

ANNEX 9

ENVIRONMENTAL ASSESMENT



ANNEX 9 ENVIRONMENTAL ASSESSMENT

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Annex 9.1

Initial Environmental Evaluation (IEE)
Report

Preface

The following Initial Environmental Evaluation (IEE) Report was prepared by JICA Study Team for Feasibility Study on Water Resources Development and Management in the Jordan River Rift Valley in cooperation with Ministry of Agriculture (MoA) and Palestinian Water Authority (PWA), and officially submitted to Environmental Quality Authority (EQA) in August 18, 2008.

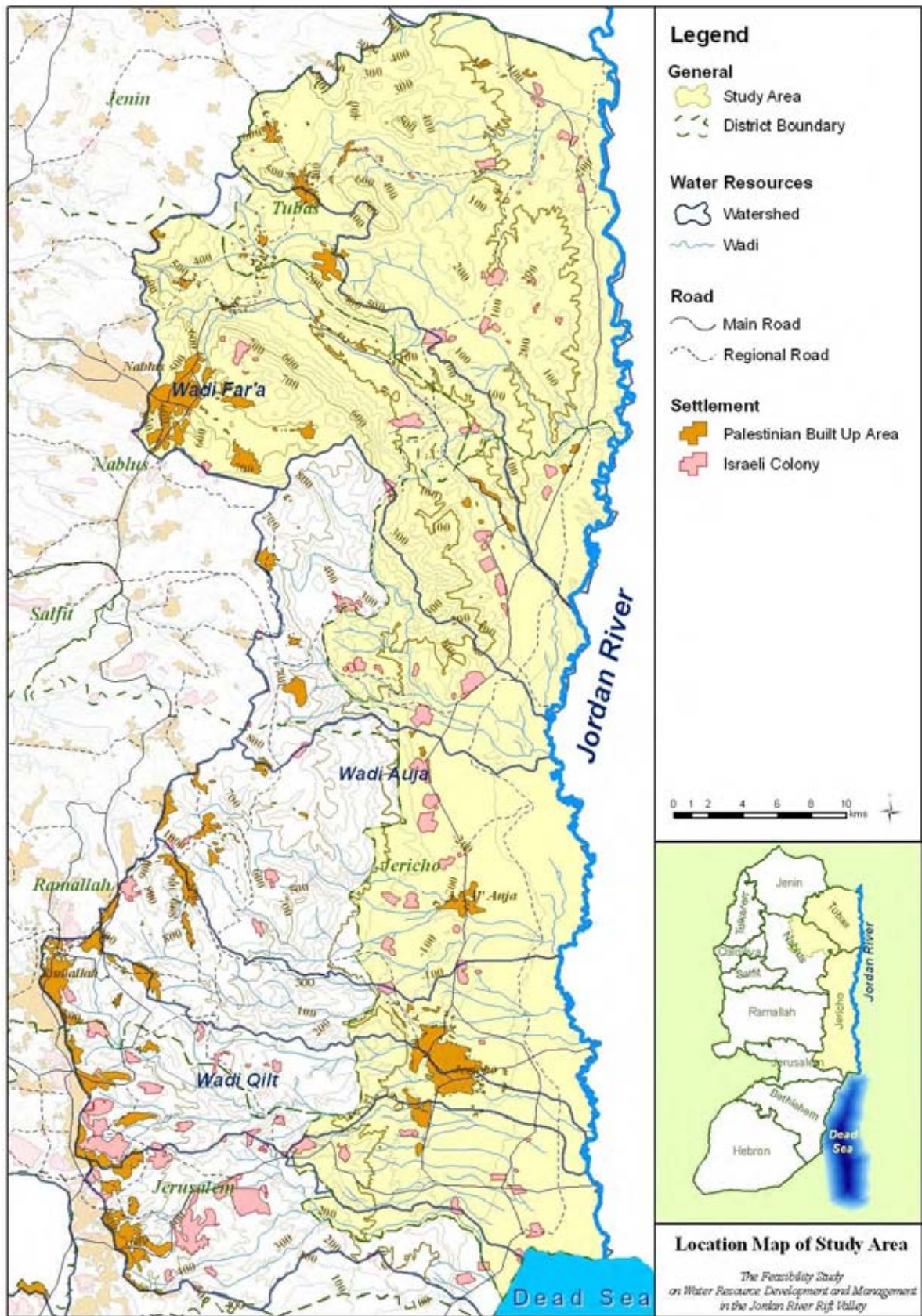
INITIAL ENVIRONMENTAL EVALUATION
FOR
THE FEASIBILITY STUDY
ON
WATER RESOURCES DEVELOPMENT AND MANAGEMENT
IN
THE JORDAN RIVER RIFT VALLEY

JUNE 2008

Ministry of Agriculture (MoA) and Palestinian Water Authority (PWA)

Supported by

JICA Study Team



Location Map of Study Area

EXECUTIVE SUMMARY

This IEE report was prepared based on Interim Report of a JICA study of “The Feasibility Study on Water Resources Development and Management in the Jordan River Rift Valley” in close cooperation with Ministry of Agriculture and Palestinian Water Authority. Objectives of the Study are:

- (1) To formulate a basic plan for efficient utilization of water for agriculture in the Jordan River Rift Valley;
- (2) To formulate a basic plan for water resources development in the Jordan River Rift Valley; and
- (3) To carry out technology transfer to Palestinian counterpart personnel through on-the-job training in the course of the Study.

Through the basic plan formulation, priority projects for future implementation were listed from the main study components, which are improvement of spring water conveyance system, rehabilitation and integrated management of agricultural wells, and storm water harvesting. In parallel with the basic plan formulation, small scale pilot projects are implemented for verification of project impacts.

Under the above situation, IEE study was conducted from October 2007 – March 2008. The results of the IEE study on the priority projects and pilot projects are summarized in the following table.

Items	Description
<p>1 Introduction of the Study <i>(Refer to the following chapter in details</i> <u>Chapter 1:</u> <i>Introduction to the Study)</i></p>	<ul style="list-style-type: none"> • Study area: Jericho and Tubas governorates, and a part of Nablus governorate including the watershed areas of Wadi Qilt, Wadi Auja and Wadi Fara • Study component: <ol style="list-style-type: none"> 1) Improvement and Updating GIS database 2) Formulation of basic plans on improvement of spring water conveyance system, rehabilitation and integrated management of agricultural wells, and storm water harvesting 3) Feasibility study on the selected priority projects through the basic plans 4) Recommendation for efficient utilization of water resources • Period of the JICA Study: March 2007 – December 2008
<p>Proponents</p>	<p>Ministry of Agriculture (MOA) and Palestinian Water Authority (PWA)</p>
<p>Purpose of IEE <i>(Chapter 2:</i> <i>Purpose of Initial Environmental Evaluation)</i></p>	<ul style="list-style-type: none"> • To grasp the current natural and socio-economic environmental conditions in the Jordan River Rift Valley • To evaluate likely environmental and social impacts to be caused by the implementation of the candidate project components • To clarify scope of work for the projects components which needs Environmental Impact Assessment (EIA) study
<p>2 Natural environmental conditions in the study area <i>(Section 4.1:</i> <i>Natural Environment)</i></p>	<ul style="list-style-type: none"> • Climate: Long, hot, dry summer and short and moderate winter • Water supply: Wells, springs and water supply by Mekorot. Water harvesting structure is not available at present. Wastewater is not used in the study area. • Land use: Agricultural lands and residential areas in the Jordan River Rift Valley. • Biodiversity: Eight ecologically significant areas are spread in the study area. Rare floral

<p>Social environmental conditions in the study area <i>(Section 4.2: Socio-economic Environment)</i></p>	<ul style="list-style-type: none"> • Population: 88,912 in 2005 • Localities concerned: Eighteen villages and one municipality in Jericho, Tubas and a part of Nablus governorates • Water demand: Demand on industrial and domestic water use is expected to quickly increase. However, the water supply is not sufficient under present situation.
<p>3 Project description of priority projects <i>(Section 7.1: Candidate Priority Projects in the Study)</i></p>	<p>[Rehabilitation of Agricultural Wells]</p> <ul style="list-style-type: none"> • Location: Twenty-one agricultural wells in Jordan River Rift Valley • Main work components: <ol style="list-style-type: none"> 1) Development of the wells including cleaning and deepening 2) Pumping test and water quality test 3) Replacement/installation of pumping equipment 4) Establishment and strengthening of WUAs <p>[Improvement of Spring Water Conveyance System]</p> <ul style="list-style-type: none"> • Location: Auja, Nwai'mah and Dyuk spring water conveyance system • Main work components: <ol style="list-style-type: none"> 1) Rehabilitation of existing open canals 2) Installation of pipelines 3) Construction of settling basin 4) Establishment and strengthening of related organizations to spring water users <p>[Storm Water Harvesting]</p> <ul style="list-style-type: none"> • Location: Wadi Fara, Wadi Auja and Wadi Qilt • Types of water harvesting: <ol style="list-style-type: none"> 1) Dam on wadi at end of mountain area at Wadi Qilt 2) Dam on wadi at downstream area of confluence between Tubas and Nablus governorate at Wadi Fara 3) Reservoirs for turbid flood near garbage dumping at Wadi Qilt 4) Reservoir for surplus spring water at downstream area of Auja spring 5) Retention dam / underground dam at alluvial fun of Wadi Auja 6) Retention dam / underground dam at alluvial fun of Wadi Qilt
<p>Project description of pilot projects <i>(Section 9.1: Description of Pilot Projects)</i></p>	<p>[Rehabilitation of 8 Agricultural Wells]</p> <ul style="list-style-type: none"> • Target area: 2,870 dunum in total at Auja (1), Frush Beit Dajan (2), Al Jiftlik (3), Ein El Beida (1), Al Fara (1) • No. of beneficiaries: 372 households in total • Expected period: December 2007 – July 2008 • Work components: <ol style="list-style-type: none"> 1) Cleaning, deepening of the selected wells 2) Pumping tests and water quality tests 3) Replacement of pumping units 4) Facilitation for forming WUA at each well 5) Implementation of technical training for WUA staff on O&M and management of the spring water conveyance system 6) Awareness promotion on efficient water use for water users 7) Collection and analysis of data and information for monitoring and evaluation <p>[Improvement of Spring Water Conveyance System at Nwai'mah]</p> <ul style="list-style-type: none"> • Target area: a part of Nwai'mah irrigation system • No. of beneficiaries: 1,128 persons • Expected period: March 2008 – July 2008 • Work components: <ol style="list-style-type: none"> 1) Installation of pipelines (approx. 1,100 m) 2) Rehabilitation of an existing concrete canal (approx. 30 m) 3) Construction of settling basin (16 m³)

	<p>4) Facilitation for forming water management unit</p> <p>5) Implementation of technical training for LGUs staff on O&M and management of the spring water conveyance system</p> <p>6) Awareness promotion on efficient water use for water users</p> <p>7) Collection and analysis of data and information for monitoring and evaluation</p>																				
<p>4 Assessment of potential impacts caused by implementation of the priority/pilot projects and measures to be taken</p> <p><i>(Section 7.2: Conceivable Impacts of Candidate Priority Projects, Section 7.3: Mitigation Measures for Major Environmental and Social Impacts, Section 9.2: Mitigation Measures taken for Major Environmental and Social Impacts)</i></p>	<p>[Rehabilitation of Agricultural Wells]</p> <table border="1" data-bbox="571 405 1399 1070"> <thead> <tr> <th data-bbox="571 405 810 454">Negative impacts</th> <th data-bbox="810 405 1399 454">Measures</th> </tr> </thead> <tbody> <tr> <td data-bbox="571 454 810 757">Conflicts on water management</td> <td data-bbox="810 454 1399 757"> <ul style="list-style-type: none"> • Obtaining agreement on project activities from stakeholders before implementation • Formation of WUAs among well owners and water users • Facilitation of WUAs registration to PWA • Conducting training on water management • Careful monitoring of WUAs activities conducted by PWA and MOA </td> </tr> <tr> <td data-bbox="571 757 810 920">Accidents during implementation</td> <td data-bbox="810 757 1399 920"> <ul style="list-style-type: none"> • Arrangement of qualified and skillful experts and a senior supervisor • Preparation of safety control system • Enforcement of safety control to workers </td> </tr> <tr> <td data-bbox="571 920 810 1070">Noise</td> <td data-bbox="810 920 1399 1070"> <ul style="list-style-type: none"> • Explanation of work contents to people living near the sites and approvals from them before implementation • Construction of pumping house, if necessary, to minimize noise generation </td> </tr> </tbody> </table> <p>[Improvement of Spring Water Conveyance System]</p> <table border="1" data-bbox="571 1122 1399 2033"> <thead> <tr> <th data-bbox="571 1122 810 1171">Negative impacts</th> <th data-bbox="810 1122 1399 1171">Measures</th> </tr> </thead> <tbody> <tr> <td data-bbox="571 1171 810 1283">Negative impact on nature reserve area at Auja spring</td> <td data-bbox="810 1171 1399 1283"> <ul style="list-style-type: none"> • No activity is conducted at and near the source of springs </td> </tr> <tr> <td data-bbox="571 1283 810 1361">Water supply for Bedouin</td> <td data-bbox="810 1283 1399 1361"> <ul style="list-style-type: none"> • Setting outlets of water supply for Bedouin </td> </tr> <tr> <td data-bbox="571 1361 810 1507">Disturbance of a recreation site along Nwai'mah spring conveyance system</td> <td data-bbox="810 1361 1399 1507"> <ul style="list-style-type: none"> • Existing open canal is utilized as it is. • Putting filter and settling basin at the downstream site of the Banana Land to protect from garbage. </td> </tr> <tr> <td data-bbox="571 1507 810 1877">Conflicts on water management</td> <td data-bbox="810 1507 1399 1877"> <ul style="list-style-type: none"> • Obtaining agreement on project activities from stakeholders before implementation • Enhancement of water management committees under agreement among water right holders • No change of present time-based water distribution system to water right holders • Conducting training on water management to water users • Monitoring of water management committees' activities conducted by PWA and MOA </td> </tr> <tr> <td data-bbox="571 1877 810 2033">Accidents during implementation</td> <td data-bbox="810 1877 1399 2033"> <ul style="list-style-type: none"> • Arrangement of qualified and skillful experts and a senior supervisor • Preparation of safety control system • Enforcement of safety control to labors </td> </tr> </tbody> </table>	Negative impacts	Measures	Conflicts on water management	<ul style="list-style-type: none"> • Obtaining agreement on project activities from stakeholders before implementation • Formation of WUAs among well owners and water users • Facilitation of WUAs registration to PWA • Conducting training on water management • Careful monitoring of WUAs activities conducted by PWA and MOA 	Accidents during implementation	<ul style="list-style-type: none"> • Arrangement of qualified and skillful experts and a senior supervisor • Preparation of safety control system • Enforcement of safety control to workers 	Noise	<ul style="list-style-type: none"> • Explanation of work contents to people living near the sites and approvals from them before implementation • Construction of pumping house, if necessary, to minimize noise generation 	Negative impacts	Measures	Negative impact on nature reserve area at Auja spring	<ul style="list-style-type: none"> • No activity is conducted at and near the source of springs 	Water supply for Bedouin	<ul style="list-style-type: none"> • Setting outlets of water supply for Bedouin 	Disturbance of a recreation site along Nwai'mah spring conveyance system	<ul style="list-style-type: none"> • Existing open canal is utilized as it is. • Putting filter and settling basin at the downstream site of the Banana Land to protect from garbage. 	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	<p>[Storm Water Harvesting]</p> <p>Necessary data especially on discharge record of the wadis and sediment volume in wadis' discharge is not available to determine the size of storm water harvesting structures. After the observation of such hydrological measurement, environmental assessment must be conducted.</p>
<p>5 Stakeholders (<u>Section 1.6:</u> <i>Steering Committee of the Study,</i> <u>Section 7.4:</u> <i>Information Disclosure</i>)</p>	<p>[Members of Steering Committee] MOA, PWA, EQA, MOP, JICA Palestine Office, JICA Study Team</p> <p>[Rehabilitation of Agricultural Wells] Well owners and water users at selected agricultural wells</p> <p>[Improvement of Spring Water Conveyance System] Village Councils, Water right holders and farmers at Auja, Nwai'mah and Dyuk</p> <p>[Storm Water Harvesting] Village Councils, land holders, farmers, villagers living around/concerned to Wadi Fara, Wadi Auja and Wadi Qilt</p>
<p>Public consultations / Information disclosure (<u>Section 7.4:</u> <i>Information Disclosure</i>)</p>	<ul style="list-style-type: none"> • Steering Committee Meetings on: 1) Inception Report; 2) Progress Report (1); 3) Interim Report; 4) Draft Final Report • Workshops for formulation of water users associations (WUAs) in pilot projects at selected eight agricultural wells and Nwai'mah spring • Preparation and distribution of brochures (Arabic and English) to concerned governmental organizations, donors, NGOs and individuals • Preparation and distribution of study reports to concerned governmental organizations • Seminar for the explanation of the Study progress in May 2008
<p>6 Environmental monitoring and management plan (<u>Chapter 8:</u> <i>Environmental Monitoring and Management Plan</i>)</p>	<p>In accordance with the Water Law enacted on 2002, PWA shall have full responsibility for managing the water resources and wastewater in Palestine including monitoring of water resource quantity and quality, regulate and halt water supply if water resources are polluted.</p> <p>On the other hand, local communities, well owners or the relative organizations have a responsibility on adequate water resources management as mentioned in the National Water Policy and Strategy.</p> <p>Based on the above consensus, main actors and actions to be taken for environmental monitoring and management are described in the main document. Environmental monitoring and management plans are composed of: 1) work component; 2) phase of the project; 3) source of impacts; 4) impact parameters; 5) actions to be taken; 6) responsibility of the actions; and 7) supervisor.</p>
<p>7 Necessity of EIA (<u>Chapter 10:</u> <i>Conclusion</i>)</p>	<p>[Rehabilitation of Agricultural Wells]: EIA is not necessary.</p> <p>[Improvement of Spring Water Conveyance System]: EIA is not necessary.</p> <p>[Storm Water Harvesting]: EIA is necessary after the discharge measurement during 5-10 year at the proposed site.</p>

The Feasibility Study
on
Water Resources Development and Management
in
the Jordan River Rift Valley

Initial Environmental Evaluation

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Abbreviation

CA	Civil Administration (Israel)
DCO	Israeli District Coordination Office
EA	Environmental Assessment
EAC	Environmental Assessment Committee
EIA	Environmental Impact Assessment
EQA	Environmental Quality Authority
GDP	Gross Domestic Product
GIS	Geographic Information System
HDPE	High-density polyethylene
IEE	Initial Environmental Evaluation
JICA	Japan International Cooperation Agency
JICA Study Team	JICA Study Team for “The Feasibility Study on Water Resources Development and Management in the Jordan River Rift Valley”
JWC	Joint Water Committee
LGU	Local Government Unit
MBAS	Methyren Blue Active Substances
MDGs	Millennium Development Goals
MOA	Ministry of Agriculture
MoNE	Ministry of National Economy
MOP	Ministry of Planning
MoTA	Ministry of Tourism and Antiquities
MTDP	Medium Term Development Plan
NGO	Non-Governmental Organization
O&M	Operation and Maintenance
PCBS	Palestinian Central Bureau of Statistics
PLA	Palestinian Liberation Army
PNA	Palestinian National Authority
PWA	Palestinian Water Authority
TDS	Total Dissolved Solids
TOR	Terms Of Reference
UNDP	United Nations Development Programme
UNRWA	United Nations Relief and Works Agency for Palestine Refugees in the Near East
VECs	Valued Environmental Components
WHO	World Health Organization
WUA	Water Users Association

1 Introduction to the Study

1.1 Background of the Study

The Jordan River Rift Valley has a population of about 88,900 and its climate is categorized as arid to semi-arid zone. Present water sources for the area depend on spring water and groundwater. Agriculture amounting to 7% of GDP in the area is a basic industry of the area and 70% of the working population is engaged in farming.

Water for agriculture is mainly utilized for livestock and irrigation. However, water resources are currently being utilized inefficiently because of improper water distribution based on time, water conveyance losses from insufficient irrigation facilities, damaged agricultural wells and lack of development of surface water. Since water demand is expected to increase in the future, efficient utilization of existing water resources, as well as development of new water resources are essential for the study area.

A study on Jericho Regional Development was conducted by JICA from October 2005 to September 2006 to formulate a Regional Development Plan for the Jericho and the Jordan River Rift Valley area and to enhance the capacity for formulation and implementation of a regional development program. The program is comprised of a Social and Community Development Program, Agriculture and Agribusiness Development Program, and Tourism and Urban Environment Program.

