

**RED SEA – DEAD SEA
WATER CONVEYANCE PROJECT**

**Feasibility Study - Environmental,
Technical and Economic
and
Environmental and Social Assessment**

Terms of Reference

April 19, 2005

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Part A – Overview

1 INTRODUCTION

1.1 The Context

Since ancient times the Dead Sea has been a centerpiece to the history and development of three cultural and religious traditions. The Dead Sea and its unique environment are changing. The water level has been dropping at an alarming rate for decades. If no urgent action is taken to remedy the situation, the decline is likely to cause severe environmental damage. Such damage has already been incurred in the Dead Sea area as a result of the declining level. Eighty percent of the decline in the level of the sea since ancient times has occurred within the last 30 years. If nothing is done irreversible damages are predicted within the next 25 years.

The regional countries and the international community view the Dead Sea as a site of cardinal environmental, economic, and touristic importance as well as a site of international significance. A fundamental assessment is required of a wide spectrum of implications that influence the environment, industry, and tourism. Accordingly, support for “Saving the Dead Sea” is important to avoid the degradation of the Dead Sea environment, and to contribute to relations among neighbors and strengthen peace in the region.

Despite the recent setbacks with the Middle East Peace Process, work continued to move forward with cooperative projects and activities within the Dead Sea and Wadi Araba area. The Red Sea–Dead Sea Water Conveyance Project, or “Peace Conduit,” is one of the projects being promoted by Jordan and Israel, and indirectly by the Palestinian Authority. The hope is that this particular Project, if found feasible, will ultimately become an integral part of and catalyst for the overall framework for cooperation.

As articulated on several occasions, notably at the Johannesburg World Summit on Sustainable Development in August-September 2002 and at the Third World Water Forum in Kyoto in March 2003, the shared vision of the Red Sea–Dead Sea Water Conveyance Project, also referred to as the “Peace Conduit,” is to:

- Save the Dead Sea from environmental degradation.
- Desalinate water / generate energy at affordable prices for Jordan, Israel, and the Palestinian Authority.
- Build a symbol of peace and cooperation in the Middle East.

The Project would constitute a major opportunity for the stakeholders to work together in its preparation, construction, and operation. If successful, this would constitute a major breakthrough in relationship-building in the region. So far, the closest collaboration on this vision has been between Israel and Jordan. The Palestinian Authority has been following the Project’s proceedings without being directly involved, but, will, as one of the beneficiary Parties (Jordan, Israel and Palestinian Authority) be directly involved technically and professionally in the Feasibility Study and Environmental and Social Assessment process.

If the Project is found to be feasible and implemented, crucial additional water resources resulting from the Project may become available to the beneficiary Parties. Cooperation amongst them will be enhanced. Global interest in this Project and the sustainability of water resources in the region will greatly depend on the degree of cooperation demonstrated by all involved. It would be advantageous for the beneficiary Parties to move towards sharing the benefits that can be generated from the water and the shared vision. The Red Sea–Dead Sea Water Conveyance Project, if proven to be feasible, could well provide a practical vehicle for working together to bring about major positive changes in the region.

The Red Sea - Dead Sea Water Conveyance Project Terms of Reference shall only consider the technical and financial aspects of the proposed Project and shall not in anyway prejudice the riparian rights of any of the beneficiary Parties.

1.2 Water Sector Related Challenges and Options

Water in the Jordan River Basin is a scarce resource whose availability is far below the competing demands for water for all purposes. Freshwater availability in the region is less than half the 500 cubic meters per capita per year, commonly used as standard for water scarcity. Population growth rate in the region is one of highest in the world. Water reaching the Dead Sea is substantially declining causing the sea level to fall at an alarming rate.

The main water challenge is to find a way to both arrest the fall of Dead Sea and restore it and at the same time address the growing water demand. Any improvement in water utilization is expected to primarily be used to meet these demands.

No degree of reform and change in management of freshwater resources in the region is likely to keep pace with the demand, attain even the minimum standard of water availability or significantly contribute to the restoration of the Dead Sea.

Consequently, other alternatives to arrest the fall and restoration of the Dead Sea would have to be explored. At this time, the conveyance of water from the Red Sea to the Dead Sea has been identified as the alternative to investigate for saving the Dead Sea.

1.3 The Concept and Its Evolution

The concept of an inter-sea transfer between the Mediterranean Sea and Dead Sea, as well as between the Red Sea and Dead Sea has been studied in many forms since the 1800s and more seriously since the mid-twentieth century. The 400-meter difference in elevation between the Red Sea (or the Mediterranean Sea) and the Dead Sea has long been enticing because of its gravity flow advantage and considerable potential for the generation of hydropower. Many plans have been drawn to bring seawater from either sea via tunnels, canals or pipelines to the Dead Sea to generate electricity and/or desalinate the seawater. The present concept, stemming from earlier peace negotiations between Jordan and Israel, proposes an alignment from the Red Sea for approximately 12 km following the border; thereafter the alignment will entirely be in Jordanian territory.

The concept currently under consideration places a high priority on restoration of the Dead Sea and involves three elements: Element 1 – Red Sea water conveyed to the Dead Sea via a “Peace Conduit;” Element 2 – a hydropower facility and a desalination

plant to be built close to the Dead Sea to produce potable water from a part of the water transferred and to provide energy,¹ and Element 3 – potable water distribution via pipelines to municipalities in Jordan, Israel, and the Palestinian Authority.

The concept of transferring water from the Red Sea into the Dead Sea could serve various purposes for many stakeholders and beneficiaries, including:

- A means of arresting and reversing the environmental degradation of the Dead Sea region.
- A potential solution to short-, medium- and long-term drinking and tourism water needs in Jordan, Israel, and the Palestinian Authority.
- A means of protecting a unique region of the world with cultural, religious and political significance.
- A mechanism for the economic development of the Dead Sea area and Wadi Araba, focusing on the expansion of tourism.
- An opportunity for the involved government entities in the region to work together on a major Project of mutual interest with a view to increasing the prospects for peace, security, and prosperity in the region.

As is normal in such cases, different stakeholders have different interests and rank the potential benefits of the Project in different ways. This is reflected in the recent history of the concept, which has at different times been promoted and marketed with a water supply focus, an environmental focus, and as a peace conduit. The phrase “promoted and marketed” is used advisedly, because the proponents of the Project have been alerted to the possibilities of obtaining financing from different sources which themselves have different interests. At times, the concept has been viewed as a water supply Project with positive environmental benefits, while more recently it has been promoted as an environmental Project with potential water supply benefits. The latter approach is the subject of the Feasibility Study for which these Terms of Reference (TOR) are written.

This approach will permit the Project to evaluate actions to address the Dead Sea decline even if the water supply options prove not to be feasible.

1.4 Objective and Scope of This Feasibility Study

This document sets out the Terms of Reference for the study of the Technical, Economic, and Environmental Feasibility of the Red Sea-Dead Sea Water Conveyance Project (RDP) hereafter referred to as the “Feasibility Study” and a full Environmental and Social Assessment.

The objective of the Feasibility Study is to investigate the feasibility of the Project as a solution to the decline of the Dead Sea. The outcome of the Feasibility Study and

¹ Taking advantage of the elevation drop at the Dead Sea, this Element also includes construction of a hydropower generating station to provide energy to the desalination plant and to generate limited hydropower for potential sale in the region.

the Environmental and Social Assessment will serve as a tool for stakeholders to determine whether the construction of the Red Sea-Dead Sea Water Conveyance Project is feasible, taking into account all relevant aspects including the technical, economic, financial, environmental, and social factors. This process will also provide an opportunity for a diverse range of stakeholders, including Civil Society Organizations and Nongovernmental Organizations, to provide their views on the proposed Project. It will provide a sound basis for decision making.

The study will examine the costs and benefits of the proposed Project. The cost-benefit analysis will assess and quantify, wherever possible, the environmental and social benefits and costs of the Project. It should be noted that the Red Sea-Dead Sea Water Conveyance Project is likely to have both environmental and social benefits and environmental and social costs.

The feasibility of the Project will be studied in an efficient and professional manner based on previously available information as well as on additional studies and investigations to be carried out specifically for the Project. The primary goal of the Feasibility Study is to evaluate conveyance of water from the Red Sea to the Dead Sea as a solution for addressing the environmental problems of the Dead Sea and the possibility of sea water desalination and use as a positive consequence.

This Terms of Reference lays out the elements on which the Feasibility Study and Environmental and Social Assessment should focus. Although the scope of the Terms of Reference is limited geographically (and to a degree technically,) it is designed to be carried out within a comprehensive development framework with a multi-disciplinary approach.

2 STRATEGIC STEPS IN THE RED SEA – DEAD SEA WATER CONVEYANCE PROJECT

The strategic approach for the Project may include the following steps, from receipt of the draft Terms of Reference to implementation if the Project is found to be feasible and acceptable:

- Validate the Shared Regional Vision for the Project.
- Review framework for cooperation/collaboration and development of working arrangements.
- Present the Terms of Reference to the public and potential donors and secure funds for the Feasibility Study and Social and Environmental Assessment.
- Carry out the Feasibility Study and Environmental and Social Assessment, including public consultations.
- Disclose Feasibility Study and Environmental and Social Assessment results and carry out further public consultations.
- If found to be feasible, finalize the preferred alternative/option for Project configuration.

- Create the necessary agreements and institutions for Project implementation.
- Finalize engineering design, costing, and schedule.
- Finalize the Environmental and Social Assessment Plan, including costing and schedule.
- Prepare detailed engineering and bidding documents.
- Secure financial commitments for the Project.
- Initiate procurement procedures and prepare for construction.

Part B – The Study Program

3 OVERVIEW OF THE STUDY PROGRAM

3.1 Introduction

The Study Program consists of a full technical, economic, environmental and social evaluation of the proposed Red Sea–Dead Sea Water Conveyance Project through preparation by independent Consultants of a Feasibility Study and an Environmental and Social Assessment. Policy Statements on Water Resources Management that provide an overview of the policies in the context of the Dead Sea and identify ongoing and planned actions to address broader water resources management issues will be prepared in the region.

The Study Program will make a specific point of:

- Carrying out the analysis of a wide range of technical, economic, financial, environmental, social and institutional issues to the highest professional standards.
- Attaching value to each of these issues to ensure that each receives its appropriate consideration.
- Evaluating whether the overall benefits exceed the costs to determine whether the Project is feasible, and if so, at what technical, economic, environmental, and social costs.
- Undertaking these tasks and studies in a way that reflects and respects the unique political context of the Middle East.

In order to support an objective evaluation of the Project, the Feasibility Study and Environmental and Social Assessment will be conducted by two separate consulting firms that will be authorized to work in an interactive manner to allow for the effective and timely exchange of information. Recognizing the significant expertise and experience in the region, a series of four Sub-Studies will be prepared to serve as building blocks for preparation of the Feasibility Study and Environmental and Social Assessment. These Sub-Studies will allow for the effective use of the findings from earlier studies and allow for coordination with teams that are conducting ongoing studies with a view of incorporating their expertise and knowledge, to the extent possible, into the work described in this Terms of Reference.

The two independent consulting firms will work with the beneficiary Parties in the planning and conduct a series of public consultations to be carried out by Jordan, Israel, and Palestinian Authority regarding the technical, economic, environmental and social aspects of the Project. The Feasibility Study and Environmental and Social Assessment will be disclosed in draft and final form to support public discussion and debate concerning the proposed Project.

3.2 Supervision and Oversight of the Study Program

Role and Mode of Operation of the Technical Steering Committee. This committee will be responsible for the overall oversight of the preparation of the Feasibility Study and the Environmental and Social Assessment. The Committee will direct the activities of the Project Management Unit. A more detailed description of the Technical Steering Committee is provided in Chapter 15.

Role and Mode of Operation of the Project Management Unit. The Project Management Unit will be responsible for supervision and management of the preparation of the Feasibility Study and the Environmental and Social Assessment. The Project Management Unit will be directed by and report to the Technical Steering Committee. The Project Management Unit will oversee the activities of the consultants on a day-to-day basis and will provide reports on progress of the studies to the Technical Steering Committee. A more detailed description of this Unit is provided in Chapter 16.

Cooperation and Coordination between the two Prime Consultants. It is essential for the efficient and timely preparation of both the Feasibility Study and the Environmental and Social Assessment that the management of two Prime Consultants work in a fully coordinated, open, and collaborative manner. Under the supervision of the Project Management Unit, they will jointly develop and implement a complementary work program in accordance with the Project schedule. In order to harmonize their work, their respective management and key specialists, including specialists undertaking the Sub-Studies will meet regularly and exchange information and data on a formal and informal basis. Interactions of specialists working for one prime consultant with the other prime consultants or its specialists will be coordinated through their management.

3.3 Elements of the Study Program

- **Policy Statement on Water Resources Management.** Given the complexity, sensitivity and importance of water resources management challenges. Policy Statements on Water Resources Management that provide an overview of the policies in the context of the Dead Sea and identify ongoing and planned actions to address broader water resources management issues will be prepared in the region.
- **Feasibility Study.** This will be a comprehensive Feasibility Study that will review and assess in an integrated manner the technical, economic, environmental, and social dimensions of the proposed Project. The Feasibility Study includes identification and evaluation of relevant technical aspects of the Project at the pre-feasibility level including review of alternative sites for project components, evaluation of technologies and design standards and a preliminary layout for these investments including cost estimates and implementation schedule.

The environmental impacts of the Project on the Red Sea, Wadi Araba and the Dead Sea are integral and central parts of the Feasibility Study. It should be established that on the long-run, the Project will not result in damages to the Dead Sea that surpass current and future degradation in the no-action alternative. The impact of pumping large volumes of seawater from the Red Sea needs to be

quantified. Environmentally and seismically sensitive areas should be identified and considered during the final selection of the alignment.

An element of the Feasibility Study is preparation of an evaluation of the overall Economic and Financial Aspects of the proposed Project. This would include use of an analytical approach that recognizes the complexity of the issues involved and the uncertainties regarding the values to be placed on the numerous non-quantifiable costs and benefits. The approach would be based on the concept of “revealed preference” and is outlined later in this Terms of Reference.

- **Environmental and Social Assessment.** This will be a comprehensive Environmental and Social Assessment that will review and assess the potential environmental and social impacts of the proposed Project at the regional and project specific level. It will include an assessment of potential positive and negative impacts, review alternatives to the proposed Project (including the “no-action” or “without-Project” alternative,) and provide an Environmental and Social Management Plan (ESMP) that outlines measures to avoid or mitigate impacts, as well as provisions for monitoring.
- **Four Key Sub-Studies.** Preparation of both the Feasibility Study and Environmental and Social Assessment will benefit from the preparation of a series of four complementary Sub-Studies that would be prepared by interdisciplinary teams of specialists. The Sub-Studies will provide detailed examinations, based on existing studies and new investigations, for the following distinct elements of the Project:
 - **Gulf of Aqaba/Eilat**
 - **Water Conveyance**
 - **Dead Sea**
 - **Hydropower Facilities and Desalination Plant.**

Recognizing the wealth of knowledge and data relevant to the Feasibility Study and Environmental and Social Assessment that has been accumulated over the last 25 years, provisions have been made in the Work Program for the preparation of the Sub-Studies to draw heavily on regional expertise in order to fully benefit from previous experience, studies, and investigations into the issues associated with the proposed Project. In some cases these studies would be prepared by regionally-based organizations and institutions affiliated with governments, applied research institutes, and universities. The Sub-Studies would serve as key inputs to the Feasibility Study and Environmental and Social Assessment to be prepared by independent Consultants.

- **Integration of Environmental and Social Management Plan (ESMP).** Provisions have been made for integration of the ESMP, prepared as a key element of the Environmental and Social Assessment, into the Feasibility Study. This would allow the key mitigation and monitoring measures to be integrated into the preliminary and detailed design of the Project; including its overall cost

estimate, schedule for Project preparation and implementation; and into spatial planning and land use management plans.

