialist	10	Social & environmental consideration	9
15	Social Environmental Specialist	10	Tender documents & bid assistance	9
16	Bid document and Bid Assistance Specialist (2)	10	Ditto	24
17	Deputy Team Leader (Construction Supervision Work)	10	D /D and supervision of civil works	9
18	Construction Engineer B-1	10	Ditto	42





**Table 10-6 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-Chaфраou)	2,590.7	18.8	3,513.3
2) River Improvement (El Mabtough 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	29.7	1,453.5
1) Base Cost	0	28.0	1,372.0
2) Price Escalation (FC: 2.1%, LC 0.2%)	0	0.3	12.3
3) Physical Contingency (5%)	0	1.4	69.2
2. Government Administration (5%)	0	11.9	584.4
3. VAT	0	42.9	2,103.8
4. Important Tax	0	0	0
5. Sub-Total (1. + 2. + 3. + 4.)	0	84.5	4,141.6
<b>Total (A+B)</b>	<b>7,414.3</b>	<b>142.1</b>	<b>14,375.7</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>142.1</b>	<b>14,965.2</b>
<b>Portion of FC &amp; LC (%)</b>	<b>53.5</b>	<b>46.5</b>	<b>100</b>
<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>	<b>73.9</b>	<b>26.1</b>	<b>100</b>

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

The project cost has been calculated under the conditions specified in the Common Elements for Examination of Yen Loan Projects for Tunisia (Nov 6, 2012).		
a.	Base for unit prices: Sep. 2012 (at the time of local survey by JICA Survey Team)	
b.	Exchange rate: 1 USD = 1.61 TND = 79.0 JPY	
	1 TND = 49.0 JPY (Nov 6, 2012)	
c.	Combination of currency: Local currency portion	
	Foreign currency portion	
d.	Inflation rate: 2.1% for local currency portion, 0.2% for domestic currency portion	
e.	Consultant labor cost:	International consultants 2,562,000 yen/M (FC)
		Local consultants 15,000 TND/M (LC)
		Local support staff 4,500 TND/M (LC)
f.	Contingency: 5.0% both for consultants and main construction	
g.	Tax: VAT 18%	
h.	Import duties: 0.0%	
i.	Office administration cost at project implementing organization: 5.0% of the total project cost	
j.	Interest during construction: Main construction 1.7%, consultant 0.01%	
k.	Commitment charge rate: 0.1%	

#### 10.4.2 Financial Plan

Of the total project cost of 14,965M yen (305.4M TND), 10,823.5M yen (220.9M TND) will be covered by this yen loan and the remaining 4,142M yen (84.5M TND) will be covered by the national budget of Tunisia. Below is the financial plan of the Project.

**Table 10-7 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	72.3
Tunisian national budget (LC)	4,141.6	84.5	27.7
Total	14,965.2	305.4	100

Note: 1 TND= 49 JP Yen

Annual fund requirements are planned as below.

**Table 10-8 Annual Fund Requirements and Breakdown (M JPY)**

Cost Year by Year	Project Cost (M. Yen)	FC Portion (M. Yen)	LC Portion (M. TND)
2013	10.7	10.7	0.00
2014	10.7	10.7	0.00
2015	106.5	47.7	1.20
2016	1,270.2	120.7	23.46
2017	899.5	30.8	17.73
2018	1,837.3	1,084.0	15.37
2019	3,044.8	1,824.6	24.90
2020	3,093.5	1,902.3	24.31
2021	3,206.9	2,004.0	24.55
2022	1,485.0	968.2	10.55
Total	14,965.2	8,003.8	142.07

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

As shown in the table above, the project cost from the start of constructions in FY2013 to FY2022 is 1.8 ~ 3.2 billion yen. The following table shows the breakdown of the annual fund requirements into the foreign currency portions (JICA portion) and the local currency portion.

*Preparatory Survey on Integrated Basin Management and Flood Control Project for Mejerda River: Development of Flood Prevention Measures  
Yachiyo Engineering Co., Ltd.*

**Table 10-9: Breakdown of Annual Fund Requirements (2013-2016, FC: M JPY, LC: M TND)**

Item	<Total>			<2013>			<2014>			<2015>			<2016>		
	Total			2013			2014			2015			2016		
	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
<b>A. ELIGIBLE PORTION</b>															
I) Procurement / Construction	6,959	44	9,103	0	0	0	0	0	0	0	0	0	0	0	0
River Improvement Section I	2,991	19	3,513	0	0	0	0	0	0	0	0	0	0	0	0
River Improvement Section II	1,859	14	2,528	0	0	0	0	0	0	0	0	0	0	0	0
River Improvement Section III	1,118	8	1,516	0	0	0	0	0	0	0	0	0	0	0	0
Gate Work	51	0	71	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	5,619	41	7,629	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	1,009	1	1,041	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	331	2	433	0	0	0	0	0	0	0	0	0	0	0	0
II) Consulting services	455	14	1,131	0	0	0	0	0	0	37	1	78	110	2	232
Base cost	381	13	1,017	0	0	0	0	0	0	33	1	72	96	2	212
Price escalation	52	0	60	0	0	0	0	0	0	2	0	2	8	0	9
Physical contingency	22	1	54	0	0	0	0	0	0	2	0	4	5	0	11
<b>Total ( I + II )</b>	<b>7,414</b>	<b>58</b>	<b>10,234</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>37</b>	<b>1</b>	<b>78</b>	<b>110</b>	<b>2</b>	<b>232</b>
<b>B. NON ELIGIBLE PORTION</b>															
a) Procurement / Construction	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Base cost for JICA financing	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Price escalation	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Physical contingency	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
b) Land Acquisition	0	30	1,453	0	0	0	0	0	0	0	0	0	0	16	792
Base cost	0	28	1,372	0	0	0	0	0	0	0	0	0	0	15	748
Price escalation	0	0	12	0	0	0	0	0	0	0	0	0	0	0	6
Physical contingency	0	1	69	0	0	0	0	0	0	0	0	0	0	1	38
c) Administration cost	0	12	584	0	0	0	0	0	0	0	0	4	0	1	51
d) VAT	0	43	2,104	0	0	0	0	0	0	0	0	14	0	4	184
e) Import Tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>Total (a+b+c+d+e)</b>	<b>0</b>	<b>85</b>	<b>4,142</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>18</b>	<b>0</b>	<b>21</b>	<b>1,028</b>
<b>TOTAL (A+B)</b>	<b>7,414</b>	<b>142</b>	<b>14,376</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>37</b>	<b>1</b>	<b>96</b>	<b>110</b>	<b>23</b>	<b>1,259</b>
<b>C. Interest during Construction</b>	482	0	482	0	0	0	0	0	0	0	0	0	0	0	0
Interest during Construction (Const.)	482	0	482	0	0	0	0	0	0	0	0	0	0	0	0
Interest during Construction (Consul.)	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0
<b>D. Commitment Charge</b>	107	0	107	11	0	11	11	0	11	11	0	11	11	0	11
<b>GRAND TOTAL (A+B+C+D)</b>	<b>8,004</b>	<b>142</b>	<b>14,965</b>	<b>11</b>	<b>0</b>	<b>11</b>	<b>11</b>	<b>0</b>	<b>11</b>	<b>48</b>	<b>1</b>	<b>107</b>	<b>121</b>	<b>23</b>	<b>1,270</b>
<b>E. JICA finance portion incl. IDC (A + C + D)</b>	<b>8,004</b>	<b>58</b>	<b>10,824</b>	<b>11</b>	<b>0</b>	<b>11</b>	<b>11</b>	<b>0</b>	<b>11</b>	<b>48</b>	<b>1</b>	<b>89</b>	<b>121</b>	<b>2</b>	<b>243</b>

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

**Table 10-10: Breakdown of Annual Fund Requirements (2017-2022, FC: M JPY, LC: M TND)**

<2017>			<2018>			<2019>			<2020>			<2021>			<2022>		
2017			2018			2019			2020			2021			2022		
FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total	FC	LC	Total
0	0	0	966	6	1,274	1,690	11	2,220	1,729	11	2,261	1,805	11	2,351	788	5	996
0	0	0	378	3	512	648	5	878	648	5	878	648	5	878	270	2	366
0	0	0	271	2	369	465	3	632	465	3	632	465	3	632	194	1	263
0	0	0	163	1	221	280	2	379	280	2	379	280	2	379	117	1	158
0	0	0	0	0	0	0	0	0	3	0	3	4	0	4	47	14	20
0	0	0	812	6	1,102	1,392	10	1,899	1,395	10	1,893	1,426	10	1,937	594	4	807
0	0	0	108	0	111	218	0	225	252	0	260	293	0	303	137	0	142
0	0	0	46	0	61	80	1	106	82	1	108	86	1	112	37	0	47
20	1	61	86	2	193	64	3	198	63	2	164	47	2	133	29	1	72
17	1	56	72	2	173	52	3	179	51	2	146	37	2	117	23	1	63
2	0	2	10	0	11	8	0	10	9	0	11	8	0	9	5	0	6
1	0	3	4	0	9	3	0	9	3	0	8	2	0	6	1	0	3
20	1	61	1,052	8	1,467	1,754	14	2,418	1,792	13	2,426	1,852	13	2,484	797	6	1,068
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	13	661	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	13	624	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	0	6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	31	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	1	36	0	1	73	0	2	121	0	2	121	0	3	124	0	1	53
0	3	130	0	5	264	0	9	435	0	9	437	0	9	447	0	4	192
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
0	17	828	0	7	337	0	11	556	0	11	558	0	12	571	0	5	246
20	18	889	1,052	15	1,805	1,754	25	2,974	1,792	24	2,983	1,852	25	3,055	797	11	1,314
0	0	0	22	0	22	60	0	60	99	0	99	141	0	141	160	0	160
0	0	0	22	0	22	60	0	60	99	0	99	141	0	141	160	0	160
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	11	11	0	11	11	0	11	11	0	11	11	0	11	11	0	11
31	18	899	1,084	15	1,837	1,825	25	3,045	1,902	24	3,094	2,004	25	3,207	968	11	1,485
31	1	72	1,084	8	1,500	1,825	14	2,489	1,902	13	2,536	2,004	13	2,636	968	6	1,239

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

## 10.5 Project Implementing Schedule

We set the project implementing schedule after considering the major processes listed below. The following table shows processes 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 10-11 Time Periods Required for Major Processes and their Contents**

No.	Process	Required time period	Contents
1	Yen loan procedures	4 months	Jun 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

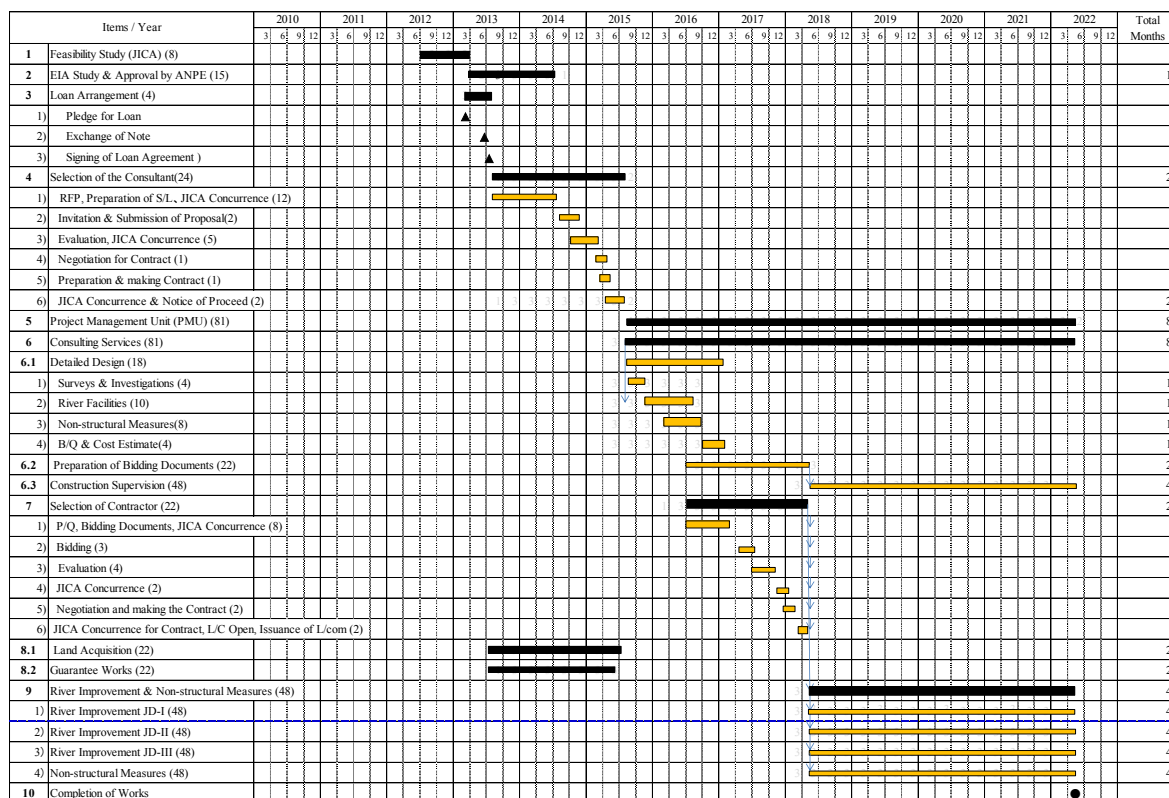
Note: The time period required for JICA's consent on procurement differs depending on the type (consultant or contractor) and the amount.

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 10-12 Implementation Processes of the Mejerda River Flood Control Project**



Source: JICA Survey Team

Below is the summary of major processes and implementing schedule based on the above.