In July 2006, the Government of Japan discussed with Palestine, Israel and Jordan and recommended the concept of “Corridor for Peace and Prosperity” aiming the realization of the permanent peace in the region. For this concept, Four-Party Consultative Unit was established and Japan intended to apply Official Development Assistance (ODA) in order to accelerate the confidence building among the countries through the regional development.

Under these circumstances, the Project Formation Mission for Agriculture and Agribusiness Development Program was dispatched by JICA in November 2006 and ideas were exchanged with the Palestinian National Authority (PNA) and the neighboring countries. In response to the official request of PNA, the Scope of Work for the Feasibility Study on Water Resources Development and Management in the Jordan River Rift Valley was also discussed and agreed upon by both parties in February 2007.

1.2 Study Area

The target area of the Study is located in the West Bank of the Jordan River Rift Valley, which includes the watershed areas of Wadi Qilt, Wadi Auja and Wadi Fara, as presented in the Location Map of Study Area of the 2nd page of this report. The study area is administratively located in three governorates: Jericho; Tubas; and a part of Nablus governorate. There are 20 localities (villages) in the study area.

1.3 Study Period

March 2007 – December 2008

1.4 Objectives of the Study

The objectives of the Study are:

- 1) To formulate a basic plan for efficient utilization of water for agriculture in the Jordan River Rift Valley;
- 2) To formulate a basic plan for water resources development in the Jordan River Rift Valley; and,
- 3) To carry out technology transfer to Palestinian counterpart personnel through on-the-job training in the course of the Study.

1.5 Scope of the Study and Expected Outcomes

Scope of the Study is categorized into four main activities. The major expected outcomes through the activities are summarized in Table 1-1.

Table 1-1 Major Expected Outcomes of the Study

No.	Major Outcomes	Contents
1	Improved and updated GIS database	Information for integrated water resources management including water resources, water utilization, farm plots etc.
2	Basic plan of water resources development	<ol style="list-style-type: none"> a) Basic plan for improvement of spring water conveyance systems b) Basic plan for rehabilitation and integrated management of agricultural wells c) Basic plan for storm water harvesting in Wadi Qilt, Wadi Auja and Wadi Fara Watersheds d) Consideration of short and long-term strategy for water resources management and development
3	Implementation of the pilot projects and Feasibility Study of the selected schemes	<ol style="list-style-type: none"> a) Improvement plan for spring water conveyance systems b) Rehabilitation and integrated management plan for agricultural wells c) Storm water harvesting plan for Wadi Qilt, Wadi Auja and Wadi Fara Watersheds
4	Recommendations for efficient utilization of water resources	<ol style="list-style-type: none"> a) Lessons learnt from the study b) Issues and recommended measures for further water resources development and management in the study area

Source: JICA Study Team

1.6 Steering Committee of the Study

Member of Steering Committee of the Study is composed on:

- 1) Palestinian Water Authority (PWA);
- 2) Ministry of Agriculture (MoA);
- 3) Ministry of Planning (MoP);
- 4) Environment Quality Authority (EQA);
- 5) Resident Representative of JICA Palestine Office;
- 6) Leader of the Study Team; and
- 7) Others appointed by the Chairperson

2 Purpose of Initial Environmental Evaluation

The main purposes of the Initial Environmental Evaluation (IEE) study are:

- 1) To determine the current natural and socio-economic environmental conditions in the Jordan River Rift Valley;
- 2) To evaluate likely environmental and social impacts caused by the implementation of the candidate project components; and
- 3) To determine scope of work for the projects components that needs Environmental Impact Assessment (EIA) study.

3 Methodology of IEE

3.1 Data Collection

Data of IEE study was basically collected based on secondary data and interview survey. The data and information was verified and/or supplemented through the field reconnaissance.

3.2 Project Description

Projects listed in this IEE report were categorized into two parts. One was a set of candidate pilot project components which was scheduled to be implemented during this study period. The other was a set of candidate priority projects and alternatives for the Feasibility Study.

3.3 Identification and Evaluation of Conceivable Impacts

Conceivable impacts to be caused by the implementation of the candidate pilot project components and priority projects were identified and evaluated especially on the following points of view:

- Importance of impacts;
- The number of people / area to be affected;
- Spatial extent and duration of the impacts;
- Reversibility of the impacts; and
- Possibility of secondary impacts.

Based on the valued environmental components described in Palestinian Environmental Assessment Policy, scoping matrices were prepared to identify and evaluate conceivable impacts by the components. Conceivable impacts were technically judged and rated by environmental consultant in the JICA Study Team based on the JICA Guidelines for Environmental and Social Considerations. Similar guidelines are utilized by World Bank and Japan Bank of International Cooperation.

4 Current Environmental Conditions in the Study Area

4.1 Natural Environment

4.1.1 Topography

The topographic conditions in the study area are categorized in the following three types.

(1) Mountainous area

It is located in the upstream area of Wadi Fara or northwest of the study area. Elevation of the area ranges from 200 m to 600 m above sea level.

(2) Foothill area

Most of the study area is covered by this type with steep slope. Elevation of the area ranges from 0 m to 200 m above sea level.

(3) Flat area

This type is observed in the length of 10 km and the width of 1 to 2 km along the Jordan River. Elevation of the area ranges from 0 m to 300 m below sea level.

4.1.2 Climate

The study area is characterized as arid to semi-arid climate.

(1) Rainfall

Large part of the rainfall is observed in the winter season from November to February. The long-term average annual rainfall (1968-2006) is 149 mm at the meteorological station in Jericho and 398 mm in Tubas.

Average annual rainfall varies by the topographic condition. The annual average rainfall in the mountainous area, foothill area and flat area is 300-500 mm, 200-300 mm and less than 200 mm, respectively.

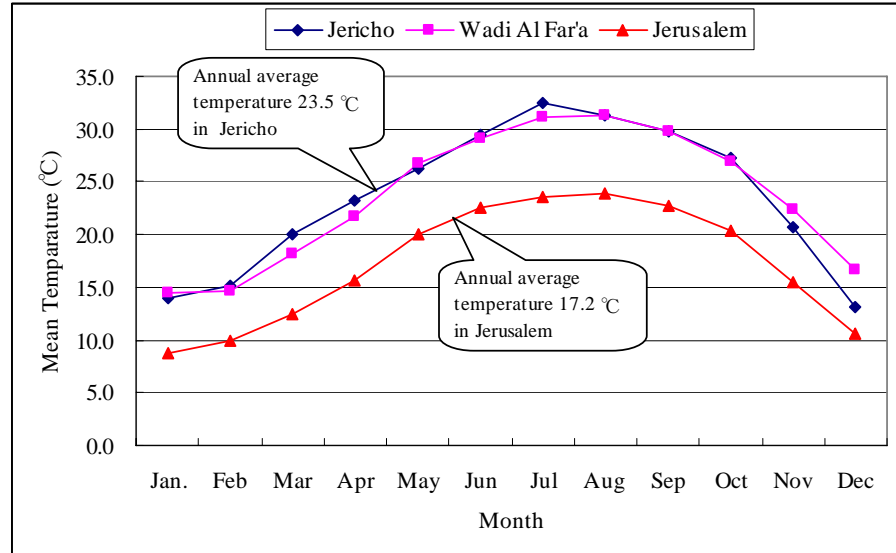
Since potential evaporation rate exceeds the rainfall, the soil water content is rarely saturated in rainfed agricultural lands.

(2) Temperature

Mean monthly temperature in/around the study area is shown in Figure 4-1. Temperature is strongly affected by the geographic condition and altitude. The mean monthly temperature in Jericho and Wadi Fara ranges between the minimum of 13.1°C in December to the maximum of 32.4°C in August.

(3) Evaporation

Evaporation rate is high due to high temperature, intensive sunshine and low humidity, particularly during the period of May through September. Annual average evaporation in Jericho reaches around 2,100 mm.



Source: Meteorological Conditions in the Palestine Territory Annual Report, PCBC, 2005

Figure 4-1 Mean Monthly Temperature

4.1.3 Geology

The study area is located in a part of Eastern basin and consists of five main aquifers, which are 1) Holocene Aquifer, 2) Pleistocene Gravel Aquifer, 3) Eocene Aquifer, 4) Upper Cretaceous Aquifer, and 5) Lower Cretaceous Aquifer. The detailed information in each aquifer is described in the Interim Report of the JICA Study.

4.1.4 Soil

In the Jordan Valley including the eastern slope area, the dominant soil type is Loessial Serozem, which has a sandy loamy texture and a weak physical structure due to a high salinity level and low organic content. In addition, steep area is highly eroded because vegetation cover of the soil surface is limited.

4.1.5 Water Resources

(1) Wadis

There are a numerous number of wadis in the study area. The wadis are mainly categorized in nine major wadi basins as shown in Table 4-1. Wadi Fara occupies the largest catchment area of 340 km². The northern part of the study area including Wadi Fara basin is blessed with abundant vegetation and rainfall. On the other hand, the ratios of low-lying flat and desert areas with annual rainfall of less than 300 mm become relatively larger in the southern wadi basins. Therefore, the rainfall hardly contributes to the yield of water resources in the southern area.

Table 4-1 Major Wadi Basins

No.	Name of Wadi	Catchment Area (km ²)
1	Wadi Hahal Milah	276.1
2	Wadi Abu Sidra	120.8
3	Wadi Fara	336.9
4	Wadi Al 'Ahmer	180.1
5	Wadi Auja	291.4
6	Wadi Nueima	152.5
7	Wadi Qilt	172.4
8	Wadi Marar	102.4
9	Wadi Mukallak	140.5
	Total	1773.1

Source: GIS data of PWA 2007

The availability of discharge records of the wadis is limited. One of the reasons is that water through the wadis has not been utilized effectively in Palestine.

(2) Spring water

There are 114 springs discharging in the West Bank and 24 springs out of them are located in the study area. The 24 springs are categorized in 8 groups by locations and origins. The characteristics of the groups are summarized in Table 4-2.

Table 4-2 List of Spring Group in the Study Area

No.	Spring Group	Basin	Catchment	Spring Name	Total Discharge (Mcm/yr)
1	Nablus Spring Group	North Eastern	Al Far'ah	Balata, Dafna	0.31
2	Al Far'ah Spring Group	North Eastern	Al Far'ah	Al Far'ah, Al Dlaib	6.51
3	Badhan Spring Group	North Eastern	Al Far'ah	Sedrah, Hamad & Baidah, Qdairah, Jeser, Tabban, Al Subyan	5.15
4	Shibli Spring Group	Eastern	Al Far'ah	Shibli, Abu Saleh, Meskah	2.14
5	Fasayil Spring Group	Eastern	Al 'Ahmer	Fasayil	0.66
6	Al 'Auja Spring Group	Eastern	Al 'Auja	Al 'Auja	9.55
7	Jericho & Dyuk Spring Group	Eastern	Al Nwai'mah	Al Dyuk, Al Nwai'mah, Al Shusah, Al Sultan	13.61
8	Al Qilt Spring Group	Eastern	Al Qilt	Al Qilt & Al Fawwar, Fara, Al Jummaizah, Al Ru'yan	7.91
	Total				45.84

Source: PWA database(2007) categorized and summarized by JICA Study Team

The Jericho & Dyuk Spring group consisted from four springs has the most abundant

discharge and accounts for 30% of all the spring discharge in the study area. The discharge volume is stable in any season.

The spring water in the study area is mainly used for agricultural purpose. However, the following constraints were observed in the current situation through the study:

- 1) The water is not used effectively because of much loss in the main conveyance canals or the natural conveyance facilities;
- 2) The water is allocated to the farmers by time based water right system and not by volumetric based water right system. This system might cause that the farmers use much more water than the volume required by crops;
- 3) There is no water users association to organize the farmers' activities or to control and manage the system except the water users association at Ein Sultan. This means that the central governmental institutions cannot control and manage the water resources and the water supply services effectively;
- 4) The capacity for operation and maintenance of water conveyance facilities is very low in the village councils and the farmers;
- 5) There are springs contaminated by untreated wastewater in the wadis, i.e. Badhan and Shibli Spring Group and Qilt Spring Group; and
- 6) The seasonal fluctuation causes shortage of water in the dry season (summer) and useless overflow in the rainy season (winter).

(3) Wells

Wells have played an important role as one of the main sources of water supply for the Palestinian in the study area. Water allocated from the wells and the springs is 95% for agriculture and 5% for human consumption. The number of working agricultural wells in the study area is 88 out of 184 existing wells as shown in Table 4-3. The others are non-pumping and abandoned wells. Most of these wells were drilled before 1967 and the wells' condition

Table 4-3 Summary of Agricultural Wells

No.	Locality	Number of wells (Working, Non-pumping)
1	Al' Auja	10 (7, 3)
2	Al Jiftlik	27 (21, 6)
3	An Nabi Musa	1 (0, 1)
4	Az Zubeidat	4 (2, 2)
5	Bardala	8 (1, 7)
6	Deir Hajleh	2 (0, 2)
7	Fasayil	1 (0, 1)
8	Furush Beit Dajan	8 (5, 3)
9	Jericho (Ariha)	92 (29, 63)
10	Marj Na'ja	13 (7, 6)
11	Wadi Al Far'a	18 (16, 2)
	Total	184 (88, 96)

Source: PWA Database, 2007

became worse due to electromechanical, hydro-geological or economic reasons.

Constraints of the agricultural wells were collected through the study as follows:

- 1) The capacity of the wells decreases because of deterioration of the drilled wells without proper maintenance work;
- 2) There is a limitation on well extractions stipulated by law;
- 3) Groundwater level is deepened and the quality is seriously affected with increased salinity of water due to over-pumping compared with the recharge capacity to the groundwater especially in the Jericho governorate;
- 4) Electricity power supply is limited in many areas;

- 5) Equipment, spare parts and maintenance costs are expensive;
- 6) Local cooperatives for well maintenance are limited; and
- 7) Qualified local drilling companies are limited.

4.1.6 Land Use

As listed in Table 4-4, the study area is classified into five types of land cover: such as 1) agricultural land; 2) Palestinian community; 3) Israeli settlement; 4) military base; and 5) others.

Table 4-4 Land Use of the Study Area in 1997 (km²)

Land Cover	Area A	Area B	Area C	Total
Agricultural Areas	86	36	219	342
Palestinian Community	16	2	47	65
Israeli Settlement	0	0	17	17
Military Base	13	3	67	84
Others (including rangeland and grassland for Bedouin)	32	16	537	586
Total	148 (13.5%)	58 (5.3%)	887 (81.2%)	1,093 (100.0%)

Source: MOP, 2007

Latest land use map in Palestine was developed based on satellite images in 1997 although the land use has been changed. MOP started to update the land use map from 2006. The updating is still on going because of the limitation of budget and transportation for field investigation.

In general, the vegetation of the West Bank is limited and scarce due to an arid climate and over-grazing in the foothill area. The remaining areas are mainly used as olive tree garden, small agricultural fields and shrub lands in the mountainous area and agricultural fields in the flat area.

4.1.7 Biodiversity

Jordan River Rift Valley has rich biodiversity of wild plant and animal species. Especially, migratory birds use the area as one of the waypoints. Under this environment, Palestinian Government recognized the importance of natural resources management and enacted Palestinian Environmental Law in 1999. The government as represented by EQA has taken actions to protect and manage the limited natural resources in cooperation with Palestinian and International NGOs, donor agencies and neighboring nations.

Eight ecologically significant areas are located in the study area as shown in Figure 4-2. The report on Ecologically Significant Areas in the West Bank Governorates (2000) mentioned that 28 floral species in Jericho and the eastern slope of the West Bank under endangered or rare situation.

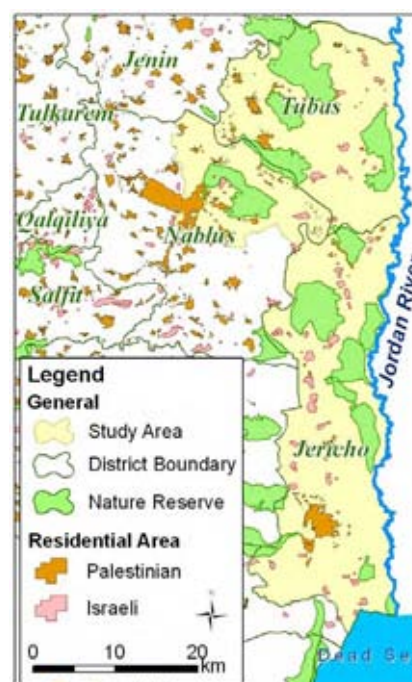


Figure 4-2 Natural Reserves in the Study Area

Table 4-5 Endangered and Rare Floral Species in the Jordan Rift Valley

No	Name	District	Locality	Rare	Endangered
1	<i>Agrostemma githago</i>	S, JD	Fields	*	
2	<i>Herenaria glabra+hirsuta</i>	S, JD	Batha	*	
3	<i>Iris vartanii</i>	S, JD	Rocky Batha		*
4	<i>Loranthus acaciae</i>	S, JD	Mountains	*	
5	<i>Raphanus raphanistrum</i>	S, JD	Cultivated fields	*	
6	<i>Abutilon pannasum + other spp.</i>	ES, JD	Hot deserts	*	
7	<i>Balanites aegyptiaca</i>	ES, JD	Hot deserts	*	
8	<i>Cistanche spp.</i>	ES, JD	Deserts and Rd sides	*	
9	<i>Commicarpus</i>	ES, JD	Herbs, shady crops	*	
10	<i>Crochorus trilicularis</i>	ES, JD	Among irrigated crops	*	
11	<i>Epipactis helleborim</i>	ES, JD	Maquis	*	
12	<i>Haloxylon persicum</i>	ES, JD	Wadis in desert	*	
13	<i>Hibiscus micranthus L.</i>	ES, JD	Hot desert	*	
14	<i>Nitaria retusa</i>	ES, JD	Salin desert	*	
15	<i>Seidlitzia rosmarinus</i>	ES, JD	Hot desert	*	
16	<i>T.systola</i>	ES, JD	Batha		*
17	<i>Tamarix</i>	ES, JD	River sides	*	
18	<i>Zygophyllum dumosum</i>	ES, JD	Desert, stony ground + Plateaus	*	
19	<i>Acaia albida</i>	JD	Hot zone = tropical	*	
20	<i>Caesia (Senna)</i>	JD	Wadi in hot regions	*	
21	<i>Calotropos procera</i>	JD	Desert	*	
22	<i>Eclipta alba</i>	JD	Fallow fields	*	
23	<i>Latrofusca</i>	JD	Batha		*
24	<i>Indigofera articulata</i>	JD	Oasios Tropical	*	
25	<i>Moltkiopsis ciliata</i>	JD	Sandy areas	*	
26	<i>Oxystelma spp.</i>	JD	Desert	*	
27	<i>Psylliostachys Spicata</i>	JD	Saline soil/desert	*	
28	<i>Solenostemma spp.</i>	JD	Desert	*	

S: South Districts, JD: Jericho Districts, ES: Eastern Slope, End.: Endangered

Source: Ecologically Significant Areas in the West Bank Governorates (2000)

Jordan River Rift Valley has rich faunal population as well. Especially, millions of migratory birds rest and pass through the area. However, limited information on fauna is available. These species inhabit and use Jordan River Rift Valley as migratory route to other destinations.

Table 4-6 Mammals and Bird Species of International Conservation Concern Identified in the West Bank and Gaza

	Species	Latin Name
Mammals	Bicoloured white-toothed and common white-toothed shrew	<i>Crocidura leucodon and C. russula</i>
	Savi's dwarf shrew	<i>Suncus etruscus</i>
	Greater mouse-eared bat	<i>Myotis myotis macrocephalus</i>
	Indian crested porcupine	<i>Hystrix indica</i>
	Badger	<i>Melis melis</i>
	Ratel	<i>Melivora capensis</i>
	Eurasian otter	<i>Lutra lutra</i>
	Wild cat	<i>Felis sylvestris tristrami</i>
	Sand cat	<i>Felis margarita</i>
	Hyrax	<i>Procavia capensis</i>
	Mountain gazelle	<i>Gazella gazella</i>
	Nubian ibex	<i>Capra nubiana</i>

Birds	Ferruginous duck	<i>Aythya nyroca</i>
	Marbled teal	<i>Marmaronetta angustirostris</i>
	White-headed duck	<i>Oxyura leucocephala</i>
	Imperial eagle	<i>Aquila heliaca</i>
	Lesser kestrel	<i>Falco naumanni</i>
	Corncrake	<i>Crex crex</i>

Source: UNDP (2003)

4.2 Socio-economic Environment

4.2.1 Demography

Total population of the Palestinian Territory is 3,770,606 in 2007 as shown in Table 4-7, of which 90,495 people lives in Jericho and Tubas. Population growth rate in Jericho and Tubas between 1997 and 2007 was 2.7% and 3.2%, respectively.