- **Consultation and Disclosure.** The Study Program includes specific provisions for public consultation during the preparation of the various studies and their disclosure to the public. These consultations will take place during all three phases of the Study Program and will be documented in the Feasibility Study and Environmental and Social Assessment. Key draft and final documents prepared under the work program will be disclosed in Jordan, Israel, and Palestinian Authority and at the InfoShop of the World Bank.
- **Post Study Program Processes and Activities.** Following completion of the Study Program and its acceptance, the Project would proceed into a detailed design phase. This will include legal, institutional, technical/engineering, environmental/social, and financial steps and processes that would be undertaken. The Consultant is expected to provide a preliminary checklist of these potential actions for use by the Technical Steering Committee.

3.4 Three Phase Process

The Study Program for the Feasibility Study and Environmental and Social Assessment will be carried out in three phases and will include in Phases 1 and 2 the preparation of the four Sub-Studies.

3.4.1 Phase 1 – Inception Reports, Review of Existing Studies, and Identification of Gaps in Knowledge

In Phase I, the Consultants for the Feasibility Study and Environmental and Social Assessment will prepare Inception Reports and a proposed Joint Work Plan for Public Consultation. The Consultants for the four Sub-Studies will focus their efforts on the submission of Work Plans for Phase I, identification of gaps in knowledge and data, and proposals for additional studies to be undertaken during Phase II. All Consultants will participate in public consultations on the Study Program.

Consultant for the Feasibility Study. In Phase I the Consultant for the Feasibility Study will:

- Participate in Launch Workshop for Study Program with the Consultant for the Environmental and Social Assessment and Consultants for the Sub-Studies.
- Submit Inception Report for Feasibility Study.
- Submit with the Consultant for the Environmental and Social Assessment a proposed Combined Work Plan for the Public Consultations.
- Submit Inception Report for Environmental and Social Assessment.
- Submit Combined Plan for Public Consultations.

- Assist the Project Management Unit with public consultations on the Study Program, including Terms of Reference for the Feasibility Study and Environmental and Social Assessment.
- Submit a Joint Report with the Consultant for the Environmental and Social Assessment on the public consultations.
- **Consultant for the Environmental and Social Assessment.** In Phase I the Consultant for the Environmental and Social Assessment will:
 - Participate in Launch Workshop for the Study Program with the Consultant for the Feasibility Study and Consultants for the Sub-Studies.
 - Submit Inception Report for Environmental and Social Assessment.
 - Submit with the Consultant for the Feasibility Study a proposed Combined Work Plan for the Public Consultations.
 - Assist the Project Management Unit with public consultations on Study Program, including Terms of Reference for the Feasibility Study and Environmental and Social Assessment.
 - Submit a Joint Report with the Consultant for the Feasibility Study on the public consultations.
- **Sub-Studies.** In Phase I the Consultant preparing the Sub-Studies will:
 - Participate in Launch Workshop for Study Program with Consultants for the Feasibility Study and Environmental and Social Assessment.
 - Submit Work Plan for Phase I of each Sub-Study.
 - Identify and review existing, ongoing and planned studies and evaluate their relevance and contribution to the tasks of the Feasibility Study and Environmental and Social Assessment.
 - Identify the gaps in knowledge and data for the purpose of preparing the Feasibility Study and Environmental and Social Assessment.
 - Conduct technical workshops to review the scope of potential additional studies to be carried out and the plan for their implementation.
 - Propose additional studies to be undertaken during Phase 2.

3.4.2 Phase 2 – Preliminary Draft Reports, New and Additional Studies

In Phase II, the Consultants for the Feasibility Study and Environmental and Social Assessment will undertake field and desk studies that complement the Sub-Studies and prepare preliminary drafts of their reports. In parallel the Consultants for the Sub-Studies will undertake new and additional studies identified at the conclusion of Phase

I, to be carried out following review and approval by the Steering Committee of the work plan, schedule and budget.

Activities during Phase 2 will include:

- **Consultant for the Feasibility Study.** In Phase 2 the Consultant for the Feasibility Study will:
 - Conduct various Field Based and Desk Studies for the Feasibility Study.
 - Coordinate with specialists and receive from the interim Sub-Studies information to support the Preliminary Feasibility Study.
 - Prepare the Draft Economic and Financial Study and the Institutional and Legal Study.
 - Prepare the Preliminary Draft Feasibility Study.

- **Consultant for the Environmental and Social Assessment.** In Phase II the Consultant for the Environmental and Social Assessment will:
 - Conduct various Field Based and Desk Studies for Environmental and Social Assessment.
 - Coordinate with specialists and receive from the interim Sub-Studies information to support the Preliminary Environmental and Social Assessment.
 - Prepare Preliminary Environmental and Social Assessment.

- **Sub-Studies.** In Phase 2 the Consultant preparing the Sub-Studies will:
 - Analyze the progress made in the ongoing studies identified in Phase I and incorporate their results in the Phase 2 Reports.
 - As approved by the Technical Steering Committee, carry out the new and additional investigations, surveys, studies and analyses identified as being incomplete at the conclusion of Phase 1.
 - Integrate the new studies and the existing studies identified in the course of Phase I into four Sub-Studies.
 - Assist the Project Management Unit with technical workshops to present the principal findings of the four Sub-Studies to the beneficiary Parties.

3.4.3 Phase 3 – Draft Final and Final Reports and Integration of Sub-Studies

During Phase 3, the two independent Consultants, with the support and assistance of the specialists that prepared the four Sub-Studies, will prepare the Final Draft and Final Feasibility Study and Environmental and Social Assessment. These consulting firms will use their own studies, as well as the inputs from the four Sub-Studies, to prepare their final Reports. As part of this process additional public consultations will be undertaken.

Activities during Phase 3 will include:

- **Consultant for the Feasibility Study.** In Phase 3 the Consultant for the Feasibility Study will:
 - Prepare the Final Economic and Financial Study.
 - Compile, integrate and evaluate all Sub-Studies to support preparation of Feasibility Study, which would include:
 - Review the four Sub-Studies;
 - Analyze the relevant findings and conclusions of the Sub-Studies;
 - Include in the Feasibility Study an evaluation of the intangible benefits of the Project as a whole; and
 - Integrate, as appropriate, the findings of the Sub-Studies into the Feasibility Study.
 - Integrate the elements of the Environmental and Social Management Plan into the implementation plan, cost estimate and schedule for the proposed Project.
 - Prepare Final Draft Feasibility Study, including the Final Economic and Financial Study.
 - Assist the Project Management Unit in public consultations on the Draft Final Feasibility Study and Environmental and Social Assessment.
 - Receive and Respond to Comments on the Draft Final Feasibility Study.
 - Prepare Final Report.
- **Consultant for the Environmental and Social Assessment.** In Phase III the Consultant for the Environmental and Social Assessment will:
 - Prepare the Final Draft and Final Environmental and Social Assessment.
 - Compile, integrate and evaluate all Sub-Studies to support preparation of the Environmental and Social Assessment:

- Compile, integrate and evaluate all Sub-Studies to support preparation of the Environmental and Social Assessment, this would include:
 - Review the four Sub-Studies;
 - Analyze the relevant findings and conclusions of the Sub-Studies;
 - Include in the Environmental and Social Assessment the evaluation of the intangible benefits of the Project as a whole; and
 - Integrate, as appropriate, the findings of the Sub-Studies into the Environmental and Social Assessment.
- Participate in public consultations on the Draft Final Feasibility Study and Environmental and Social Assessment.
- Receive and Respond to Comments on the Draft Final Environmental and Social Assessment.
- ***Sub-Studies Specialists.*** In Phase 3 the specialists for the Sub-Studies will provide support for preparation of the Feasibility Study and Environmental and Social Assessment as requested on specific issues.

Table 1 provides a schematic overview of the three phases and their respective deliverables.

Table 1 – Schedule of Phases and Deliverables from Consultants

	Phase 1	Phase 2	Phase 3
Duration	4 Months	15 Months	5 Months
Main Tasks	<p>Participate in Launch Workshop for Study Program</p> <p>Submit Inception Report for Feasibility Study</p> <p>Submit Inception Report for Environmental and Social Assessment</p> <p>Submit Combined Plan for Public Consultations</p> <p>Assist the Project Management Unit in public consultations on Work Program, including Terms of Reference for Feasibility Study and Environmental and Social Assessment</p> <p>Submit Proposed Work Program for 4 Sub-Studies</p> <p>Compile, Review and Evaluate Existing and Ongoing Studies, including interim report for the sub-studies</p> <p>Prepare Study Proposal for Phase 2</p>	<p>Conduct Various Field Based and Desk Studies for the Feasibility Study</p> <p>Prepare Preliminary Draft Feasibility Study, including Draft Economic and Financial Study</p> <p>Conduct Various Desk and Field Studies for Environmental and Social Assessment</p> <p>Prepare Preliminary Draft Environmental and Social Assessment</p> <p>Conduct studies on areas identified as Knowledge Gaps in 4 Sub-Studies</p> <p>Propose plan to the Project Management Unit and assist in targeted Public Consultations to Support Study Program</p>	<p>Prepare Final Draft and Final Feasibility Study, including Economic and Financial Study</p> <p>Prepare Final Draft and Final Environmental and Social Assessment</p> <p>Compile, integrate and evaluate all Sub-Studies to support preparation of Feasibility Study and Environmental and Social Assessment</p> <p>Assist the Project Management Unit in public consultations on the Draft Final Feasibility Study and Environmental and Social Assessment</p>
Output	<p>Interim Report on:</p> <ul style="list-style-type: none"> - Existing Studies - Gaps in knowledge - Studies proposed for Sub-Studies during Phase II 	<p>Draft and Final Reports on the Four Sub-Studies</p> <p>Reports on Public Consultations on the Four Sub-Studies</p>	<p>Draft Final and Final Feasibility Study</p> <p>Draft Final and Final Economic and Financial Study</p> <p>Draft Final and Final Environmental and Social Assessment</p> <p>Report on Public Consultations on Draft Final Studies</p>

Table 1 – Schedule of Phases and Deliverables from Consultants			
	Phase 1	Phase 2	Phase 3
Major Deliverables	Inception Report for Feasibility Study	Preliminary Draft Feasibility Study	Final Draft and Final Feasibility Study
	Inception Report for Environmental and Social Assessment	Preliminary Draft of Economic and Financial Study	Final Draft and Final Economic and Financial Study
	Plan for Public Consultation Process	Preliminary Draft Environmental and Social Assessment	Final Draft and Final Environmental and Social Assessment
	Proposed Work Program for 4 Sub-Studies	Reports from Sub-Studies: Gulf of Aqaba/Eilat-Calibrated dynamic models for various scenarios of pumping	Report on Final Public Consultations Meetings
	Report on Initial Public Consultation Meetings	Water Conveyance-Geotechnical investigations Dead Sea-Calibrated dynamic models for various brine disposal scenarios Hydropower Facilities and Desalination Plant-Technical, economic, and environmental evaluation	
Performing Team	Prime Consultant for Feasibility Study, including Sub-Studies	Prime Consultant for Feasibility Study, including Sub-Studies	Prime Consultant for Feasibility Study, including Sub-Studies
	Prime Consultant for Environmental and Social Assessment	Prime Consultant for Environmental and Social Assessment	Prime Consultant for Environmental and Social Assessment

3.5 Outline of the Reports

3.5.1 Red Sea–Dead Sea Water Conveyance Project – Feasibility Study - Environmental, Technical, and Economic

The Feasibility Study Report would have the following structure:

- *Executive Summary*
- *Main Report - Part A: Overview*
 - Background
 - Description of Proposed Project

- Policy, Legal and Administrative Framework
- **Main Report - Part B: Gulf of Aqaba/Eilat**
 - Environmental, economic, technical, financial and legal
- **Main Report - Part C: Alignment and Water Conveyance**
 - Environmental, economic, technical, financial and legal
- **Main Report - Part D: The Dead Sea**
 - Environmental, economic, technical, financial and legal
- **Main Report - Part E: Hydropower Facilities and Desalination Plant**
 - Environmental, economic, technical, financial and legal
- **Main Report - Part F: Overall Feasibility Assessment**
 - Executive Summary
 - Introduction
 - Technical Aspects, including engineering and geotechnical
 - Economic and Financial Feasibility
 - Environmental and Social Impact of the Proposed Project
 - Environmental and Social Management Plan
 - Integration of Studies into a Decision Framework
- **Main Report - Part G: Public Consultation and Discussion**
 - Introduction
 - The Process
 - Outcomes from Consultations
- **Annexes of Supporting Documents**
 - List of Preparers
 - Technical data and design details
 - Record of Meetings (Governments, agencies, etc.)
 - Record of Public Consultations
 - Public Consultation and Disclosure Plan for the Implementation Period

- List of References.

3.5.2 Red Sea–Dead Sea Water Conveyance Project – Environmental and Social Assessment Report

The Environmental and Social Assessment would have the following structure:

- ***Executive Summary (Covering Parts A, B and C)***
- ***Main Report - Part A: Overview***
 - Background
 - Description of Proposed Project
- ***Main Report - Part B: Regional Environmental and Social Assessment***
 - Key Environmental and Social Baseline Conditions
 - Analysis of Marine and Coastal Management in the Upper Gulf of Aqaba/Eilat
 - Analysis of the Wadi Araba
 - Analysis of the Dead Sea
 - Assessment of Environmental and Social Impacts
 - Evaluation of Induced Impacts
 - Special Risks
 - Evaluation of Cumulative Regional Impacts
 - Analysis of Regional Alternatives (including No-Action Alternative)
 - Environmental and Social Management Plan
 - Mitigation Measures
 - Monitoring Measures
- ***Main Report - Part C: Project Specific Environmental and Social Assessment***
 - Environmental and Social Baseline Conditions
 - Environmental and Social Analysis
 - Upper Gulf of Aqaba/Eilat
 - Aqaba and Eilat Region
 - Wadi Araba

- Dead Sea Region
- Environmental Conditions of the Dead Sea
- Impact of Mixing Red Sea and Dead Sea Waters
- Impact on Groundwater
- o Environmental and Social Impacts
- o Impacts to Archeological, Historical and Cultural Sites
- o Occupational Health and Safety
- o Health and HIV/AIDS Risks
- o Evaluation of Induced Impacts
- o Special Risks
- o Evaluation of Cumulative Project Specific Impacts
- o Analysis of Project Specific Alternatives (including “No-Action Alternative”)
- o Project Specific Environmental and Social Management Plan
 - Mitigation Measures
 - Monitoring Plan
 - Resettlement and Land Acquisition Policy Framework / Resettlement and Land Acquisition Plan
 - Indigenous Peoples Development Framework / Indigenous Peoples Development Plan
 - Occupational Health and Safety Plan
 - Health and HIV/AIDS Management Plan
- o Institutional Strengthening and Training Plan
- o Public Consultation and Discussion
- ***Annexes of Supporting Documents***
 - o List of Prepares
 - o Record of Meetings (Governments, Agencies, etc.)
 - o Record of Public Consultation

- Public Consultation and Disclosure Plan for the Implementation Period
- List of References
- Archaeological and Historical Sites Survey
- Archaeological Chance Find Procedures
- Social Assessment
- Resettlement and Land Acquisition Policy Framework
- Resettlement and Land Acquisition Plan(s)
- Indigenous Peoples Development Framework
- Indigenous Peoples Development Plan(s)
- Occupational Health and Safety Plan
- Health and HIV/AIDS Assessment and Management Plan
- Detailed Corridor Location Maps (in ArcGIS or a compatible format) for Key Baseline Data and Constraints, including all Project Facilities and Water Conveyance Alignment
- Detailed Corridor Location Maps (in ArcGIS or a compatible format) for All Mitigation Measures and Recommended Actions, including all Project Facilities and Water Conveyance
- Copies of Clearances from Concerned Ministries.

3.5.3 Red Sea–Dead Sea Water Conveyance Project – Sub-Studies Report

The Sub-Studies Report would have the following structure:

- ***Summary***
- ***Sub-Study A - Gulf of Aqaba/Eilat***
 - Technical, economic, environmental and social
 - Public consultation
- ***Sub-Study B - Alignment and Water Conveyance***
 - Technical, economic, environmental and social
 - Public consultation
- ***Sub-Study C - The Dead Sea***
 - Technical, economic, environmental and social

- Public consultation
- ***Sub-Study D - Hydropower Facilities and Desalination Plant***
 - Technical, economic, environmental and social
 - Public consultation
- ***Annexes of Supporting Documents***
 - List of Preparers
 - Technical data and design details
 - Record of Meetings (Governments, agencies, etc.)
 - Record of Public Consultations
 - List of References.