**Table 10-13 Implementing Schedule of Major Processes of the Mejerda River Flood Control Project**

Major Procedure	Required Period (Months)	Envisioned Implementation Period (From – To)
1.EIA Survey	16	2013.5 - 2014.4
2.Loan Procedure	4	2013.6 - 2013.10
3.Selection of Consultant	24	2013.11 - 2015.11
4.Consulting Service	81	2015.12 - 2022.8
4.1 Detailed Design	(18)	2015.12 - 2017.5
4.2 Tender Documents	(22)	2016.10 - 2018.8
	(23)	2019.4 - 2021.2
4.3 Supervision works	(48)	2018.9 - 2022.8
5.Selection of Contractor	23	2016.10 - 2018.8
6.Construction	48	2018.9 - 2022.8
7.Completion of the Project	-	2022.9



## 10.6 Procurement Method

### 10.6.1 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.

### 10.6.2 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 10-14 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

## 10.7 Project Implementing Structure

### 10.7.1 Borrower

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

### 10.7.2 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) and its organization structure is as shown below. We believe that DGBGTH has sufficient budget and human resources to implement and manage the Project.

Table 10-15: Human Resources of the General Direction of Dams and Large Hydraulic Works

	Direction of Studies for Water Mobilization	Direction of Large Hydraulic Works	Direction of Dams Exploitation	Direction of Huge Dams
Senior engineer	1	1		
Chief engineer	2		3	2
Principal engineer	7	3	13	16
Construction engineer	-	-	5	1
Principal technician	2	3	9	19
Technician	5	2	9	8
Assistant technician	4	1	6	7
Total no. of engineers and technicians	21	10	45	53
Clerical assistant	1	3	2	1
Chief administrator	2	2	16	7
Administrative staff	3	2	2	5
Clerical employees	2	2	3	3
Specialized worker	14	4	85	122
Worker	18	37	171	88
Driver	6	2	25	16
Security staff	2	1	32	11
Grand total	69	63	381	306

Source: DGBGTH (interview in Oct 2011)

As seen from the above, DGBGTH has a sufficient number of engineering staff and construction

supervisors to carry out, operate and maintain 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.

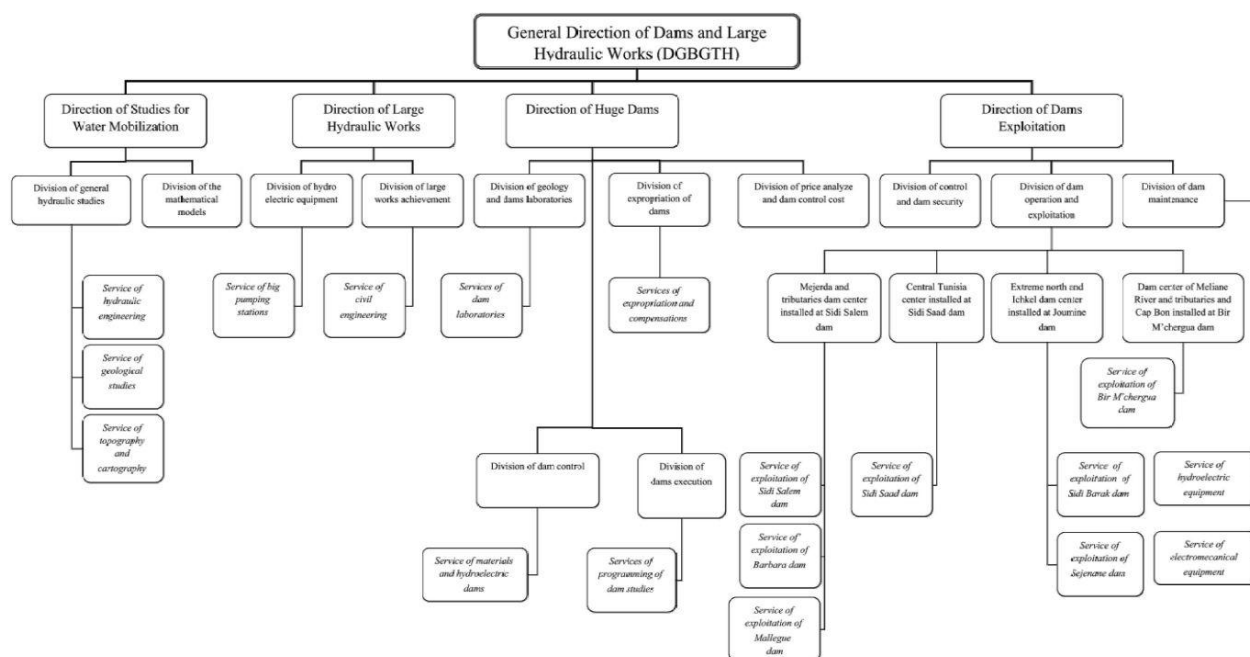
**Table 10-16 Actual Project Accomplishment by DGBGTH**

No.	Project (Works)	Name of Project	Name of Contractors	Amount (Million TND)	Amount (Million JPY)
1	Dam	Harka	SOTUDEF(TN)/EURAFRICAIN-BREDERO(TN)	16.6	813
2		Gangoum	HYDROTEKNIKA(YG)/HYDROSOL (TN)	19	931
3		Ziatine	CWE(China)/CRC(TN)	34	1,666
4		Tine	SONATRA(TN)/ETH(TN)	22	1,078
5		Melah	CWE(China)/CRC(TN)/EURAFRICAIN-BREDERO(TN)	26.5	1,299
6		Douimis	SOTUDEF(TN)/EURAFRICAIN-BREDERO(TN)	22.7	1,112
7		Barrage Kebir Gafsa	Stabag(GN)/Chaabane et Cie(TN)	34.8	1,705
	CWE(China)/STTT(TN)		23.2	1,137	
	SOMATRA(TN)/GET(TN)		38.4	1,882	
8	Pipe Line, Pumping House, etc.	Transfert Ziatine	BONNA-TUNISIE (TN)	3.4	167
9		Transfer Harka	BONNA-TUNISIE (TN)	5.3	260
10		Galerie de transfert Harka	HYDROTEKNIKA(YG)/HYDROSOL(TN)	8	392
11		Transfer Gangoum	SONATRA(TN)	3.6	176
12		Transfer Melah	BONNA-TUNISIE (TN)	3.2	157

Note: TN: Tunisian Contractor, YG: Yugoslavian Contractor, GN: German Contractor

Source: DGBGTH (2013.2)

As seen from the above, DGBGTH has a sufficient number of engineering staff and construction supervisors to carry out, operate and maintain the Project.



**Fig. 10-2 Organization Chart of the General Direction of Dams and Large Hydraulic Works (DGBGTH)**

### 10.7.3 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. Establishment and operation of the PMU are as follows;

- 1) PMU establishment is done based on the Presidential Decree. Organization configuration and function are defined by the decree.
- 2) A committee is established with the chairman, Minister of the Ministry of Agriculture, as the observation organization of PMU.
- 3) Possible major personnel organization for the PMU of this project is as follows;
  - a. Chief: Director-General level of the Ministry
  - b. One Deputy Chief: Director-General level of the Ministry
  - c. One Project Manager: Department-Manager level of the Ministry
  - d. One Manager in Charge of Office Work: Department Manager level of the Ministry
- 4) It is under reviewing that the government owned building at Tobias weir is used as an office.
- 5) The proceeding of Presidential Decree for the PMU establishment will be started at the completion of the Yen loan pledge.
- 6) Time required for the Presidential Decree becoming effective after pledge is 6 ~ 8 months. Before that timing, DGBGTH will conduct project implementation management directly.

Organizations and functions of PMU are shown as follows;

Organizations and functions of PMU are shown as follows;

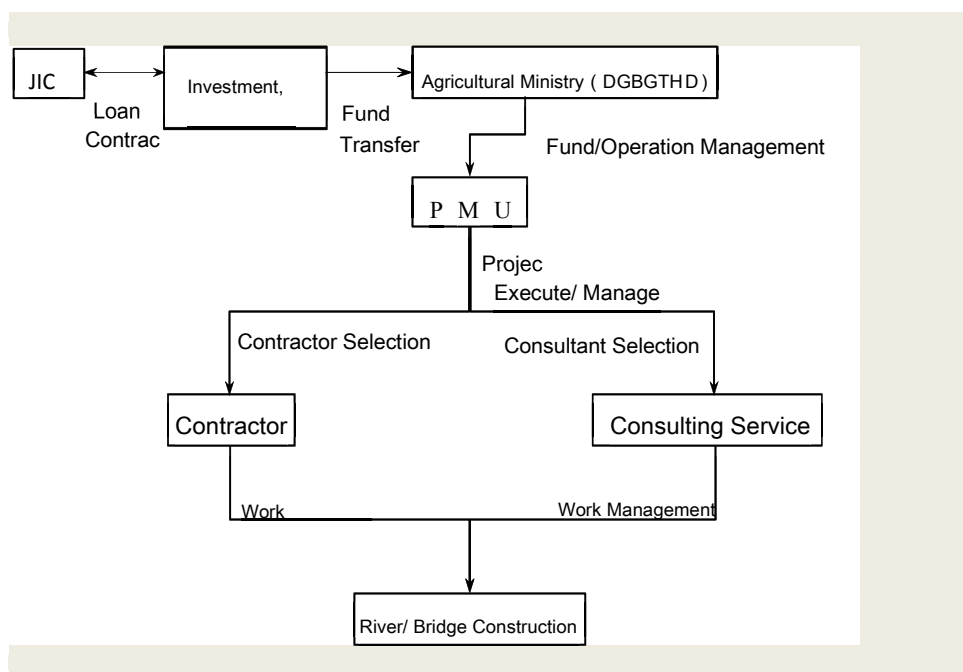


Figure 10.3 PMU Organizations and Functions

Under the project manager, engineering staffs (river engineering, bridge superstructure, construction management, environment management, resident relocation) and under the office work manager, administrative staffs (PR, accounting, general-affairs) are allocated. Those workers shall be responsible for required jobs such as detailed design, bidding (selection of consultants and contractors), project implementation, implementation progress report to the relevant organizations, resident relocation, environmental management, etc. PMU shall be given authorities to approve contracts with consultants and contractors on behalf of the related organizations. Regarding project management, PMU shall be in charge of operational control and progress management of consulting services (CS) and contractors.

It is supposed that the personnel size will be 20 ~ 25 persons in total. In addition, PMU constituent manpower at current Northern Raw Water Transmission by Yen Loan Project is 45 persons.

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 10.17 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),

### **10.8 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.

CRDAs, local organizations of the Ministry of Agriculture, give approval concerning various issues of engineering, administration and finance, introduce new technologies in the field of agriculture and manage major rivers.

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 Manuba Governorate

### **10.9 Performance Indicator**

By considering flow amount observation is performed at many observation points from upstream to downstream on Mejerda River, select annual maximum flow amount as operation index and annual maximum flood area and annual maximum number of flooded houses due to dike breakage or overflow as effect index as indices of evaluating the operational effect of this project quantitatively and qualitatively.

Reference value and target value two (2) years after the completion of project are as follows;

**Table 10-18      Operation and Effect Indicators of the Project**

Operation and effect indicator		Reference level (10-year flood)	2023 target (2 years after the project completion)
Operation indicator	Annual maximum water level (m) *1	--	--
Effect indicator	Annual maximum inundation area (km <sup>2</sup> ) *2	9,137 ha	4,171 ha*2
	Annual maximum flood damage (houses) *2	10,975 houses	0 house

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

\*2: Due to dike breakage or overflow

\*3: The lower stream of the Delta Bridge will be flooded as the Project does not cover the zone.

## **Chapter 11 Project Economic Evaluation**

### **11.1 Economic Evaluation**

The purpose of economic evaluation in this research is to consider efficiency of investment in the project for structural measures by a cost benefit analysis method from the standpoint of the national economy.

Specifically, 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 project is carried out (With Project) and the case where the project is not carried out (Without Project).

EIRR is defined as a discount rate obtained from equalization of the present value of the cost incurred by the project and the present value of the benefit. The discount rate that has 0 NPV and 1 B/C ratio shows the percentage of the profit that will be brought by the investment.

- 1) With Project: Case where the river improvement project proposed by the JICA study team is carried out
- 2) Without Project: Case where the above-mentioned river improvement project is not carried out (current state)

### **11.2 Premises**

The premises used for the evaluation are shown below.

#### **(1) Evaluation Period**

The project evaluation period is 50 years from 2022 to 2071. The schedule of the project implementation is planned as below.

- |              |  |
|--------------|--|
| 2013 - 2017: | Land acquisition, detailed design etc. |
| 2018 - 2021: | Construction                           |
| 2022 - 2071: | Evaluation                             |

#### **(2) Price Level**

The prices are based on those in 2012. The following exchange rate as of September 2012 is used in the evaluation.

$$1 \text{ JPY} = 0.02041 \text{ TND and } 1 \text{ US\$} = 1.5998 \text{ TND}$$

#### **(3) Economic Price**

As below, market prices shall be converted into economic prices.

##### 1) Transfer Payment

Economic prices shall not include transfer payments such as tax and subsidies. Cost and benefit of the project plan shall not include 18% VAT.

##### 2) Land Price



As the details of unskilled workers are unknown, in this evaluation only land prices shall be converted into economic prices with the standard conversion factor calculated with the following calculation formula.

Standard conversion factor = border price / domestic market price

Border price = total import price (CIF) + total export price (FOB)

Domestic market price = (total import price (CIF) + import duties) + (total export price (FOB) – total export duties + total export subsidies)

As shown below, the standard conversion factor is 1.0.

**Table 11-1 Standard Conversion Factor** (Million TDN)

		2007	2008	2009	2010	2011
Trade Amount	Imports (CIF)	24,437	30,241	25,878	31,817	33,702
	Exports (FOB)	19,410	23,637	19,469	23,519	25,092
Customs Duties	Import Tax	425	482	425	455	n.a.
	Import Service Fees	71	82	83	96	n.a.
	Export Tax	0	0	0	0	n.a.
	Export Service Fees	19	20	11	12	n.a.
	Total Custom Duties	514	585	520	564	565
SCF		0.99	0.99	0.99	0.99	0.99

Note: Import duties are calculated as the total of export and import duties because only the total amount of export and import duties are announced in 2011 and they consist mostly of import duties.