Table 4-7 Population Change between 1997 and 2007

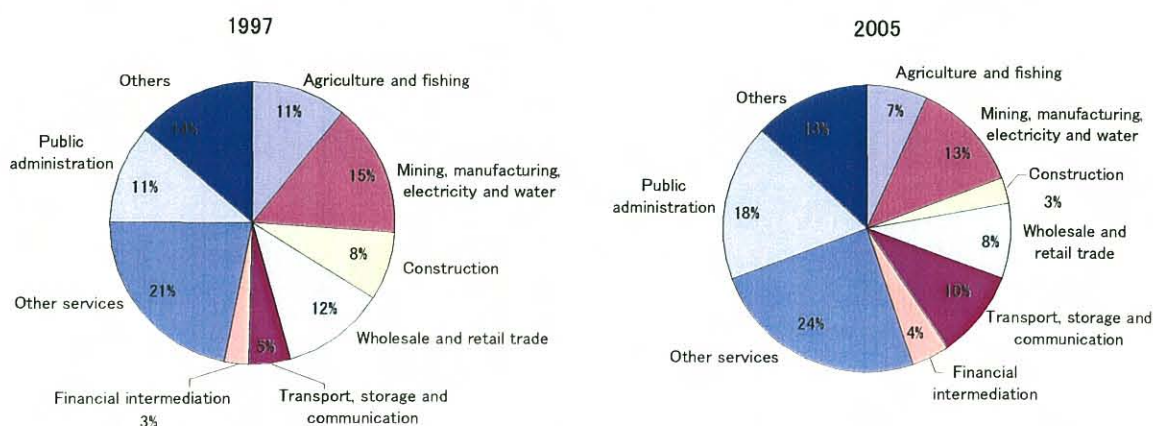
	Population		Compound Annual Growth Rate	Area (km ²)	Population Density, 2007 (Persons/km ²)
	1997	2007			
Palestinian Territory	2,895,683	3,770,606	2.5%	6,020	626
West Bank	1,873,476	2,345,107	2.1%	5,655	415
Jericho	31,412	41,724	2.7%	593	70
Tubas	35,176	48,771	3.2%	402	121
Study Area	66,588	90,495	3.0%	995	91

Source: Palestinian Central Bureau of Statistics (PCBS), 2007

4.2.2 Economy and Employment

(1) Economic trend

GDP in the Palestinian Territory is gradually increasing after 2002 and recovering to USD 4,500 million in 2005 approximately. In comparison with the statistics in 1997 and 2005, the service industry has been expanded from 66% of the GDP to 77 % in this period, while primary and secondary industries have been shrinking from 34% to 23% as illustrated in the following figure.

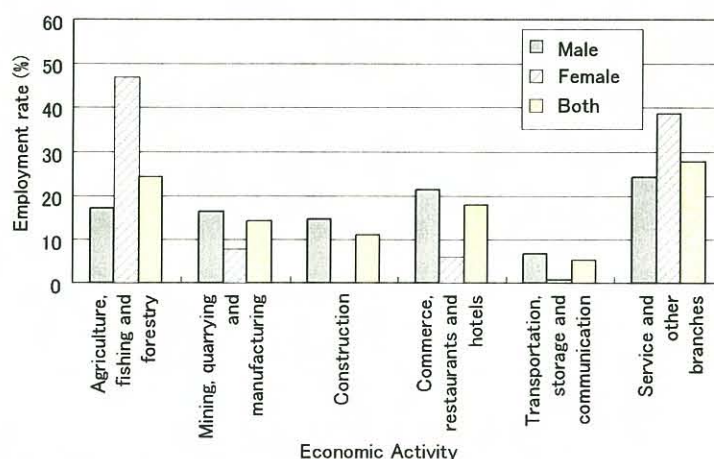


Source: PCBS, 2006

Figure 4-3 Contribution of Economic Activity to GDP in Palestinian Territory in 1997 and 2005

(2) Employment

The average unemployment rate of the West Bank was 17.3% as of January-March 2007. In the study area, the rate was high in the northern area: 23.2% in Tubas, 17.6% in Nablus. On the other hand, the rate was 14.0% in Jericho and it was relatively lower than the average of the West Bank. Figure 4-4 shows the percentage distribution of employed person by economic activity and sex in West Bank in the fourth quarter of 2006. 46.7% and 38.7% of total female labor involved in primary industry sector and service sector, respectively.



Source: PCBS, Labor Force Survey (Oct-Dec, 2006)

Figure 4-4 Percentage Distribution of Employed Persons Aged +15 in West Bank by Economic Activity and Sex

4.2.3 Agriculture

(1) Farm households and farmers

According to information from the MOA Jericho and Tubas branch offices, about 32,000 people in about 2,200 households are engaged in agriculture in the study area.

Table 4-8 Farm Household Type

Locality	Holding Type			Total
	Plant Production	Animal Production	Mixed	
Bardala	39	44	32	115
'Ein el Beida	35	12	34	81
Kardala	14	1	9	24
Wadi al Far'a	N.A.	N.A.	N.A.	N.A.
Ras al Far'a	N.A.	N.A.	N.A.	N.A.
Al Badhan	159	13	25	197
An Nassariya	31	28	43	102
Al' Aqrabaniya	23	25	27	75
Furush Beit Dajan	52	29	32	113
Marj Na'ja	40	13	7	60
Az Zubeudat	51	20	25	96
Marj al Ghazal	30	3	3	36

Al Jiftlik	184	81	19	284
Fasayil	1	69	2	72
Al' Auja	56	145	55	256
An Nuwei'ma	21	9	0	30
'Ein ad Duyuk al Fauqa	26	9	2	37
'Ein ad Duyuk al Tahta	18	21	15	54
Jericho City	380	112	90	582
Total	1,160	634	420	2,214

Source: Agricultural Database provided by MOA, 2007

(2) Land tenure, holding and ownership system

Three main forms of land tenure are mainly observed in the study area and a mixed form is adopted in a small part of the area. These tenures are referred to as 1) ownership system, 2) sharecropping system, 3) rental system, and 4) combined rental and sharecropping system. These adopted ownership systems vary by localities as shown in Table 4-9.

1) Ownership system

Fifty percent (50%) of land holdings in Al-Fara possess less than 20 dunums in size. The size of the farm holdings in the Jordan Valley is relatively larger than that in other districts. Reduction in the size of farms has occurred as a result of inheritance laws and also of rental and sharecropping systems which increase land fragmentation and dispersion of portions of the same holding. Only 10% of land ownerships have the farm land between 30-50 dunums.

2) Sharecropping system

The sharecropping system is an old system which appeared at the beginning of irrigation. In this system, the crop yield (or profit from the crop) is shared between the land owner and a farmer who cultivates the land.

3) Rental system

The rental system is based on simple renting of the land. Usually a farmer will pay 60 to 90 US\$ per dunum for the landowner. The rent includes using the water rights if the land is registered as an irrigated land and there is available water supply from springs.

4) Combined rental and sharecropping system

The rent and share cropping system, usually, includes the water rights if the rent is done for the lands that were registered as irrigated lands and spring water supply is available. However, if the land does not have water rights, farmers buy water from the wells owners for irrigation. The responsibility of buying water is on the investors and farmers who jointly share in farming the lands.

Table 4-9 Ownership System of Irrigated Land in Al-Fara Area in 2004

Area	Percentage of ownership system of irrigated land in the area of Al-Fara'a basin				Water rights Minutes/ dunum	Agricultural water supply	
	Rental %	Share cropping%	Rental and sharecropping system %	Owner %		Spring	Well
Ras Al-Fara'a	5	10	0	85	60	A	A
Wadi-Al-Fara'a	10	6	0	84	60	A	A
Al-Bathan	2	4	0	94	60	A	A
An-Nassariyya	26	45	4	25	16	A	A
Al-Aqrabaniya	25	52	3	20	14	A	A
Beit Hassan	25	45	3	27	14	A	A
Froush B Dajan	10	12	0	78	9	NA	A
Al Jiftlik	38	50	2	10	1-3	NA	A

A: Available, NA: Not available

Source: Data provided by EQA, 2004.

(5) Water right

Water right in the study area is basically categorized into three: 1) private water right holders who are the owners/farmers of their agricultural lands; 2) private water right holders who sells the water to the owners/farmers; and 3) water right obtained by communities or municipalities. The third category of water right is observed only in spring water. On the other hand, agricultural wells are owned by private owner.

(6) Water distribution rule

Water from agricultural wells and springs are shared with water right holders based on local water distribution rule. Time-based water sharing rule is the dominant traditional rule in the study area.

(7) Crops and farming

Main agricultural production in the Jericho governorate and Tubas governorate are summarized in the following tables.

Table 4-10-1 Field Cropped Area, Yield and Production in Jericho (2004/2005)

Crop	Production (Ton)	Total area (Dunum)	Yield (Ton/Dunum)	Percentage of Irrigated Area (%)
Field crops and forages				
Dry onion	1,420	355	4.00	100
Clover and Sern, etc.	1,230	820	1.50	100
Wheat	920	3,680	0.25	100
Vegetables				
Eggplant	24,810	4,962	5.00	100
Tomato	18,422	4,008	4.60	100
Squash	13,834	6,917	2.00	100
Fruits				
Banana	9,810	3,305	2.97	100
Date	1,274	1,938	0.66	100
Grape	1,251	428	2.92	100

Source: JICA Study Team

Table 4-10-2 Field Cropped Area, Yield and Production in Tubas (2004/2005)

Crop	Production (Ton)	Total area (Dunum)	Yield (Ton/Dunum)	Percentage of Irrigated Area (%)
Field crops and forages				
Potato	7,560	2,520	3.00	100
Wheat	5,355	31,500	0.17	0
Dry onion	4,300	1,400	3.07	57
Vegetables				
Tomato	16,715	2,253	7.42	79
Cucumber	10,768	2,971	3.62	65
Eggplant	7,120	1,240	5.74	74
Fruits				
Olive	542	13,652	0.04	1
Shammoty orange	395	159	0.40	99
Navel orange	358	169	0.47	85

Source: JICA Study Team

4.2.4 Water Demand

The previous JICA study, namely Jericho Regional Development Study in 2006 mentioned that municipal and industrial use of water would be highly prioritized for water allocation in the study area. The following table shows expected available water for agriculture in the future.

Table 4-11 Future Municipal and Industrial Water Demand and Water Available for Agriculture

Area	Population	2003 Current Volume (MCM/yr)			Potential Resources (MCM/yr)	M&I Demand (MCM/yr)	Available for Agriculture (MCM/yr)
		Dom.	Agri.	Total			
Short Term: 2006-2009 (4 years)							
Jericho/Al 'Auja	39,910				32.67	3.07	29.60
Lower Al Far'a	8,964				3.43	0.58	2.85
West Tubas	56,171				7.63	2.14	5.50
North Tubas	3,531				5.58	0.13	5.42
Others	797					0.03	
Total	109,373	2.52	39.04	41.55	49.31	5.95	43.36
Medium Term: 2010-2012 (3 years)							
Jericho/Al 'Auja	43,144				36.71	3.36	33.35
Lower Al Far'a	9,690				3.64	0.66	2.99
West Tubas	60,722				8.12	2.92	5.19
North Tubas	3,817				5.85	0.18	5.63
Others	862					0.04	
Total	118,235	2.52	39.04	41.55	54.32	7.17	47.15
Long Term: 2013-2015 (3 years)							
Jericho/Al 'Auja	46,430				38.61	3.67	34.95
Lower Al Far'a	10,429				3.86	0.74	3.12
West Tubas	65,347				10.25	3.84	6.41
North Tubas	4,108				6.12	0.24	5.83
Others	927					0.06	
Total	127,240	2.52	39.04	41.55	58.85	8.54	50.30

Source: JICA study report on Jericho Regional Development Study, 2006

4.2.5 Other Social Environment Issues

(1) Education

Education is one of the most important sectors in the Palestinian Government and under responsibility of Ministry of Education and Higher Education. Compulsory and primary education in Palestine covers from grade 1 to grade 9 or 6-15 years olds' pupil. Secondary or higher education covers from grade 10, 11 and 12. Before receiving the above basic education services, some children can enter private kindergartens. There are three types of school in Palestine, which are managed by government, private sector and UNRWA, respectively.

As shown in the following table, further effort is required to achieve the Palestinian MDGs; "Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling."

Table 4-12 Summary of Education Services in West Bank (2005/2006)

	Kindergarten	Basic Education		
		Primary	Secondary	Total
Number of Schools				
Government	2	820	560	1,380
Private	727	176	67	243
UNRWA	-	92	-	92
Total	729	1,088	627	1,715
Net Enrollment Ratio				
Male	25.7	86.7	59.2	-
Female	25.2	88.3	65.4	-
Both	25.4	87.5	62.3	-

Source: PCBS, Statistical Abstract of Palestine No.7 (2006)

(2) Public Health

Health sector is also emphasized in the Palestinian MDGs: 1) Reduce child mortality; 2) Improve maternal health; and 3) Combat HIV/AIDS, malaria and other diseases. However, number of facilities and services provided from health sector are still under the satisfactory level especially in rural areas. The gap between urban localities and rural localities are observed not only in the health care facilities but also in domestic water supply and sewage network as shown in Table 4-13.

Table 4-13 Percentage of Population by Availability of Water and Sewage Networks and Type of Locality in Palestinian Territory

Type of locality	Household connected to public water network	Household connected to public sewage network
Urban	91.9	56.4
Rural	63.3	6.8
Refugee camp	89.4	71.2

Source: PCBS, Children Health in the Palestinian Territory (2000)

(3) Historical and Cultural Heritage

Since the pre-historic era, the Jordan Rift Valley area has matured unique history and culture as a resting place for travelers, a crossroad for traders among Arabic and Mediterranean countries, and the holy place for religious people. Their tracks in the area

are internationally recognized as valuable cultural and historical heritages and regional tourism resources, having common roots of the civilization. They are the attractive and valuable cultural assets of the Jordan Rift Valley area.

Jericho governorate has 532 archaeological sites and features, 83 main archaeological sites and 449 archaeological features such as caves, churches, springs etc. Among them, twenty archaeological sites have been excavated. Tubas governorate, on the other hand, has 489 archaeological sites and features, 130 main archaeological sites and 359 archaeological features. Among them, six archaeological sites have been excavated based on the information from Ministry of Tourism and Antiquities (MoTA).

5 Development Plan

5.1 Medium Term Development Plan

The Palestinian National Authority (PNA) is seeking the way to achieve: 1) economic growth and poverty alleviation; 2) development of social and human resources; 3) improvement of physical infrastructure network; and, 4) realization of good governance under the above mentioned situation as well as Israeli occupation. To achieve the target, the PNA compiled three years' development plan named as "Medium Term Development Plan (MTDP) 2005-2007" and is finalizing the compilation of MTDP 2008-2010. The MTDP 2005-2007 states overarching goals, national programs and program components (named as program areas) as follows:

Overarching Goals	
1)	To address poverty in a sustainable way, by providing a framework to shift PNA and donor assistance from emergency relief to job creation, recovery and social and economic development, particularly focusing to engage women in this process;
2)	To improve the effectiveness of PNA governance by building institutional capacity and accelerating reform; and,
3)	To enhance PNA accountability by providing clear and gender sensitive development objectives which are monitored throughout the period of implementation.



National Programs	
1)	Establishment of an independent democratic Palestinian state;
2)	Establishment of a modern economy, working with human capital as the highest priority resource;
3)	Provision of social care and protection for all citizens; and,
4)	Protection and development of natural resources, including land, water, the environment and energy sources.



Program Areas	Required Budget (USD 1,000)
1) Budget support	1,925,000
2) Social safety net	490,000
3) Ensure social protection	587,856
a) Food and cash aid, b) Job creation and emergency municipal support, c) Emergency education, health and social affair, d) Rehabilitation of ex-detainees, e) Educational and cultural human development,	

f) Health resources development, g) Support vulnerable groups and improve targeting assistance	
4) Invest in physical capital	1,618,294
a) Education facilities, b) Health equipment, c) Transportation, d) Energy, e) Water, waste water and solid waste, f) PNA and local public building, g) Antiques, cultural heritage and land administration, h) Integration of communities, i) Industrial zone, j) Gaza sea port, k) Airport, l) Entry points, m) strategic and national infrastructure projects, n) Desalinization plants, o) Rehabilitation of public buildings, p) Rehabilitation of roads	
5) Invest in institutions of good governance	301,280
a) PNA good governance, b) Institutional building, c) Supply of materials and equipment	
6) Create an environment for private sector growth	709,664
a) loans and grants, b) Internal industrial areas, c) Private sector development and capacity building, d) Rehabilitation of private building, e) Rehabilitation of private agriculture land, f) Rehabilitation of non-building assets of private sector	

This study result is expected to accelerate the activities categorized in 4) *Invest in physical capital* of the program areas of the MTDP.

5.2 National Water Policy and Strategy

Most development plans by sector are similar to and defined under the MTDP, while some sector development plans or strategy have been additionally formulated.

PWA is scheduled to finalize the National Water Policy and Strategy.

Circumstance of Water Resources	
1) Water Resources to be Available in West Bank	982,000,000 m³/year
- Renewable fresh water of the mountainous aquifer:	650,000,000
- Surface runoff in wadis:	70,000,000
- Palestinian's annual to be shared from the Jordan River:	262,000,000
2) Present Water Consumption in West Bank	120,000,000 m³/year
- Irrigation from ground water:	86,000,000
- Domestic and industrial use from groundwater:	34,000,000
3) Increment of Future Demand	
- Target rates for domestic water demand:	Increase water supply up to 150 liter/capita/day
- Projected potential agricultural demand:	200,000,000 m ³ /year including Gaza Strip
- Commercial and industrial water demand:	9% increase compared with present situation
4) Other Important Issues	
- Deterioration of groundwater quality	
- Lack of awareness that water has a high social, environmental and economic value	
- Not well-functioned Joint Water Committee (JWC)	
- Not well-functioned PWA	



National Water Policy	
1) Basic concept	Palestine must develop and manage its water resources efficiently in order to meet present and future water needs in an environmentally sustainable way.
2) Main Principles of Sustainable Water Resources Management	<ul style="list-style-type: none"> - All source of water to be a public property - Compatible water supply for domestic, industrial and agricultural use - Polluter-pays principle - Coordination by national level; implementation by local level - Public participation - Integrated water quality and quantity management including wastewater management - Protection and pollution control, etc.

3) Key Elements of the Water Management Strategy
<ul style="list-style-type: none"> - Secure Palestinian water rights - Strengthen national policies and regulations - Build institutional capacity and development human resources - Improve information services and assessment of water resources - Regulate and coordinate integrated water and wastewater investments and operation - Enforce water pollution control and production of water resources - Build public awareness and participation - Promote regional and international cooperation

5.3 Agricultural Medium Term Development Plan 2006-2008

MOA was drafted sector specific MTDP as Agricultural Medium Term Development Plan 2006-2008 in December 2005. The outline of the Agricultural MTDP is summarized as follows:

Background
1) Sector Constraints (particular in rural area) <ul style="list-style-type: none"> - Food insecure - Lack of income opportunity - Lack of employment opportunity
2) Main Reasons of the Constraints <ul style="list-style-type: none"> - Limitation of any types of movement; access to land resources, internal/international market and agricultural inputs caused by movement restrictions on people - Limitation of access to water for irrigation - Physical losses of damaged crop, destruction of agricultural infrastructures and bulldozing land
3) Advantages of Palestinian Agriculture <ul style="list-style-type: none"> - Climate in winter are mild and favorable for agricultural activities - Technical knowledge regarding modern agricultural systems and produce - High potential and strong demand for food supply to Israel, Europe and some Gulf countries - Favorable trade conditions offered by EU - Strong network of community; NGOs, village councils, women’s groups, associations and cooperatives - Motivated staff in directorates of agriculture - Relatively high level of education - Additional or underused water pockets available for further use



Agricultural Development Plan
1) Goal Increasing income and job opportunities through increasing of agricultural productions and enhancement of agricultural activities
2) Targeted Programs <ul style="list-style-type: none"> - Improve rural livelihoods (food security, poverty alleviation, creation of rural employment and raising income) through maintaining and agricultural activities - Undergo institutional reform and capacity building - Develop natural resource - Support and provide technical assistance to farmers - Support development of marketing and agricultural trade - Preserve green areas and wildlife, etc.