Part C – Sub-Studies

These studies constitute the building blocks for the overall Feasibility Study and the Environmental and Social Assessment.

4 SUB-STUDY A – GULF OF AQABA/EILAT

4.1 Introduction

4.1.1 Upper Gulf of Aqaba/Eilat

The continuous withdrawal of a substantial volume of seawater from the terminal point of the Gulf of Aqaba/Eilat to supply the conveyance has the potential to impact the coral reefs and fishery resources in the north end of the Gulf of Aqaba/Eilat. The withdrawal may modify Red Sea circulation to the extent that salinity and nutrient supply is changed over some part of the reefs, or it may redirect wastewater discharge plumes. Any potential increase in nutrient levels over the reefs is potentially harmful, as it promotes algae growth, which interferes with the ability of the coral to re-colonize dead areas. It is essential to minimize alterations in the Red Sea circulation patterns so that possible reef impacts are kept to a minimum.

Coastal zone management in the upper Gulf of Aqaba/Eilat is complex due to the high intensity and competing uses made of this area, which include commercial, industrial, military, recreation, and tourism uses. The construction period for the Project could lead to loss of a limited area of coastline, risk of suspended sediment in the nearshore waters, and risks of pollution from fuel, lubricants and wastes from construction equipment. The operational period may result in changes in local currents and water quality, restrictions on access in the vicinity of intake, and some reduction in recreational activities.

4.1.2 Aqaba/Eilat Region

Regardless of the chosen alignment, it is likely that there will be significant above-ground construction in the vicinity of Aqaba, which immediately adjoins Eilat. The construction involves the intake structure, the first sections of the conveyance, the pumping station needed to lift the water over the coastal ridge, and the electrical transmission facilities needed for the pumping station. Since this all takes place in a populated coastal region, there will be both ecological and social impacts of the construction and the later operation of the facilities. Dust and vehicle traffic will be important problems during construction. The operation of the pumping station will require significant amounts of electric energy, with related environmental impacts depending on the method of generation (most likely natural gas-fired steam-electric.) The introduction of non-resident construction workers to the area may have various social consequences, creating health risks including transmission of HIV/AIDS, as well temporary or permanent changes in local transportation networks.

4.2 Objectives of Sub-Study A

The objectives of Sub-Study A – Gulf of Aqaba/Eilat are to: (a) provide a technical review of the proposed sea water intake, pumping station and associated infrastructure, (b) assess potential impacts from pumping significant quantities of Red Sea water to the Dead Sea on a long-term basis from this ecologically and economically important area, and (c) review economic and financial aspects of the proposed investments and their operation. The specialists working on the overall Economic and Financial Study will work with the teams preparing the Sub-Studies in conducting this review. The consultant is advised that regional specialists have been involved in the development of the oceanographic models that may be relevant to this study.

4.3 Tasks

4.3.1 Task 1 – Technical Aspects

The objective of this task is to identify and assess relevant technical aspects of the proposed sea water intake, pumping station, and associated infrastructure, including power supply, transmissions lines, and access roads. An additional issue is the disposal of waste materials from the excavation of the intake structure. Undertaking this task would include identification and evaluation of relevant technical aspects of the intake structure and related facilities at a pre-feasibility level, including review of alternative sites, evaluation of technologies and design standards, and a preliminary layout for these investments, including a cost estimate and implementation schedule.

The Consultant shall:

- Prepare an assessment of alternative sites, layouts and engineering for the construction and operation of the sea water intake and associated pumping facilities.
- Evaluate potential technologies for use in the sea water intake and pumping station.
- Prepare a study of energy needs and energy availability for pumping facilities; if additional power is needed for the pumping station, review alternative locations for the expansion of existing power plants or the construction of additional power plants.
- Prepare a preliminary layout for linking the pumping station to the power grid.
- Propose a layout for the supporting infrastructure.
- Identify suitable locations and methods for the environmentally sound disposal of waste materials from excavation of the sea water.
- Prepare preliminary cost estimates for the proposed investments, evaluate their operation and maintenance costs, and present a proposed schedule for their detailed design, tendering, construction and commissioning.

4.3.2 Task 2 – Identify and Assess Oceanographic Aspects

The objective of this task is to identify and assess the oceanographic aspects of the construction and operation of the sea water intake and pumping operations under the Project on the Gulf of Aqaba/Eilat. Identification will consist of projecting future conditions with the Project then comparing these with conditions without the Project. If alternative Project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance.

The Consultant shall:

- Prepare an assessment of baseline conditions prior to the construction and operation of the Project.
- Assess sea water pumping and its oceanographic impacts under a series of scenarios: (a) no action / no pumping, (b) a selected range of pumping levels up to 2 cubic km/year, and (c) at the proposed level of 2 cubic km/year.
- Study the impact of various pumping quantity scenarios and placement of pumping facilities on water circulation, upwelling/downwelling at the head of the Gulf of Aqaba/Eilat.
- Study various alternatives for the site selection and depth of water withdrawal for the sea water intake and pumping station.
- Review the impact of natural filtration versus artificial filtration on water quality, operational cost, water circulation, etc.

4.3.3 Task 3 – Identify and Assess Environmental and Social Impacts in the Gulf of Aqaba/Eilat and the Aqaba/Eilat Region

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project in: (a) coastal and marine environment of the Gulf of Aqaba / Eilat; and (b) terrestrial environment in the Aqaba/Eilat Region. This will consist of projecting future conditions with the Project, then comparing this with conditions without the Project. If alternative Project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance.

The Consultant shall:

- Assess the impacts of the construction and operation of the conveyance on the water quality and current patterns in the upper Gulf of Aqaba/Eilat.
- Identify and assess possible impacts on the marine environment and coastal zone in the upper Gulf of Aqaba/Eilat from the construction and operation of the Project.

- Evaluate the potential short-term and long-term impacts of the Project on coral reefs and other elements of the marine ecosystem of the upper Gulf of Aqaba/Eilat.
- Identify and assess impacts of the construction and operation of the Project on the coastal zone of the upper Gulf of Aqaba/Eilat including impacts on navigation, fishing, recreational and tourism activities.
- Assess air quality impacts from the generation of power for the pumping station and its operation. Review potential changes to the transport network in marine and terrestrial areas due to the construction and operation of the sea water intake and associated infrastructure.
- Identify and assess social impacts of construction and operation of the Project in the Aqaba/Eilat region, including the temporary influx of construction workers.

4.3.4 Task 4 – Identify and Assess Economic Aspects of the Sea Water Intake and Pumping Station

The objective of this task is to prepare a preliminary review of the economic and financial aspects of the construction, operation and maintenance of the sea water intake, pumping station, and associated facilities.

The Consultant shall:

- Assess the construction cost of the sea water intake and pumping station.
- Review the current and planned availability of electrical power for operation of the sea water intake and pumping station.
- Evaluate the potential economic impacts of the construction and operation of the sea water intake and pumping station on:
 - Regional economy of the Gulf of Aqaba/Eilat area.
 - Navigational activities at the head of the Gulf of Aqaba/Eilat.
 - Tourism infrastructure and operations during Project construction and operation.
 - Recreational activities for international, regional and local user groups.
 - Fishing industry during Project construction and operation.

5 SUB-STUDY B – WATER CONVEYANCE

5.1 Introduction

The 1998 Prefeasibility Study considered fourteen different alternatives for various alignments and conveyance elevation. The alternatives were reduced to less than six and eventually to a preferred option. A brief review of all the alternatives considered in the past and any new ones that may emerge is essential to help guide the selection of a set of preferred alternatives for a detailed Feasibility Study.

5.2 Ecological Connectivity in Wadi Araba

The Red Sea–Dead Sea conveyance will extend for approximately 180 km south to north along the Wadi Araba. Depending on the alignment, water conveyance mode, and construction method, east-west ecological connectivity may be disrupted in Wadi Araba. Movement of people and animals may be obstructed to some extent, as well as surface water flows from side wadis intersected by the conveyance. A tunnel for conveyance of water may cross as many as nineteen major side wadis. Although surface water flow will not necessarily be affected, the tunnels may pass through the alluvial aquifers, altering groundwater flow patterns. The alternative of a piped water conveyance structure, depending on the alignment and configuration (buried on the wadi floor or laid along the valley side) could also affect the east-west ecological connectivity.

5.3 Objectives of Sub-Study B

The objectives of Sub-Study B – Water Conveyance are to: (a) provide a technical review of the proposed water conveyance structure, pumping stations and infrastructure, (b) assess potential impacts from pumping significant quantities of Red Sea water to the Dead Sea on a long-term basis through the environmentally and ecologically sensitive Wadi Araba, (c) assess environmental sensitivity, geological hazards and seismicity, and (d) review engineering, economic and financial aspects of the proposed investments and their operation. The specialists working on the overall Economic and Financial Study will work with the teams preparing the Sub-Studies in conducting this review. The consultant is advised that regional specialists have been involved in the geological and geotechnical investigations that may be relevant to this study.

5.4 Tasks

5.4.1 Task 1 – Revisit Red Sea – Dead Sea Alternatives Previously Considered and Rejected

The objective of this task is to document the historical decisions that were taken for each Red Sea – Dead Sea alternative by examining the justifications advanced for those decisions at the time they were taken. The objective of this task is not to re-open these decisions, but rather to provide a context for the current situation by setting out clearly the basis for the decisions taken (e.g., economic, environmental, financial, technical, political, or a combination).

The Consultant shall:

- Review, summarize, and tabulate the Red Sea – Dead Sea alternatives that were examined in the course of the Prefeasibility Study and ultimately rejected. Utilizing the most recent available information and data, the previously considered and rejected alternatives should be compared in terms of potential sustainability for both environmental impacts and economic costs. Irreversible and/or unavoidable impacts along with potential mitigating actions should be re-examined. The “no action” alternative should be included, in order to demonstrate which impacts are irreversible or unavoidable. The geopolitical, economic, and technical implications of each alternative should also be included. A listing and brief description of these alternatives reproduced from the 1998 Prefeasibility Study Report is given in Annex 2.

5.4.2 Task 2 – Update the Preferred Conveyance Alternative as Given in the Prefeasibility Study

The Consultant shall:

- Prepare a detailed description of the proposed water conveyance alternatives, including the various alignment options and transfer conveyances considered or proposed. The description should include the technical, engineering, economic, social, and environmental aspects of the alternative as presented in the 1998 Prefeasibility Study Report and those proposed since. For example, the pipeline option (versus a tunnel), modular approach to allow for phased investment for water transfer should be evaluated.
- Revise and update the proposed alternatives as necessary to reflect current conditions in sufficient detail to allow environmental, social, and economic/financial analysis of the alternatives in the Feasibility Study. A discussion of the issues related to alignment, pumping energy needs, and tradeoffs among the environmental, cooperation, water supply, and power generation objectives of the Project should be included.
- In updating the proposed alternatives, include an engineering and geotechnical evaluation of the environmentally safest alignment, examine the options of a closed versus an open design for the water conveyance structure, and review design and operational measures for effectively coping with seismic events.

5.4.3 Task 3 – Identify and Assess Environmental and Social Impacts in the Wadi Araba, Including Geological and Hydrological Aspects

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project. This will consist of projecting future conditions with the Project, then comparing this with conditions without the Project. If alternative Project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance.

The Consultant shall:

- Assess the geological and seismic hazards and define geologically sensitive areas on maps.

- Identify and assess environmental impacts of construction and operation of the Project in the Wadi Araba, including impacts related to loss of ecological connectivity across the conveyance and associated risks to natural habitats and biodiversity.
- Identify and assess environmental impacts associated with the potential need to have the conveyance cross a number of wadis, which could have an impact on their hydrology, sediment transport, and erosion characteristics.
- Identify and assess environmental and social impacts on the limited vegetation in Wadi Araba due to construction and operation of the conveyance along with the potential for successful stabilization of the land surface and revegetation where appropriate.
- Identify and assess aesthetic impacts associated with the construction and operation of the conveyance and associated structures, which will cross through an area viewed by many as a semi-natural setting of significant beauty.
- Assess impact of unidentified water leakage on groundwater resources and undertake mapping of leakage sensitive areas.
- Assess impact of a failure of the water conveyer, such as from an earthquake or other major event, on groundwater resources.
- Identify and assess social impacts of construction and operation of the Project in the Wadi Araba, including the impact of a temporary influx of construction workers and the impacts on the Bedouin and their herds.

6 SUB-STUDY C – DEAD SEA

6.1 Introduction

While the principal objective of the Red Sea-Dead Sea Water Conveyance Project is the stabilization of the Dead Sea level at a desired elevation, the inflow of Red Sea waters into the Dead Sea could have adverse impacts on the composition of the Dead Sea waters. The purpose of the Sub-Study is therefore to assess the impact of the inflow of Red Sea water (or brines) on the Dead Sea in order to determine whether the inflow will cause excessive damage.

6.2 Key Issues

6.2.1 Dead Sea Region

The Dead Sea is the environmental focal point of the whole of the Jordan Valley. The water surface is the lowest point on land (over 415 meters below sea level and dropping.) The topography, the climate and the elevation combine to produce a unique ecology and a landscape of exceptional global interest and value. The decline of the Dead Sea water level has already had a noticeable negative impact on this landscape. The sea level has fallen some 20 meters since the 1960s and continues to do so at an average rate of 0.80 meter per year. This has caused serious economic and

ecological impacts. If the situation is not corrected, the Dead Sea will continue to shrink to a new equilibrium with a much smaller surface area. As the Dead Sea level falls, groundwater inflows to the Sea increase and groundwater levels fall, drying freshwater springs on the wadi side slopes. This reduces access to fresh and brackish groundwater, seriously impacting existing economic activities in the Dead Sea area including tourism, agriculture, and light industry. Furthermore, the soil matrix around the Sea is collapsing as the water level falls, causing sinkholes and other structural damage.

Another set of environmental and economic impacts arises from the present rate of shoreline retreat. Large expanses of seabed have been exposed, creating unsightly conditions and with negative consequences for landscape values. This situation will continue to grow worse until the water level is stabilized. Also, the shoreline has receded away from existing tourism facilities (hotels, restaurants, spas), impacting regional economics and reducing amenities.

6.2.2 Mixing Red Sea and Dead Sea Waters

The physical, chemical and biological characteristic of the two water bodies, the Red Sea and the Dead Sea, are significantly different. The current understanding of the unique Dead Sea system is the product of decades-long data collection and systemization through continuous study. Yet, the outcome of mixing of these two water bodies over a time scale of decades is unknown and is extremely difficult to model and predict. Clearly, the Dead Sea will change its composition and characteristics—as they are known today or were in the past—if it receives a massive volume of water from the Red Sea. The magnitude and dynamics of the change in these characteristics (e.g. rate of mixing, surface water density, chemical composition, water temperature, rate of evaporation, mineral precipitation, biological activity, depth of stratification, etc.) which are all interrelated, can only be determined following careful limnological modeling based on deep insight into the unique Dead Sea system. Such dynamic modeling is crucial for evaluating the intrinsic environmental aspects and is essential for the technical design and mode of operation of the Red Sea-Dead Sea water conveyance.

In addition to chemical/physical impacts, the proposed inflows to the Dead Sea may have ecological consequences. At present, the Dead Sea aquatic ecology consists mostly of two microflora: the algae *Dunaliella parva* and halophilic red bacteria. Over time, inflows of seawater and/or desalination reject brine will alter the salinity gradient and chemical composition and inoculate the Dead Sea with potentially alien species, some of which may survive. Furthermore, the pollution from the Red Sea, especially from oil spills in the Gulf of Aqaba / Eilat, might find its way to the Dead Sea intake so that nutrients and toxic contaminants could make their way to the Dead Sea.

6.2.3 Impacts on Groundwater

Under current conditions, the groundwater aquifers are being drained at an accelerated rate due to the falling water level of the Dead Sea. There is evidence that freshwater springs on the hill slopes around the Dead Sea have dried up due to the fall of the groundwater level. Furthermore, dewatering of these aquifers seems to result in the collapse of surface and subsurface geological structures, causing numerous sinkholes

and general land subsidence and with accompanying destruction of roads, culverts, buildings, etc. A major issue to be evaluated is the specific hydrogeological relationship between the water level of the Dead Sea and the behavior of groundwater aquifers around it.