Source: INS, Ministry of Finance and JICA Study Team

#### **(4) Social Discount Rate**

Global financial institutes including the World Bank and the Asian Development Bank use 10-12% social discounts for developing countries. The social discount rate for the Project shall be 12%.

#### **11.3 Project Cost**

The project cost is based on the cost accumulation that has been separately calculated and shall not include reserves for tax and inflation. Through interviews with the Ministry of Agriculture, the counterpart in Tunisia, we have obtained information that the maintenance cost in Tunisia is usually around 0.5% of the construction cost. Therefore, we have used 0.5% for the cost of maintenance after the completion of the project.

**Table 11-2 Project Cost**

(Thousand TDN)

	Investment Costs										
	Land Costs			Compensation for Crop	Compensation for Relocation	Admin Costs	Civil Costs	Consulting Service Fees	Base Cost	Physical Contingency	Total Investment Costs
	Land Acquisition Costs (Private)	Land Acquisition Costs (Government)	Total Land Costs								
2013									0		0
2014									0		0
2015								1,470	1,470		1,470
2016	4,950	1,372	6,322	12,936	202	20		4,320	23,800	1,140	24,940
2017	4,050	1,078	5,128	10,164	158	20		1,140	16,610	820	17,430
2018						30	22,500	3,540	26,070	1,430	27,500
2019						50	38,560	3,650	42,260	2,350	44,610
2020						50	38,560	2,980	41,590	2,360	43,950
2021						50	38,560	2,400	41,010	2,410	43,420
2022						20	16,070	1,290	17,380	1,040	18,420
<b>Total</b>	<b>9,000</b>	<b>2,450</b>	<b>11,450</b>	<b>23,100</b>	<b>360</b>	<b>240</b>	<b>154,250</b>	<b>20,790</b>	<b>210,190</b>	<b>11,550</b>	<b>221,740</b>

Note: For details on the work schedule, refer to the implementation schedule of Table 12 in Chapter 9.

Source: The Study Team

## 11.4 Benefits

### 11.4.1 How to Calculate Benefit

Benefit of a flood control project is the reduction of flood damage that can be achieved by the implementation of the project, calculated from the flood damage amounts of the Case With Project and the Case Without Project.

Specifically, the benefit shall be calculated in the following method.

- ① Sort out assets in the possible inundation zone.
- ② Analyze inundation for the Case without Project by occurrence probability (2-10 years) and calculate the amounts of flood damage.
- ③ Calculate the reduction of flood damage based on the flood damage amounts of the Case With Project (no flood damage) and the Case Without Project (②).

### 11.4.2 Collection and Arrangement of Asset Data

The following data concerning assets in the possible inundation zone shall be collected and arranged.

## (1) Residential Buildings

### 1) Number of Residential Buildings

As below, the number of residential buildings in the possible inundation zone has been calculated with the following estimation formula, based on the average number of residential buildings (24.18 residential buildings in an area of 150 meters by 150 meters) in sample areas in the selected three cities (Jedeida, Tebourba and Kalaat el Andalous) listed in the following table.

No. of residential buildings in the possible inundation zone = living space in the inundation area (m<sup>2</sup>) x 24.18 residential buildings/22,500 m<sup>2</sup>

**Table 11-3      No. of Residential Buildings in Sample Areas in Three Cities  
(Jedeida, Tebourba and Kelaat el Andalous)**

	JEDEIDA	TEBOURBA	KELAAT EL ANDALUUS		Urban Area
1	20.25	14.00	12.30	19.00	
2	26.75	20.25	22.75	15.00	
3	29.50	28.75	13.25	33.25	
4	42.00	30.75	15.00	14.75	
5	33.00	33.25		18.25	
6	61.00	29.00		16.50	
7					
8					
9					
Average	35.42	26.00	15.83	19.46	24.18

Note: Each area is 150 m x 150 m (22,500 m<sup>2</sup>).

## 2) House Price

Values from the Development Survey shall be used for the average living space and the average house price. However, as the Development Survey was carried out in 2008, the 2008 average house price shall be converted into the 2012 price with the consumer price index.

### 1) Average Living Space in the Three Governorates at the Time of Development Survey

The average area of living space in the three governorates at the time of the development survey is shown below.

**Table 11-4      Average Living Space in the Three Governorates**

	Ariana	Manouba	Bizerte
Average floor area of a residential building	114.1 m <sup>2</sup>	101.5 m <sup>2</sup>	95.2 m <sup>2</sup>

## 2) Average House Price at the Time of the Development Survey

The price of an average house in an urban area is 4000 TND/m<sup>2</sup>. The following table shows the average house prices in the three governorates in 2012.

**Table 11-5 Average House Price in the Three Governorates**

Year	Ariana	Manouba	Bizerte
2008	45,700 TND	40,600 TND	38,100 TND
2012*	53,700 TND	47,700 TND	44,800 TND

\* 2008 price x 1.175 (consumer price index)

Based on the above, the following table shows the number of residential buildings and the house property value in the three governorates in the possible inundation zone of the three governorates.

**Table 11-6 No. of Residential buildings and House Property Value in the Possible Inundation Zone of the Three Governorates**

	Ariana	Manouba	Bizerte
Urban Area	759.32 ha	3,522.40 ha*	836.59 ha
No. of residential buildings	8,158	37,846	8,989
House property value	438,110K TND	1,805,265K TND	402,694K TND

Note \*: Including some outside Manouba

## (2) Appraised Value of Household Effects

### 1) Appraised Value of Household Effects per Household

Appraised value of household effects in the possible inundation zone shall be based on the appraised value of household effects in Japan and adjusted with the GDP ratio between Japan and Tunisia, as with the Development Survey. Then the value shall be converted into the 2012 value with the consumer price index. For the number of residential buildings, the data shown in (1) shall be used.

**Table 11-7 Appraised Value of Household Effects per Household**

	Per Capita GDP (US\$ in 2011) <sup>*1</sup>	Appraised value of household effects per household (TND in 2011)	Appraised value of household effects per household (TND in 2012)
Japan	34,278	299,000 <sup>*2</sup>	
Tunisia	9,415	82,000 <sup>*3</sup>	87,000 <sup>*4</sup>

Note \*1: World Bank

\*2: Unit Prices and Deflators for Various Asset Evaluation, Flood Control Economic Research Manual (Draft) (revised in February 2012, River Planning Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism), 14,653K yen/household x 0.0204 TND/yen = 299,000 TND

\*3: 299,000 TND x 9,415 US\$/34,278 US\$ = 82,125 TND

\*4: Estimated with the consumer price index in Tunisia 2011 → 2012 5.5%

## 2) Appraised Value of Household Effects

The following table shows the appraised value of household effects in the possible inundation zone.

**Table 11-8 No. of Households and Appraised Value of Household Effects in the Possible Inundation Zone of the Three Governorates**

	Ariana	Manouba	Bizerte
No. of households	8,158	37,846	8,989
Appraised value of household effects	709,746K TND	3,292,602K TND	782,043K TND

## (3) Depreciable Assets and Stock Inventories of Business Establishments

### 1) Amounts of Depreciable Assets and Stock Inventories per Worker

The amounts of depreciable assets and stock inventories per worker at the time of the Development Survey in 2008 shall be converted into the 2012 values using a consumer price index.

**Table 11-9 Depreciable Assets and Stock Inventories per Worker** (Unit: TND/worker)

		Ariana	Manouba	Bizerte
2008	Depreciable Assets	7,300	6,900	6,400
	Stock inventories	3,600	3,500	3,700
2012*	Depreciable Assets	8,600	8,100	7,500
	Stock inventories	4,200	4,100	4,300

\* 2008 value x 1.175 (consumer price index)

### 2) Amounts of Depreciable Assets and Stock Inventories in the Possible Inundation Zone

The amounts of depreciable assets and stock inventories in the possible inundation zone shall be calculated with the following formulas. The following table shows the calculated amounts of depreciable assets and stock inventories in each of the three governorates. The employment rate used for the calculation was the average rate from 2008 to 2010.

Amount of depreciable assets in the possible inundation zone = no. of households in a mesh x no. of family members per household x employment rate in the governorate x depreciable assets in the governorate (TND/worker)

Amount of stock inventories in the possible inundation zone = no. of households in a mesh x no. of family members per household x employment rate in the governorate x stock inventories in the governorate (TND/worker)

**Table 11-10 Depreciable Assets and Stock Inventories in the Three Governorates**

	Ariana	Manouba	Bizerte
No. of households	8,158	37,846	8,989
No. of family members per household	3.6	4.2	3.7
Employment rate	62.2%	58.4%	60.3%
No. of workers	18,267	92,829	20,055
Amount of depreciable assets per worker	8,600 TND	8,100 TND	7,500 TND
Amount of depreciable assets	157,100K TND	751,912K TND	150,415K TND
Amount of stock inventories per worker	4,200 TND	4,100 TND	4,300 TND
Amount of stock inventories	76,723K TND	380,598K TND	86,238K TND

#### (4) Depreciable Assets and Stock Inventories of Farmers and Fishermen

##### 1) Amounts of Depreciable Assets and Stock Inventories per Farmer/Fisherman

The amounts of depreciable assets and stock inventories per farmer/fisherman in the possible inundation zone shall be based on the amounts in Japan and calculated with the GPD ratio between Japan and Tunisia. The amounts in 2012 shall be estimated with the consumer price index.

**Table 11-11 Depreciable Assets and Stock inventories per Farmer/Fisherman**

	Per Capita GDP (US\$ in 2011) <sup>*1</sup>	Amount of depreciable assets per farmer/fisherman (TND in 2011)	Amount of stock inventories per farmer/fisherman (TND in 2011)	Amount of depreciable assets per farmer/fisherman (TND in 2012)	Amount of stock inventories per farmer/fisherman (TND in 2012)
Japan	34,278	37,000 <sup>*2</sup>	10,000 <sup>*2</sup>		
Tunisia	9,415	10,000 <sup>*3</sup>	3,000 <sup>*3</sup>	11,000 <sup>*4</sup>	3,000 <sup>*4</sup>

- Note
- \*1: World Bank
  - \*2: Unit Prices and Deflators for Various Asset Evaluation, Flood Control Economic Research Manual (Draft) (revised in February 2012, River Planning Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism),  
 Depreciable assets 1,802K yen/household x 0.0204 TND/yen = 37,000 TND  
 Stock inventories 469K yen/household x 0.0204 TND/yen = 10,000 TND
  - \*3: Depreciable assets 37,000 TND x 9,415 US\$/34,278 US\$ = 10,000 TND  
 Stock inventories 10,000 TND x 9,415 US\$/34,278 US\$ = 3,000 TND
  - \*4: Estimated with the consumer price index in Tunisia 2011 → 2012 5.5%

##### 2) Depreciable Assets and Stock inventories in the Possible Inundation Zone

The amounts of depreciable assets and stock inventories in the possible inundation zone shall be calculated with the following formulas. The table below shows the calculated amounts of depreciable assets and stock inventories in the three governorates. The employment rates in farming and fishing used for the calculation are the average rates from 2008 and 2010.

Amount of depreciable assets in the possible inundation zone = no. of households in a mesh x  
 employment rate in farming/fishing x depreciable assets (TND per

farmer/fisherman)

Amount of stock inventories in the possible inundation zone = no. of households in a mesh x  
employment rate in farming/fishing x stock inventories (TND per  
farmer/fisherman)

**Table 11-12 Depreciable Assets and Stock inventories in the Three Governorates**

	Ariana	Manouba	Bizerte
No. of households	8,158	37,846	8,989
Employment rate in farming/fishing	1.8%	5.1%	12.8%
No. of farmers and fishermen (households)	147	1,930	1,151
Amount of depreciable assets per farmer/fisherman	11,000 TND		
Amount of depreciable assets	1,615K TND	21,232K TND	12,657K TND
Amount of stock inventories per farmer/fisherman	3,000 TND		
Amount of stock inventories	441K TND	5,790K TND	3,452K TND

**(1) Agricultural Crops**

**1) Planted Area of Major Crops**

The major crops in the possible inundation zone are cereals, vegetables and fruits. The following table shows the planted area of the major crops in the three governorates.

**Table 11-13 Planted Area of Major Crops in Three Governorates**

	ARIANA	MANOUBA	BIZERTE
Cereals	11,917.21 ha	18,313.33 ha	12,959.47 ha
Vegetables	611.15 ha	2,339.58 ha	765.97 ha
Fruit trees	1,020.82 ha	3,715.34 ha	1,076.76 ha

Source; CRDA ARIANA, CRDA MANOUBA, CRDA BIZERTE

**2) Yields of Major Crops per Unit Area**

The following table shows the yields of major crops per unit area.

**Table 11-14 Yields of Major Crops per Unit Area** (Unit: t/ha)

	ARIANA	MANOUBA	BIZERTE
Cereals	2.5	2.1	2.3
Vegetables	17.2	20.1	26.5
Fruits	4.3	3.6	3.6

Source; CRDA ARIANA, CRDA MANOUBA, CRDA BIZERTE

### 3) Value of Crop Production in the Possible Inundation Zone

The following table shows the values of major crop production in the possible inundation zone.

**Table 11-15 Values of Major Crop Production in the Possible Inundation Zone**

	Value per ton (TND/t)*	ARIANA	MANOUBA	BIZERTE
Cereals	419	12,483K TND	16,114K TND	12,489K TND
Vegetables	450	4,730K TND	21,162K TND	9,134K TND
Fruits	779	3,419K TND	10,419K TND	3,020K TND

\*: Source; INS

The following table and figure show the breakdown of land use in the possible inundation zone of the three governorates.