6 Legal Basis

6.1 Palestinian Environmental Assessment Policy

The Palestine Environmental Law was enacted in 1999 and showed the basic stance for environmental management in Palestine. The objectives of the law are:

- 1) Protection of the environment against all forms and types of pollution;
- 2) Protection of public health and welfare;
- 3) Insertion of the bases of environmental protection in social and economic development plans; and encouragement of sustainable development of vital resources in a manner that preserves the rights of future generations;
- 4) Protection of bio-diversity and environmentally sensitive areas, as well as improvement of environmentally harmed areas;
- 5) Encouragement of collection and publication of environment-related-information to raise public awareness of environmental problems.

Based on the law, “Palestinian Environmental Assessment Policy” was approved by the Ministerial Council in resolution No: 27-23/4/2000 on April, 2000. This policy is positioned as a guideline for environmental management. The detailed information concerned to Environmental Approval, IEE and EIA are described in the follows.

6.1.1 Outline of Environmental Assessment (EA)

Article 3 of the policy stipulates the principles underlying the policy and it clearly mentions that “*environmental assessment should begin as early as possible since it is a means for both planning and evaluation development activities through all stages including decommissioning,*” and “*Proponents of development activities should pay the costs of carrying out environmental assessment studies. Preparation of the studies and reports must be carried out by specialists qualified to carry out the work.*”

6.1.2 Procedure of EA

According to the responsible person of environmental assessment in EQA, any development study and action including technical cooperation project must follow the EA procedure in order to receive environmental approval of the project implementation.

Two kinds of EA studies may be required. The policy mandates the implementation of EIA for the following types of the development projects: 1 Power plants; 2 Quarries and mines; 3 Waste water treatment plants including main sewers; 4 Cement plants; 5 Solid waste disposal sites; 6 Hazardous waste disposal sites; 7 Plants producing, storing or using hazardous substances; 8 Airports and landing strips; 9 Seaports, jetties and harbors; 10 Refineries; 11 Industrial estates; 12 Major dams and reservoirs; 13 Major roads; and, 14 Steel miles.

In addition, screening of necessity of IEE or EIA is judged based on the requirements of relevant land use plans, and on whether the project is likely to:

- 1) Use a natural resource in a way that pre-empts other uses of that resource;
- 2) Displace people per communities;
- 3) Be located in or near environmentally sensitive areas such as natural reserves, wetlands, or unacceptable levels of environmental impact;
- 4) Generate unaccepted levels of environmental impact;

- 5) Create a state of public concern; or
- 6) Require further, related development activities which may cause significant environmental impacts.

6.1.3 General Environmental Items

General Environmental Items to be described in the IEE and EIA reports are enumerated in Table 6-1.

Table 6-1 Valued Environmental Components

Category	√	Environmental Component
Biophysical, Resource and Land Use Components	√	Climate and air quality
	√	Surface water hydrology and quality
	√	Groundwater hydrology and quality
	√	Terrain and natural hazards
	√	Soils and vegetation
	√	Wildlife resources and use
	√	Aquatic resources and use
	√	Recreation and tourism resources and use
	√	Forest resources and use
	√	Agricultural resources and use
	√	Mineral resources and use
Economic Components	√	Direct employment and income
	√	Indirect/induced employment and income
	√	Labor market conditions
	√	Sources of supplies, materials and services
	√	Transportation requirements
	√	Infrastructure development requirements and costs
	√	Government revenues/costs
Cultural and Heritage Components	√	Indirect/induced economic development opportunities
	√	Archaeological sites
	√	Traditional use sites
Social Components	√	Historic sites and landscape features
	√	Social/demographic profile
	√	Population
	√	Housing and accommodation
	√	Land and water use
	√	Transportation and traffic
	√	Community service delivery
	√	Local government revenues/costs
	√	Social support services
	√	Community stability, cohesion and well being
	√	Gender equity
Health Components	√	Supply of health facilities and services
	√	Community water supply and watersheds
	√	Waste treatment and discharge
	√	Ambient air and water quality
	√	Public health risks
	√	Worker health and safety
	√	Noise
√	Local community health	

Source: Palestinian Environmental Assessment Policy (2000)

6.1.4 Environmental Laws and Regulations to be Applied in Various Different Jurisdiction

Depending on the site location (Area A, B, or C), the applications of environmental

laws and regulations vary as shown in Table 6-2.

Table 6-2 Environmental Laws and Regulations

Area	A	B	C
International Agreement	Oslo II Agreement		
Laws to be Applied	PNA Law		PNA Law + Israeli Law*
Regulations to be Applied	PNA Regulation		PNA Regulation + Israeli Regulation* + Israeli Military Orders*

PNA: Palestinian National Authority

** In case of obtaining constructing permission in Area C from Israel, these law and regulation are basis for*

their judgment.

Source: Interview survey to EQA (2007)

6.2 Water-Related Laws

6.2.1 History of Water-Related Laws

The present water law enacted on 17 July, 2002 consists of 44 articles. The Water Law repeals the previous laws and any other legislation irrelevant to this law and reaffirms the PWA's mandate and its full responsibility for the management of water resources and wastewater in Palestine.

The other water-related laws are rather complicated because of the long history of occupation by different countries. An outline of previous series of laws is summarized in Table 6-3.

Table 6-3 Water-Related Laws Introduced to Palestine

	Epoch	Laws Introduced
1	Jordanian Legislation (1948-1967)	<p><u>1. Land and Water Settlement Law No.40/1952</u> The law provides for a settlement and registration of land and water rights in the Jordanian Land Registry. The law provides the procedures on the process of registration.</p> <p><u>2. Water Control Law No.31/1953</u> This law prescribes rules relating to the construction of irrigation structures in Irrigation Areas, Water Allocations. Tables were prepared to show in detail the quantities allocated for each land parcel and irrigated land.</p> <p><u>3. Municipalities Law No.29/1955</u> This law shows in detail the powers of the municipalities. It stipulates that the council would be responsible for the provision of water to the residents. This includes determination on the means pipelines are to be installed, the organization of water allocations, determination of tariffs and fees, and the prevention of pollution of springs, canals, pools, and cisterns.</p> <p><u>4. Law on the Organization of Matters of Drinking Water in the Jerusalem District No.9/1966</u> This law created the Municipal-Regional Water Authority with the responsibility and powers to supply water in the district of Jerusalem including to Ramallah, Bethlehem and their neighboring townships and villages. The legal norms which were applicable to the West Bank on the eve of the 1967 war included the Ottoman Laws, the British Mandatory Ordinances and the Jordanian Laws.</p>
2	Israeli Military Orders	<p><u>1. Military Order on Powers Concerning Water Laws No.92/1967</u> The order provided that any and all of the powers in the sphere of water laws which were held by the Government of the Hashemite Kingdom of Jordan would be held</p>

	Epoch	Laws Introduced
	(1967-1995)	<p>henceforth by a person to be appointed by the Military Commander.</p> <p><u>2. Military Order Amending Law No.31/1953 on Water Control No.158/1968</u></p> <p>The order added a provision to the Jordanian Law to the effect that henceforth not only irrigation installations in Irrigation Areas were put under the control of the authorities but the centralized control to include all water production installations. The Order provided that the erection, possession and operation of any water production installation would require henceforth a license.</p> <p><u>3. Military Order on Land and Water Settlement No.291/1969</u></p> <p>This order amended the Jordanian Law on Water and Land Organization of 1952 and provides that any water and land settlement which has not yet been completed in accordance with the Jordanian Law is put in abeyance and may not prevent real estate transactions.</p> <p><u>4. Military Order Amending the Law on the Regulation of the Natural Resources No.457/1972</u></p> <p>The Order provides that the assessment of the value of land and water quotas for the purpose of compensation is to be made by an official body appointed by the Military Commander.</p>
3	Palestinian Legislation (1995-To Date)	<p><u>1. Presidential Decree No.5/1995</u></p> <p>The Decree established the Palestinian Water Authority.</p> <p><u>2. Law No.2/1996</u></p> <p>This law established the Palestinian Water Authority and defined its objectives, functions and responsibilities. This Law gave the Palestinian Water Authority the mandate to manage the water resources, execute the water policy, establish, supervise and monitor water projects, and to initiate coordination and cooperation between the stakeholders in the water sector.</p> <p><u>3. Presidential Decree No.66/1997</u></p> <p>The Decree established the internal regulations of the Palestinian Water Authority and the rules of procedures.</p> <p><u>4. Palestine Water Law No.3/2002</u></p> <p>The Water law No.3/2002, which was signed on 17 July 2002 by the President, mentioned and assured these responsibilities; Develop, Supervise, and Manage Water Sector .The available Water Policy which states that “Water resources should be developed and managed efficiently in order to meet present and future needs in an environmentally sustainable way”, was the guide in stipulating the Water Law. The Water Law includes within its articles the institutional framework of each level in the water sector, the roles of each level, and some water regulations.</p>

Source: Water Legislation in Palestine provided by PWA (2007)

6.2.2 Water-Related Laws and Regulations by Jurisdiction

Depending on the site location (Area A, B, or C), the applied water-related laws and regulations vary as shown in Table 6-4.

Table 6-4 Water-Related Laws and Regulations

Area	A	B	C
International Agreement	Oslo II Agreement		
Laws to be Applied	PNA Law		PNA Law + Israeli Law*
Regulations to be Applied	PNA Regulation		PNA Regulation + Israeli Regulation* + Israeli Military Orders*

PNA: Palestinian National Authority

* In case of obtaining constructing permission in Area C from Israel, these law and regulation are basis for their judgment.
 Source: Interview survey to PWA (2007)

Article 40 Water and Sewage of Oslo II Bilateral agreement stipulates that all development of water resources and systems by either side shall require the prior approval of the Joint Water Committee (JWC). In case of the development in Area C, approval by Civil Administration (CA) at Beit El is additionally required. After all the approvals have been secured by PWA, JWC and CA (in case of Area C) the development can proceed to the designated phase.

6.2.3 Palestinian Standard of Water-Related Regulation

Environmental standard provides a framework for sustainable environmental growth. It also minimizes risk associated with potential environmental hazard and consequently its adoption as technical regulations are justified for their ability to protect the environment. Palestine has already made a great stride in coming up of few standards that focus mainly on public health. Most of these standards are based on the values from neighboring countries like Jordan, Israel and international organization like World Health Organization (WHO).

(1) Regulations for ground water pollution control

These regulations were prepared in cooperation between EQA and PWA, and enacted on January 16, 2006 in order to regulate groundwater pollution by contamination of ground water or restoration of polluted water and obtain an acceptable water quality in accordance with prevailing standards. Especially, in case of: 1) boring of new wells and obtaining of a new license; or, 2) taking actions around/at well head, proponents shall comply with the regulations. Additionally, expected pollutants by activities and regulated substances are listed as appendices.

(2) Palestinian guideline for drinking water

Water quality of drinking water is regulated under this guideline of Palestinian Standardization Institutes. The indicator and value are shown in the following table.

Table 6-5 Palestinian Guideline for Drinking Water

Chemical Properties			
Indicator	Value	Indicator	Value
Ca	< 100 mg/L	Mn	< 0.1 mg/L
Mg	< 100 mg/L	NO3	< 70 mg/L
Na	< 200 mg/L	SO4	< 200 mg/L
K	< 10 mg/L	PO3	< 0.6 mg/L
Fe	< 0.3 mg/L	Phenol	< 0.002 mg/L
Zn	< 5 mg/L	F	< 1.5 mg/L
Pb	< 0.01 µg/L	Cl	< 250 mg/L
Cd	< 0.005 mg/L	HCO3	< 350 mg/L
Cu	< 1 mg/L	CaCO3	< 500 mg/L
Physical and Biological Properties			
Indicator	Value	Indicator	Value
Temperature	25 degree Celsius	Total coliform	0-3
Turbidity	< 5 NTU	PH	6.5 – 7.5
Faecal coliform	0	Color, taste, odor	To be acceptable

Source: Drinking Water published by Palestinian Standardization Institutes (2005)

(3) Palestinian guideline for wastewater quality

Following table shows the treated wastewater quality by basic indicators and maximum acceptable values.

Table 6-6 Treated Wastewater Quality by Basic Indicators

Indicator	Discharge to sea	Groundwater recharge by infiltration	Dry foddors	Green foddors	Gardens, play grounds, parks	Industrial and cereal crops	Forests	Fruiting trees
COD	200	150	200	150	150	200	200	150
DO	> 1	> 1	> 0.5	> 0.5	> 0.5	> 0.5	> 0.5	> 0.5
TDS	-	1,500	1,500	1,500	1,200	1,500	1,500	1,500
pH	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9	6 - 9
Fat oil & grease	10	0	5	5	5	5	5	5
Phenol (mg/L)	1	0.002	0.002	0.002	0.002	0.002	0.002	0.002
MBAS	25	5	15	15	15	15	15	15
NO3 (mg/L)	25	15	50	50	50	50	50	50
NH4 (mg/L)	5	10	-	-	50	-	-	-
Org-N (mg/L)	10	10	50	50	50	50	50	50
Cl (mg/L)	-	600	500	500	350	500	500	400
SO4 (mg/L)	1,000	1,000	500	500	500	500	500	500
Na (mg/L)	-	230	200	200	200	200	200	200
Mg (mg/L)	-	150	60	60	60	60	60	60
Ca (mg/L)	-	400	400	400	400	400	400	400

Source: Treated wastewater published by Palestinian Standardization Institutes (2003)

Table 6-7 Number of Barriers Required for Different Crops and the Types of Treated Wastewater

High Quality (Class A)	Good (Class B)	Medium (Class C)	Low (Class D)	Usage	Inedible cover or protection **	Under- ground irrigation **	Plastic ground cover **	Distance from drippers **	Sterilization of treated wastewater **	Sand filter or prolonged detention or 10% treated wastewater (1of 3) **
0	Banned	Banned	Banned	Gardens, Parks and Playgrounds						
0	0	0	Banned	Artificial recharge of groundwater						
0	0	0	Banned	Disposal to the sea at a distance of 500m						
0	0	0	0	Seed producing crops						
0	3	3	4	Wild areas		++	+	++	+	+
0	3	3	4	Corn		++	+	++	+	+
0	0	0	Banned	Green fodder						
0	0	0	0	Dry fodder						
0	2	2	3	Citruses irrigated by drip irrigation	+			++	+	+
0	3	3	4	Citruses irrigated by other methods	+			+	+	+
0	2	2	3	Crops with inedible shell (ex. Walnuts, almonds, pomegranate)	+			++	+	+
0	2	2	3	Deciduous trees (ex. Apple, Pear, Peach)				++	+	+
0	2	2	3	Year round crops (ex. Avocado, mango)		+		+	+	+
0	2	2	3	Grapes with high vines				++	+	+
0	2	2	3	Grapes with normal vines		+		+	+	+
0	2	2	3	Cactus	+	+		++	+	+
0	2	2	3	Dates		+		+++	+	+
0	2	2	3	Olives		+		++	+	+
0	2	2	3	Flowers	+	+		+	+	+
0	0	0	0	Wild forests						
0	0	0	0	Industrial crops						

*Fecal Coliform

** The + sign indicates one barrier

Source: Treated wastewater published by Palestinian Standardization Institutes (2003)

6.3 Land-Related Laws

The land-related laws and regulations to be referred to would differ depending on the land jurisdiction (Area A, B, or C) as shown in the following table.

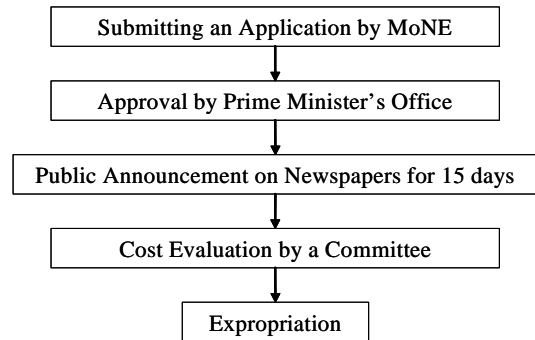
Table 6-8 Land-Related Laws and Regulations

Area	A	B	C
Laws to be Referred to	PNA		PNA + Israeli Law*
Regulations to be Applied	PNA		PNA + Israeli Military Orders*

* In case of obtaining permission in Area C from Israel, these law and regulation are basis for their judgment

Source: Interview survey to PLA (2007)

Land expropriation and related matters are specified in the Expropriation Law (No.2/1953). In case that land expropriation is to be executed in private lands, the procedure of expropriation will be like the flowchart in the right portion of Figure 6-1.



MoNE: Ministry of National Economy
Source: Interview survey to PLA (2007)

Figure 6-1 Typical Procedure of Land Expropriation

7 Identification of Conceivable Impacts of Priority Projects for Feasibility Study

7.1 Candidate Priority Projects in the Study

Three types of projects were proposed in the study: 1) Rehabilitation of agricultural wells; 2) Improvement of spring water conveyance system; and, 3) Storm water harvesting. The description of each project is as follows:

(1) Rehabilitation of Agricultural Wells

This project type is planned to consist of two components, which are 1) hardware component to increase the total amount of water supply from wells up to their license extraction amount, and 2) software component to improve the water use efficiency as well as effective water management.

The following wells were given the high priority for the rehabilitation. Out of these wells, 8 wells highlighted in yellow are planned to be rehabilitated under pilot project.

List of Alternatives: Rehabilitation of Agricultural Wells				
	Well Name (Code)	Locality (Area)	Status	Needs (Cleaning, Deepening, Procurement etc.)
1	Arab Project No.1 (19-14/064)	Jericho (A)	Not pumping	- Cleaning up to 90 m - Submersible pump, pipes and panel
2	Raly Al Skakah (19-17/034)	Frush Beit Dajan (C)	Bad	- Pump rising, logging, acidization, assessment, testing after development
3	Jawad Al Masri (19-17/055)	Jiftlik (C)	Bad	- Motor, vertical pump, gear head
4	Daya' Saleh 'Abdu (19-17/033)	Jiftlik (C)	Not pumping	- Deepening more than 50 m - Motor, vertical pump, gear head, assessment testing after deepening
5	Hasan 'Abed Al Jaleel (19-17/047)	Frush Beit Dajan (C)	Bad	- Deepening more than 20 m - Acidization, motor, assessment, testing after deepening
6	Ibrahem Dyab (18-18/027A)	Fara (B)	Not pumping	- Deepening up to 100 m - Motor, assessment, testing after deepening
7	Ma'rouf Abu Samrah (19-17/054)	Jiftlik (C)	Bad	- Submersible pump, electric panel
8	Hasan Al Sumadl (19-17/027)	Jiftlik (C)	Bad	- Motor
9	'Abed Al Kareem Njum (19-15/008)	Auja (A)	Not pumping	- Cleaning up to 58 m - Generator, submersible pump, cable, pipes
10	Rafeeq Al Zua'bl (19-19/005A)	Ein El Beida (C)	Bad	- Transformer, electric drive motor
11	Khaleel 'Abed Al Hadl (18-18/036)	Fara (B)	Bad	- Motor, turbine rehabilitation, shafts, gear head
12	Yusef Mahmood Al Nojoom (19-15/019)	Auja (C)	Not pumping	- Cleaning up to 50m - Motor, submersible pump, cable and pipes
13	Mustafa Abu Khayzaran (18-18/016)	Fara (A)	Bad	- Submersible pump
14	Khursheed Mbaslat (19-20/001A)	Bardalla (C)	Not pumping	- Motor, gear head
15	Sulayman Saleh (20-17/022)	Marji Naja (C)	Not pumping	- Motor, vertical pump, gear head
16	Sa'eed' 'Ala' Al Deen (19-14/062)	Jericho (A)	Fair	- 2 pipes with shafts
17	Abed Al'azeez Lubbad (19-16/005)	Jiftlik (C)	Bad	- Motor
18	Yunes 'Abdu (19-14/058B)	Jericho (A)	Not pumping	- Deepening up to 120 m - Submersible pump, cable and pipes
19	Marj Na'ja C5 (19-17/012)	Marji Ghzal (C)	Not pumping	- Motor
20	Al 'Auja (19-15/028A)	Auja (A)	Not pumping	- Generator, submersible pump
21	Abdul Kareem Salem (18-18/019)	Fara (B)	Bad	- Motor

Source: JICA Study Team

Location map of the above agricultural wells is illustrated in Fig. 7.1

(2) Improvement of Spring Water Conveyance System

This project type is planned to consist of three components as summarized in the following table.