6.3 Objectives of Sub-Study C

The objectives of Sub-Study C – Dead Sea are to: (a) provide a technical review of the proposed water conveyance structure, pumping stations and associated infrastructure; (b) evaluate the long-term evolution of the Dead Sea of mixing large quantities of Red Sea water or brine on its limnological uniqueness, and (c) review economic and financial aspects of the proposed investments and their operation. The specialists working on the overall Economic and Financial Study will work with the teams preparing the Sub-Studies in conducting this review. The consultant is advised that regional specialists have been involved in the development of the limnological and hydrogeological models that may be relevant to this study.

6.4 Tasks

6.4.1 Task 1 – Assess the Hydrology and Water Balance of the Dead Sea

The Dead Sea has a complex hydrology driven by a combination of the surface/groundwater inflow sources on the one hand and evaporation and industrial uses on the other. Chemical composition of the Dead Sea and its density stratification are additional complicating factors in the hydrology of the Dead Sea. This task involves a review and update of the current hydrologic characteristics of the Dead Sea and assessment of the potential future scenarios with and without the Project.

The Consultant shall:

- Gather, review, and summarize the available literature and records on the hydrology of the Dead Sea.
- Evaluate temporal changes in the Sea’s hydrology as a result of reduced inflows and other factors such as climate change.
- Specifically, evaluate the incremental loss of fresh groundwater resources as a result of the fall in the level of the Sea.
- Update the water balance assessment and trends in and around the immediate area of the Dead Sea, including surface water, groundwater, precipitation, evaporation, and industrial abstractions.
- Specifically, update projections of the Sea’s level, surface area and volume.
- Evaluate the hydro-geological impact of the falling sea on the soil matrix around the Sea, with particular emphasis on the sinkholes being created around it and on the surrounding aquifers and springs.

6.4.2 Task 2 – Identify and Assess Environmental Impacts of Expected Changes to the Dead Sea

The objective of this task is to identify and assess all relevant environmental impacts of the Project on the Dead Sea. This will consist of evaluating the projected future conditions of the Dead Sea with the Project, then comparing this with conditions without the Project. If alternative Project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance.

The Consultant shall:

- Review the past and current studies/research related to the limnology of the Dead Sea with particular attention to the recent efforts by the Israeli and Jordanian scientists in modeling the dynamic limnology of the Dead Sea. This includes:
 - Study of the dynamics of stratification due to mixing.
 - Evaluation of the chemical impact of water mixing.
 - Assessment of micro-biological blooming such as intensity, duration and other parameters.
 - Review of the impact of inflow on the rate of evaporation and provide a long-term forecast for evolution of the Dead Sea with and without the project.
- Identify and assess environmental impacts of the introduction of seawater and/or reject brine to the Dead Sea, with particular attention to the changes in the chemical composition of the Dead Sea, salts precipitation, stratification of water column turnovers, and/or changes in ecology and appearance.
- Identify and assess impacts on the chemical extraction industry of the introduction of seawater and brine into the Dead Sea.
- Assess the impact of sinkholes and changes in underground water flows.
- Provide recommendations for the future water level of the Dead Sea and the optimal design of the discharge system; including:
 - Proposed amount and rate of seawater/reject brine inflow.
 - Proposed site for discharge of inflow in the Dead Sea.
 - Proposed depth below the surface of the Dead Sea for the discharge of the inflow.

6.4.3 Task 3 – Identify and Assess Environmental and Social Impacts in the Dead Sea Area

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project in the Dead Sea area. This will consist of evaluating the projected future conditions with the Project, then comparing this with conditions without the Project. If alternative Project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance.

The Consultant shall:

- Identify and assess environmental impacts of construction and operation of the Project in the Dead Sea area, including impacts related to desalination and electric generation facilities and the associated electric transmission lines.
- Assess the environmental and social impacts of the implementation and operation of the Project on the chemical facilities in Jordan and Israel.
- Identify and assess the social impacts of construction and operation of the Project in the Dead Sea area, including the impact of a temporary influx of construction workers, the impacts on the residents of the area adjacent to the Dead Sea, and on the management and staff of the business and tourist facilities adjacent to the Dead Sea, as well as other impacts on tourism.
- Identify and assess social impacts on the Bedouin and their herds in the Dead Sea area.

6.4.4 Task 4 – Identify and Assess the Economic Aspects of the Discharge of Sea Water and Brine into the Dead Sea

In this task the Consultant is required to study the economic aspects of the discharge of sea water and brine into the Dead Sea. This includes a review of the economic impact of these discharges on tourism infrastructure, health based tourism, and the chemical industries.

The Consultant shall:

- Evaluate the economic impact of raising the level of the sea on the tourism infrastructure along the shores of the Dead Sea and its implications for future tourism infrastructure investments.
- Assess the impact of the mixing of the Dead Sea waters on the therapeutic characteristics of the water and the economic impact on health tourism. This analysis should be based on the results from the studies (described above) on the limnological effects of the mixing of waters from different sources and / or the dilution of the upper layers of the sea.
- Examine the economic impact on the chemical industries that are based on the utilization of chemical substances of the Dead Sea. In this category the Consultant shall study and assess, as a minimum, the economic impact of:

- Changes in physical state and chemical composition of the water body.
 - Raising of the sea level on the evaporation ponds of the chemical industries in Jordan and Israel.
- Assess additional economic impacts, positive and negative, from a higher sea level, such as the reduction in the rate of formation of sinkholes, etc.

7 SUB-STUDY D – HYDROPOWER FACILITIES AND DESALINATION PLANT

7.1 Introduction

The Sub-Study D – Hydropower Facilities and Desalination Plants will provide a technical, environmental and social, and economic assessment of the issues associated with the site selection, construction, and operation of these elements of the Project. The hydropower plant will generate electricity based on the head created by the difference in elevation between the Red Sea and Dead Sea. This power will allow for operation of an associated desalination plant.

7.2 Objectives of Sub-Study D

The objectives of Sub-Study D – Hydropower Facilities and Desalination Plant are to: (a) provide a technical review of the proposed hydropower facilities, desalination plant, water pumping and distribution investments and associated infrastructure; (b) assess potential impacts from the construction and operation of these investments on a long-term basis on the Dead Sea Region; and (c) review economic and financial aspects of the proposed investments and their operation. The specialists working on the overall Economic and Financial Study will work with the teams preparing the Sub-Studies in conducting this review.

7.3 Tasks

7.3.1 Task 1 – Technical Aspects

The objective of this task is to identify and assess relevant technical aspects of the proposed hydropower facilities and desalination plant and their associated infrastructure including pumping stations, water distribution systems, and roads. An additional issue is the disposal of waste materials from the construction of these investments. Undertaking this task includes identification and evaluation of relevant technical aspects of the hydropower facilities, desalination plant and related facilities at a pre-feasibility level, including review of alternative sites, evaluation of technologies and design standards, and a preliminary layout for these investments, including a cost estimate and implementation schedule.

The Consultant shall:

- Prepare an assessment of alternative sites and layout of facilities for the construction and operation of the hydropower facilities and desalination plant.

- Evaluate potential technologies for use in the hydropower facilities and desalination plant.
- Prepare a layout and preliminary design for a brine disposal mechanism for approximately 800 MCM / year plant in a modular design for various quantities of desalinated water.
- Review and propose design standards and layout for the pumping and distribution systems for delivery of desalinated water to users. The Consultant shall:
 - Prepare a preliminary layout for the pumping stations and distribution systems for the delivery of desalinated water to users.
 - Prepare a layout for possible interface to supply desalinized water to the beneficiaries.
 - Prepare layout for pipelines to convey the desalinated water to the neighboring entities.
- Propose a layout for the supporting infrastructure.
- Prepare preliminary cost estimates for the proposed investments, evaluate their operation and maintenance costs and present a proposed schedule for their detailed design, tendering, construction and commissioning.

7.3.2 Task 2 – Identify and Assess Environmental and Social Impacts of Site Selection, Construction and Operation of the Hydropower Facilities and Desalination Plant

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project related to site selection, construction, and operation of the hydropower facilities for electricity generation and the desalination plant for drinking water production. This includes an evaluation of risks associated with geological aspects of site selection and those linked to groundwater impacts from leakage water or a failure at the desalination plant. This will consist of projecting future conditions with the Project, then comparing this with conditions without the Project. This will include an analysis of alternative site locations for the hydropower and desalination facilities and a comparative analysis of their potential impacts during both construction and operation.

The Consultant shall:

- Analyze geological conditions for proposed hydropower facilities and desalination plant site.
- Identify and assess environmental and social impacts of construction and operation of the hydropower facilities for electricity generation and desalination plant for drinking water production. This will include impacts related to the hydropower and desalination facilities as well as their support

facilities, storage yards, housing facilities, and the necessary electric transmission lines.

- Identify and assess social impacts of construction and operation of the hydropower facilities and desalination plant. Particular attention should be given to the effect of these facilities on the landscape aesthetics/values, cultural values, and tourism.
- Conduct sensitivity analysis of water (raw, desalinated and brine) leakage on groundwater resources at the proposed site for the desalination plant. This includes the mapping of leakage sensitive areas.
- Evaluate the potential impact of desalination plant failure (major break-down scenario) on groundwater resources.

7.3.3 Task 3 – Identify and Assess Environmental and Social Impacts of Drinking Water Pumping and Conveyance

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project related to drinking water production, pumping and conveyance. This will consist of projecting future conditions with the Project, then comparing this with conditions without the Project. If alternative Project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance.

The Consultant shall:

- Identify and assess environmental impacts of construction and operation of the desalination phase of the Project in the areas adjacent to drinking water transmission facilities. This includes a review of potential alignment alternatives and/or adjustments to alignments for these facilities, as well as impacts related to the pipelines themselves, including the pumping stations, storage tanks, and the necessary electric transmission lines.
- Identify and assess social impacts of construction and operation of the desalination phase of the Project in areas adjacent to drinking water transmission facilities. Particular attention should be given to the effect of these facilities on the landscape aesthetics/values, cultural values, and tourism.

7.3.4 Task 4 – Identify and Assess Economic and Financial Aspects of Hydropower Facilities and Desalination Plant

The objective of this task is to prepare a preliminary review of the economic and financial aspects of the construction, operation and maintenance of the hydropower facilities, desalination plant, and water distribution system.

The Consultant shall:

- Assess the installed cost of the hydropower facilities to energize a desalination plant with rated capacity of 800 MCM/year of Red Sea water, to be installed and brought into operation in a phased manner.
- Assess the operation and maintenance costs of the above hydropower facility, to be installed and brought into operation in a phased manner.
- Assess the installed cost of an 800 MCM / year desalination plant, developed in a modular design.
- Assess the operation and maintenance costs of an approximately 800 MCM / year plant, adopting the modular design described above.
- Assess the operation and maintenance costs of the water distribution system.
- Develop a preliminary analysis for the cost of water produced by the desalination plant under a series of scenarios.
- Analyze the impact of increased freshwater availability from the desalination plant on regional development for the beneficiary Parties.

Part D - Overall Feasibility of Project

8 OVERALL ECONOMIC AND FINANCIAL ASPECTS

8.1 Introduction

A classical benefit-cost approach to economic feasibility would be too narrow given the complexity of the issues involved and the uncertainties regarding the values to be placed on the numerous non-quantifiable costs and benefits. Rather, the approach that should be followed in the Feasibility Study borrows more from the economic concept of “revealed preference.” This concept is commonly used in the water sector in situations where the amount that a beneficiary or consumer is willing to pay for water is accepted as a proxy for the minimum value of that water to that particular beneficiary or consumer.

A similar approach can be taken concerning the intangible benefits created by the Project. If a donor, financier, or even the global community is willing to pay to save the Dead Sea, then saving the Dead Sea must be worth at least the cost of the investment required to achieve the benefit. The same would be true for the benefits associated with improving cooperation among the stakeholders.

It is worth noting that this is still economic analysis in the sense that the Feasibility Study will be required to identify and enumerate *all* the benefits likely to arise from the Project that may have a value to someone. The difference between this and the more classical approach is that the Consultants will not be asked to put a monetary value on all benefits. Rather, the Consultant will create a hierarchy of benefits in which each potential benefit will be identified and quantified to the extent possible. The objective is to facilitate the process of identifying beneficiaries, stakeholders, or financiers who consider that the value of each benefit to them or to a group of them is sufficiently high that they would be willing to contribute to the costs of achieving the benefit.

The overall approach to the investigation of the economic and financial feasibility of the Project will be to:

- First, examine the costs and benefits of a basic conveyance designed solely to restore the Dead Sea and to provide a vehicle for cooperation, including impacts on the tourism and potash industries.
- Second, examine the marginal feasibility of modifying the conveyance to permit adding energy or potable water components, which might be viable in their own right or which might make a contribution to the operations and maintenance and/or investment costs of the conveyance itself. This could imply a more costly high elevation conveyance in order to create the hydrostatic head that would be required to optimize electricity generation or desalination. It could also imply the construction of freshwater transmission lines and associated infrastructure.

8.2 Key Issues

8.2.1 The “Without-Project” Alternative

"Saving the Dead Sea" is a broad goal. The Project as proposed will halt the decline in water level and then, over a period of years, return the Sea to an earlier stage. The Project will also create or induce a range of environmental and social impacts, which will be investigated through a series of tasks carried out under the Feasibility Study.

The Feasibility Study will also address the consequences of not restoring the Dead Sea as the no action alternative. If the current situation is allowed to continue unchecked, the Dead Sea level will continue to fall, reducing the size of this unique water body. This will have a profound impact on tourism, light industry and potash extraction. Furthermore, the landscape will be changed irrevocably due to the loss of water surface, structural collapse of the soil, and dust storms. The changes may be so great that the Dead Sea valley might lose much of its meaning as a world cultural and religious symbol. This is an outcome from which there is probably little chance of recovery.

In other words, the “without-Project” alternative is not the current situation; it is the continuously deteriorating situation that might be predicted to occur.

8.2.2 Identifying the Intangible Benefits

It will be important to break down the potential non-tangible benefits in as much detail as possible so that potentially interested stakeholders and financiers can identify with them. Even if it is not possible to place an explicit value on them, the future financiers of the Project will contribute based on the value that they themselves attach to saving the Dead Sea or creating a “Peace Dividend.” It is noted that some studies and reviews of this issue have been prepared, which can provide background information for undertaking this task.

Discriminating finely among the different benefits will allow each potential financier to identify with specific benefits and to contribute on that basis. For example, religious groups may contribute on the basis of the religious significance of particular sites in the basin, while the tourism industry would take a more pragmatic approach and contribute in order to stay in business.

The intangible benefits of the Project will concern principally:

- The environmental benefits associated with the reversal of the degradation of the Dead Sea.
- The cultural heritage benefits of preserving a site with global religious and cultural significance.
- The “Peace Dividend” benefits associated with having regional cooperation to solve the practical problems linked to a major infrastructure Project.

These benefits are described in more detail below.

Environmental Benefits

The benefit often characterized as “Saving the Dead Sea” can be divided into several pieces. Environmental benefits are typically broken down into Resource Losses and Non-Resource Losses. In this case, Resource Losses include preventing a deterioration (or permitting an expansion) of the tourism and chemical industries.

Non-Resource Losses of the Dead Sea include its:

- “Bequest Value” (the fact that, if it deteriorates beyond recognition, it will not be available to future generations).
- “Existence Value” (the fact that, even if a person may not plan to visit it, that person may derive value from knowing that it exists).
- “Option Value” (reserving the potential to do something with it in the future).

One key question is: how much would global environmental stakeholders be prepared to pay for preserving a unique ecological site? Environmental economists have developed techniques, including assessing bequest, existence and option values, for examining such questions. This involves investigating how much donor agencies or groups have (or have not) been prepared to pay in the past to save similar unique features. Case examples to review include the Mediterranean Sea, North American Great Lakes, and Aral Sea.

Cultural Benefits

There are also bequest, existence, and option values associated with the protection of the unique cultural heritage represented by the area around the Dead Sea. It is found that such projects generally constitute valuable opportunities for bringing peoples together. The World Bank and UNESCO funded Mostar Bridge Project is an example of how rehabilitation of a cultural heritage and the bringing together of peoples divided by war can have positive benefits. There are agencies and funds charged with protecting national and world heritage sites. The Feasibility Study should be carried out with the potential interest and financing from these agencies and organizations in mind.