**Table 11-16: Breakdown of Land Use in the Possible Inundation Zone in Three Governorates**

(Unit: ha)

Landuse	ARIANA	BIZERTE	MANNOUBA
Garaat, Wetlands	1,182	2,817	2,770
Non Agricultural	708	5,040	1,459
Cereal	11,917	12,959	18,313
Other ( Fallow)	327	1,398	833
Fruit Trees	1,021	1,077	3,715
Vegetable	611	766	2,340
Urban Area	759	837	3,522
Forest	8	57	354
Water	394	318	1,160
Total	16,928	25,269	34,465



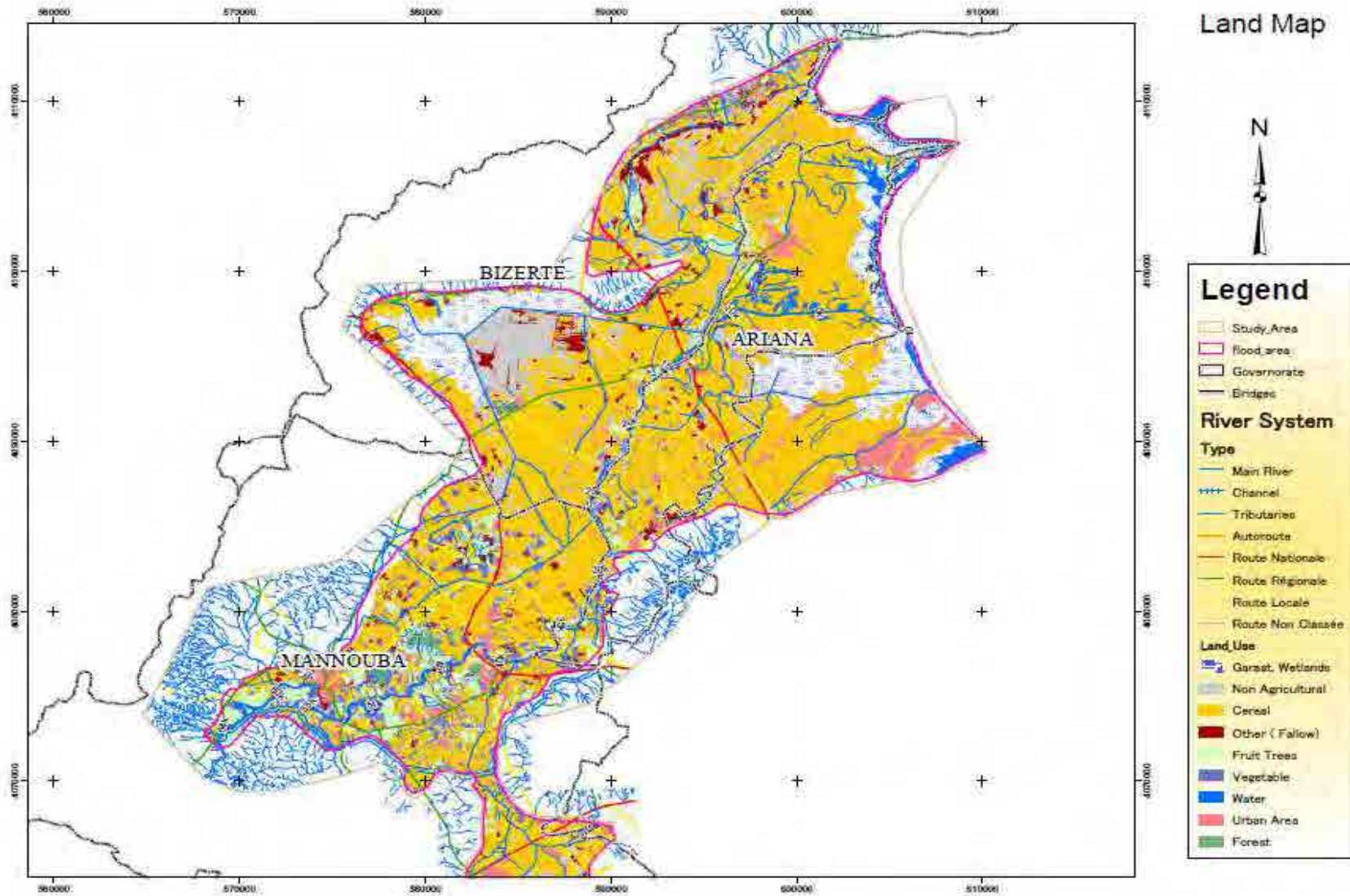


Figure 11-1 Land Use in the Possible Inundation Zone

## 11.5 Calculation of Damage Amount

### 11.5.1 How to Calculate Damage Amount

In this research, damage amount shall be calculated with the following direct and indirect damage items.

**Table 11-17 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>

### 11.5.2 Direct Damage

#### 1) Damage to residential buildings

The amount of damage to residential buildings in the possible inundation zone shall be calculated with the following formula.

Damage to residential buildings = value of residential buildings in a mesh of the possible inundation zone x damage rate by inundation depth

For the damage rate by inundation depth, we used the following values from the Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism),

**Table 11-18 Damage Rate by Inundation Depth**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
Damage rate	0.092	0.119	0.266	0.580	0.834

Source: Rate of damage to residential buildings by inundation depth for the group of ground slope A (below 1/1,000), Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

## 2) Damage to Household Effects

Damage to household effects in the possible inundation zone shall be calculated with the following formula.

Damage to household effects = value of household effects in a mesh of the possible inundation zone x damage rate by inundation depth

For the damage rate by inundation depth, we used the following values from the Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism),

**Table 11-19            Damage Rate by Inundation Depth**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
Damage rate	0.145	0.326	0.508	0.928	0.991

Source: Rate of damage to household effects by inundation depth for the group of ground slope A (below 1/1,000), Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

## 3) Damage to Assets of Business Establishments

Damage to assets of business establishments in the possible inundation zone shall be calculated with the following formula.

Damage to depreciable assets and stock inventories of business establishments = amounts of depreciable assets and stock inventories of business establishments in a mesh of the possible inundation zone x damage rate by inundation depth

For the damage rate by inundation depth, we used the following values from the Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism),

**Table 11-20            Damage Rate by Inundation Depth**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
Damage rate (Depreciable assets)	0.232	0.453	0.789	0.966	0.995
Damage rate (Stock inventories)	0.128	0.267	0.586	0.897	0.982

Source: Rate of damage to assets of business establishments by inundation depth for the group of ground slope A (below 1/1,000), Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

#### 4) Damage to Assets of Farmers and Fishermen

Damage to assets of farmers and fishermen in the possible inundation zone shall be calculated with the following formula.

Damage to depreciable assets and stock inventories of farmers and fishermen = amounts of depreciable assets and stock inventories of farmers and fishermen in a mesh of the possible inundation zone x damage rate by inundation depth

For the damage rate by inundation depth, we used the following values from the Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism),

**Table 11-21                  Damage Rate by Inundation Depth**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
Damage rate (Depreciable assets)	0.156	0.237	0.297	0.651	0.698
Damage rate (Stock inventories)	0.199	0.370	0.491	0.767	0.831

Source: Rate of damage to assets of farmers and fishermen by inundation depth for the group of ground slope A (below 1/1,000), Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

#### 5) Damage to Agricultural Crops

Damage to agricultural crops in the possible inundation zone shall be calculated with the following formula.

Damage to agricultural crops = value of crop production in a mesh of the possible inundation zone x damage rate by inundation depth

For the damage rate by inundation depth, we used the following values from the Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism),

**Table 11-22                  Damage Rate by Inundation Depth**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
7 days or longer	0.67	0.74	0.91	0.91	0.91

Source: Rate of damage to agricultural crops by inundation depth (average per unit area of farmland, Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

## 6) Damage to Infrastructure

Damage to infrastructure in the possible inundation zone shall be calculated with the following formula with reference to the actual damage by ARIANA Flood in January 2003 (1,626,000 TND of damage in the inundation area of 4,000 ha, 400 TBD/ha) and then converted into the 2012 value with the consumer price index ( $400 \text{ TND/ha} \times 1.408 = 560 \text{ TND/ha}$ ).

Damage to infrastructure = inundation area in the possible inundation zone x 560 TND/ha

### 11.5.3 Indirect Damage

#### 1) Loss from Business Interruption

Loss from business interruption shall be calculated with the following formula.

Loss from business interruption = no. of workers in the possible inundation zone x no. of days of business interruption or slowdown x added value

Added value shall be calculated based on the amount in Japan, adjusted with the GDP ratio between Japan and Tunisia, using the method of weighted average. Then the value shall be converted into the 2012 value with the consumer price index. The following table shows the calculation result for the three governorates.

**Table 11-23: Added Value for Three Governorate**

(Unit: TND/person)

	ARIANA	MANOUBA	BIZERTE
2011	150	140	160
2012*	160	150	170

\*: 2011 value x 1.055 (consumer price index)

For the number of days of business interruption and slowdown, we used the following values from the Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism).

**Table 11-24: Number of Days of Business Interruption and Slowdown**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
No. of days of business interruption	4.4	6.3	10.3	16.8	22.6
No. of days of business slowdown	8.8	12.6	20.6	33.6	45.2

Source: No. of days of business interruption and slowdown, Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

## 2) Cost for Emergency Measures in Households

Cost for emergency measures in households in the possible inundation zone shall be calculated with the cleaning labor cost shown below and increase of expenses for alternative activities etc.

### a) Labor Cost for Cleaning in Households

Labor cost for cleaning in households shall be calculated with the following formula.

Labor cost for cleaning in households = no. of households in a mesh of the possible inundation zone x total no. of days of cleaning per household by inundation depth x cleaning cost per day

As below, the 2012 cleaning cost has been calculated from the cost at the time of the Development Survey (15.12 TND/day) and the consumer price index.

Year	Cleaning cost (TND/day)
At the time of Development Survey (2008)	15.12
2012	17.77

For the number of days of cleaning by inundation depth, we used the following values from the Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism).

**Table 11-26: Total Number of Days of Cleaning**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
No. of days of cleaning	7.5	13.3	26.1	42.4	50.1

Source: Total no. of days of cleaning, Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

### b) Increase of Expenses for Alternative Activities etc. in Households

Increase of expenses for alternative activities etc. in households shall be calculated with the following formula.

Increase of expenses for alternative activities etc. in households = no. of households in a mesh of the possible inundation zone x unit cost of alternative activities per household

The unit cost of alternative activities by inundation depth shall be based on the cost in Japan and adjusted with the GDP ratio between Japan and Tunisia. Then the value shall be converted into the 2012 cost with the consumer price index. The following table shows the calculation results.

**Table 11-27: Unit Cost of Alternative Activities etc. by Inundation Depth**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
Unit cost (Japan) <sup>*1</sup>	147.6K yen/ /household	206.5K yen/ household	275.9K yen/ household	326.1K yen/ household	343.3K yen/ household
Unit cost (Japan) <sup>*2</sup>	2,579 TND/ household	3,608 TND/ household	4,820 TND/ household	5,698 TND/ household	5,998 TND/ household
Unit cost (Tunisia) <sup>*3</sup>	708 TND/ household	991 TND/ household	1,324 TND/ household	1,565 TND/ household	1,647 TND/ household
Unit cost (Tunisia) <sup>*4</sup>	700 TND/ household	1,000 TND/ household	1,400 TND/ household	1,700 TND/ household	1,700 TND/ household

- \*1: Unit cost of alternative activities etc. by inundation depth, Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)
- \*2: The 2011 unit cost calculated with the general price index (flood damage deflator) from the Various Asset Evaluation and Deflators of the Flood Control Economic Research Manual (Draft) (revised in February 2012, River Planning Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism), and converted into TND
- \*3: Calculated with the GDP ratio between Japan and Tunisia
- \*4: 2012 cost = 2011 cost x 1.055 (consumer price index)

### 3) Cost for Emergency Measures in Business Establishments

Cost for emergency measures in business establishments in the possible inundation zone shall be calculated with the following formula.

Cost for emergency measures in business establishments in the possible inundation zone = no. of business establishments in a mesh of the possible inundation zone x unit cost of alternative activities etc. by inundation depth

The unit cost of alternative activities by inundation depth shall be based on the cost in Japan adjusted with the GDP ratio between Japan and Tunisia. Then the value shall be converted in to the 2012 value with the consumer price index. The following table shows the calculation results.

**Table 11-28: Unit Cost of Alternative Activities etc., by Inundation Depth**

Inundation depth	0.5m or less	0.5m – 0.99m	1.0m – 1.99m	2.0m – 2.99m	3.0m or more
Unit cost (Japan) <sup>*1</sup>	925K yen/ household	1,714K yen/ household	3,726K yen/ household	6,556K yen/ household	6,619K yen/household
Unit cost (Japan) <sup>*2</sup>	16,161 TND/ household	29,946 TND/ household	65,100 TND/ household	114,544 TND/ household	115,645 TND/ household
Unit cost (Tunisia) <sup>*3</sup>	4,439 TND/ household	8,225 TND/ household	17,881 TND/ household	31,461 TND/ household	31,764 TND/ household
Unit cost (Tunisia) <sup>*4</sup>	4,700 TND/ household	8,700 TND/ household	18,900 TND/ household	33,200 TND/ household	33,500 TND/ household

- \*1: Unit cost of alternative activities etc. by inundation depth, Flood Control Economic Research Manual (Draft) (April 2005, River Bureau, Ministry of Land, Infrastructure, Transport and Tourism)
- \*2: The 2011 unit cost calculated with the general price index (flood damage deflator) from the Various Asset Evaluation and Deflators of the Flood Control Economic Research Manual (Draft) (revised in February 2012, River

Planning Division, Water and Disaster Management Bureau, Ministry of Land, Infrastructure, Transport and Tourism), and converted into TND.

\*3: Calculated with the GDP ratio between Japan and Tunisia

\*4: 2012 cost = 2011 cost x 1.055 (consumer price index)

The table below shows damage amounts in the three governorates calculated based on the above. The summary is as follows.