No.	Code	Name of Well
1	19-14/064	Arab Project No.1
2	19-17/034	Rajy Al Skakah
3	19-17/055	Jawad Al Masri
4	19-17/033	Deya' Saleh 'Abdu
5	19-17/047	Hasan 'Abed Al Jaleel
6	18-18/027A	Ibrahim Dyab
7	19-17/054	Ma'rouf Abu Samrah
8	19-17/027	Hasan Al Sumadi
9	19-15/008	'Abed Al Kareem Njum
10	19-19/005A	Rafeeq Al Zua'bi
11	18-18/036	Khaleel 'Abed Al Hadi
12	19-15/019	Yusef Mahmood Al Nojoom
13	18-18/016	Mustafa Abu Khayzaran
14	19-20/001A	Khursheed Mbaslat
15	20-17/022	Sulayman Saleh
16	19-14/062	Sa'eed 'Ala' Al Deen
17	19-16/005	'Abed Al'azeez Lubbad Sarrees
18	19-14/058B	Yunes 'Abdu
19	19-17/012	Marj Na'ja C5
20	19-15/028A	Al 'Auja
21	18-18/019	Abdul Kareem Salem

Source: JICA Study Team

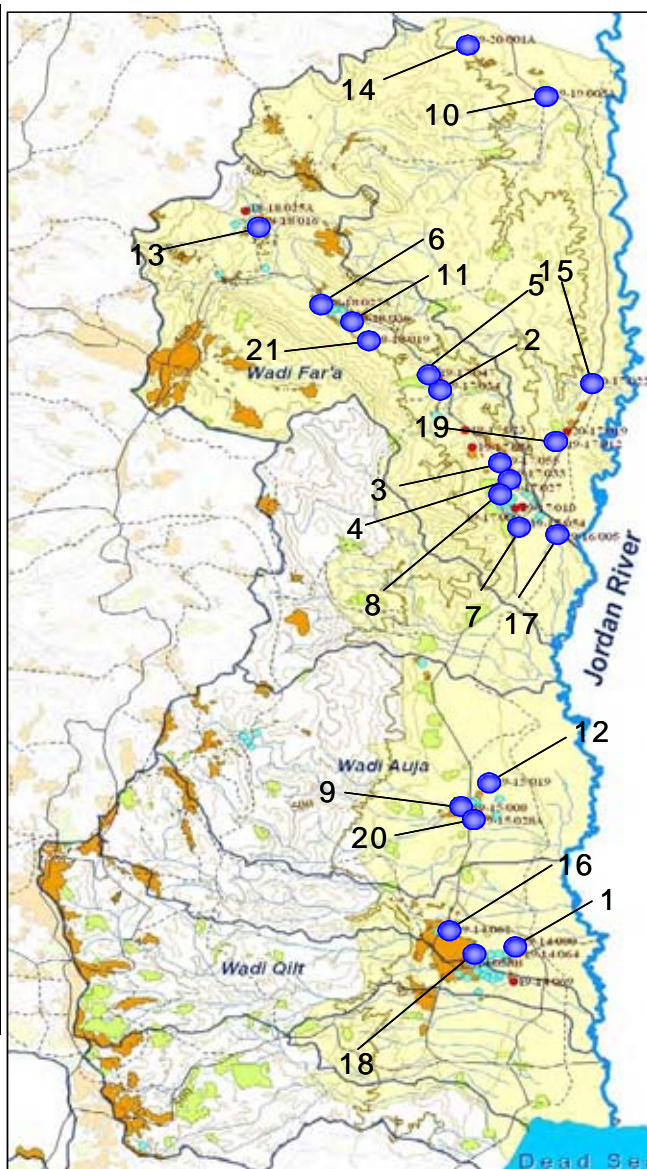


Figure 7.1 Location Map of Priority Group for Rehabilitation of Agricultural Wells

Table 7-1 Components of Priority Projects for Improvement of Spring Water Conveyance System

Components	Work Item
(1) Improvement of conveyance system	<ol style="list-style-type: none"> 1) Rehabilitation or construction of intake facilities 2) Rehabilitation or construction of conveyance facilities 3) Rehabilitation or construction of regulation reservoir
(2) Improvement of water control system	<ol style="list-style-type: none"> 1) Construction of piped water distribution facilities 2) Establishment of rules and regulations on water management system 3) Establishment of water management organization system 4) Establishment of O&M organization 5) Establishment of roles and responsibilities of related organizations 6) Strengthening of O&M organization
(3) Improvement of water use system and activities	<ol style="list-style-type: none"> 1) Awareness promotion on water management system 2) Establishment of water users association 3) Establishment of rules and regulations of water users association 4) Strengthening of water users association 5) Training on water saving irrigation method

Source: JICA Study Team

Three (3) out of 19 springs were selected and highly prioritized in the basic plan for the improvement of spring water conveyance system in the study.

Alternative 1: Improvement of Auja Spring Water Conveyance System

Locality	Auja in Jericho governorate
Target area	14,700 dunum (<i>Approximate estimation based on aerial photos</i>)
No. of beneficiaries	3,886 persons (<i>Source: PCBS, 2005</i>)
Expected project components	<ol style="list-style-type: none"> 1) Basic Design Study 2) Construction Works <ul style="list-style-type: none"> - Rehabilitation of weir - Rehabilitation and expansion of open canal (approx. 2 km) - Construction of settling basin - Installation of main pipeline (approx. 5 km) - Installation of sub-main pipeline (approx. 20 km) 3) Consultancy Service of Establishment and Strengthening of Related Organization

Alternative 2: Improvement of Nwai'mah Spring Water Conveyance System

Locality	Nwai'mah in Jericho governorate
Target area	5,000 dunum (<i>Approximate estimation based on aerial photos</i>)
No. of beneficiaries	1,128 persons (<i>Source: PCBS, 2005</i>)
Expected project components	<ol style="list-style-type: none"> 1) Basic Design Study 2) Construction Works <ul style="list-style-type: none"> - Rehabilitation of open canal (under study) - Construction of settling basin - Installation of main pipeline (under study) - Installation of sub-main pipeline (under study) 3) Consultancy Service of Establishment and Strengthening of Related Organization

Alternative 3: Improvement of Dyuk Spring Water Conveyance System

Locality	Dyuk Tahta and Dyuk Foqa in Jericho governorate
Target area	3,100 dunum (<i>Approximate estimation based on aerial photos</i>)
No. of beneficiaries	1,726 persons (<i>Population summed up in Dyuk Tahta and Dyuk Foqa, Source: PCBS, 2005</i>)
Expected project components	<ol style="list-style-type: none"> 1) Basic Design Study 2) Construction Works <ul style="list-style-type: none"> - Rehabilitation of open canal (under study) - Construction of settling basin - Installation of main pipeline (under study) - Installation of sub-main pipeline (under study) 3) Consultancy Service of Establishment and Strengthening of Related Organization

Source: JICA Study Team

Location map for the above project sites is illustrated in the following figures.



Source: JICA Study Team

Figure 7.2 Location Map of Auja Spring Conveyance System



Figure 7.3 Location Map of Nwai'mah and Dyuk Spring Water Conveyance System

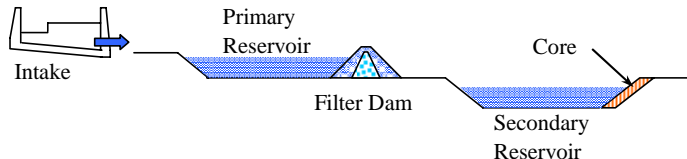
Source: JICA Study Team

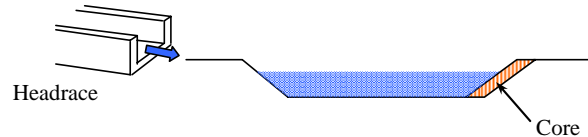
(3) Storm Water Harvesting

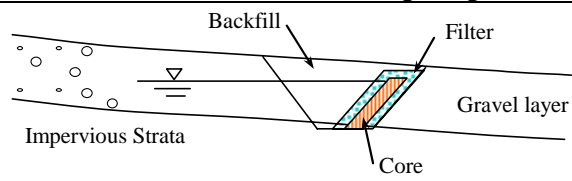
Potential alternatives for storm water harvesting were explored in the study based on geological maps, satellite images, site reconnaissance and limited hydrological data.

No storm water harvesting structure has been constructed yet. A detailed survey and design, water management distribution system must be established in parallel with the construction. It can be recalled that Palestine Water Law states that regional utilities and/or WUA shall be established as they are responsible for setting the price of water for different usage. Such software component is also required to realize the following alternatives:

Potential Alternative 1: Dam on Wadi Qilt	
Location	End of mountain area at Wadi Qilt
Capacity	Under estimation because of deficit of geological data
Sketch	
Remarks from technical aspects	1) Difficulty of grouting due to limestone, 2) Small storage capacity, 3) Necessity of measure against siltation, 4) Headrace and road to be constructed, 5) Necessity of treatment for evaporation
Potential Alternative 2: Dam on Wadi Fara	
Location	Downstream area of confluence between Tubas basin and Nablus governorate
Capacity	Approx. 1,337,000 m ³ in total <i>(Estimation based on topographic data generated by aerial photos)</i>
Sketch	Refer to Alternative 1
Remarks	Same as Alternative 1

Potential Alternative 3: Reservoir for Turbid Flood neighboring Wadi Qilt	
Location	Near garbage dumping site at Wadi Qilt
Capacity	Approx. 36,000-127,000 m ³ in total <i>(Estimation based on topographic data generated by aerial photos)</i>
Sketch	
Remarks	1) Complicated structure, 2) Necessity of maintenance of filter dam, 3) Necessity of treatment for evaporation

Potential Alternative 4: Reservoir for Surplus Spring Water neighboring Wadi Auja	
Location	Downstream area of Auja Spring
Capacity	Approx. 1,050,000 m ³ in total <i>(Estimation based on topographic data generated by aerial photos)</i>
Sketch	
Remarks	1) Simple structure, 2) Necessity of treatment for evaporation

Potential Alternative 5: Retention Dam/ Underground Dam at Wadi Auja	
Location	Aluvial fun at Wadi Auja
Capacity	Under estimation because of deficit of geological data
Sketch	
Remarks	1) Small storage, 2) Easy to maintain, 3) Unnecessary treatment for evaporation

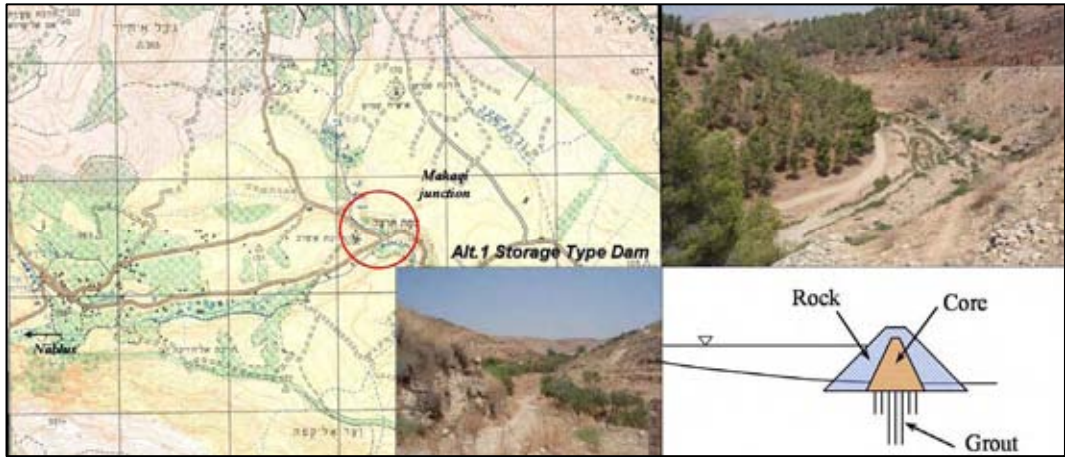
Potential Alternative 6: Retention Dam/ Underground Dam at Wadi Qilt	
Location	End of mountain area at Wadi Qilt
Capacity	Under estimation because of deficit of geological data
Sketch	Refer to Alternative 5
Remarks	Refer to Alternative 5

Source: JICA Study Team

Location maps for the above potential project sites are illustrated in Fig. 7.4, 7.5 and 7.6.

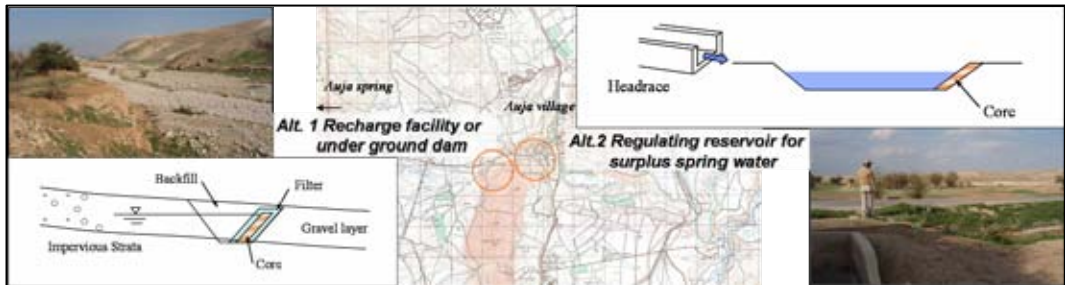
7.2 Conceivable Impacts of Candidate Priority Projects

Conceivable impacts caused by the implementation of alternatives above were examined thorough the IEE study. The scoping matrices to identify the impacts in each project component are listed in Table 7-2, 7-3 and 7-4. It must be noted that the rating or evaluation made in scoping matrices were based on the guideline set by JICA, namely Environmental and Social Consideration Guidebook.



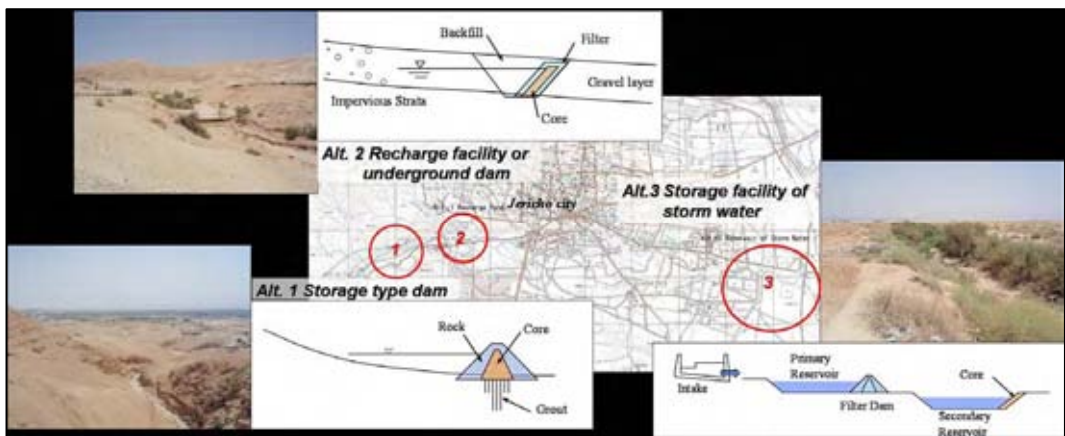
Source: JICA Study Team

Figure 7.4 Location Map of Potential Storm Water Harvesting Site at Wadi Fara Area



Source: JICA Study Team

Figure 7.5 Location Map of Potential Storm Water Harvesting Site at Wadi Auja Area



Source: JICA Study Team

Figure 7.6 Location Map of Potential Storm Water Harvesting Site at Wadi Qilt Area

Table 7-2 Scoping Matrix for Rehabilitation of Agricultural Wells

Category			Rating by Phase				Without project	Brief Description
			Pump test, WUA formulation	Installation of pumping units	Operation and maintenance			
Biophysical Resources and Land-Use Components	1	Climate and Air Quality	D	D	D	D	No impact	
	2	Surface Water Hydrology and Quality	D	D	D	D	No impact	
	3	Groundwater Hydrology and Quality	D	D	D	D	Deterioration of water quality and quantity might be accelerated negligibly by the project, because very limited number of wells will be rehabilitated to abstract small amount of additional water compared with the present abstraction volume.	
	4	Terrain and Natural Hazards	D	D	D	D	No impact	
	5	Soils and Vegetation	D	D	D	D	Negligible impact might be caused by expansion of agricultural lands since the project scale is small.	
	6	Wildlife Resources and Use	D	D	D	D	No impact because the target areas are located in agricultural lands and the scale is small.	
	7	Aquatic Resources and Use	D	D	D	D	No impact because the target areas are located in agricultural lands and the scale is small.	
	8	Recreation and Tourism Resources and Use	D	D	D	D	No impact	
	9	Forest Resources and Use	D	D	D	D	No impact because the target areas are located in agricultural lands.	
	10	Agricultural Resources and Use	D	D	D	D	Negligible increase of agricultural land is expected after the rehabilitation since the scale is small.	
	11	Mineral Resources and Use	D	D	D	D	No impact	
Economic Components	12	Direct Employment and Income	D	D	B*	D	Farmers' and well owners' income will increase after the rehabilitation.	
	13	Indirect/ Induced Employment and Income	D	D	D	D	People who belong to the agricultural sector will be the beneficiaries after the rehabilitation. But the impact is negligible.	
	14	Labor Market Conditions	D	D	B*	D	Refer to 12 and 13.	
	15	Sources of supplies, materials, and services	D	D	D	D	No impact	
	16	Transportation Requirements	D	D	D	D	No impact because the access road condition is enough good. Only the difficulty is limitation of transportation by Israel.	
	17	Infrastructure Development Requirements and Costs	D	D	D	D	No impact	
	18	Government Revenues and Costs	D	D	D	D	No impact is expected on the government revenues and costs if the rehabilitation is implemented by donor agencies under grant aid scheme.	
	19	Indirect/ Induced Economic Development Opportunities	D	D	B*	D	Refer to 13.	
Cultural and Heritage Components	20	Archeological Sites	D	D	D	D	No impact because the target areas are located in agricultural lands.	
	21	Sites for Traditional Use	D	D	D	D	Refer to 20.	
	22	Historic Sites and Landscape Features	D	D	D	D	Refer to 20.	

Category		Rating by Phase				Without project	Brief Description
		Pump test, WUA formulation	Installation of pumping units	Operation and maintenance			
Social Components	23	Social/ Demographic Profile	D	D	D	D	No impact
	24	Population	D	D	D	D	No impact
	25	Housing and Accommodations	D	D	D	D	No impact
	26	Land and Water Use	B	D	B*	D	Difficulty is expected in the phase of formulation of WUAs and water sharing system. On the other hand, increase of agricultural lands is expected after the rehabilitation. In addition, water saving irrigation is also expected to be disseminated around the target area.
	27	Transportation and Traffic	D	D	D	D	Negligible impact will be caused by the increase of transportation of agricultural products.
	28	Community Services Delivery	D	D	D	D	No impact
	29	Local Government Revenues/ Costs	D	D	D	D	No impact because the operation and maintenance is well owners' and WUAs' responsibility
	30	Social Support Services	D	D	D	D	No impact
	31	Community Stability, Cohesion, and Well-Being	D	D	D	D	No impact because the direct beneficiaries are limited within the farmers working in the small target area and well owners.
Health Components	32	Gender Equity	D	D	D	D	No impact
	33	Supply of Health Facilities and Services	D	D	D	D	No impact
	34	Community Water Supply and Watersheds	D	D	D	D	No impact is expected because the abstracted water from the wells will be used only for irrigation.
	35	Waste Treatment and Discharge	D	D	D	D	No impact
	36	Ambient Air and Water Quality	D	D	D	D	Refer to 3
	37	Public Health Risks	D	D	D	D	Drinking water quality abstracted from wells around the target wells might be deteriorated negligibly (Refer to 3).
	38	Worker Health and Safety	B	B	D	D	Careful operation is required during the phase from pump test including well development and deepening until rehabilitation of pumps and motors.
	39	Noise	B	B	B	D	There is some impacts during the phase of the pump test and the rehabilitation. In addition, noise from generators might be made after rehabilitation.
40	Local Community Health	D	D	D	D	No impact	

Evaluation Categories: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. (Examination is needed. Impacts may become clear as study progress.) D: No impact is expected. EIA is not necessary. *: Positive impact is expected.