The same approach as the environmental valuation is increasingly being applied to cultural assets and the justification for preserving them. It is generally recognized, and this case is no exception, that tourist revenues provide benefits that can help justify investment in conserving cultural heritage. This perspective remains valid, but tourist revenues should not be seen as the sole rationale for such investments. The economic justification for investment in culture must also recognize its intrinsic existence value, its public-good character, and the positive externalities that it brings.

Benefits from the “Peace Dividend”

Undertaking a joint regional Project with shared costs and shared benefits that could lead to mutual interdependence and trust and improve the chances of achieving a lasting peace in the Middle East is a key issue to be investigated in the Feasibility Study. Much is said about cooperation, but the best way of developing cooperation is to work on a concrete regional Project that all stakeholders want to achieve. Cooperation is much more feasible in the concrete than in the abstract; solving

practical problems is easier than solving abstract problems and what is learned regarding working together can be translated into other spheres of endeavor.

It is well known that conflict in the region has many causes. Working on the Red Sea–Dead Sea water conveyance will not remove these causes and may only bring cooperation to a limited extent. Nonetheless, given the intractability of the issues, the Project and the potential “Peace Dividend” would constitute a contribution to the process of understanding and dealing with the underlying causes of conflict. That is why it is important to attempt, at least, to describe the potential benefits, to set them in the proper context, to suggest the order of magnitude of their value, and to compare them to the construction, operation and maintenance costs of the Project so that a decision can be made as to whether the benefits are commensurate with the costs.

8.2.3 Tangible Benefits

Elements of the Project that lend themselves to classical benefit-cost analysis in the Feasibility Study are the tourism and potash industries, freshwater supply development, and energy development. For each Project configuration, analysis should be carried out on the benefits to the tourism and potash industries of restoring the Dead Sea and on the marginal benefit-cost ratio of adding energy and/or water components to the basic water conveyance.

Tourism and Chemical Industries

The continued deterioration of the Dead Sea could lead to a parallel deterioration in the prospects for the tourism industry. In contrast, the restoration of the Dead Sea could create an opportunity for enhanced tourism with a consequent effect on the economy of the communities around the Dead Sea.

The continued deterioration of the Dead Sea could have positive or negative impact on the potash extraction sites and the destruction of the industry, with consequent losses in terms of businesses and jobs, not to mention the potential costs of cleaning up the sites and restoring their visual amenity. One key issue is the length of time the industries could continue to operate in the “without Project” scenario.

Traditional economic methods can be used to examine these questions.

Freshwater Supply

Projected municipal and industrial demand for water in the region shows a continuous growth and is expected to far outstrip traditional sources of water. This opens up the possibility of modifying the basic water conveyance option to create a larger hydrostatic head that could be used to feed and power a desalination plant to produce freshwater for drinking use by the beneficiary Parties. Developing a system for a future water supply option could add substantial costs to the construction, operations and maintenance of the plant and to upgrade the conveyance from the basic conveyance necessary to transmit the water needed for the Dead Sea. Nonetheless, the predicted extreme shortage of water over the next 50 years makes this an option that is worth considering, particularly for Jordan.

Energy

By the time the conveyance is completed, it is expected that the electricity networks of the region will be more interconnected than is currently the case. In particular, Jordan's electricity grid will be fully integrated with the grids of Egypt, Syria and Turkey.

This opens up the possibility of designing the water conveyance for power generation as an additional option. The viability of this option and the related Project design should be addressed in the Feasibility Study. Any hydropower option that could provide electricity more economically than from other sources or that could produce a free cash flow that could be used to contribute to the operations and maintenance costs of the conveyance and even to its investment costs would be potentially interesting,

Given the uncertainties about the regional trading mechanism that would apply, the price of oil, and the price of renewable energy (in particular solar energy,) any estimate of the future opportunity cost of electricity is fraught with considerable uncertainties. A sensitivity analysis within a broad range of bulk electricity prices should be applied to the results of the economic and financial analyses.

Phased Combined Energy and Potable Water Options

In examining the energy and water supply options, the Consultant may discover that a combination of the two is more suitable than simply one or the other. For example, while a substantial flow of water is required to recharge the Dead Sea, it may be most appropriate to opt for an energy option. When the Dead Sea is recharged and the water scarcity has increased, it may be appropriate to shift to a water supply option. Such a strategy has implications for the investment program. It might be possible to postpone the investments for the desalination plant and the transmission pipelines; it might also be possible to phase in the modules of the plant as demand increases, although the pipelines would almost certainly have to be built to their final capacity at the beginning. It is, of course, possible that a power plant, built for a limited lifespan, might not be economically justified.

Benefits from Job Creation

The creation of a very large number of jobs through an enormous construction Project such as the Red Sea-Dead Sea Water Conveyance Project will have an important economic impact. This benefit has two dimensions. First, there is the purely economic aspect of job creation. The income received by construction workers could constitute an important increase in GDP for the economies concerned. Second, job creation will contribute meaningfully to the "Peace Dividend" since there is no better catalyst for peace and stability than full employment. The creation of jobs is important and the timing of the job creation could play an important role in the drive towards Palestinian economic growth.

8.3 Financing Plan

It is clear that there is no single source of financing willing or able to finance the entire cost of the conveyance and its associated infrastructure. Different players may

be interested in different aspects of the Project. Bilateral donors may well be interested in financing construction and equipment contracts. The environmental funds may be interested in the Dead Sea restoration part of the Project and other players may be interested in the cultural preservation aspects. Finally, those players that have been trying to promote peace in the Middle East may be interested in investing for the potential “Peace Dividend” from the Project.

Private partners might be interested in participating as investors in certain facilities or through the use of a variety of contractual instruments from management contracts through leases to concessions. Private partners might also be interested in the energy option if the power generated could be sold at a commercial rate. The Feasibility Study should seek to determine whether or not the Project is bankable in the sense that there is a financier or group of financiers willing to cover the cost of each of the components. It will be important in the Feasibility Study to identify clearly the different elements of the Project and the costs and benefits associated with each so that potential investors can have an opportunity to identify the niches in which they would be interested in investing.

8.4 Tasks

8.4.1 Task 1 – Economic and Financial Analysis of Restoring the Dead Sea

The objective of this task is to analyze the benefits (intangible and tangible) arising from a Project design whose main objective is to restore the Dead Sea to some earlier stage and in the process create economic benefits and a “Peace Dividend,” compared to the “without-Project” situation that could be expected to result if the Project were not undertaken. It must be stressed that benefits are to be evaluated on a “with Project-without Project” basis and not on a “before-after” basis. This distinction, while a routine part of Project evaluation, requires particular emphasis in this Feasibility Study because the dramatic changes that are expected to take place in the Dead Sea area over the next several decades mean that the “without Project” option could be significantly worse than the current situation.

The following sections are intended to serve as a guide to the Consultants in preparing a proposal. Given the complexity of the task and the need to be innovative, this section is not intended to be prescriptive but rather to give the Consultants the opportunity to exercise creativity in order to produce a methodological proposal that responds to the challenge set out in the “Issues” sections of this Terms of Reference in combination with the more specific suggestions set out below.

Where appropriate, the economic analysis should be carried out by taking into account the following parameters:

- Technical features:
 - Low elevation conveyance along the bed of the wadi.
 - No power generation.
 - No desalination plant.

- No water transmission to any of the beneficiary Parties.
- Benefits would include:
 - Restoring the Dead Sea.
 - Creating a vehicle for cooperation (the “Peace Dividend”).
 - Enhancing tourism potential.
 - Maintaining the chemical industry.
 - Creating additional economic development in the Dead Sea area.
- The economic analysis would include:
 - Standard conversion factor, if deemed appropriate.
 - No taxes and duties.
 - Use of constant prices.
 - To evaluate the cost of freshwater produced at the desalination plant and delivered to various users.
 - Shadow pricing of bulk electricity costs (border prices).
 - Shadow pricing of labor, if deemed appropriate.
 - Sensitivity analysis concerning energy prices, investment cost increases and construction delays.
- The financial analysis would include:
 - Inclusion of duties and taxes in costs.
 - Current prices based on appropriate price indices.
 - Estimates of equity and debt financing with various ratios and terms, and the resulting Return on Equity.
 - Analysis of specific financial and political risks, such as the risk of devaluation, convertibility risk, and the risk of changes in interest rates and payment risk.
 - For the financial analysis, the Consultant will calculate both the Net Present Value (NPV) and Internal Rate of Return (IRR).

Sub-Task 1 – Intangible Benefits and Costs

The Consultant shall:

- Identify and assess the intangible costs and economic benefits of a Project carried out in the spirit of regional cooperation. These costs and benefits might relate to the intrinsic environment, social and cultural elements, stability and investment environment, productivity and economic development in the region, health and education, and other intangibles. It is understood that it will not be possible to place a detailed cost and benefit estimate on these factors. The Consultant may use any innovative but theoretically sound methodology (including but not limited to hedonic pricing or contingent valuation methods) for evaluating these factors. However, the Consultant is expected to make some estimate of their orders of magnitude.
- For example, the Consultant could identify indicators of improved cooperation so as to permit the stakeholders to identify what specific benefits would be likely to arise from the sought-after cooperation. These benefits do have economic value, which could be estimated based on the cost of the lack of peace in the area—the cost of insecurity and hospital treatment, as well as the cost of lost productivity and economic development.
- The Consultant will estimate the construction, operations and maintenance costs of this variant and compare them with their benefits. Some of the benefits are expected to be set out in qualitative terms, although the Consultant is free to suggest innovative methods of estimating benefits based on revealed preferences in similar projects or other economic techniques. For the remaining benefits, the Consultant will apply traditional economic techniques to estimate the value of the benefits.
- The Consultant will specifically investigate the question of the financing of operations and maintenance costs. While the donor community might be willing to finance the construction costs for the Red Sea-Dead Sea Water Conveyance Project, it is unlikely to be willing to finance operation and maintenance costs. The Consultants should, therefore, analyze the magnitude of the operations and maintenance costs in the context of the budgetary situations in the beneficiary Parties and reach a judgment regarding the affordability of the operations and maintenance costs.
- The Consultant will use a discount rate that reflects the cost of capital to the beneficiary Parties; the discount rate should not be used to attempt to account for the value of the non-tangible benefits.
- Furthermore, the Consultant is expected to present findings in a manner that permits the tangible and the non-tangible benefits to be compared with the costs and with each other in such a way that any tradeoffs between them are made explicit.

Sub-Task 2 – Tourism Industry

The Consultant shall:

- Investigate the likely evolution of the tourism industry around the Dead Sea, taking into account the potential effects of the continued deterioration of the Dead Sea on the factors that attract tourists to the area, including activities

associated with the Sea itself; activities associated with the cultural heritage of the area; and activities associated with the visual amenities of the site. It will be important for the Consultant to distinguish between the different activities, since the stakeholders who might be inclined to finance, for example, the restoration of the environment are likely to be different from those who might be inclined to finance the preservation of the cultural sites.

- Investigate and assess the extent to which the governments might be able to tax the tourism industry (through a bed tax, visit fees, etc.) in order to finance part of the Dead Sea restoration.

Sub-Task 3 – Chemical Industry

The Consultant shall:

- Estimate the costs and benefits the industries might have as a result of the currently decreasing surface area of the Dead Sea and as a result of increasing the surface area due to the Project.
- Estimate what the cost/benefit impact of any changes in the chemical composition of the Dead Sea due to the mixing of the Red Sea and the Dead Sea ecologies might be.
- Estimate the costs to the industries from changes in stratification and dilution of the brine.
- Estimate the additional cost/benefits to the national economies with and without the Project.
- Estimate any cost of clean-up activities should the industry go into permanent decline.

8.4.2 Task 2 – Water Supply and Energy Options

In this analysis, the Consultant will examine the marginal costs and benefits of adding water supply and/or energy components to the basic “Saving the Dead Sea” option. Given the level of intangible benefits, the Consultant is not expected to calculate a rate of return for the Project as a whole. The Feasibility Study should, however, examine the marginal rate of return associated with adding energy and/or water components to the basic conveyance Project.

Sub Task 2.1 Potable Water Options

The objective is to analyze the financial and economic feasibility of using the hydrostatic head to produce potable water for the beneficiary Parties through desalination. The projected value of water shall be estimated using two different methods: (a) willingness to purchase and (b) the construction and operations and maintenance costs of alternative supplies. The net benefits after subtraction of pumping costs shall be estimated separately for various geographic regions in the beneficiary Parties since it is expected that both gross and net benefits will differ both among the beneficiary Parties and between regions due to pumping costs, various degrees of water scarcity, and income levels. The cost of freshwater transport and

delivery after desalination can be substantial due to the large piping and pumps required to lift and transport water from the Dead Sea to urban destinations in the region. A separate economic analysis of the freshwater transport is required.

Willingness to purchase and demand curves shall be estimated based on prices paid to water vendors (for a certain limited quantity of water,) the value added per unit of water in industry, as well as the actual water tariffs charged to various categories of users (industries, tourism, households). The values obtained through willingness to purchase estimates shall be reduced by a realistic estimate of future physical leakage losses to estimate the economic value of bulk water supply, as opposed to the value of water at the retail level. The cost of alternative supplies shall be estimated based on the costs of seawater desalination, with particular consideration given to the falling cost of seawater desalination and transmission costs to each geographic region (value of bulk water).

The Consultant shall:

- Re-examine the water supply component proposed in the Prefeasibility Study from the perspective of identifying the marginal costs and benefits that would be associated with it compared with the basic version of the conveyance. The Consultant has the option of suggesting any other schemes considered more feasible in terms of making a bigger contribution to the operations and maintenance and/or investment costs.

The examination will consider:

- The investment, operations and maintenance costs of the desalination plant and the bulk water conveyances to urban centers of each beneficiary Party, particularly in light of advancements in seawater desalination and the associated falling unit cost.
- The financial revenues and economic benefits that might be obtained from water sales, paying particular attention to the likely prices that the consumers would be prepared to pay and that the authorities would be prepared to charge for the water. Since the water to be sold to consumers in the beneficiary Parties is likely to be on the expensive side, it will be important to review the work that has been done on affordability to ensure that consumers will actually be able and willing to pay for the water and to demonstrate that paying for water through subsidies will not become an unacceptable contingent liability for the beneficiary Parties.
- The portion of the main conveyance operations and maintenance costs that might be covered by the revenues.
- The cost of lifting and transport of potable water from the Dead Sea to intended destinations.
- The public health and environmental benefits that would be generated by a water supply component and the extent to which the beneficiary Parties to the Project might be prepared to invest local and central government funds to pay for these benefits.

- The Consultant should also examine a scaled-down or phased construction of the desalination plant, perhaps associated with the basic conveyance, to supply potable water to the Dead Sea area only. In this case, the Consultant should examine the current pricing of water in the area and the potential for regulating boreholes in such a way as to oblige consumers to buy water from the desalination plant, which could also have the beneficial effect of preventing over-extraction of the groundwater sources in the area.

Sub Task 2.2 Electricity Option

The objective of this task is to examine the utility of including an electricity component for the feasible alignment along Wadi Araba.

The Consultant shall:

- Analyze the investment, operations and maintenance costs of power generation.
- Estimate the revenues from consumption by the Project itself.
- Estimate revenues that might be obtained from sales into the regional grid.
- Estimate the portion of the main conveyance operations and maintenance costs that might be covered by revenues.
- Assess the impact of potential changes in the price of oil on the above analyses.
- Assess the potential competition from other power development projects under development in the region

Sub Task 2.3 Combined and/or Phased Potable Water, Power Generation and Electricity Options

The purpose of this task is to investigate the potential for combining and phasing the water supply options and the energy options and comparing the results with the stand-alone option for each.

The Consultant shall:

- Carry out an economic and financial analysis for an optimized combination of water supply and energy production for two scenarios—combined and phased, including, but not limited to:
 - Stand-alone energy scenarios for both the Dead Sea area alone and the Mediterranean region.
 - Stand-alone water scenarios for the Dead Sea area alone and for transmission to the beneficiary Parties.
 - Combined water supply plus energy for the Dead Sea area alone.