1. The direct damage of a 5-year flood is about 331,0740K TND (about 68,223K TND in Ariana, about 105,205K TND in Manouba, and about 158,313K TND in Bizerte).
2. The indirect damage of a 5-year flood is about 55,428K TND (about 11,074K TND in Ariana, about 16,474K TND in Manouba, and about 27,880K TND in Bizerte).
3. The sum of the direct and indirect damage of a 5-year flood is about 387,169K TND.
4. The direct damage of a 10-year flood is about 374,893K TND (about 75,503K TND in Ariana, about 127,673K in Manouba, and about 171,716K TND in Bizerte).
5. The indirect damage of a 10-year flood is about 61,765K TND (about 12,023K TND in Ariana, about 19,587K TND in Manouba, and about 30,145K TND in Bizerte).
6. The sum of the direct and indirect damage of a 10-year flood is about 436,657K TND.

**Table 11-29: List of Damage Amount in Three Governorates  
(Without Project, 5-year flood)**

		ARIANA	MANOUBA	BIZERTE	合計
Direct Damage	Damage to Residential Buildings(TND)	12,539,165	16,144,924	26,743,930	55,428,018
	Damage to Household Effects(TND)	35,623,803	56,370,693	87,028,275	179,022,771
	Amount of Depreciable Assets(TND)	11,648,193	19,425,679	30,028,238	61,102,110
	Amount of Stock Inventories(TND)	3,662,177	6,059,365	8,812,014	18,533,557
	Damage to Depreciable Assets(TND)	492,261	674,377	1,394,811	2,561,449
	Damage to Stock Inventories(TND)	185,922	255,231	507,375	948,528
	Damage to Cereals (TND)	2,382,511	1,888,714	2,533,159	6,804,384
	Damage to Vegetables (TND)	1,134,072	3,299,413	905,950	5,339,435
	Damage to Fruits (TND)	554,432	1,086,273	359,288	1,999,993
	Sub Total	68,222,537	105,204,670	158,313,039	331,740,246
Indirect Damage	Damage to Infrastructure (TND)	2,107,980	2,202,480	4,088,700	8,399,160
	Loss of Interruption of Business Activities(TND)	3,669,264	6,594,164	11,123,327	21,386,755
	Emergency Cleaning Cost(TND)	351,677	547,543	873,442	1,772,662
	Emergency Substitute Activity Cost(TND)	1,439,300	2,370,800	4,398,900	8,209,000
	Emergency Measure for Business Establishments(TND)	3,506,100	4,758,600	7,396,000	15,660,700
	Sub Total	11,074,321	16,473,587	27,880,369	55,428,277
Total		79,296,858	121,678,257	186,193,408	387,168,523



**Table 11-30: List of Damage Amount in Three Governorates  
(Without Project, 10-year flood)**

		ARIANA	MANOUBA	BIZERTE	合計
Direct Damage	Damage to Residential Buildings(TND)	14,035,354	20,051,315	28,504,350	62,591,020
	Damage to Household Effects(TND)	39,381,507	68,690,850	94,720,641	202,792,998
	Amount of Depreciable Assets(TND)	12,895,089	23,031,824	32,299,581	68,226,494
	Amount of Stock Inventories(TND)	4,157,387	7,548,469	9,670,754	21,376,610
	Damage to Depreciable Assets(TND)	522,621	796,202	1,562,022	2,880,845
	Damage to Stock Inventories(TND)	197,310	300,012	578,709	1,076,031
	Damage to Cereals (TND)	2,463,086	2,302,450	3,040,150	7,805,687
	Damage to Vegetables (TND)	1,231,518	3,773,466	977,706	5,982,690
	Damage to Fruits (TND)	619,231	1,178,720	362,277	2,160,228
	Sub Total	75,503,103	127,673,307	171,716,191	374,892,602
Indirect Damage	Damage to Infrastructure (TND)	2,170,980	2,535,120	4,514,580	9,220,680
	Loss of Interruption of Business Activities(TND)	4,013,296	7,747,138	11,744,530	23,504,964
	Emergency Cleaning Cost(TND)	393,305	667,582	945,538	2,006,425
	Emergency Substitute Activity Cost(TND)	1,555,200	2,685,200	4,661,700	8,902,100
	Emergency Measure for Business Establishments(TND)	3,889,900	5,962,100	8,278,500	18,130,500
	Sub Total	12,022,681	19,597,140	30,144,848	61,764,669
Total		87,525,785	147,270,447	201,861,039	436,657,270

#### 11.5.4 Expected Amount of Average Annual Damage Reduction

Based on the above, 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 11-31 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

## **11.6 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.

The cash flow table is shown in the next page.

**Table 11-32      Result of Economic Evaluation**

Economic indicator	Result	Evaluation
Economic internal rate of return (EIRR)	23.6%	As EIRR is well over 12%, the cost-effectiveness is high.
Net present value (NPV)	186M TND	As the benefit substantially exceeds the cost, the cost-effectiveness is high.
Benefit-cost (B/C) ratio	2.7	The B/C ratio is well over 1, the cost-effectiveness is high.

**Table 11-33 Cash Flow**

Year	Economic Benefits	Economic Costs											Net Savings		
		Investment Costs										Operation and Maintenance Costs		Total Costs	
		Land Costs			Construction For Groe	Construction For Rehabilitation	Admin Costs	Civil Costs	Operating Service Fees	Base Cost	Physical Contingency				Total Investment Costs
Land Acquisition Costs (Private)	Land Acquisition Costs (Government)	Total Land Costs													
2003											0	0	0	0	
2004											0	0	0	0	
2005											0.470	0.470	0.470	0.470	
2006		4.950	0.372	5.322	0.000	270	20				4.320	20.944	0.040	22.084	-22.084
2007		4.050	0.075	4.125	1.920	000	20				0.040	04.000	020	05.000	-10.000
2008							20	22.000	3.040	25.040	0.400	25.000	25.000	25.000	-25.000
2009							00	00.000	3.000	42.000	2.000	44.000	44.000	44.000	-44.000
2010							00	00.000	2.000	40.000	2.000	42.000	42.000	42.000	-42.000
2020							00	00.000	2.400	40.000	2.400	42.400	42.400	42.400	-42.400
2022							20	00.000	0.200	07.000	0.040	07.000	07.000	07.000	-10.000
2023	00.200												770	770	00.400
2024	00.200												770	770	00.400
2025	00.200												770	770	00.400
2026	00.200												770	770	00.400
2027	00.200												770	770	00.400
2028	00.200												770	770	00.400
2029	00.200												770	770	00.400
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2066	00.200												770	770	00.400
2067	00.200												770	770	00.400
2068	00.200												770	770	00.400
2069	00.200												770	770	00.400
2070	00.200												770	770	00.400
2071	00.200												770	770	00.400
2072	00.200												770	770	00.400

**ERR 22.0%**

## **11.7 Sensibility Analysis**

### **11.7.1 Purpose of Sensibility Analysis**

Sensibility analysis shall be conducted to deal with future uncertainties caused by fluctuation of social and economic circumstances. For cost-benefit analysis, we need to predict future costs and benefits concerning the project to be evaluated. However, as public work projects, characterized by a long period from planning to start of service as well as a long service period, they have a large number of uncertain factors that have a great impact on the future costs and benefits and it is impossible to accurately predict such costs and benefits. Therefore, pre-defined premises and assumptions often lose touch with the reality and therefore the result of cost-benefit analysis can differ from the reality.

Therefore, the result of the cost-benefit analysis involving such uncertainties should be calculated and presented as a range rather than something absolute based on a single scenario. One of the methods for this is sensibility analysis.

By conducting sensibility analysis and presenting the result of cost-benefit analysis with some margin, we will improve accuracy and reliability of the project evaluation as well as fulfilling our responsibility for appropriate supervision of the project and accountability to the public.

### **11.7.2 Considerations for Sensibility Analysis**

In this research, we shall adopt the method of factorial sensibility analysis, which is generally used in public work projects. The following cases shall be subject to sensibility analysis.

**Table 11-34      Cases Subject to Sensibility Analysis**

Indicator	Range of factors
Cost	Cases where the cost increases by 20%, 30% and 40%
Benefit	Cases where the benefit decreases by 20%, 30% and 40%

### **11.7.3 Result of Sensibility Analysis**

Below are the results of the sensibility analysis of the above-described cases.

- 1) We conducted sensibility analysis with fluctuating benefits and costs to see how EIRR changes. As shown in the following table, the EIRR of Case 1 (20% benefit increase and 20% cost increase) is 21.9%. We can say that the economic effect of the project is substantially high.
- 2) For Case 2 and Case 3, where benefit and profit decreases/increases by 30% and 40%, the EIRRs are 18.8% and 15.8%. The economic effect of the project is still substantial.

EIRR becomes 12% when benefit decreases by 50% and cost increases by 50%.

**Table 11-35 Result of Sensibility Analysis**

	Case 1	Case 2	Case 3
Benefit	-20%	-30%	-40%
Cost	+20%	+30%	+40%
EIRR	19.8%	17.0%	14.5%

Source: The Study Team

### 11.8 Selection of Operation and Effect Indicators

Operation and effect indicators for each major sector have been adopted as performance indicators for yen loan projects since FY2000. The indicators are defined as below.

- 1) Operation indicator: Indicator for quantitative measurement of the operational status of the project
- 2) Effect indicator: Indicator for quantitative measurement of the appearance of benefit of the project

Operation and effect indicators for river projects can include the followings. However, considering the above-described definitions of operation and effect indicators and the fact that discharge observation is continued at many observation points from the upper basin to the lower basin of Mejerda River, we shall select annual maximum flow 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. (Details of reference values and target values are described in Figure 10-2 to -4)

**Table 11-36 Typical Operation and Effect Indicators in the Field of Flood Control**

Field	Typical operation indicator (unit)	Typical effect indicator (unit)
Flood control	<ul style="list-style-type: none"> <li>• Annual maximum flow (m<sup>3</sup>/s)</li> <li>• Annual maximum water level (m)</li> <li>• Discharge capacity (m<sup>3</sup>/s)</li> </ul>	<ul style="list-style-type: none"> <li>• Annual maximum inundation area (km<sup>2</sup>)</li> <li>• Annual maximum flooded households (households)*</li> </ul>

\*: Caused by dike break and overflow.

**Table 11-37      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 flow (m <sup>3</sup> /s) * <sup>1</sup>	-	-
Effect indicator	Annual maximum inundation area (km <sup>2</sup> )* <sup>2</sup>	9,137 ha	4,171 ha* <sup>3</sup>
	Annual maximum flooded households (households)* <sup>2</sup>	10,975	0

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

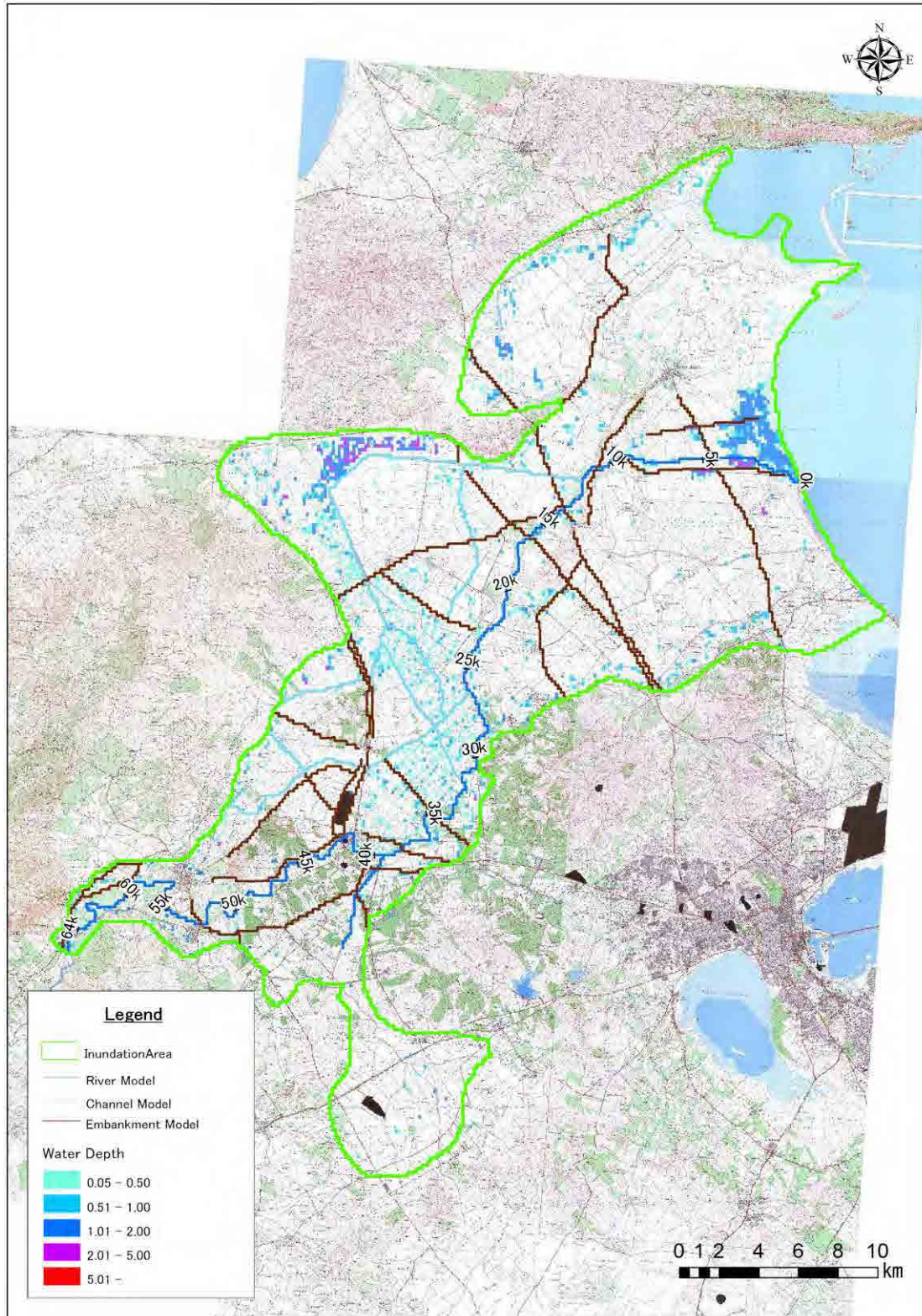
\*2: Caused by dike break and overflow.