Scores of the scoping matrix were rated on the basis of the JICA Guidelines for Environmental and Social Considerations.

Source: JICA Study Team

Table 7-3 Scoping Matrix for Improvement of Spring Water Conveyance System

Category			Rating by Phase				Without project	Brief Description
			WUA formulation, Design stage	Improvement	Operation and maintenance			
Biophysical Resources and Land-Use Components	1	Climate and Air Quality	D	D	D	D	No impact	
	2	Surface Water Hydrology and Quality	D	D	D	D	No impact	
	3	Groundwater Hydrology and Quality	D	D	D	D	Improvement of water conveyance efficiency is expected through the project. As the result, volume of wells' abstraction might negligibly decrease in the target area and deterioration of ground water resources might be alleviated.	
	4	Terrain and Natural Hazards	D	D	D	D	No impact	
	5	Soils and Vegetation	D	D	B*	D	Irrigable land, which is expected to be irrigated by the spring water, would be cultivated after the improvement of water conveyance efficiency.	
	6	Wildlife Resources and Use	D	B	B	D	Source of Al'Auja spring is located in a natural reserve area. Negligible impact might be caused by change of conveyance system from open canals to pipelines. Rare species were not observed in the project areas.	
	7	Aquatic Resources and Use	D	B	B	D	Source of Al'Auja spring is located in a natural reserve area. Negligible impact might be caused because no aquatic lives and endangered aquatic plants are observed in the existing canals.	
	8	Recreation and Tourism Resources and Use	D	B	B	D	Source of Al'auja spring is located in a natural reserve area and used as a recreation site.	
	9	Forest Resources and Use	D	D	D	D	No impact because the target areas are located in not used bare ground and agricultural lands.	
	10	Agricultural Resources and Use	D	D	B	D	Irrigated lands are expected to expand by the improvement. Water for livestock of Bedouin, who uses water in the open canal, is to be considered.	
	11	Mineral Resources and Use	D	D	D	D	No impact	
Economic Components	12	Direct Employment and Income	D	D	B*	D	Farmers' income will increase after the improvement.	
	13	Indirect/ Induced Employment and Income	D	D	B*	D	People who belong to the agricultural sector will be the beneficiaries after the rehabilitation.	
	14	Labor Market Conditions	D	D	B*	D	Refer to 12 and 13.	
	15	Sources of supplies, materials, and services	D	D	D	D	Negligible impact might be caused by the improvement under the limited access condition by Israel although the project size is relatively big and the pipeline for the main canal is required.	
	16	Transportation Requirements	D	D	D	D	No impact because the access road condition is enough good. Only the difficulty is limitation of transportation by Israel.	
	17	Infrastructure Development Requirements and Costs	D	D	D	D	Rehabilitation of farmer's canals is required. However, the rehabilitation is implemented by farmers under present situation. Therefore, no additional impact is expected through the project.	
	18	Government Revenues and Costs	D	D	D	D	No impact is expected on the government revenues and costs if the improvement is implemented by donor agencies under grant aid scheme	
	19	Indirect/ Induced Economic Development Opportunities	D	B*	B*	D	Refer to 13.	

Category			Rating by Phase				Without project	Brief Description
			WUA formulation, Design stage	Improvement	Operation and maintenance			
Cultural and Heritage Components	20	Archeological Sites	D	D	D	D	No impact because the target areas are in agricultural lands.	
	21	Sites for Traditional Use	D	D	D	D	Refer to 20.	
	22	Historic Sites and Landscape Features	D	D	D	D	Refer to 20.	
Social Components	23	Social/ Demographic Profile	D	D	B	D	Life style of Bedouin, who uses water in the open canal, would be changed after the improvement.	
	24	Population	D	D	D	D	Negligible increase of population will be expected by activation of agriculture after the improvement.	
	25	Housing and Accommodations	D	D	D	D	Refer to 24.	
	26	Land and Water Use	B	D	B	D	Difficulty is expected in the phase of formulation of WUAs and water sharing system and water use by Bedouin would be changed after rehabilitation. On the other hand, increase of agricultural lands is expected after the rehabilitation. In addition, water saving irrigation is also expected to be disseminated around the target area.	
	27	Transportation and Traffic	D	D	D	D	Negligible impact will be caused by the increase of transportation of agricultural products.	
	28	Community Services Delivery	D	D	D	D	No impact.	
	29	Local Government Revenues/ Costs	D	D	B*	D	Financial condition of local governments will be improved by establishment of gathering system of water tariff.	
	30	Social Support Services	D	D	D	D	No impact	
	31	Community Stability, Cohesion, and Well-Being	B*	D	B	D	Unity of the community is expected to be strengthened through the process of WUA formulation. Existing water distribution system is applied after the rehabilitation. Therefore, no impact is expected after the rehabilitation. But changes of Bedouins' life style and livestock should be considered in the WUA formulation and design stage.	
	32	Gender Equity	D	D	D	D	No impact	
Health Components	33	Supply of Health Facilities and Services	D	D	D	D	No impact	
	34	Community Water Supply and Watersheds	D	D	B*	D	Water will keep high quality after implementation since the main conveyance system will be replaced to pipelines. After the improvement, there might be surplus of the spring water. In the case, the water could contribute to improve domestic water supply.	
	35	Waste Treatment and Discharge	D	D	D	D	No impact	
	36	Ambient Air and Water Quality	D	D	D	D	Improvement of water efficiency might cause expansion of area of water supply sourced by spring water. In the case, volume of well abstraction would negligibly decrease in the target area.	
	37	Public Health Risks	D	D	B*	D	If surplus water could be generated by improvement of water conveyance efficiency, the situation of water supply will be improved around the target areas.	
	38	Worker Health and Safety	D	B	D	D	Careful operation is required during the phase of the improvement work.	
	39	Noise	D	D	D	D	No impact	
40	Local Community Health	D	D	B*	D	Refer to 37.		

Evaluation Categories: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. (Examination is needed. Impacts may become clear as study progress.) D: No impact is expected. EIA is not necessary. *: Positive impact is expected.

Scores of the scoping matrix were rated on the basis of the JICA Guidelines for Environmental and Social Considerations. Source: JICA Study Team

Table 7-4 Scoping Matrix for Potential Storm Water Harvesting

Category		Rating by Phase				Without project	Brief Description
		WUA formulation, Design stage	Construction	Operation and maintenance			
Biophysical Resources and Land-Use Components	1	Climate and Air Quality	D	D	D	D	No impact.
	2	Surface Water Hydrology and Quality	D	B	A	D	Pattern of surface runoff might be drastically changed after the construction.
	3	Groundwater Hydrology and Quality	D	C	C	D	Impacts during the construction and operation and maintenance phase cannot be estimated without water balance study between surface water and groundwater. If the water stored in the water harvesting structures is used for artificial recharge to underground water, the water quality and water level might be recovered.
	4	Terrain and Natural Hazards	D	B	B*	D	Landscape might be changed through the construction. Risk of flood will be alleviated after the construction.
	5	Soils and Vegetation	D	B	B	D	Soils and vegetation would be affected in the surrounding area of the structures.
	6	Wildlife Resources and Use	D	B	B	D	Ecosystem around the structures might be changed. Some of the proposed sites are located in nature reserve areas.
	7	Aquatic Resources and Use	D	B	B	D	If the surface dam is constructed, the aquatic life might start activating. Some of the proposed sites are located in nature reserve areas.
	8	Recreation and Tourism Resources and Use	D	B	B	D	The water harvesting site might be a recreation field for Palestinian people. On the other hand traditional use of the land as a recreation site in nature reserve areas would be affected by the implementation
	9	Forest Resources and Use	D	D	D	D	No impact because the sites are located in agricultural lands, bare ground and residential area.
	10	Agricultural Resources and Use	D	B	B*	D	Some of the target sites for the dams or reservoirs are located in agricultural lands. In the case, impacts would be caused by land acquisition. Expansion of agricultural area is expected after the construction.
	11	Mineral Resources and Use	D	D	D	D	No impact.
Economic Components	12	Direct Employment and Income	D	B*	B*	D	Increase of employment opportunity as civil engineers and labors will increase caused by the construction work. Farmers' income will increase after the construction.
	13	Indirect/ Induced Employment and Income	D	B*	B*	D	Construction company will receive the benefit by the improvement work. People who belong to the agricultural sector will be the beneficiaries after the construction.
	14	Labor Market Conditions	D	B*	B*	D	Refer to 12 and 13.
	15	Sources of supplies, materials, and services	D	B	D	D	Impact might be caused by the construction under the limited access condition by Israel because the project size is relatively big and relatively great volume of construction materials is required.
	16	Transportation Requirements	D	B	D	D	Access road for O&M is required to be constructed in some of the sites.
	17	Infrastructure Development Requirements and Costs	D	B	B	D	Construction of water conveyance system from the water harvesting structures to the beneficiaries is required. Preparation of farmer's canals and canal rehabilitation roads is required as well.
	18	Government Revenues and Costs	B	D	D	D	If acquisition of private land is required, its budget should be arranged by governmental organization. No additional impact is expected on the government revenues and costs if the rehabilitation is implemented by donor agencies under grant aid scheme
	19	Indirect/ Induced Economic Development Opportunities	D	B*	B*	D	Refer to 13.

Category			Rating by Phase			Without project	Brief Description
			WUA formulation, Design stage	Construction	Operation and maintenance		
Cultural and Heritage Components	20	Archeological Sites	D	D	D	D	No impact because the target areas are located in agricultural lands or bare ground.
	21	Sites for Traditional Use	D	B	B	D	Some impacts might be caused by land acquisition.
	22	Historic Sites and Landscape Features	D	D	D	D	Refer to 20.
Social Components	23	Social/ Demographic Profile	D	B	B	D	Social profile might be slightly changed by improvement of water supply.
	24	Population	D	D	D	D	Population might increase slightly by improvement of water supply.
	25	Housing and Accommodations	D	D	D	D	Refer to 24.
	26	Land and Water Use	B	B	B*	D	Land acquisition is required for construction of the structures and access roads. Total amount of water resources will increase and the agricultural lands will be expanded after construction.
	27	Transportation and Traffic	D	D	D	D	Negligible impact will be caused by the increase of transportation of agricultural products.
	28	Community Services Delivery	D	D	D	D	No impact.
	29	Local Government Revenues/ Costs	D	D	B*	D	Financial condition of local governments will be improved by increase of tax revenue and establishment of gathering system of water tariff although O&M cost will increase.
	30	Social Support Services	D	D	D	D	No impact
	31	Community Stability, Cohesion, and Well-Being	B	B	B	D	Through the process of land acquisition, negative impacts on the community are expected. Continuous explanation to the stakeholders is inevitable.
	32	Gender Equity	D	D	D	D	No impact
Health Components	33	Supply of Health Facilities and Services	D	D	D	D	No impact
	34	Community Water Supply and Watersheds	D	D	B*	D	New water resources will be developed by the construction. The water could contribute to improve domestic water supply if water purification facilities are attached with the water harvesting structures.
	35	Waste Treatment and Discharge	D	D	D	D	No impact
	36	Ambient Air and Water Quality	D	D	B*	D	Development of new water resources will cause expansion of area of water supply. In the case, volume of well abstraction will decrease in the target area, and finally, it might be alleviated to deteriorate underground water quality, and drop water level of the underground water.
	37	Public Health Risks	D	D	B*	D	Refer to 34 and 36.
	38	Worker Health and Safety	D	A	B	D	Some of the proposed water harvesting structures are first experience for Palestinian. Therefore, the risk of contractor would be higher than the other project such as: rehabilitation of agricultural wells and improvement of water conveyance system. Skillful and experienced supervisors are inevitable.
	39	Noise	D	B	D	D	Work period of some of the alternatives is expected to be long and the sites are located near to communities. During the period, measure for noise is to be applied.
	40	Local Community Health	D	D	B*	D	Refer to 34 and 36.

*Evaluation Categories: A: Serious impact is expected. B: Some impact is expected. C: Extent of impact is unknown. (Examination is needed. Impacts may become clear as study progress.) D: No impact is expected. EIA is not necessary. *: Positive impact is expected.*

Scores of the scoping matrix were rated on the basis of the JICA Guidelines for Environmental and Social Considerations. Source: JICA Study Team

7.3 Mitigation Measures for Major Environmental and Social Impacts

(1) Rehabilitation of Agricultural Wells

Expected major environmental and social impacts in relation with rehabilitation of agricultural wells are summarized as: 1) Conflicts on water tariff and water management; 2) Accidents during pump tests and rehabilitation of the agricultural wells; and 3) Noise. The mitigation measures for the above impacts are as follows:

1) Conflicts on water tariff and water management

Under present situation, the water tariff is decided by well owners and most of the water users do not form WUAs. However, to improve water management of agricultural wells, formation of WUAs is necessary. This includes the well owners and other water users with special reference to water tariff issues. Non adoption of the process of might cause conflicts among WUAs.

To avoid the conflicts, the following mitigation measures should be applied for the project:

- To obtain agreement on whole project activity is obtained from stakeholders before implementation;
- To obtain agreement for formation of WUAs among well owners and water users;
- To facilitate WUAs to register to PWA;
- To conduct training on water management; and
- Careful monitoring of WUAs activities conducted by PWA and MOA.

2) Accidents

Workers for the pumping tests and the rehabilitation will be fraught with danger since various machines are utilized for the work. Only qualified and skillful experts and supervisors should be hired in the rehabilitation. In addition, safety control system for the workers should be enforced to assure that nobody is harmed.

3) Noise

Noise generated during the rehabilitation of wells should be addressed only if the wells are located in or near the community. To minimize work period rehabilitation, activities should be explained with the neighbors including purpose of the work, work period, what kind of heavy equipment to be used, etc.

Noise from the generator can be remedied by sound proofing the pumping house if the pump station is located in/near community areas.

(2) Improvement of spring water conveyance system

Expected major environmental and social impacts in relation with improvement of spring water conveyance system are summarized as 1) Wildlife and aquatic life near the source of Auja spring, 2) Water supply for Bedouin, 3) Disturbance of recreation site at Nwai'mah spring, 4) Conflicts on water tariff and water management, and 5) Accidents. The mitigation measures for the above impacts are as follows:

1) Wildlife and aquatic life near the source of Auja spring

Auja spring originates from a nature reserve area, which is a natural ecosystem teemed

with wildlife and aquatic life. The area is currently being used as a recreation site for communities near the spring source. To safeguard the spring source all activities must be carefully planned before any intervention can be made.

2) Water supply for Bedouin

Water in the existing open canal is sometimes used as drinking water for livestock owned by the Bedouin. Therefore, any improvement in the conveyance system should seek first an agreement with the Bedouins.

To address this issue, the outlet for the Bedouin should be set aside along the improved pipelines. The location and volume of water to be supplied should be discussed and decided with the Bedouin, officers of relevant village councils and the design team.

3) Disturbance of a recreation site along Nwai'mah spring conveyance system

Nwai'mah spring water conveyance system flows through a recreation site named as Banana Land. If all existing open canals are replaced to pipelines, value of the recreation site will significantly reduce.

To remedy this issue, existing open canal should only be utilized as recreation site but filter can be installed into the open canal to prevent rubbish from spilling in.

4) Conflicts on water tariff and water management

To improve the spring water conveyance system management, water users committee must be formed and strengthened to be facilitated by the JICA Study Team. The water right holders normally do not want to change the present water distribution rule. To avoid conflicts on water distribution, the following approaches should be applied:

- Obtain agreement on project activities from stakeholders before implementation;
- Enhance water management committees among water right holders;
- Status quo of present time-based water distribution system to water right holders;
- Conducting training on water management to water users; and
- Monitoring of water management committees' activities conducted by PWA and MOA

5) Accidents

Workers for the improvement will be fraught with danger since heavy equipment is utilized for the work. Only qualified and skillful experts and a senior supervisor should be allowed to work. In addition, safety control system for the work should be provided to ensure that no accidents can happen in the working place.

(3) Storm water harvesting

To clarify the impacts caused by storm water harvesting, size of structures to be constructed and location should be identified. However, the size and locations could not be decided yet due to deficit of wadis' discharge data. Major conceivable impacts and mitigation measures are identified in general and under the most serious case as follows:

1) Surface water and groundwater hydrology and quality

Surface water condition will be completely changed by construction of dams or large

scale structures in/along wadis. It is recommended that discharge of wadis is measured during 5-10 years at least. After obtaining complete record of the discharge, water balance study in surface water as well as between surface water and groundwater is recommended to be executed.

In addition, the sediment balance in the wadis will be modified if the scale of the structures is large. Concentration of suspended solid in the flood water is recommended for measurement in parallel with the discharge as well.

2) Ecosystem

Ecosystem including aquatic life, wildlife and vegetation might change even if the structures for the water harvesting are located in the agricultural lands, community areas or bare ground. This is because surface water condition will completely change by the construction of dams especially if the scale is large structures. Environmental Impact Assessment shall be implemented after the completion of the above discharge measurement.

3) Land acquisition

Without determination of exact location and size of the structures, it is difficult to discuss about land acquisition. However, in general, if construction sites are selected in Area A or Area B, there is a high possibility of necessity of land acquisition because unused and large area could not be found in this study. Considering the government budgetary situation, it is recommended that donors to support the funding of land acquisition.

4) Government expenditure

Depending on the scale, government expenditure for land acquisition, detailed design of the structures and the construction will be much higher than the annual revenue. Donors support is inevitable to realize the storm water harvesting project especially in large scale construction.

5) Accidents

Although the storm water harvesting might be including large scale construction work such as construction of dams, subsurface dams and weir in wadis, there is very limited experience for storm water harvesting in Palestine. Serious accidents could be caused by the construction work. To avoid the accidents, it is strongly required that foreign consultants with enough experiences and skills are employed during design stage as well as construction and supervision stage. It is also necessary that foreign construction companies with enough experiences and skillful staffs are invited as the main contractor. Local engineers and labors should work under the supervision and guidance of foreign consultants.

6) JWC approval

Obtaining the approval from JWC on water harvesting project will be much more difficult compared to rehabilitation of agricultural wells and improvement of spring water conveyance system. The main reason is that it is not been implemented anywhere in the area hence impacts have not yet been known.

To convince JWC, it will be required to measure actual discharge, to study the expected change by using hydraulic and hydrological simulation model.

7.4 Information Disclosure

At governmental level, the JICA Study Team has implemented the survey in close coordination with main the counterpart organizations, namely MOA and PWA. The study result was summarized as Progress Report 1 of the study and approved by the steering committee that included EQA and MOP organizations. In addition, The JICA Study Team has published brochures in Arabic, English and Japanese versions to explain about the study. The brochures have been distributed to the relevant organizations.

At local level, the JICA Study Team collected the farmers' and communities' needs through baseline survey and side visits to discuss about their present situation and difficulties. After deciding on the site selection, the JICA Study Team has explained and agreed with village councils and well owners regarding the rehabilitation and improvement work to be implemented in the area. In parallel with the above, farmers were made to understand on the scope of work including confirmation on the formulation and enhancement of WUA in their locality.

Past and future planned activities in the Study are listed as follows:

[Past Activities]

1. To hold Steering Committee meetings on 1) Inception Report in Apr.2007, 2) Progress Report (1) in Aug.2007 , 3) Interim Report in Feb.2008;
2. To hold workshops for formulation of water users associations (WUAs) in pilot projects at selected eight agricultural wells and Nwai'mah spring during Nov.2007 - Aug. 2008;
3. To prepare and distribute brochures (Arabic and English) to concerned governmental organizations, donors, NGOs and individuals starting from Aug.2007;
4. To prepare and distribute study reports to governmental organizations concerned;
5. To hold the 1st seminar for explanation of the Study progress in May 2008

[Planned activities]

6. To enhance WUAs and clarify their roles and responsibilities;
7. To hold final Steering Committee meeting for Draft Final Report in August 2008; and
8. To hold the 2nd seminar for explanation of the final result of the Study in November 2008.

8 Environmental Monitoring and Management Plan

In accordance with the Water Law enacted on 2002, the PWA shall have full responsibility for managing the water resources and wastewater in Palestine including monitoring of water resource quantity and quality, regulate and halt water supply if water resources are polluted.

On the other hand, local communities, well owners or the relative organizations have the responsibility on adequate water resources management as mentioned in the National Water Policy and Strategy.

Based on the above consensus, the environmental monitoring and management plans are recommended as shown in Table 8-1 for rehabilitation of agricultural wells, and Table 8-2 for improvement of improvement of spring water conveyance system. The environmental management and monitoring plan for storm water harvesting is not mentioned in this IEE report since such preparation should be done after the discharge of the wadis and the decision on the size of the structures.