- Combined water supply for the beneficiary Parties and energy for the Mediterranean region.
 - Phased scenarios, such as electricity alone until the Dead Sea is stabilized, followed by desalination.
 - Any additional scenarios representing combinations and phases that the Consultant may consider to be interesting from the perspectives of either creating self-sufficient components or contributing to the operations and maintenance and/or investment costs of the basic conveyance.
- Use the appropriate combination of the sub-tasks above to analyze the various scenarios.

The fact that there is a substantial technical difference between hydrostatically assisted Reverse Osmosis (RO) desalination (as proposed in the Prefeasibility Study) and the more classic RO process should be taken into consideration. The former applies the pressure from the hydrostatic head directly to the RO membranes and uses relatively limited electrical energy. The latter takes electricity from the grid (or in this case, potentially, from a hydro component) to drive high-pressure pumps that generate the pressure needed to push the seawater through the membranes. If the head were to be used exclusively for hydropower generation at the beginning, it may not be possible to retrofit a hydrostatically assisted RO plant, because it might make the operation of the turbines unfeasible. This may require the installation of a hydropower plant that would restrict the desalination option to the classical option, which may be less energy-efficient than hydrostatically assisted RO.

Sub Task 2.4 Benefits from Job Creation

The objective of this task is to investigate the impact of the Project on job creation and on the economies in the region.

The Consultant shall:

- Estimate the share of the Project costs that will be expended in the economies of the beneficiary Parties.
- Estimate the number of temporary and permanent jobs that will be created.
- Evaluate the value of these jobs.
- Using reasonable estimates of the respective potential multiplier effects, estimate the impact on the GDP and growth rates of each economy.

8.4.3 Task 3 – Financing Plan

The objective of this task is to produce an indicative financing plan showing the types and sources of funding and financing that might be interested in the Project.

The Consultant shall:

- Determine the level of interest in financing the Project components by potential sources. Identify clearly the different elements of the Project and the costs and benefits associated with each so that potential investors can have an opportunity to identify the niches in which they would be interested in investing.
- Provide an indication of which donors/financiers might be interested in each benefit in order to assist in organizing an Investors’ Meeting for the Project and raising funds for the Project. Sources of funds considered should include, but not be limited to: water users through water tariffs; national governments; bilateral aid agencies; multilateral funding agencies; private infrastructure funds; and private sector commercial interests.
- Examine the possibility of including private partners as investors in certain facilities by analyzing the full range of partnership options from management contract through leases to concessions. For example, the environmental funds and groups might be interested in the Dead Sea restoration components of the Project; UNESCO and other global agencies/organizations might be interested in the cultural preservation aspects; and players that have been engaged in promoting peace and stability in the Middle East might be interested in investing in the potential “Peace Dividend” from the Project.

9 LEGAL AND INSTITUTIONAL ASPECTS

9.1 Introduction

A suitable and appropriate framework for the Feasibility Study will address issues concerning cooperation, asset ownership/management, Project development, financing and sharing of the benefits. It will provide guidelines for relationships with development partners (bilateral, multilateral, international financial agencies, and nongovernmental organizations, etc.), which may provide financing, technical assistance and/or monitoring for the Project.

The framework should be broad enough to include private sector partners who may participate in the Project as operators, financiers, or contractors/suppliers. Each would require that a sound legal framework, backed by some sort of guarantee, govern the contracts into which they enter.

9.2 Key Issues

9.2.1 International Legal Dimensions of the Project

A number of bilateral and multilateral water and environmental agreements and treaties already exist among some of the parties in the region, including among the beneficiary Parties, which may have relevance to the Project. These include, but not limited to review and analyze the provisions of relevant conventions and international agreements; any existing treaties and conventions on the Gulf of Aqaba/Eilat, as well as on the Red Sea that may have an impact on the Gulf of Aqaba/Eilat. The Consultant should take note of all existing relevant multilateral and bilateral treaties and agreements and their possible implications.

9.2.2 Framework for Cooperation

A complicated Project such as this requires an appropriate cooperative framework under which the detailed aspects of the Project, including its construction and operation, will be discussed, agreed upon, and implemented. A key question in this area concerns the institutions that will need to be established to own, manage, operate, and regulate the Project.

9.3 Tasks

9.3.1 Task 1 – A Framework for Cooperation

The objective of this task is to review and recommend an inclusive cooperative framework in order to be able to work together and make progress on mutually beneficial processes and activities related to the Project without having to negotiate a comprehensive legal agreement. Obviously, legal agreements and other related instruments will have to be developed at a later stage. Given the unique situation in which regional cooperation currently operates, this task requires a broad approach.

The Consultant shall:

- Review and document the existing and emerging global experience with frameworks for cooperation, assess options and identify lessons learned that may be applicable to the Project. The review should be organized around frameworks for cooperation formulated for physical structures, common resources, and even common currency (e.g., European Union), etc. Special consideration should be given to bases and parameters for cooperation as applied to the Nile Basin Initiative, the Lesotho Highlands Water Project Treaty, the Senegal Basin agreement, and other similar examples.
- Investigate the applicability of instruments as simple as a memorandum of understanding, or even a treaty, under which this Project can be implemented.
- Recommend the nature and language of a framework that is needed (and feasible) at this stage, and the kind of issues to be addressed (including the institutions to be established, the capacity to provide the needed expertise for such institutions and their costs and funding.)
- Recommend the key subsidiary institutions and the composition and mandate of such institutions to facilitate the process of initiating the Project. Examine global experience in this regard and relevant lessons in recommending these institutions.

9.3.2 Task 2 – Framework for Ownership of Assets

The objective of this task is to investigate options for the ownership of the assets created under the Project.

The Consultant shall:

- Review relevant existing and emerging global experience in the ownership and management of assets owned jointly by multiple nations and make recommendations. The recommendations should specifically identify an entity (or body) that would operate and manage the conveyance and associated system and address accountability and liability issues. The recommendations should also include the authority and powers to be vested in such entity (or body), such as whether the entity is empowered to enter into contracts and undertake financial obligations. The composition, operation, administration and source of funding for this body shall be addressed as part of the Feasibility Study. The relevancy of lessons learned from the Chad-Cameroon Pipeline, and the Lesotho Highlands Development Project, among others, should be investigated.

9.3.3 Task 3 – Framework for Implementation

The objective of this task is to investigate and make recommendations as to how the Project might be implemented.

The Consultant shall:

- Review relevant existing and emerging global experience in the implementation of large-scale projects such as this one and make specific recommendations. The recommendations should be based on the cooperative framework recommended above and must address issues such as accountability, authority, ability to enter into contractual agreements, liability, and monitoring/reporting. Funding options for the implementing entity should also be addressed. Similar experiences elsewhere around world should be reviewed, including the Mekong Commission and the Lesotho Highland Development Project.

9.3.4 Task 4 – International Implications of Red Sea at Aqaba / Eilat

The Consultant should take note of all existing relevant multilateral and bilateral treaties and agreements and their possible implications.

The Consultant shall:

- Review and analyze the relevant provisions of conventions and international agreements; any existing treaties and conventions on the Gulf of Aqaba/Eilat, as well as on the Red Sea that may have an impact on the Gulf of Aqaba/Eilat; and the relevant international regimes on Marine Protection, including the regime on the Marine Protected Areas along the Gulf of Aqaba.
- Review and assess the impact on the Project of the results of the Global Environment Facility (GEF) Regional Environmental Action Plan for the Gulf of Aqaba, particularly the development and enforcement of a legal framework for control of transponder pollution. Highlight any provisions that might facilitate or hinder the development and implementation of the Project.

9.3.5 Task 5 – International Recognition of Dead Sea / Wadi Araba

Parts or all of the Project area may be potentially eligible for recognition under UNESCO-sponsored programs, such as Man and the Biosphere and the World Heritage Convention. Such recognition could have important implications for Project design and operation and for many of the environmental and social impacts of the Project.

The Consultant shall:

- Determine the current international status of the Project area, and the status of any pending or proposed applications for recognition under Man and the Biosphere, World Heritage, or similar programs.
- In the event that the Project area, or any portions thereof, are determined to have potential for formal international recognition, determine the possible impact of this on the Project configuration, design, and financing.

10 INTEGRATION OF STUDIES

10.1 Introduction

Overall assessment of the environmental, technical and economic feasibility of the Project for which the Sub-Studies, Economic and Financial Study, and Legal and Institutional Study will serve as building blocks. The economic feasibility and financing requirements can be determined based on the proposed preliminary layout and design parameters derived from the sub-studies. The results of the environmental and social studies within the Sub-Studies will also be used as input to a full Environmental and Social Assessment for the Project prepared according to international practice.

10.2 Task

10.2.1 Task 1 – Integrate Findings into a Coherent Decision Support Framework

The Consultant shall:

- Integrate the findings from the various studies into a coherent decision support framework, ensuring that the environmental, technical, and economic issues, challenges, and tradeoffs are explicit and any intractable issues are explicitly identified, with the decision support parameters clearly set out for the decision makers.
- A decision matrix setting out findings from each discipline, identifying tradeoffs, and framing decision parameters for decision makers is recommended.
- The public consultation process should inform this framework. In cases where there is no self-evident answer to a tradeoff issue, the Consultant should clearly describe the situation and frame the issues for the decision makers. The

consultant will use the Sub-Studies and hold discussions with the members of the teams preparing these studies to benefit from their knowledge and experience.

Part E – Environmental and Social Assessment

11 OBJECTIVES AND STRUCTURE

11.1 Introduction

"Saving the Dead Sea" is a broad goal. The Project as proposed will halt the decline in water level and then, over a period of years, return the Dead Sea to an earlier water level. The Project will also create or induce a range of environmental and social impacts (positive and negative), which will be investigated through a series of tasks carried out under the Feasibility Study. The Feasibility Study will also address the consequences of not restoring the Dead Sea as the no action alternative. If the current situation is allowed to continue unchecked, the Dead Sea level will continue to fall, reducing the size of this unique water body. This will have a profound impact on tourism, light industry and potash extraction. Furthermore, the landscape will be changed irrevocably due to the loss of water surface, continued expansion of the area affected by sinkholes, and dust storms. The changes may be so great that the Dead Sea region might lose much of its meaning as a world cultural and religious symbol. This is an outcome from which there is probably little chance of recovery.

11.2 Linkage to the Feasibility Study, including the Sub-Studies

- Preparation of the Environmental and Social Assessment will be closely coordinated with the overall Feasibility Study of the Project and will use the Sub-Studies, Economic and Financial Study, and Legal and Institutional Study as building blocks. It is emphasized that the results of the environmental and social studies within the Sub-Studies will also be used as input for the Environmental and Social Assessment.
- The preparation of the Environmental and Social Assessment will be undertaken by an independent Consultant, who will prepare the study on the basis of available information and data, as well as field based and desk studies prepared specifically to support the assessment process. In order to fully benefit from the efforts of specialists involved in the Feasibility Study and Sub-Studies, including their field based investigations, the Consultant will have full access to the data and draft documents developed by them for these studies within the framework of the Feasibility Study.
- In addition, the Consultant will have access to the specialists who worked on the Feasibility Study, including the Sub-Studies to provide additional information and clarifications concerning the data, findings and recommendations resulting from these studies. It is anticipated that some tasks that will support preparation of the assessment will be largely based on information developed from the Sub-Studies. Where this is anticipated to be the case, the text of this chapter makes specific reference to the Sub-Studies and links them to the work program for the assessment process.

11.3 Structure of the Environmental and Social Assessment Report

Given the broad implications of the proposed Project for Jordan, Israel and the Palestinian Authority, and the linkages to the upper Gulf of Aqaba / Eilat, the Environmental and Social Assessment will consist of three main elements:

- Executive Summary – This will provide an overview of scope and objectives of the Project, its potential environmental and social impacts; an analysis of alternatives and an Environmental and Social Management Plan (ESMP) based on a Regional Environmental and Social Assessment and a Project Specific Environmental and Social Assessment.
- Regional Environmental and Social Assessment – This will examine the Project and its broader environmental and social impacts with reference to both existing and future conditions.
- Project Specific Environmental and Social Assessment – This will examine the specific environmental and social issues with interventions to be undertaken under the Project in the implementation and operational phases.

12 ENVIRONMENTAL AND SOCIAL ISSUES

12.1 Introduction

Implementation of the Project will present a variety of environmental and social impacts, some positive and some negative, at both the area and project specific level. These issues include, but are not limited to, those summarized in the following paragraphs. All of these conditions should be analyzed and projected into the future in order to form a baseline for assessment of impacts, analysis of alternatives and development of mitigation and monitoring actions.

12.2 The Current Challenge

In the absence of the Project and with the prevailing conditions, the water level in the Dead Sea will continue to fall at a rate close to one meter per year. This will be accompanied by major shoreline recession, and replacement of most of the present water surface with mud flats. Existing groundwater aquifers in the valley will be drained to similar levels and the dewatered aquifers will collapse, causing numerous sinkholes and general land subsidence, with accompanying destruction of roads, culverts, buildings, etc. It is anticipated that the Dead Sea will be frequently anoxic, inhospitable to bird populations, and the source of hydrogen sulfide and other releases. The area will be subject to dust storms and visibility will be permanently lowered due to aerosols from mud flats. The chemical industry, based on potash extraction, will be subject to a variety of impacts. Generally, there will be a dramatic reduction in aesthetic values as well as disappearance or severe diminution of most tourism-related attributes.

12.3 Key Issues

12.3.1 Upper Gulf of Aqaba/Eilat and Red Sea Coral Reefs

The continuous withdrawal of a substantial volume of seawater from the terminal point of the Gulf of Aqaba / Eilat to supply the conveyance has the potential to impact the coral reefs in the north end of the Gulf. The withdrawal may locally modify Red Sea circulation to the extent that salinity is changed over some part of the reefs, or it may redirect wastewater discharge plumes. Salinity changes may have negative or positive effects on the health of coral reefs, depending on present salinity levels and whether the circulation changes increase or decrease salinity. Any potential increase in nutrient levels over the reefs is potentially harmful, as it promotes algae growth, which interferes with the ability of the coral to re-colonize dead areas. It is essential to minimize alterations in the Red Sea circulation patterns, so that possible reef impacts are kept to a minimum.

Coastal zone management in the upper Gulf of Aqaba/Eilat is complex due to the high intensity and competing uses of this area, which include commercial, industrial, military, recreation and tourism uses. The construction period for the Project could lead to loss of a limited area of coastline, risk of suspended sediment in the nearshore waters and risks of pollution from fuel, lubricants and wastes from construction equipment. The operational period may result in changes in local currents and water quality, restrictions on access in the vicinity of intake and some reduction in recreational activities.

12.3.2 Aqaba and Eilat Region

Regardless of the chosen alignment, it is likely that there will be significant above-ground construction in the vicinity of Aqaba, which immediately adjoins Eilat. The construction involves the intake structure, the first sections of the conveyance, the pumping station needed to lift the water over the coastal ridge, and the electrical transmission facilities needed for the pumping station. Since this all takes place in a populated coastal region, there will be both ecological and social impacts of the construction and the later operation of the facilities. Dust and vehicle traffic will be important problems during construction. The operation of the pumping station will require significant amounts of electric energy, with related environmental impacts depending on the method of generation (most likely natural gas-fired steam-electric). The introduction of non-resident construction workers to the area may have various social consequences, creating health risks including transmission of HIV/AIDS, as well as temporary or permanent changes in local transportation networks.

12.3.3 Ecological Connectivity in Wadi Araba

The Red Sea–Dead Sea water conveyance will extend for approximately 180 km south to north along the Wadi Araba. Depending on the alignment, water conveyance mode and construction method, east-west ecological connectivity may be disrupted. Movement of people and animals may be obstructed to some extent, as well as surface water flows from side wadis intersected by the conveyance. A tunnel may cross as many as nineteen major side wadis. Although surface water flow will not necessarily be affected, the tunnels may pass through the alluvial aquifers, altering groundwater

flow patterns. A piped conveyance, depending on the alignment and configuration (buried on the wadi floor or laid along the valley side) would affect the east-west ecological connectivity.