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



Inundated Area (ha)	Number of Submerged Houses (house)
9,137	10,975

Figure 11-2: Inundation Analysis (current channel, 10th-year discharge)



Inundated Area (ha)	Number of Submerged Houses (house)
4171*	0

\*: Flood is assumed to happen in downstream of the Kalaat el Andalous Bridge because it is out of scope of this project (river repair).

**Figure 11-3: Inundation Analysis (planned channel, 10th-year discharge)**



## **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.

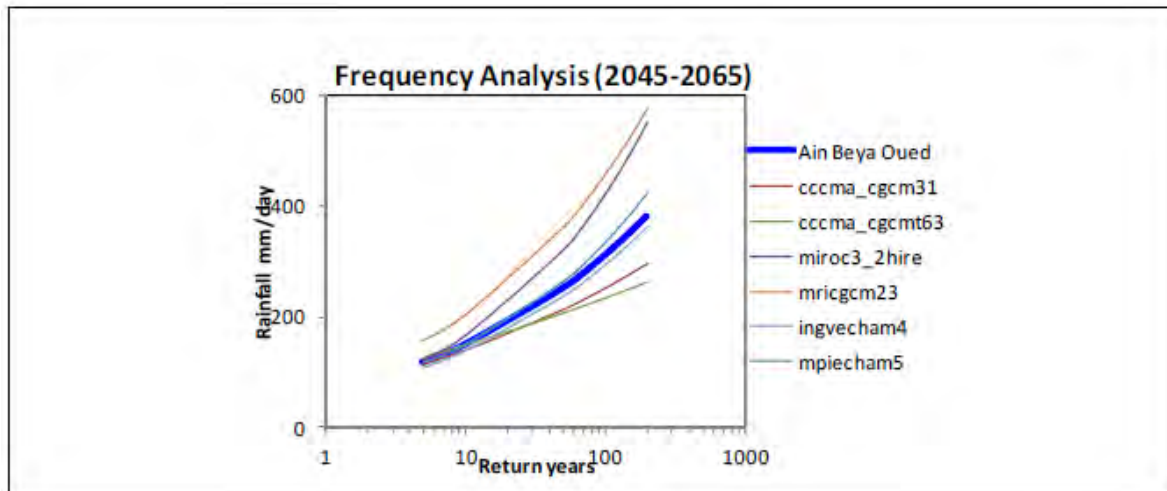
#### **(1) Impacts on rainfall amounts**

- Concerning fluctuation in frequency of torrential rainfall, there is significant uncertainty between models. (See Figure 12-1.)
- 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. (See Figure 12-2.)
- 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. (See Figure 12-3.)
- Special distribution of average values clearly shows larger decrease in the upper reach and smaller decrease in the lower reach. (See Figure 12-4.)
- Annual precipitation will be on the decrease in all GCMs. (See Figure 12-5.)
- The number of continuous dry spell days will be on the decrease in all GCM. (See Figure 12-6.)

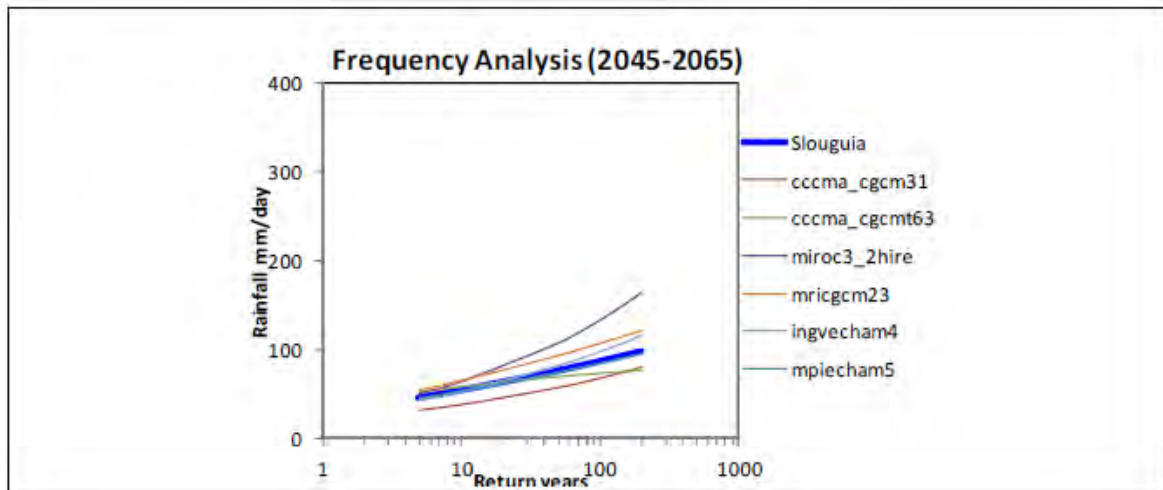
#### **(2) Impact on flood volume**

- As a result of the calculation of the maximum probable flood level of the Sidi Salem Dam and the Laroussia Dam as shown in Figure 12-7, 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.

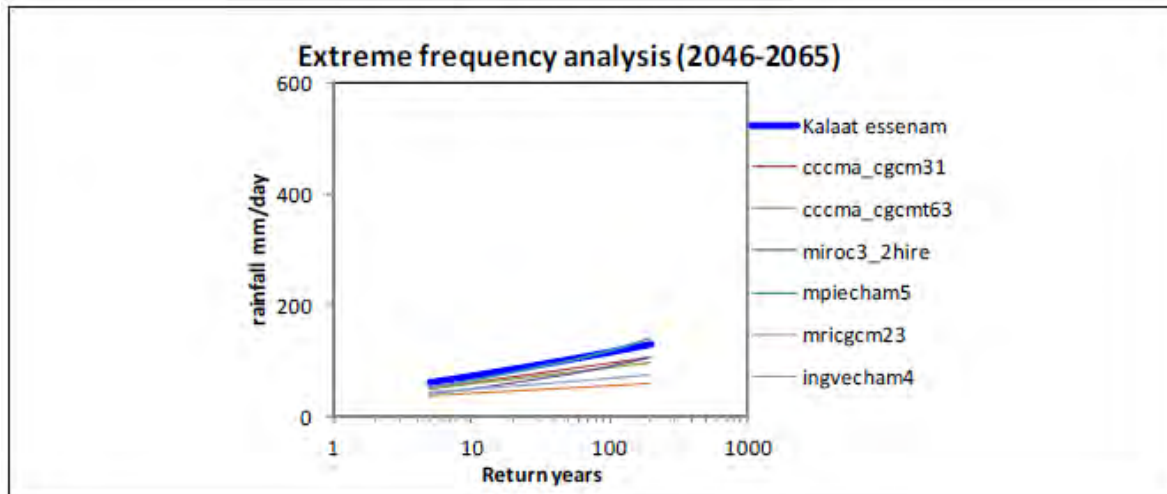
(Ain Beya Oued Observation Point)



(Slougua Observation Point)



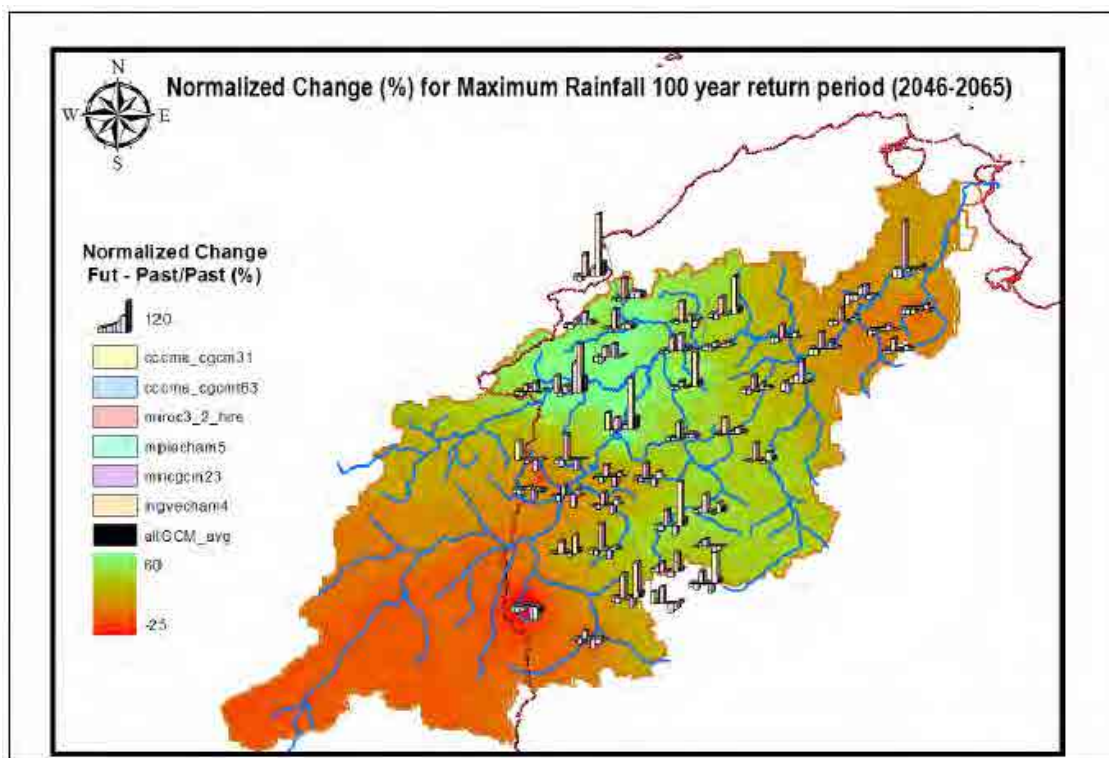
(Kalaat Essenam Observation Point)



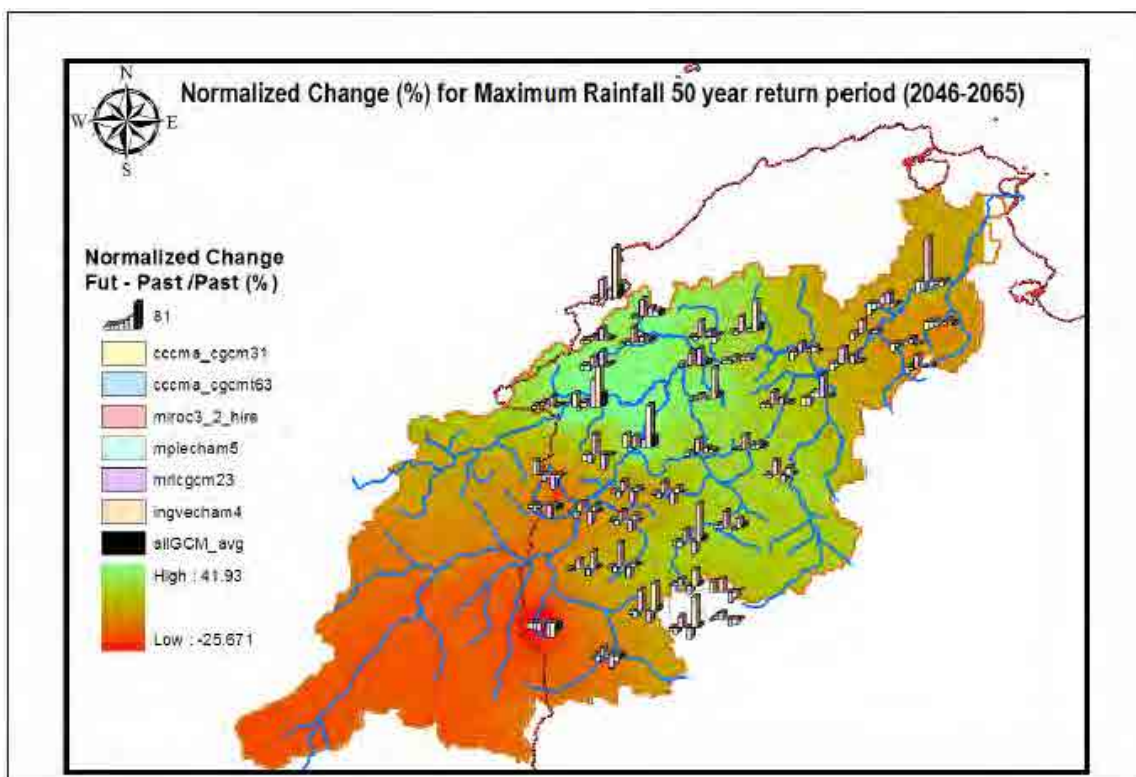
Source: Operating Report of Tunisia's Mejerda River Basin Climate Change Impact Analysis

Figure 12-1 Future Probable Rainfall Predicted in Different Methods

(100-year probability)



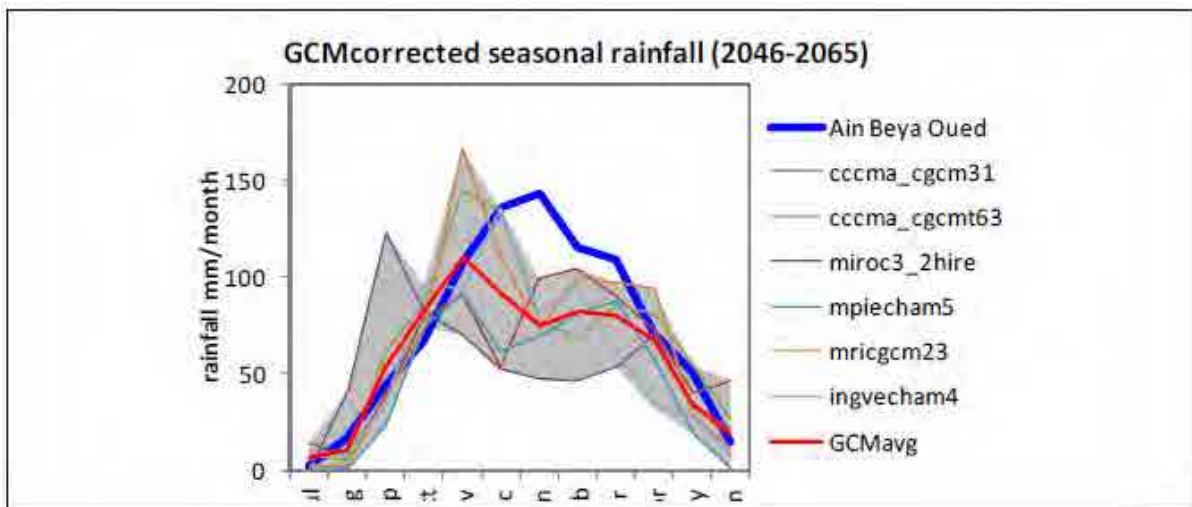
(50-year probability)