Table 8-1 Environmental Monitoring and Management Plan
(Rehabilitation of Agricultural Wells)

Type of impacts	Source of impacts	Impact parameters	Actions to be taken	Responsibility of the actions	Supervisor
a) Pre-rehabilitation Phase					
1) Ground water deterioration	Well development and deepening	- Depth of ground-water level - Water salinity (TDS) - Other water quality indicators mentioned in regulated substances	To report the result of pump tests and the water quality to the supervisor	Contractor of pumping tests	Project managers of MOA&PWA
			To judge whether the water quantity and quality is enough to proceed the next step	Project managers of MOA&PWA	Head of MOA&PWA
2) Conflicts in WUAs	Formation of WUAs (Misunderstand on WUAs)	Water rights of well owners	To obtain agreement from well owners on project activities before implementation	Project managers of MOA&PWA	Head of MOA&PWA
			To obtain agreement for formation of WUAs among well owners and water users	Contractor of WUA formulation	Project managers of MOA&PWA
			To facilitate WUAs to register to PWA	Contractor of WUA formulation	Project managers of MOA&PWA
3) Accidents	Heavy equipment used by the contractor	Number of casualties	- To supervise all activities by the contractor - To inform the work progress to the supervisor	Contractor of pumping tests	Project managers of MOA&PWA
4) Noise	Heavy equipment used by the contractor	Noise level	To explain and obtain understanding from the neighbors	Contractor of WUA formulation	Project managers of MOA&PWA

Type of impacts	Source of impacts	Impact parameters	Actions to be taken	Responsibility of the actions	Supervisor
5) Overall	Any kinds of activities in pre-rehabilitation phase	Any types of environmental and social impact parameters even if the impact was not expected in the IEE stage	- To conduct researches on environmental and social impact through the pre-rehabilitation activities - To advice project manager to take action for mitigation of environmental and social impacts	Environmental Monitoring & Inspection Department, EQA	General Directorate for Environmental Protection, EQA
b) Rehabilitation Phase					
1) Accidents	Heavy equipment used by the contractor	Number of casualties	- To supervise the all activities by the contractor - To inform the work progress to the supervisor	Contractor of rehabilitation of agricultural wells	Project managers of MOA&PWA
2) Noise	Heavy equipment used by the contractor	Noise level	To explain and obtain understanding from the neighbors	Contractor of rehabilitation of agricultural wells	Project managers of MOA&PWA
3) Overall	Any kinds of activities in rehabilitation phase	Any types of environmental and social impact parameters even if the impact was not expected in the IEE stage	-To conduct researches on environmental and social impact through the rehabilitation activities -To advice project manager to take action for mitigation of environmental and social impacts	Environmental Monitoring & Inspection Department, EQA	General Directorate for Environmental Protection, EQA
c) Operation and Maintenance Phase					
1) Ground water deterioration	Over pumping	- Depth of ground-water level	To monitor depth of groundwater regularly	Planning Directorate, PWA	Head of PWA
		- Water salinity (TDS)	To monitor groundwater quality regularly	Water Resources Directorate	Head of PWA
		- Other water quality indicators mentioned in regulated substances	-To provide the guidance of adequate groundwater usage -To regulate the over-pumping or invalidate water license	- Water Control Directorate - Regulatory Directorate	Head of PWA
2) Conflicts in WUAs	Non-function of WUAs	Records to be kept by WUAs such as account book, pumping hour etc.	To keep records on WUAs' activities	WUAs	Water Control Directorate, PWA
			-To monitor WUAs' activities through: 1. Checking records of WUAs' activities 2. Interview survey and questionnaire survey to WUAs -To provide	- Water Control Directorate - Regulatory Directorate	Head of PWA

Type of impacts	Source of impacts	Impact parameters	Actions to be taken	Responsibility of the actions	Supervisor
			administrative and technical guidance to WUAs		
3) Noise	Generators and pumps	Noise level	To monitor the noise level and provide the guidance of noise mitigation	- Water Control Directorate - Regulatory Directorate	Head of PWA
			To construct noise mitigation wall, if necessary	WUAs	Water Control Directorate, PWA
4) Overall	Any kinds of activities in operation and maintenance phase	Any types of environmental and social impact parameters even if the impact was not expected in the IEE stage	-To conduct researches on environmental and social impact through the operation and maintenance activities -To advice project manager to take action for mitigation of environmental and social impacts	Environmental Monitoring & Inspection Department, EQA	General Directorate for Environmental Protection, EQA

Source: JICA Study Team

Table 8-2 Environmental Monitoring and Management Plan
(Improvement of Spring Water Conveyance System)

Type of impacts	Source of impacts	Impact parameters	Actions to be taken	Responsibility of the actions	Supervisor
a) Pre-improvement Phase					
1) Conflicts in communities	Fear of insecurity of future water supply	Amount of water planned to be allocated to water right holders and Bedouin	To explain and obtain understanding and agreement on volume and rule of water supply from water right holders	Contractor of WUA formulation	Project managers of MOA&PWA
			To plan arrangement of outlets for water supply to Bedouin	Design engineer of the conveyance system	
2) Deterioration of nature reserve area at the source of Auja spring	Development activities in the nature reserve area	Number and species of wildlife and aquatic life in nature reserve	To monitor that no activity is planned in the nature reserve	Project managers of MOA&PWA	Head of MOA&PWA
			To check design report of the project	E.A Department, EQA	General Directorate for Environmental Protection, EQA
3) Disturbance of a recreation site at Nwai'mah spring	Replacement of an existing open canal to a pipeline	Amenity of the recreation site	To monitor that no activity is planned in the recreation site	Project managers of MOA&PWA	Head of MOA&PWA

Type of impacts	Source of impacts	Impact parameters	Actions to be taken	Responsibility of the actions	Supervisor
4) Overall	Any kinds of activities in pre-improvement phase	Any types of environmental and social impact parameters even if the impact was not expected in the IEE stage	-To conduct researches on environmental and social impact through the pre-improvement activities -To advice project manager to take action for mitigation of environmental and social impacts	Environmental Monitoring & Inspection Department, EQA	General Directorate for Environmental Protection, EQA
b) Improvement Phase					
1) Conflicts in communities	Fear of insecurity of future water supply	Amount of water planned to be allocated to water right holders and Bedouin	To monitor the implementation based on the decided volume and rule of water supply	Project managers of MOA&PWA	Head of MOA&PWA
			To arrange outlets for water supply to Bedouin	Contractor of improvement of spring water conveyance system	Project managers of MOA&PWA
2) Deterioration of nature reserve area at the source of Auja spring	Development activities in the nature reserve area	Number and species of wildlife and aquatic life in nature reserve	To monitor the nature reserve periodically	Environmental Monitoring Department, EQA	General Directorate for Environmental Protection, EQA
			To monitor that no activity is planned in the nature reserve	Project managers of MOA&PWA	Head of MOA&PWA
3) Disturbance of a recreation site at Nwai'mah spring	Replacement of an existing open canal to a pipeline	Amenity of the recreation site	To monitor that no activity is implemented in the recreation site	Project managers of MOA&PWA	Head of MOA&PWA
4) Accidents	Heavy equipment used by the contractor	Number of casualties	-To supervise the all activities by the contractor -To inform the work progress to the supervisor	Contractor of rehabilitation of agricultural wells	Project managers of MOA&PWA
5) Overall	Any kinds of activities in improvement phase	Any types of environmental and social impact parameters even if the impact was not expected in the IEE stage	-To conduct researches on environmental and social impact through the improvement activities -To advice project manager to take action for mitigation of environmental and social impacts	Environmental Monitoring & Inspection Department, EQA	General Directorate for Environmental Protection, EQA

Type of impacts	Source of impacts	Impact parameters	Actions to be taken	Responsibility of the actions	Supervisor
c) Operation and Maintenance Phase					
1) Conflicts in communities	Deficit of water supply to the farmers Deficit of water supply to Bedouin	- Water discharge in pipelines - Amount of water distributed to the farmers and Bedouin	To monitor the water discharge in pipelines and amount of water distributed to the farmers	WUA	Water Control Directorate, PWA
			To guide and regulate the water distribution based on the monitoring result, if necessary	Water Control Directorate, PWA	Head of PWA
2) Overall	Any kinds of activities in operation and maintenance phase	Any types of environmental and social impact parameters even if the impact was not expected in the IEE stage	-To conduct researches on environmental and social impact through the operation and maintenance activities -To advice project manager to take action for mitigation of environmental and social impacts	Environmental Monitoring & Inspection Department, EQA	General Directorate for Environmental Protection, EQA

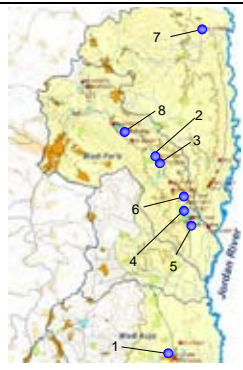
Source: JICA Study Team

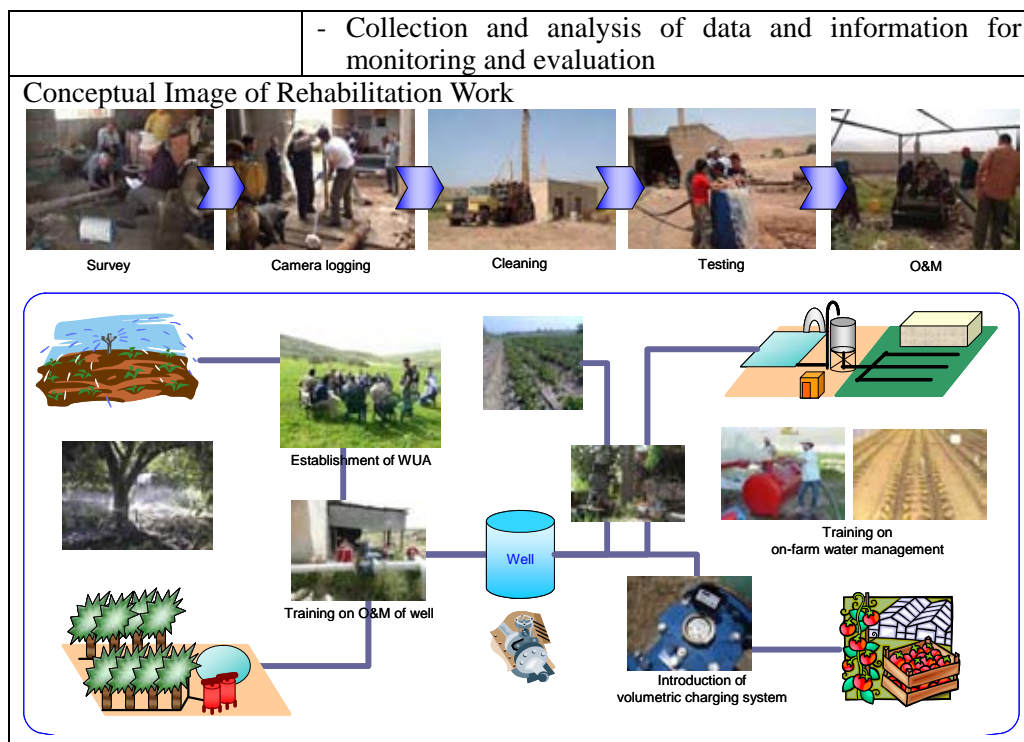
9 Pilot Projects

9.1 Description of Pilot Projects


Two components of the pilot projects are scheduled to be implemented under the study: 1) Pilot project for rehabilitation of agricultural wells after pumping tests; and, 2) Pilot Project for improvement of Nwai'mah spring water conveyance system.

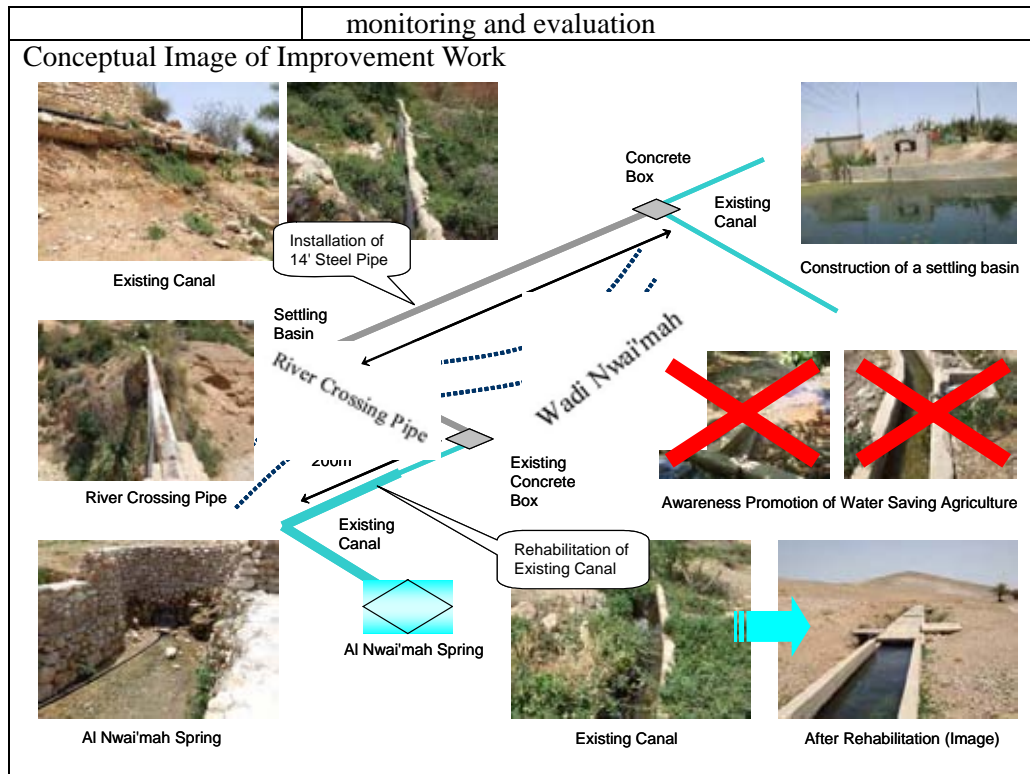
(1) Pilot Project for Rehabilitation of Agricultural Wells

Location	<p>Selected Eight Wells (planned)</p> <ol style="list-style-type: none"> 1) 19-15/008: Auja 2) 19-17/047: Frush Beit Dajan 3) 19-17/034: Frush Beit Dajan 4) 19-17/027: Al Jiftlik 5) 19-17/054: Al Jiftlik 6) 19-17/055: Al Jiftlik 7) 19-19-005a: Ein El Beida 8) 18-18/036: Al Fara 
Target area	Approx. 2,870 dunum in total
No. of beneficiaries	372 households in total
Project components	<p>Hardware component</p> <ul style="list-style-type: none"> - Cleaning of the selected wells - Deepening of the selected wells, if required - Pumping test and water quality tests - Replacement of pumping units <p>Software component</p> <ul style="list-style-type: none"> - Facilitation for forming WUA at each well - Implementation of technical training for WUA staff on O&M, and management of the well - Awareness promotion on efficient water use for water users



(2) Pilot Project for Improvement of Nwai'mah Spring Water Conveyance System

Location	Nwai'mah spring in Jericho Governorate (planned) 
Target area	A part of Nwai'mah Irrigation System
No. of beneficiaries	1,128 persons (Source: PCBS, 2005)
Project components	<p>Hardware component</p> <ul style="list-style-type: none"> - Installation of pipelines (dia. 14inch HDPE with approx. 1,100m length) - Rehabilitation of the existing concrete canal (approx. 30m length) - Construction of settling basin (concrete structure with the capacity of 16m³) <p>Software component</p> <ul style="list-style-type: none"> - Facilitation for forming water management unit in LGU - Implementation of technical training for LGU staff on O&M, and management of the spring water conveyance system - Awareness promotion on efficient water use for water users - Collection and analysis of data and information for



9.2 Mitigation Measures taken for Major Environmental and Social Impacts

(1) Rehabilitation of Agricultural Wells

Expected major environmental and social impacts in relation with rehabilitation of agricultural wells are summarized as 1) Conflicts on water tariff and water management, 2) Worker health during pump tests and rehabilitation, and 3) Noise as mentioned in Clause 7.2. In addition, 4) Deterioration of groundwater is to be considered before the implementation.

In the pilot project of eight wells, the measures taken to mitigate the impact are as follows:

1) Conflicts on water tariff and water management

All well owners agreed on the project concept and the formation of WUAs before the project implementation. Under supervision of the JICA Study Team, WUAs were formed and trained on water management by contracted facilitators. Registration of WUAs to PWA is now in progress. So far no conflicts are observed on water tariff and water management issues.

2) Accidents

In the pilot project, only experienced with good track record contractor was selected for pumping test and replacement of pump, motor and other equipment under the supervision of JICA Study Team. No accidents were observed so far.

3) Noise

The well owners were briefed and agreed on the purpose, expected work period and what kind of equipment to be used by the contractor under the supervision of the JICA Study Team. The measures to reduce noise in the working place during operation and

maintenance period will be carried out by well owners under the supervision of PWA and MOA, if necessary.

4) Deterioration of groundwater

The current water quantity and quality were carefully examined through pumping test. Based on the test made, the wells were assessed to proceed to the next stage, which was installation and replacement of pumping equipment. If the water quantity or quantity was not achieved to the desired level, further rehabilitation such as replacement of pump, motor or other equipment will be cancelled. The above conditions were agreed between JICA Study Team and owners of the targeted wells.

For water quality test, it was found that a well (ID: 19-15/008) was not applicable for irrigation and it could be used only through water purification process. Finally, the decision to cancel was agreed with the well owners.

In parallel with the above hardware component, the capacity of the WUA in each targeted well has been enhanced through periodic training that includes record keeping of water distribution. The daily record of water use is an important indicator for the PWA to supervise, guide and control the water usage of farmers or well owners.

(2) Improvement of Spring Water Conveyance System

Expected major environmental and social impacts in relation with improvement of spring water conveyance system are summarized as follows: 1) Water supply for Bedouin, 2) Disturbance of recreation site at Nwai'mah spring, 3) Conflicts on water tariff and water management, and 4) Accidents as mentioned in Clause 7.2. In the pilot project of improvement of Nwai'mah spring water conveyance system, the measures that were taken to mitigate the impact are as follows:

1) Water supply for Bedouin

There is no Bedouin affected by the pilot project in the target site.

2) Disturbance of recreation site

Under discussion with water right holders, it was agreed and decided that no activity would be implemented in the recreation site named as Banana Land.

3) Conflicts on water tariff and water management

With close coordination and discussion with the Nwai'mah village council, an outline of the rehabilitation was identified and prepared. It was also agreed that the village council shall have the responsibility on operation and maintenance of the conveyance system after the rehabilitation has been completed.

Moreover, a water management unit has been empowered by a series of training conducted by the contractor under supervision of the JICA Study Team. This includes equitable water distribution to the water users. This activity is effective to avoid the conflict. So far no conflicts were observed.

4) Accidents

To avoid accidents in the working place, an experienced and skillful contractor are selected for the rehabilitation work under the supervision of JICA Study Team. JICA

Study Team has provided lectures on basic safety measures among supervisors and workers. No accidents were observed so far.

9.3 Environmental Management and Monitoring Plan

During the implementation of the pilot projects, JICA Study Team has a responsibility on environmental management and monitoring including their effects and/or impacts. After the completion of the pilot projects, the responsibility would be transferred: 1) to the WUAs on the agricultural wells; and 2) to the water management unit under Nwai'mah village council on the spring, under supervision and guidance of the PWA and MOA.

10 Conclusion

Based on the IEE study and as discussed in this report, the necessity of EIA would be concluded as follows:

(1) Rehabilitation of Agricultural Wells

The impacts caused by the rehabilitation both physical and socio-economical parameters are manageable and can be mitigated by various measures mentioned above. Therefore, **EIA in this project is no longer necessary hence no survey in detail is forthcoming.**

However, the results of pumping tests shall be carefully checked by PWA, MOA and EQA. Safety control and impacts of noise should be taken into consideration through the rehabilitation activities as well. WUAs activities are also to be monitored closely by PWA.

Environmental monitoring is recommended to be followed strictly including submission and publication of the monitoring report.

(2) Improvement of Spring Water Conveyance System

The impacts caused by the improvement can be managed and mitigated by the measures mentioned above. Therefore, **EIA is no longer necessary including survey in detail for this component.**

However, careful monitoring during and after project implementation is required especially on water management by water users. PWA and MOA are the two bodies that have the responsibility to implement periodical monitoring.