12.3.4 Dead Sea Region

The Dead Sea is the environmental focal point of the whole of the Jordan Valley. The water surface is the lowest point on earth (over 415 meters below sea level, and dropping). The topography, the climate and the elevation combine to produce a unique ecology and a landscape of exceptional global interest and value. The decline of the Dead Sea water level has already had a noticeable negative impact on this landscape, and continued deterioration can be expected in the absence of the Project. As the Dead Sea level falls, groundwater inflows to the Sea increase and groundwater levels fall, drying freshwater springs on the wadi side slopes. This reduces access to fresh and brackish groundwater, seriously impacting existing economic activities in the Dead Sea area, including tourism, agriculture and light industry.

Another set of environmental and economic impacts arises from the present rate of shoreline retreat. Large expanses of seabed have been exposed, creating unsightly conditions and providing a source of windblown particulates. As aerosols are trapped in the chronic atmospheric temperature inversion, there has been long-term deterioration in visibility, with negative consequences for landscape values. This situation will continue to grow worse until the water level is stabilized. Also, the shoreline has receded away from existing tourism facilities (hotels, restaurants, spas), impacting regional economics and reducing amenities.

12.3.5 Mixing Red Sea and Dead Sea Waters

The physical, chemical and biological characteristics of the two water bodies—the Red Sea and the Dead Sea—are significantly different. The Red Sea ecology is rich with aquatic life and nutrients characteristic of sub-tropical marine environments, while the Dead Sea is practically void of aquatic life, with salt concentration about ten times that of the Red Sea. The physiochemical effects of mixing these two ecologies and the outcome are unknown at this time. It remains to be demonstrated that the solution of adding seawater will actually have the desired effect on the Dead Sea and that there will not be unwelcome side effects such as precipitation that could change the chemical composition (with negative side effects on the chemical industry) or on the appearance of the Dead Sea (with negative impacts on tourism development). It is understood that this question is under study by a joint Israeli/Jordanian scientific team. It is important that the study be completed in time to be used as an input to the Feasibility Study.

In addition to chemical/physical impacts, the proposed inflows to the Dead Sea may have ecological consequences. At present, the Dead Sea aquatic ecology consists mostly of two microflora: the algae *Dunaliella parva* and halophilic red bacteria. Over time, inflows of seawater and/or desalination reject brine will alter the salinity gradient and chemical composition, and inoculate the Dead Sea with potentially alien species, some of which may survive. Furthermore, pollution from the Red Sea, especially from oil spills in the Gulf of Aqaba / Eilat, might find its way to the Dead Sea intake, so that nutrients and toxic contaminants could make their way to the Dead Sea.

Contaminants and altered biota could also affect the use of the Dead Sea by bird populations, due to changes in the freshwater lens floating on the top of the hypersaline Dead Sea water. On the other hand, as the Dead Sea steadily shrinks in the absence of the Project, other doubtless undesirable changes in water quality can be expected. These include more frequent turnovers of the water column with possible appearance of hydrogen sulfide and other odor problems and negative effects on bird populations.

12.3.6 Impacts on Groundwater

Under current conditions, the groundwater aquifers are being drained at an accelerated rate due to the falling water level of the Dead Sea. There is evidence that freshwater springs on the hill slopes around the Dead Sea have dried up due to the fall of the groundwater level. Furthermore, dewatering of these aquifers seems to result in collapse of surface and subsurface geological structures, causing numerous sinkholes and general land subsidence, with accompanying destruction of roads, culverts, buildings, etc. A major issue to be evaluated is the specific hydrogeological relationship between the water level of the Dead Sea and the behavior of groundwater aquifers around it.

12.3.7 Impacts to Archeological, Historical and Cultural Sites

The Gulf of Aqaba/Eilat, Wadi Araba and Dead Sea area have one of the longest histories of human activity to be found anywhere. There are a number of known sites in the valley with cultural and religious significance in the history of Judaism, Christianity and Islam. In addition there are places mentioned in the religious scriptures that are believed to be in the Dead Sea region but have not been positively identified (or for which the identification is controversial).

The construction of the water conveyance, desalination plant, brine discharge conduit, and drinking water conveyances is virtually certain to encounter sites or artifacts of archeological significance. In the absence of a complete field based archeological and historical sites survey of the entire alignment, it is essential that sufficient exploration be done in advance of construction to ensure that valuable cultural resources are not damaged or destroyed. Induced impacts from the Project could also have significant adverse impacts on archaeological and historical sites in the area around the Gulf of Aqaba/Eilat, Wadi Araba and Dead Sea. In addition, procedures need to be put in place to address “archaeological chance finds” if buried sites are uncovered during the course of construction activities.

12.3.8 Hydropower Facilities and Desalination Plant

The Project may result in the construction on a phased basis of both hydropower generation facilities and a very large desalination plant. Both these investments would have temporary construction phase impacts. While the impact of the hydropower facilities would be limited during the operational phase, the desalination plant would require the use of significant energy and disposable materials such as membranes and concentrates. The scope of the impacts from these facilities and alternative sites for their location should be reviewed as part of the Environmental and Social Assessment.

12.3.9 Drinking Water Transmission Corridors

The proposed desalination facility, if built, will produce considerable volume of freshwater. This water will be distributed to the beneficiary Parties. The result will be the construction of pipelines, electric transmission lines, balancing tanks, and other facilities along the floor of the Dead Sea valley and up the sides of the Valley.

Impacts can be expected on surface water flow and on the free movement of people and animals, at least during construction and to some extent thereafter. There may also be a significant degradation of the visual amenity of the landscape in the northern part of the Dead Sea valley, the area that receives the heaviest tourist traffic.

12.3.10 Induced Impacts

It is expected that stabilization and partial recovery of the Dead Sea will give rise to major efforts to expand tourism on both sides of the Dead Sea and possibly at some selected locations in Wadi Araba. In some scenarios, total hotel rooms are projected to rise to as many as 40,000 over the next 20 years, a 10-fold increase over the current situation. This large increase in economic activity would require much infrastructure construction (water, wastewater, roads, electric energy, telecommunications, as well as the tourist facilities themselves). But it is also responsible for an important category of project benefits: the increased value of goods and services produced in the region as a consequence of the Project, net of costs.

While generally beneficial, expanded tourism brings with it a variety of environmental and social impacts. The very large increase in visitor populations, including substantial growth in activity on the east shore of the Dead Sea in places where little or no tourism activity has occurred before, implies greatly increased vehicle traffic with associated congestion, noise, and air pollution. Hotels and restaurants will generate wastewater and solid waste, which must be disposed of safely to avoid additional environmental problems. The construction of hotels, parking lots and upgraded roads will create disruption and pollutants during construction, and the degradation of the visual amenity thereafter. The tourism activity will create many jobs in the Dead Sea area, beneficial to economies but requiring the presence of numerous workers, some of who may be non-nationals, potentially resulting in social conflicts. All of these impacts, while not originating directly from the Project, are induced by it and must be accounted for in the Environmental and Social Assessment.

12.3.11 Special Risks

All large construction projects involve risks of various kinds, including construction accidents, unexpected negative impacts, uncertainties regarding outcomes, etc. In this case, however, there are at least two additional categories of risk that require special attention. The first one concerns the possibility of leakage from the conveyance at any location other than immediately adjacent to the Dead Sea. The release of seawater at or below the surface could have very serious consequences for ground and surface water and for the local ecology. Careful design and construction can greatly reduce, but not eliminate, the probability of small and moderate leaks. The conveyance passes through a region of known seismic activity, intersecting one major fault line and a number of minor ones. Furthermore, it is a region with a long history of political instability. A seismic event or a deliberate act would have the potential to cause a

catastrophic failure, resulting in large-scale soil and groundwater contamination and other ecological damage.

13 KEY TASKS FOR THE REGIONAL AND PROJECT SPECIFIC ENVIRONMENTAL AND SOCIAL ASSESSMENT

13.1 Tasks

13.1.1 Task 1 – Overview of Policy, Legal, and Administrative Framework

The objective of this task is to provide an overview of the policy, legal and administrative framework under which environmental and social aspects of the Project would be evaluated and implemented.

The Consultant shall:

- Prepare a review of applicable regulations and standards governing environmental quality, protection of sensitive areas, protection of endangered species, land use controls, and social issues such as involuntary resettlement and land acquisition, etc.
- Consider and discuss the status of proposed regulatory changes. Environmental and social requirements of any co-financiers, contractors, and third parties should be delineated.
- Various environment-related licenses, permits and approvals from public authorities that will likely be required from public authorities (government, regional, and/or municipal jurisdictions in which the Project is located) should be identified. Detailed annexes should be included as needed and summarized in the main report.

13.1.2 Task 2 – Project Description

The objective of this task is to provide a summary description of earlier proposed projects and the current Project:

The Consultant shall:

- Describe in a summary manner the Project alternatives examined in the previous Pre-Feasibility Study.
- Describe the current proposed approach to the Project design.
- Include diagrams, maps, tables and descriptive text based on the existing information.
- Update the Project description throughout the preparation of the Environmental and Social Assessment.

13.1.3 Task 3 – Describe Regional and Project Specific Baseline Environmental and Social Conditions

The objective of this task is to provide a description, based on previously collected and original data where necessary, of the environmental and social conditions at the regional and project specific level.

The Consultant shall:

- Assemble, evaluate and present baseline data on the relevant environmental and social characteristics at the regional and project specific levels. The environmental and social description should be concise and focused on the potential impacts of the proposed Project. Detailed baseline data should only be presented when it is relevant to corresponding mitigation measures.
- When extensive background information is required for documentation purposes, and/or for the Project files, the information should be provided in annexes.
- Coordinate with the Consultants preparing the Sub-Studies to obtain regional and project specific information and data on completed, ongoing and planned studies and analyses.
- In addition, carry out field surveys, interviews and consultations to fill any information gaps critical to the potential impacts and to development of mitigation measures that are not included in the scope of the Sub-Studies.
- A description of the study area should be provided, which will include the following items:
 - Physical environment: geology; topography; soils; climate and meteorology; ambient air quality; surface and groundwater hydrology; existing sources of noise and air emissions; existing water pollution discharges; and receiving water quality.
 - Biological environment: flora; fauna; rare or endangered species; sensitive habitats, including parks or preserves, significant natural sites, etc.
 - Socio-cultural environment (include both present and projected where appropriate): population; land use; planned development activities; community structure; Bedouin populations, employment; distribution of income, goods, and services; recreation; and public health.
 - Cultural properties, including archaeological sites, historical sites, graveyards and burials.

The previous studies in the greater Project area include many types of baseline data, but the Consultant, working in coordination with the specialists for the Sub-Studies, will need to identify additional data that may have become available since those studies, and include them in the Environmental and Social Assessment.

It is particularly important to accurately identify any additional lands that could be required on a permanent or short-term basis for the Project. In such cases, it is essential to identify any involuntary relocation of people, including any individuals or Bedouin populations, who may have livelihoods affected by the Project. The numbers, locations and socio-economic conditions of the affected people should be fully documented as well as the location and specific lands proposed for use in the Project.

13.1.4 Task 4 – Design and Conduct of a Social Assessment at the Regional and Project Specific Levels

The objective of this task is to provide for an understanding of the social conditions and social issues that may be positively and negatively affected by the Project at the regional and project specific levels. Information developed by the Sub-Studies, among other sources, will be used by the Consultant in undertaking this task.

The Consultant shall:

- Prepare a social assessment, as part of the Environmental and Social Assessment, to determine how the Project will affect local communities and to serve as a broader analysis of Project related social issues beyond those concerning potential impacts and risks. The Consultant must use specialized anthropological and sociological experts to conduct the Social Assessment.
- Identify the various stakeholders and on the basis of a literature survey, field visits, focus groups and other methods, clarify and assess the most relevant issues at the regional and project specific levels.
- Detail how all communities are affected by the current conditions of the Dead Sea and how they would be influenced by the Project including the implementation and operational phases.

13.1.5 Task 5 – Assess Regional and Project Specific Environmental Impacts and Social Impacts

The objective of this task is to provide an assessment of the potential positive and negative impacts at the regional and project specific levels. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources.

The Consultant shall:

- Assess the proposed Project's likely environmental impacts and social influences, both positive and negative, based on changes brought about by the Project to the baseline conditions described above at the regional and project specific levels. These impacts should be quantified to the extent possible, in terms of costs and benefits.
- Distinguish between positive and negative impacts, direct and indirect impacts, and immediate and long-term impacts. Normal conditions, start-up and shutdown activities during construction and commissioning and emergency situations should all be considered.

- Identify the type, relative likelihood, and broad consequences of major hazards or accidents that might occur. Mitigation measures and any residual negative impacts that cannot be mitigated should be determined.
- Investigate opportunities for environmental enhancement.
- Identify and estimate the extent and quality of available quantitative data, key data gaps, and uncertainties associated with predictions, and note topics that do not require further attention.
- Categorize the environmental impacts and social influences based on construction and operational phases, and summarize them according to issues and themes in the main report text, with the detailed findings documented in annexes.

A table should be prepared for both regional and project specific impacts during the implementation and operational phases of the Project on a thematic and area specific basis.

13.1.6 Task 6 – Assess Risks Related to Archeological, Historical and Other Cultural Sites

The objective of this task is to assess possible impact of the construction and operation of the Project on the known, discovered, or inferred sites or artifacts of archeological, cultural or touristic value. As part of this task, the Consultant shall commission a field based archaeological and historical sites survey of the potentially Project affected areas at the head of the Gulf of Aqaba / Eilat, Wadi Araba, and the Dead Sea. This will include the proposed sites for the sea water intake, hydropower facilities, desalination plant and major elements of the water distribution system.

The Consultant shall:

- Based on a literature review, discussions with relevant ministries and individual scholars, and a field-based survey undertaken specifically for the Project, prepare an inventory of sites of spiritual significance, archeological, historical, social and touristic value. This will include an inventory of graveyards and burials that may be affected by the proposed Project.
- Using a combination of expert opinion, historical inference, and field investigations, identify any sites with significant probability of future interest.
- Determine the impact on the Project of avoiding known and inferred archeological, cultural, or tourism sites.
- Develop and propose mitigation measures, where applicable, to minimize the impact of the Project on known or inferred archeological, cultural, and touristic sites.
- Develop a set of procedures to address “archaeological chance finds” if buried sites are uncovered during the course of construction activities.

13.1.7 Task 7 – Identify and Assess Environmental and Social Impacts on the Upper Gulf of Aqaba / Eilat and the Aqaba / Eilat Region

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project in the: (a) coastal and marine environment of the Gulf of Aqaba / Eilat; and (b) terrestrial environment in the Aqaba / Eilat Region.

Identification will consist of projecting future conditions with the Project, then comparing these with conditions over the same time period without the Project. If alternative project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources. The Consultant shall:

- Identify and assess possible impacts on the Red Sea marine environment, including the coral reefs, and on the coastal zone in the upper Gulf of Aqaba / Eilat.
- Identify and assess possible impacts on the marine environment and coastal zone in the upper Gulf of Aqaba / Eilat from construction and operation of the Project.
- Evaluate the potential short-term and long-term impacts of the Project on coral reefs and other elements of the marine ecosystem of the upper Gulf of Aqaba / Eilat.
- Identify and assess environmental impacts of construction and operation of the Project in the upper Gulf of Aqaba / Eilat including impacts on navigation, fishing, recreation and tourism activities.
- Assess air quality impacts from the generation of power for the pumping station and its operation.
- Identify and assess social impacts of construction and operation of the Project in the Aqaba region, including the impact of the temporary influx of construction workers.

13.1.8 Task 8 – Identify and Assess Environmental and Social Impacts in the Wadi Araba, Including Geological and Hydrological Aspects

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project. Identification will consist of projecting future conditions with the Project and comparing this with conditions without the Project. If alternative project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources.

The Consultant shall:

- Assess the geological and seismic hazards and define geologically sensitive areas on maps.
- Identify and assess environmental impacts of construction and operation of the Project in the Wadi Araba, including impacts related to loss of ecological connectivity across the conveyance and associated risks to natural habitats and biodiversity.
- Identify and assess environmental impacts associated with the potential need to have the conveyance cross a number of wadis, which could have an impact on their hydrology, sediment transport and erosion characteristics.
- Identify and assess environmental and social impacts on the limited vegetation in Wadi Araba due to construction and operation of the conveyance, along with the potential for successful stabilization of the land surface and revegetation where appropriate.
- Identify and assess aesthetic impacts associated with the construction and operation of the conveyance and associated structures, which will cross through an area viewed by many players as a semi-natural setting of significant beauty.
- Assess impact of unidentified water leakage on groundwater resources and undertake mapping of leakage sensitive areas.
- Assess impact of a failure of the water conveyor, from an earthquake or other major event, on groundwater resources.
- Identify and assess social impacts of construction and operation of the Project in the Wadi Araba, including the impact of a temporary influx of construction workers and the impacts on Bedouin and their herds.