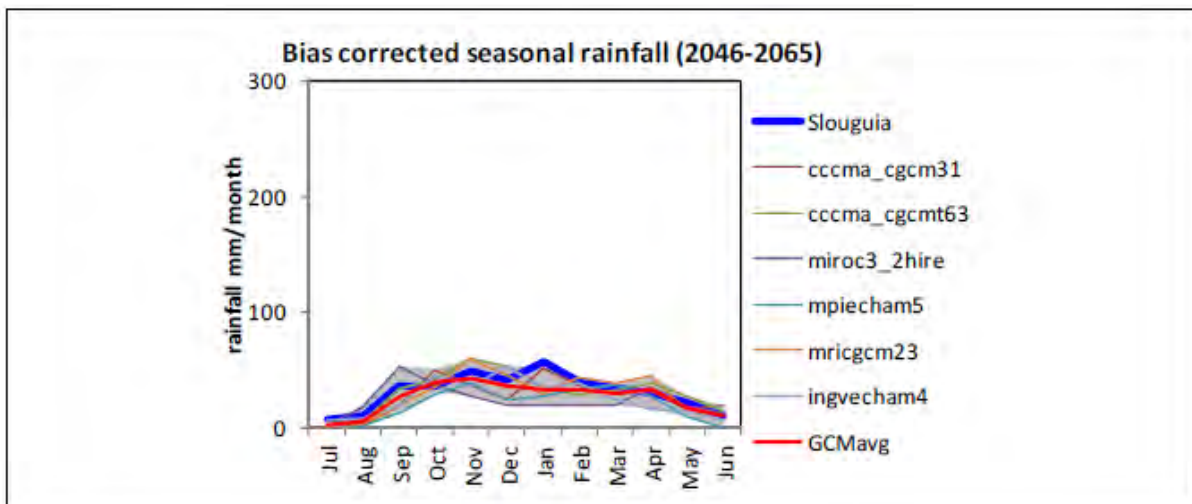
Source: Operating Report of Tunisia's Mejerda River Basin Climate Change Impact Analysis

Figure12-2 Geographical Distribution of Changes in Probable Rainfall

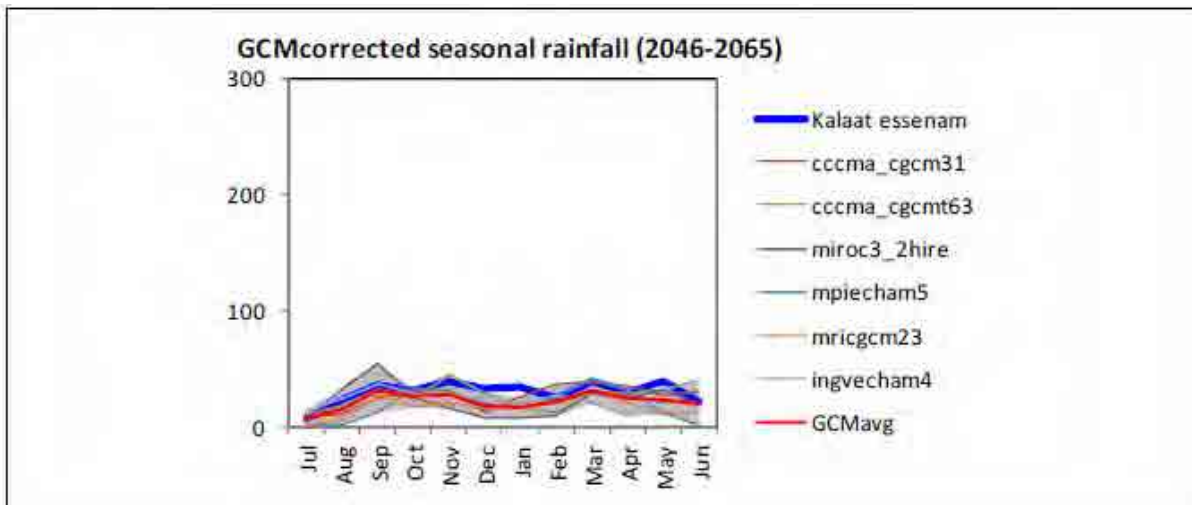
(Ain Beya Oued Observation Point)



(Slougua Observation Point)



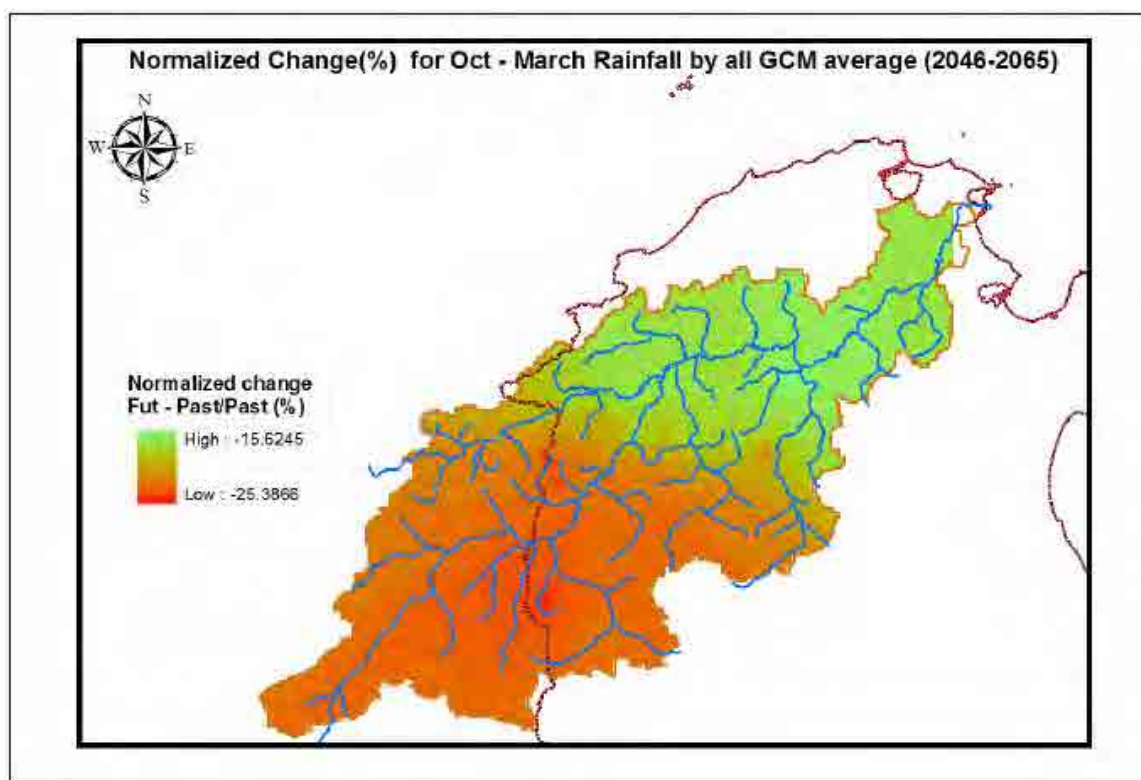
(Kalaat Essenam Observation Point)



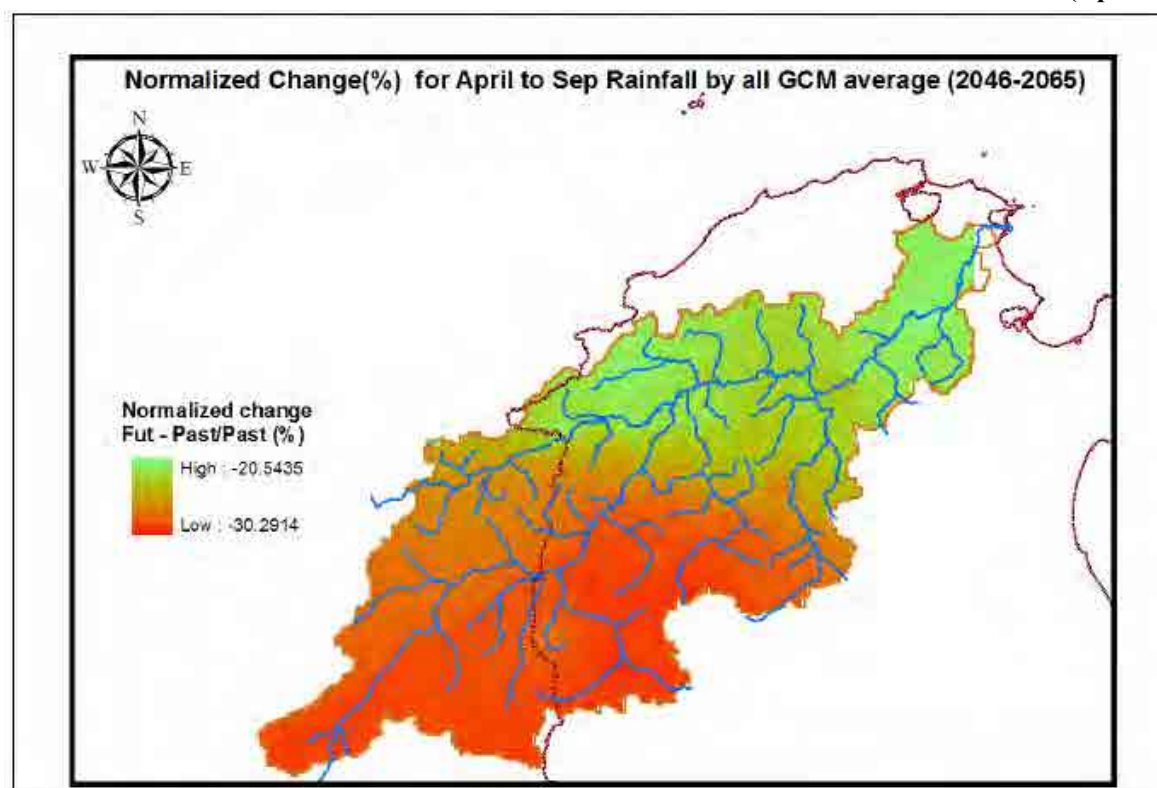
Source: Operating Report of Tunisia's Mejerda River Basin Climate Change Impact Analysis

Figure 12-3 Future Monthly Average Rainfall Predicted in Different Methods

(Oct-Mar)



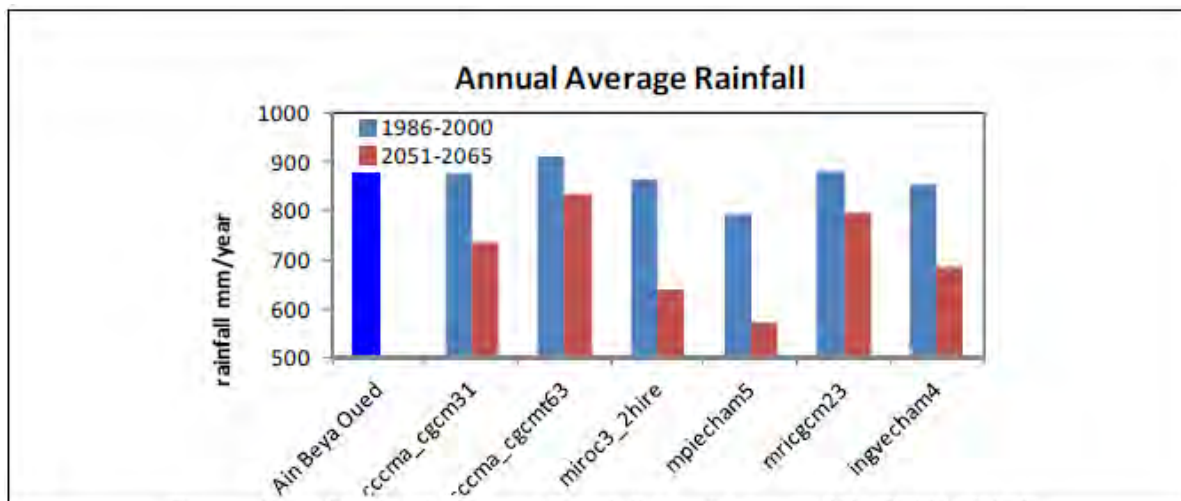
(Apr-Sep)