(3) Storm Water Harvesting

The impacts caused by the storm water harvesting are expected but the extent has not been totally determined. One of the reasons is the deficit of reliable and continuous discharge records. Without this information, decision of the size of water harvesting structures cannot be made. In parallel with the discharge measurement, the other basic information such as geology, concentration of suspended solid in the wadis should be also collected in order to complete the feasibility study on storm water harvesting structures. Therefore, **after measurement of the discharge during 5–10 years at least, EIA study should be conducted in parallel with feasibility study on water harvesting structures.**

11 Terms of Reference for Environmental Impact Assessment

EIA is required in the component of storm water harvesting. However, the project outline and other requirements can only be identified after basic data on wadis' discharge record are collected.

Tentative and proposed Terms of Reference for EIA study are shown in Appendix-1. The details of the EIA study such as: work items, valued environmental components, target area of the EIA study can be modified or adjusted based on the scope of works of the next feasibility study, if necessary.

Terms of Reference (TOR) **For Environmental Impact Assessment** **(Draft June, 2008)**

Project:	The Feasibility Study on Storm Water Harvesting at Wadi Fara, Wadi Auja and Wadi Qilt in the Jordan River Rift Valley (Project name to be decided later)
Proponent:	Ministry of Agriculture (MOA) Palestinian Water Authority (PWA)
Contact:	
Project No:	
Application Date:	
Terms of Reference Date:	

1 GENERAL REQUIREMENTS

1.1 Environmental Assessment (EA)

The terms of reference (TOR) for an Environmental Impact Assessment (EIA) apply to the captioned study (The Feasibility Study on Storm Water Harvesting at Wadi Fara, Wadi Auja and Wadi Qilt in the Jordan River Rift Valley) as described in the Proponent's Application for Environmental Approval. Any significant changes to the Project as described in the said application may require that new TOR be prepared and approved by Environment Quality Authority (EQA) before the application can be considered further.

The EIA shall be carried out in conformity with requirements of the Palestinian Environmental Assessment Policy, and with the General Guidelines for Environmental Assessment (the Guidelines) published by EQA.

The EIA shall be a comprehensive evaluation of environmental impacts of the Project. Its main purposes are (1) to assist the Proponent in planning the Project and (2) to provide EQA with information it needs to consider granting Environmental Approval. The EIA provides an environmental plan in which features to be incorporated to mitigate adverse impact and potential benefits to be captured shall be described. It shall include a sever analysis and significance of impacts and benefits, especially for individuals and communities directly influenced by the project. It shall also provide an environmental

management plan.

The EIA Report shall be of excellent quality to provide the EQA with sufficient information to:

- a) Grant Environmental Approval, with or without conditions; *OR*
- b) Withhold Environmental Approval since the project has severe or unacceptable environmental impacts.

1.2 Background of the EIA Study

On the occasion of the visit of Prime Minister “Mr. Koizumi” to Palestine in July 2006, the concept “Corridor for Peace and Prosperity” was proposed to promote regional development. Under this concept, a governmental consultation platform was set up among Palestine, Jordan, Israel and Japan for the purpose of promoting economic cooperation in the region. This concept aims to create stability in the region surrounding Palestine.

In August 2006, the Japan International Cooperation Agency (JICA) decided to implement “The Jericho Regional Development Program” which is composed of three sub-programs: (1) Government Administration and Social Service; (2) Agriculture, Agro-industry and Distribution; and (3) Tourism and Urban Environment.

As one of the inputs under this initiative, the “Feasibility Study on Water Resources Development and Management in the Jordan River Rift Valley (Past JICA Study)” was launched in March 2007. Objectives of the study were composed of: (1) Rehabilitation of agricultural wells; (2) Improvement of spring water conveyance system; and (3) Storm water harvesting.

As the result of the study, it was recommended that feasibility study on the storm water harvesting should be executed again after collection of basic information such as discharge record, geological survey result, etc. In addition, EIA study was recommended to be conducted in parallel with the next feasibility study.

2 OUTLINE OF THE EIA STUDY

2.1 Objective of EIA Study

Objective of the EIA study is to assess the comprehensive environmental impact based on sufficient survey and fieldwork, data analysis, identification of mitigation measures, and drafting of environment management plan, etc.

2.2 Work Component

Work components of the EIA study are summarized as follows:

- a) To review and update IEE study result of the Past JICA Study based on the latest information and field investigation at/around the target area;
- b) To identify sources and extent of expected negative impact caused by the storm water harvesting;
- c) To prepare mitigation measure, and environmental monitoring and management plan;
- d) To disclose the study result through workshops, public consultations, etc. and incorporate comments, suggestions and/or opinions to the project; and
- e) To prepare EIA report and submit to EQA in order to receive Environmental Approval

2.3 Target Area

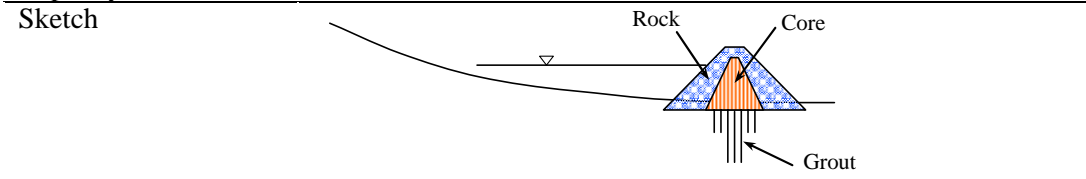
The target area of the EIA study is located at Wadi Fara, Wadi Auja and Wadi Qilt in the Jordan River Rift Valley (Refer to Location Map of IEE Report of the Past JICA Study)

2.4 Alternatives of Storm Water Harvesting

List of the prospective alternatives for storm water harvesting are listed as follows and documented in detail in the reports prepared by the Past JICA Study:

Alternative 1: Dam on Wadi Qilt

Location	End of mountain area at Wadi Qilt
Capacity	Under estimation



Remarks from technical aspects	1) Difficulty of grouting due to limestone, 2) Small storage capacity, 3) Siltation, 4) Headrace and road to be constructed, 5) Necessity of treatment for evaporation
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Alternative 2: Dam on Wadi Fara

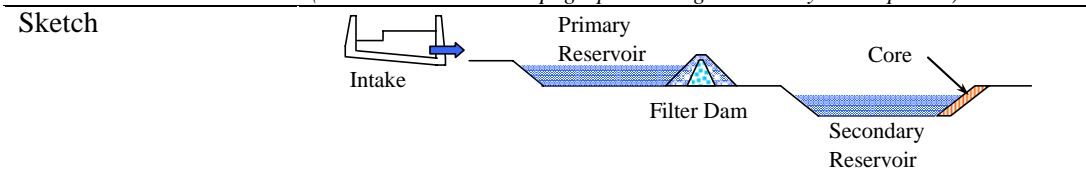
Location	Proposed dam site A, B and C
Capacity	Approx. 1,337,000 m ³ in total <i>(Estimation based on topographic data generated by aerial photos)</i>

Sketch Refer to Alternative 1

Remarks Same as Alternative 1

Alternative 3: Reservoir for Turbid Flood neighboring Wadi Qilt

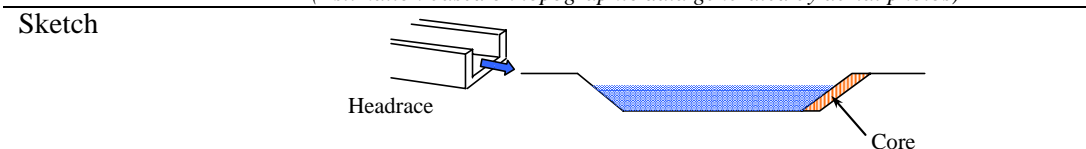
Location	Downstream area of garbage dumping site at Wadi Qilt
Capacity	Approx. 36,000-127,000 m ³ in total <i>(Estimation based on topographic data generated by aerial photos)</i>



Remarks	1) Complicated structure, 2) Necessity of maintenance of filter dam, 3) Necessity of treatment for evaporation
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Alternative 4: Reservoir for Surplus Spring Water neighboring Wadi Auja

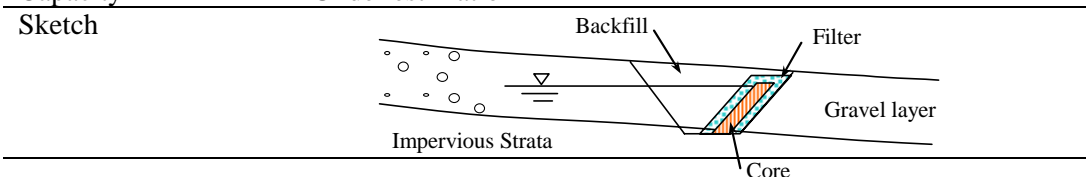
Location	Downstream area of Auja Spring
Capacity	Approx. 1,050,000 m ³ in total <i>(Estimation based on topographic data generated by aerial photos)</i>



Remarks	1) Simple structure, 2) Necessity of treatment for evaporation
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Alternative 5: Retention Dam/ Underground Dam at Wadi Auja

Location	Aluvial fun at Wadi Auja
Capacity	Under estimation



Remarks	1) Small storage, 2) Easy to maintain, 3) Unnecessary treatment for evaporation
Alternative 6: Retention Dam/ Underground Dam at Wadi Qilt	
Location	End of mountain area at Wadi Qilt
Capacity	Under estimation because of deficit of geological data
Sketch	Refer to Alternative 5
Remarks	Refer to Alternative 5

Source: JICA Study Team

2.5 Valued Environmental Components

Valued environmental components (VECs) which must be considered during the EIA are indicated with a check mark (√) in Annex A. As required for clarification, the VECs and related issues discussed shall be the items specified in Annex B.

The EIA shall assess project compliance with relevant local, district, regional and national land use and development policies, plans and programs, and with relevant regulatory standards.

3 ENVIRONMENTAL PLANNING

The EQA expects the EIA to contribute positively and significantly to the planning and design of the Feasibility Study. The EIA Report shall document how environmental factors are incorporated into the planning and design, and what the results are. EIA's study and reporting requirements on environmental planning are described in the Guidelines. The Proponent shall consider the following issues:

- a) Consider alternatives in planning and designing including an alternative of without-Project; and
- b) Improve the environmental management plan proposed in the Past JICA Study reports.

4 STAKEHOLDER CONSULTATION

Prior to EIA, the Proponent shall consult with relevant local, district and governmental agencies to ensure that their concerns, interests and regulatory requirements are adequately reflected in the EIA strategy and report. Expected agencies and organizations as stakeholders are listed in B-3 in Annex B.

General guidance on public consultation is given in the Guidelines of Environmental Assessment.

5 MINIMUM EIA REPORT REQUIREMENTS

Detailed guidance on the conduct of an EIA and the preparation of EIA Reports is given in the Guidelines.

The EIA Report must contain at least:

- a) Non-technical executive summary;
- b) An introduction to the project, the proponent, and the EIA strategy;
- c) A summary of stakeholders and public consultations about the project;
- d) Baseline conditions (natural and social environmental conditions)
- e) A description of the environmental planning for the project, and particularly of the alternatives to be considered;

- f) A description of the project, including design and strategies for environmental protection;
- g) Suitable maps showing the location of the project site(s), route(s) and alternatives, and the arrangement of project facilities within the preferred site or route;
- h) An assessment of significant, potential impacts and their mitigation measures during and after construction;
- i) An environmental monitoring and management plan and;
- j) Identification of the names and responsibilities in charge of the EIA.

The EIA Report, and/or the letter of submission which accompanies it, must clearly indicate to which the Proponent:

- a) Is in agreement with the contents of the Report; and
- b) Is committed to implementing the environmental planning, design, mitigation, compensation and management measures it contains.

The Proponent shall note that the EIA Report will be reviewed by EQA and other Palestinian National Authority (PNA) agencies using standard procedures (see the guidelines). The comprehensive evaluation criteria used in these procedures represent quality standards which EQA expects the Proponent to meet in his EIA Report.

The Proponent shall also note that if the draft EIA Report fails to meet the minimum requirements specified above, it will not be accepted for review by the Authority.

6 SUBMISSION AND REVIEW OF EIA REPORT

The Proponent shall submit three (3) copies of the draft EIA Report to the Director of the environmental assessment department at EQA Office in Ramallah.

After the draft EIA Report meets the minimum reporting requirements, the Proponent shall submit twelve (12) copies of the final Report for detailed technical review under the provisions of the EA Policy.

Annex A Valued Environmental Components

Category	Water Harvesting	Environmental Component
Biophysical, Resource and Land Use Components		Climate and air quality
	√	Surface water hydrology and quality
	√	Groundwater hydrology and quality
	√	Terrain and natural hazards
	√	Soils and vegetation
	√	Wildlife resources and use
	√	Aquatic resources and use
	√	Recreation and tourism resources and use
		Forest resources and use
	√	Agricultural resources and use
		Mineral resources and use
Economic Components	√	Direct employment and income
	√	Indirect/induced employment and income
	√	Labor market conditions
	√	Sources of supplies, materials and services
	√	Transportation requirements
	√	Infrastructure development requirements and costs
	√	Government revenues/costs
	√	Indirect/induced economic development opportunities
Cultural and Heritage Components		Archaeological sites
	√	Traditional use sites
		Historic sites and landscape features
Social Components	√	Social/demographic profile
	√	Population
	√	Housing and accommodation
	√	Land and water use
	√	Transportation and traffic
	√	Community service delivery
	√	Local government revenues/costs
		Social support services
	√	Community stability, cohesion and well being
		Gender equity
Health Components		Supply of health facilities and services
	√	Community water supply and watersheds
		Waste treatment and discharge
	√	Ambient air and water quality
	√	Public health risks
	√	Worker health and safety
	√	Noise
	√	Local community health

Source: IEE report prepared by JICA Study Team of Feasibility Study on Water Resources Development and Management in the Jordan River Rift Valley

Annex B Specific EIA Requirements

(B-1) VECs and Related Issues/Concerns

The EIA Report shall study issues and concerns related to the following VECs as follows:

- **Surface water hydrology and quality**
 1. Discharge of targeted wadis
 2. Sediment balance study of the targeted wadis
 3. The impacts on flood mitigation and hydrological characteristics in the downstream area after construction of storm water harvesting structures.
 4. Mitigation measures for wadis' water flow of the downstream areas, if the impact is negative.
 5. Monitoring plan of surface flow and the sediments
- **Groundwater hydrology and quality**
 1. Historical trend of groundwater level and quality at/near the sites
 2. The impacts on groundwater quality and quantity at/near the sites and mitigation measures, if the impact is negative.
 3. Volume of surplus water caused by improvement of spring water conveyance system
 4. The impacts on groundwater level and its quality by construction of infiltration ponds and mitigation measures, if the impact is negative.
 5. The impacts on groundwater level and its quality caused by using harvested water as water for artificial recharge to the groundwater and mitigation measures, if the impact is negative.
 6. Monitoring plan of underground water
- **Terrain and natural hazard**
 1. The impacts on flood mitigation and hydrological characteristics in the downstream area after construction of storm water harvesting structures and mitigation measures, if the impact is negative.
- **Soils and vegetation**
 1. The presence of endangered species in the area and measures to conserve them
 2. Possible negative impacts on the surrounding biodiversity, sensitive areas, forests and the procedures to conserve and enhance them
 3. Soil erosion especially during and after construction and mitigation measures required for conserving soils for other uses such as greening
- **Wildlife resources and use**
 1. The native fauna
 2. The endangered wildlife in the area
 3. The impact of replacement of existing canals to pipelines on the wildlife presence
 4. The impact of construction of storm water harvesting structures on the wildlife presence
 5. Mitigation measures required to reduce or avoid wildlife and habitat disturbance or fragmentation
 6. Monitoring plan of wildlife, if necessary

- **Aquatic resources and use**
 1. The native aquatic resources
 2. The endangered aquatic life in the area
 3. The impact of replacement of existing canals to pipelines on the aquatic life presence
 4. The impact of construction of storm water harvesting structures on the aquatic life presence
 5. Mitigation measures required to reduce or avoid aquatic life and habitant disturbance or fragmentation
 6. Monitoring plan of aquatic life, if necessary
- **Recreation and tourism resources and use**
 1. The impacts of the project especially on the storm water harvesting in and around the target areas
- **Agricultural resources and use**
 1. The project impact on the area of agricultural lands and the activities
 2. Possible mitigation measures, if necessary
- **Employment and income including direct and indirect impacts**
 1. The project's impact on employment and income
 2. Measures to enhance the employment and income rates
 3. The impacts on local communities
 4. Possible mitigation measures of any negative impacts on local communities
- **Sources of supplies, materials and services**
 1. The nature of such sources
 2. The impact of such sources on the project, local communities, and the Palestinian economy
 3. Measures to mitigate such impacts and benefits to local communities
 4. Plans to insure the sources
- **Transportation requirements**
 1. The impact of the movement of people, agricultural equipment's, agricultural products after the project
 2. Measures to mitigate congestion and to ease transportation and prevent traffic interruption, if necessary.
- **Infrastructure development requirements and costs**
 1. The condition of farmers' canal
 2. The capacity of the farmers and WUAs in the target area
 3. Sketch of storm water harvesting structures including water conveyance system from storm water harvesting structures to the beneficiaries, maintenance roads and transmission line, if necessary.
- **Government and local government revenues/costs**
 1. Present governmental financial condition
 2. Expected expenses by the government for the project implementation
 3. Project implementation schedule and expected source of funds, if required
 4. Financial and economic analysis on project implementation
- **Indirect/induced economic development opportunities**
 1. Present economic activities and economic indicators

2. Economic impacts of the project implementation and mitigation measures if the impacts are negative
- **Social/demographic profile including population, housing and accommodation**
 1. Present social profiles of the target areas
 2. The impacts of the project implementation on social profile and mitigation measures if the impacts are negative
 - **Land and water use**
 1. Land owner and the possibility of land acquisition especially in the target area of storm water harvesting
 2. Present and future water demand and supply including domestic use, irrigation water, industrial use etc.
 3. Water distribution strategy after the construction
 4. Mitigation measures if the negative impacts are expected
 - **Community stability, cohesion and well being**
 1. Present water management system and WUAs
 2. The impact of the formulation and enhancement of WUAs and mitigation measures if the impacts are negative
 - **Worker health and safety**
 1. Identification of work items and skills or experiences to implement the work
 2. Preparation of implementation schedule
 3. Selection criteria of contractors in each work item
 4. Measures for safety control
 - **Noise**
 1. Present situation of noise surrounding the target areas
 2. The result of public consultation meeting with village councils, farmers and the other stakeholders
 3. Mitigation measures and/or measures to obtain the public agreement

(B-2) Spatial Boundaries and Timeframe for the Study

- **As appropriate to encompass anticipated effects on each VECs or group of VECs**
 1. Mapped definition of study area, including any alternatives to be considered.
 2. Study time frame for construction phase and operation phase for up to 20 years.
 3. The possible transboundary impacts.
- **Alternatives regarding social and environmental aspects:**
 1. Choice of technologies and processes;
 2. Supply of materials, especially where local suppliers exist;
 3. Scheduling for construction;
 4. Handling of hazardous materials; and
 5. Water supply.
- **For monitoring each phase of the project:**
 1. Environmental variables to be monitored, and frequency; and
 2. Reporting to appropriate authorities and local community.
- **Issues/concerns that are to be the subject of the environmental management plan, and reporting requirements to government and the public,**

- **Environmental standards and guidelines that will be adopted or required.**
- **Stakeholder consultation will be carried out during the early stages of report preparation. The purposes of consultation are:**
 1. To inform the public of all issues and concerns related to the project;
 2. To determine public concerns.
 3. To collect data, information or local knowledge;
 4. To avoid future conflicts with affected or concerned stakeholders; and
 5. To mitigate public environmental concerns.
- **The consultant has to examine suitable means to reach and get feedback from the public.**
- **Consultations and feedback should be included in the report.**

(B-3) Stakeholders that will be consulted are the following

1. The site and neighborhood land owners.
2. The surrounding municipalities.
3. Public institutions in the area.
4. The Palestinian organizations of:
 - Ministry of Agriculture;
 - Palestinian Water Authority;
 - Ministry of Local Government;
 - Ministry of Planning
 - Environment Quality Authority
5. Universities and NGOs in the region.
6. Other stakeholders that the consultant may find that they are affected by the project.

Continuous consultation should be held with EQA during the preparation process. The significance of all issues and concerns mentioned in this TOR or presented during public consultations should be examined based on clear environmental criteria.