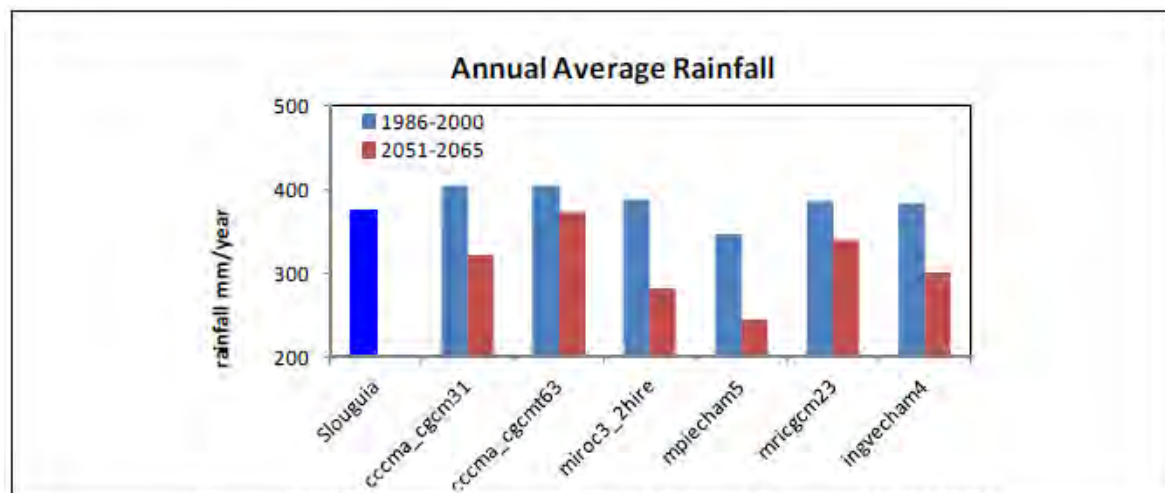
Source: Operating Report of Tunisia's Mejerda River Basin Climate Change Impact Analysis

Figure 12-4 Geographical Distribution of Changes in Rainfall

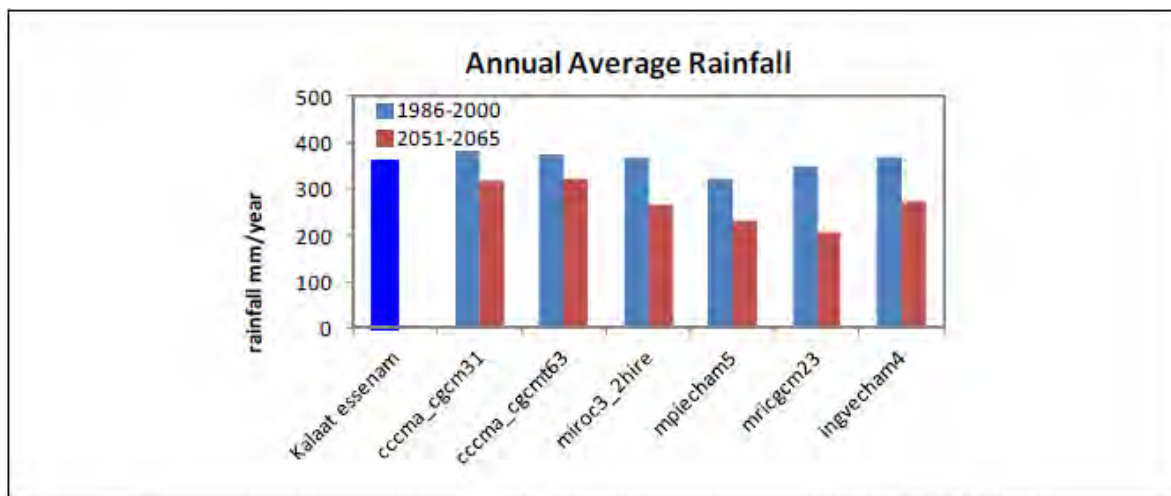
(Ain Beya Oued Observation Point)



(Slougua Observation Point)



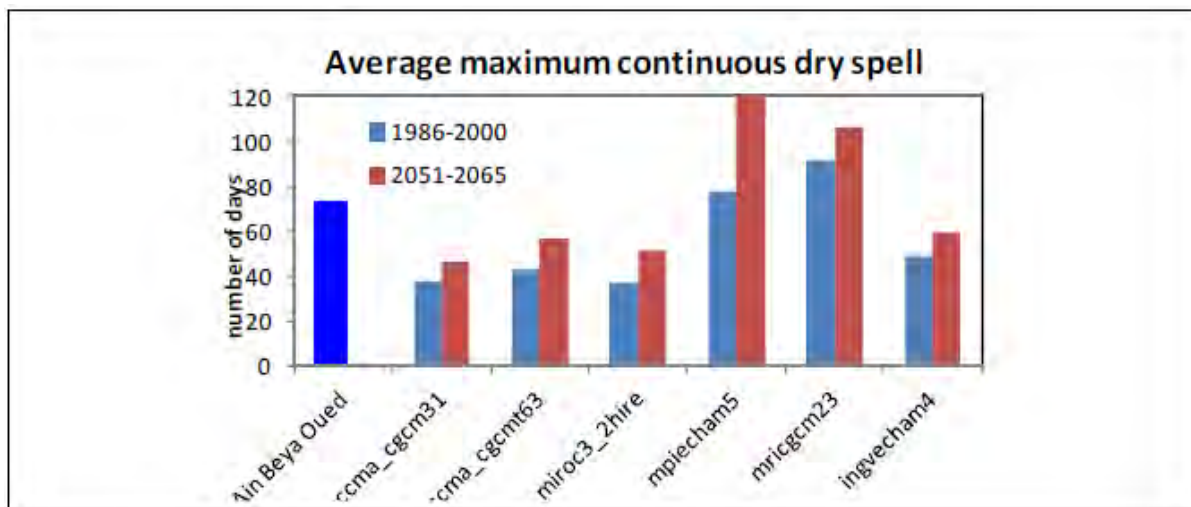
(Kalaat Essenam Observation Point)



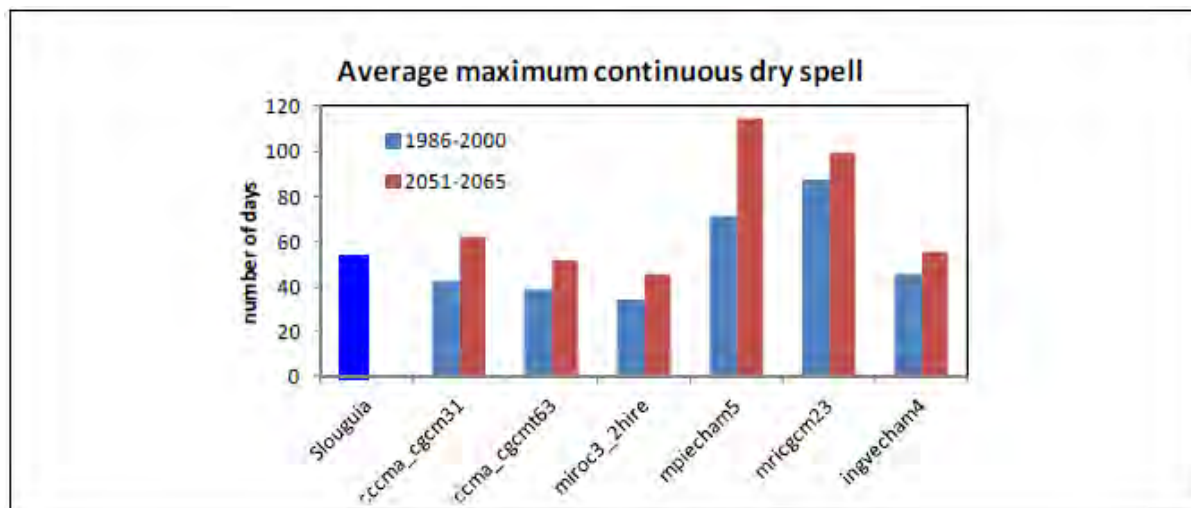
Source: Operating Report of Tunisia's Mejerda River Basin Climate Change Impact Analysis

Figure 12-5 Annual Average Rainfall

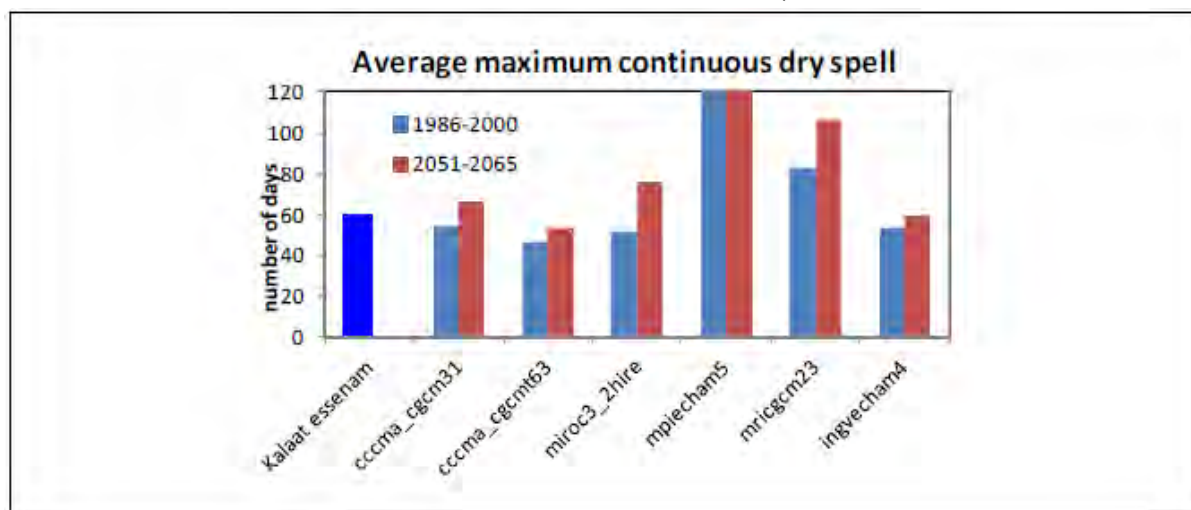
(Ain Beya Oued Observation Point)



(Slougua Observation Point)



(Kalaat Essenam Observation Point)



Source: Operating Report of Tunisia's Mejerda River Basin Climate Change Impact Analysis

Figure 12-6 Average Maximum Number of Continuous Dry Spell Days

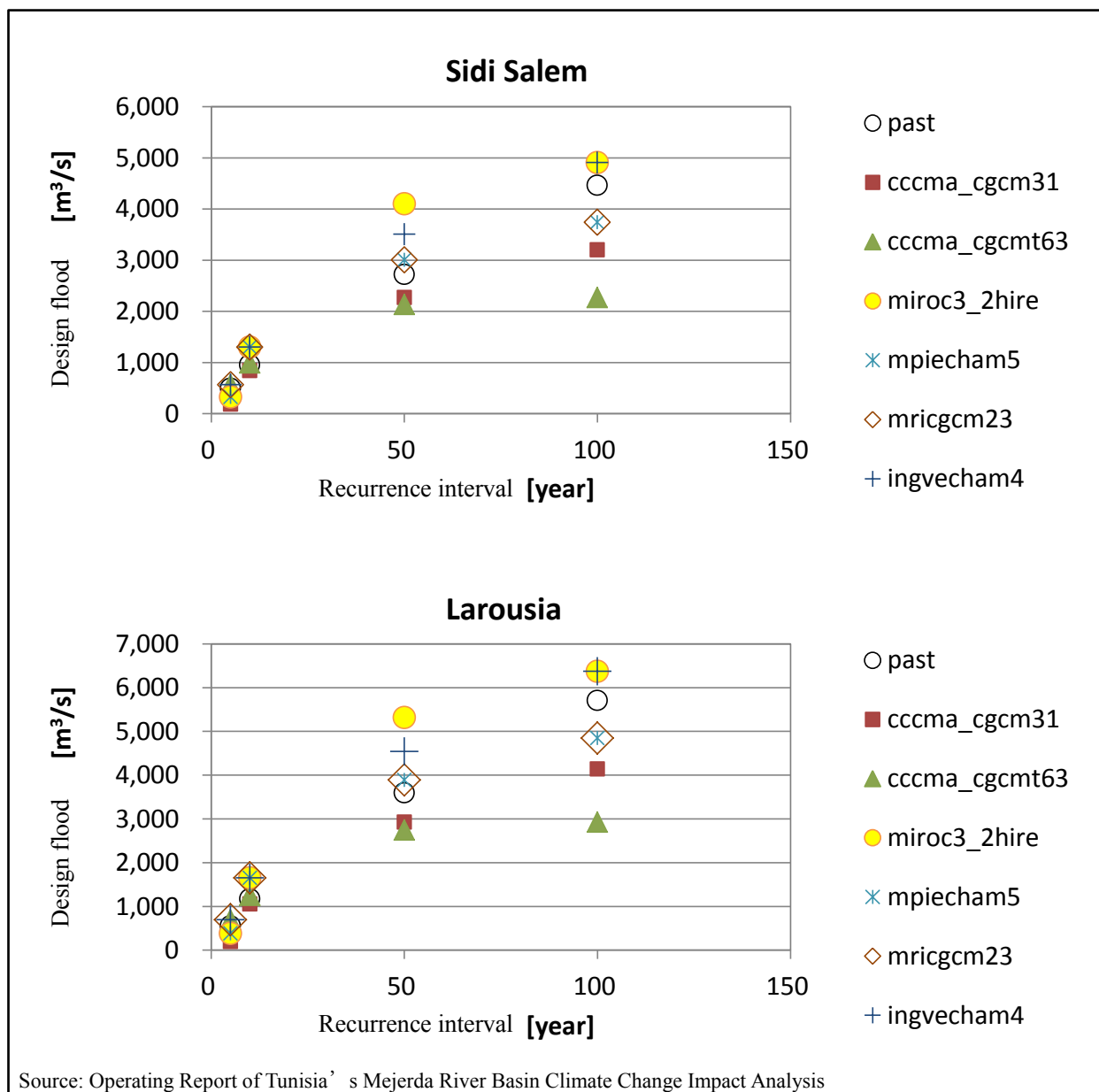


Figure 12-7 Result of Design Flood Calculation in Different Methods

### 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 stated earlier, as the result of river runoff analysis in consideration of the impact of climate change shows large variations among different methods, there seems to be a high level of uncertainty. 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 The average rate of future increase of 10-year probable rainfall will be 1.0 (minimum 0.9, maximum 1.0). 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 Concerning floods exceeding the design level (50-year and 100-year probable rainfall), the average rate of increase in rainfall will be 1.0 (minimum 0.8 and maximum 1.2 for 50-year probable rain, minimum 0.8 and maximum 1.3 for 100-year probable rain). Rainfall will not increase dramatically. 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.