13.1.9 Task 9 – Identify and Assess Environmental Impacts of Expected Changes to the Dead Sea

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project on the Dead Sea. Identification will consist of projecting future conditions with the Project and comparing this with conditions without the Project. If alternative project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources.

The Consultant shall:

- Review the past and current studies/research related to the limnology of the Dead Sea with particular attention to the recent efforts by the Israeli and Jordanian scientists in modeling the dynamic limnology of the Dead Sea. This will include:
 - Study of the dynamics of stratification due to mixing.

- Evaluation of the chemical impact of water mixing.
- Assessment of micro-biological blooming such as intensity, duration and other parameters.
- Review of the impact of inflow on the rate of evaporation.
- Identify and assess environmental impacts of the introduction of seawater and/or reject brine to the Dead Sea, with particular attention to the changes in the chemical composition of the Dead Sea, salts precipitation, increased frequency of water column turnovers, and/or changes in ecology and appearance.
- Identify and assess impacts on the chemical extraction industry of the introduction of seawater and/or reject brine to the Dead Sea.
- Assess the impact of sinkholes and changes in underground water flows.
- Provide recommendations for the future water level of the Dead Sea and the optimal design of the discharge system; including:
 - Proposed amount and rate of seawater/reject brine inflow;
 - Proposed site for discharge of inflow into the Dead Sea; and
 - Proposed depth below the surface of the Dead Sea for the discharge of the inflow.

13.1.10 Task 10 – Identify and Assess Environmental and Social Impacts in the Dead Sea Area

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project in the Dead Sea area. Identification will consist of projecting future conditions with the Project and comparing this with conditions without the Project. If alternative project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources.

The Consultant shall:

- Identify and assess environmental impacts of construction and operation of the Project in the Dead Sea area, including impacts related to desalination and electric generation facilities and the associated electric transmission lines.
- Assess the environmental and social impacts of the implementation and operation of the Project on the chemical facilities in Jordan and Israel.
- Identify and assess social impacts of construction and operation of the Project in the Dead Sea area, including the impact of a temporary influx of construction workers, the impacts on the residents of the area adjacent to the

Dead Sea, and on the management and staff of the business and tourist facilities adjacent to the Dead Sea, as well as other impacts on tourism.

- Identify and assess social impacts on the Bedouin and their herds in the Dead Sea area.

13.1.11 Task 11 – Identify and Assess Environmental and Social Impacts of Construction and Operation of the Desalination Plant for Production of Drinking Water

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project related to construction and operation of the desalination plant for drinking water production. Identification will consist of projecting future conditions with the Project and comparing this with conditions without the Project. This will include an analysis of alternative site locations for the desalination facilities and a comparative analysis of their potential impacts during both construction and operation. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources.

The Consultant shall:

- Analyze geological conditions at sites proposed for hydropower facilities and the desalination plant.
- Identify and assess environmental and social impacts of construction and operation of the desalination plant for drinking water production. This will include impacts related to the desalination facilities, as well as their support facilities, storage yards, housing facilities and the necessary electric transmission lines.
- Identify and assess social impacts of construction and operation of the desalination plant. Particular attention should be given to the effect of these facilities on landscape values, and the impact of any visual disamenity on landscape and cultural values, and on tourism.
- Conduct sensitivity analysis of water (raw, desalinated and brine) leakage on groundwater resources at the proposed site for the desalination plant. This includes mapping of leakage sensitive areas.
- Evaluate the potential impact of desalination plant failure (major break-down scenario) on groundwater resources.

13.1.12 Task 12 – Identify and Assess Environmental and Social Impacts of Drinking Water Pumping and Conveyance

The objective of this task is to identify and assess all relevant environmental and social impacts of the Project related to drinking water production, pumping and conveyance. Identification will consist of projecting future conditions with the Project and comparing this with conditions without the Project. If alternative Project configurations are under consideration, this task will be performed for each

configuration of the Red Sea–Dead Sea water conveyance. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources.

The Consultant shall:

- Identify and assess environmental impacts of construction and operation of the desalination phase of the Project in the areas adjacent to drinking water transmission facilities. This includes a review of potential alignment alternatives and/or adjustments to alignments for these facilities, as well as impacts related to the pipelines themselves, including the pumping stations, storage tanks, and the necessary electric transmission lines.
- Identify and assess social impacts of construction and operation of the desalination phase of the Project in areas adjacent to drinking water transmission facilities. Particular attention should be given to the effect of these facilities on landscape values, and the impact of any visual disamenity on landscape and cultural values, and on tourism.

13.1.13 Task 13 – Assess Occupational Health and Safety

The objective of this task is to prepare an Occupational Health and Safety Plan to minimize health and safety risks to permanent and temporary employees of contractors during the construction phase, to the staff during the operational phase; and to the public during both phases.

The Consultant shall:

- Prepare an Occupational Health and Safety Plan as a mechanism to reduce health and safety risks to workers and the public at large. This plan should present in table form a description of the actions to be taken, describe the benefit of the proposed actions, identify the organizations responsible for the action and specify the costs for the program during the planning and implementation phases.

13.1.14 Task 14 – Assess Health and HIV/AIDS Risks

The objective of this task is to prepare a Health and HIV/AIDS Management Plan to provide a framework to protect the health of, and prevent transmission of HIV/AIDS to, employees and the public during the construction and operational phases of the Project.

The Consultant shall:

- Review potential health risks, including the transmission of HIV/AIDS, from the temporary influx of construction workers and permanent operation and maintenance staff in the various sections of the Project area.
- Prepare a Health and HIV/AIDS Management Plan to provide a framework to protect the health of, and prevent the transmission of HIV/AIDS to, employees and the public during the construction and operation phases. This plan should present in table form a description of the actions to be taken, the benefit of the

proposed actions, identification of the organizations responsible for the action and the costs for the program during the planning and implementation process.

13.1.15 Task 15 – Prepare a Set of Topographic Base Maps for Data Display and Locations for Mitigation Actions

The objective of this task is to provide for preparation of a set of topographic base maps for display of baseline data and information of mitigation and monitoring actions on a site-specific basis. This approach is routine practice at the international level for oil and gas pipelines. In undertaking this task, the Consultant will use information developed by the Sub-Studies, among other sources.

The Consultant shall:

- Prepare a set of topographical base maps with an overlay of property ownership boundaries along the alignment of the proposed route for the conveyance at the scale of approximately 1:25,000 or smaller. The corridor width should be sufficient to include all related permanent facilities (e.g., pumping stations, hydropower and desalination facilities, etc.) and temporary facilities (construction camps, material storage yards, etc.).
- These basic alignment maps will be used to produce two sets of maps for the project specific assessment described below: (a) map set to illustrate all key environmental and social baseline data and all major constraints; and (b) map set to clearly indicate the nature and locations for all site-specific mitigation measures and all other recommended site-specific actions.

13.1.16 Task 16 – Identify and Assess Induced Environmental and Social Impacts at the Project Specific Level

The objective of this task is to identify and assess all relevant induced environmental and social impacts of the Project. Identification will consist of projecting future conditions with the Project and comparing this with conditions without the Project. If alternative project configurations are under consideration, this task will be performed for each configuration of the Red Sea–Dead Sea water conveyance. Information developed by the Sub-Studies, among other sources, will be used by the Consultant in undertaking this task.

The Consultant shall:

- Using assumptions and projections developed elsewhere in the Feasibility Study; develop a projection of Project-induced growth in the tourism industry, including expansion of tourism infrastructure.
- Estimate and assess the environmental impacts of the movement, lodging, and feeding of the Project-induced increase in the number of tourists.
- Estimate and assess the social impacts of the expanded number of tourists, as well as the increased work force required to accommodate tourism, with specific attention to the probable use of non-national workers.

- Describe and evaluate any other significant Project-induced environmental or social impacts, not addressed elsewhere in this Terms of Reference.

13.1.17 Task 17 – Characterize and Assess Major Environmental, Social, and Security Risks

The objective of this task is to assess the risks of certain low-probability, high-magnitude events that deserve special treatment. In addition to the various environmental and social consequences of the Project described above, there are events that are highly uncertain, and not easily addressed in the usual procedure of comparing expected positive outcomes to expected negative outcomes. Information developed by the Sub-Studies, among other sources, will be used by the Consultant in undertaking this task.

The Consultant shall:

- Identify, characterize, and assess any major Project-related environmental risks not addresses in the previous tasks. These include large-magnitude events, which are highly uncertain, such as development of a major unexpected nuisance condition in the Dead Sea, or a catastrophic failure of the seawater conveyance due to a seismic event or a deliberate act.
- Identify, characterize, and assess any major Project-related social risks not addresses in the previous tasks. These might include significant social unrest caused by the presence of non-national workers, or Project-related events that cause local populations to lose any means of livelihood for periods of time.
- Identify, characterize, and assess the potentially significant Project-related security risks. These include the potential for facility destruction as well as interference with operations.

13.1.18 Task 18 – Identify and Assess Cumulative Environmental and Social Impacts at the Project Specific Level

The objective of this task is to identify and assess the cumulative environmental and social impacts from the Project including the upper Gulf of Aqaba / Eilat, Aqaba and Eilat Region, Wadi Araba Region and the Dead Sea Region. It will also examine the cumulative impacts, both positive and negative, on the region. This analysis will examine the complex environmental, social and economic linkages of this large Project during construction and operation of the Project. Information developed by the Sub-Studies, among other sources, will be used by the Consultant in undertaking this task.

The Consultant shall:

- Using materials prepared for preparation of the Feasibility Study, especially on the environmental, social and economic aspects identify and assess the cumulative environmental and social impacts from construction and operation of the Project. This analysis will look at the “big picture” of potential impacts, both positive and negative, as they might occur in a systemic manner over

time and space. It will focus on identification of larger patterns of impacts that are not readily identified using the regional or project specific approaches to analysis of impacts.

- Prepare a management and monitoring plan to address cumulative impacts in a cost-effective and timely manner. This plan will include a table that identifies the actions to be taken, the reason they are recommended, their investment and operational costs, and which organizations should undertake these activities.

13.1.19 Task 19 –Alternatives at the Regional and Project Specific Level, Including Definition and Description of the No-Action Alternative

This task includes:

- A report provided by the Technical Steering Committee (Sub-Task 2 below)
- Two reports prepared by the Consultant (Sub Tasks 1 and 3 below).

Information developed by the Feasibility Study and Sub-Studies, among other sources, will be used by the Consultant in undertaking Sub Tasks 1 and 3.

Sub-Task 1 – Definition and Description of the No Action Alternative

Define and describe the “no action” or “without project” alternative. This task involves a comprehensive description of current and projected future environmental and social conditions in the Project area, with particular emphasis on the Dead Sea and its immediate surroundings. The objective of this task is to develop a baseline against which with-Project conditions can be contrasted, in order to identify Project effects. All projections apply to the expected economic life of the Project (e.g., 50 years after start date).

The Consultant shall:

- Assemble, evaluate and present available current reports, documents, and data on the relevant environmental and social characteristics of the Project area.
- Augment available data with field based observations or from other sources, as needed, to develop a complete description of relevant environmental and social conditions at the present time.
- Using water balance data developed elsewhere in the Feasibility Study, project changes in the water surface elevation, shoreline, and salinity of the Dead Sea, assuming no project or other inflow augmentation measure.
- Assess relevant environmental and social conditions assuming no project or other Dead Sea inflow augmentation measure. Particular attention should be given to the environmental consequences of the continued lowering of the Dead Sea water level.
- Describe present levels of tourism activity in the Project area; document present tourism-related infrastructure.

- Project likely future levels of tourism activity and infrastructure, assuming no project or other Dead Sea inflow augmentation measure.
- Describe present activity levels (product quantities, value, employment, etc.) for the chemical industry. Project future activity levels for the chemical industry, assuming no project or other Dead Sea inflow augmentation measure.

Sub-Task 2 – Alternatives at the Regional Level

The Technical Steering Committee shall provide the Consultant, for use in the Environmental and Social Assessment, with a report on alternatives/ options that have been proposed, studied and/or are being undertaken under a variety of initiatives to arrest the decline of the Dead Sea. The report will include water management measures and/or water conservation measures and options such as expanded use of treated wastewater and brackish waters and desalination in order to meet the current and future demands for water. The report will discuss whether the option of increasing Jordan River flows to the Dead Sea is or will be attainable taking into account all considerations, including the need to meet the current and future demands for water. The report will be presented in a table format, which includes a discussion of the “no action alternative” with information on the investment, operation, and maintenance cost, including intangible benefits, for the alternatives reported on.

Sub-Task 3 – Analysis of Alternatives at the Project Specific Level

The Consultant shall:

- Review at the project specific level, the several conveyance options considered in the Feasibility Study, incorporating different conveyance alignments and different plans regarding hydroelectric generation, desalination and drinking water distribution. Each alternative selected should be compared to a baseline or no action alternative for purposes of identifying environmental and social consequences of the Project. Projected with-project conditions over the Project life must be compared to expected without-project conditions over the same period.
- Evaluate alternatives on a “with-without,” not a “before-after” basis. This distinction, a routine part of project evaluation, requires particular emphasis in this Feasibility Study because of the dramatic changes that are expected to take place in the Dead Sea area over the next several decades.
- Prepare an analysis of alternatives that provides an evaluation of strategic and technical alternatives for all major elements of the Project, including the alignments for the conveyance. The analysis should be presented in a table format for the design, construction and implementation phases and include the recommended action, why it should be undertaken, when it should be undertaken, which parties would be responsible and what would be the investment and/or operational cost for this alternative. This table should include an analysis of the no action alternative at the project specific level.

13.1.20 Task 20 – Develop an Environmental and Social Management Plan

The objective of this task is to prepare a detailed Environmental and Social Management Plan (ESMP) to mitigate and monitor potential environmental and social impacts during implementation and operation of the Project.

The Consultant will prepare an Environmental and Social Management Plan to identify: (a) the set of mitigation measures to address potentially adverse impacts; (b) the legal framework and institutional structure and strengthening required to implement the mitigation measures; and (c) the monitoring program to verify compliance with the recommended mitigation measures and to monitor unanticipated impacts that might arise. Information developed by the Sub-Studies, among other sources, will be used by the Consultant in undertaking this task. Specific details concerning each of these components are discussed below.

The Consultant shall prepare an Environmental and Social Management Plan that:

- Identifies and describes a detailed plan for mitigation and monitoring of potential environmental and social issues associated with the Project at the regional and project specific level.
- Provides for a phased program of Project implementation and identifies a process for development, review and approval of supplemental ESMPs for Project elements that may need to be developed in detail in the future.
- Provides an evaluation of projected mitigation and monitoring activities for the Project elements, which should be presented in a table format for the design, construction and implementation phases, including the recommended action, why it should be undertaken, when it should be undertaken, who will be responsible and what would be the investment and/or operational cost for this action.
- Includes a cost estimate and implementation schedule that is fully coordinated with those to be used for the final design, implementation and operation of the Project.

Sub-Task 1 – Design of Mitigation and Monitoring Measures

Mitigation measures should include feasible and cost-effective measures to prevent significant adverse environmental and social impacts or reduce them to acceptable levels. There should be a distinction made between measures associated with the construction phase of the Project and those associated with the operational phase. Each mitigation measure should be described in as much technical detail possible, to a level of detail equivalent to preliminary engineering. The type of impact to be minimized and the conditions under which it is required should be described, along with clear objectives for construction methods, equipment selection and performance criteria.

At a minimum, the Consultant should prepare the following:

- Construction Phase Mitigation and Monitoring

- *Archaeology/Cultural Resources Mitigation Plan* to manage any archeological or cultural impacts that may be encountered during construction.
- *Involuntary Resettlement and Land Acquisition Framework and Involuntary Resettlement and Land Acquisition Plans (if required)* to manage the relocation and income restoration of persons that might be subject to involuntary resettlement and/or land acquisition.
- *Indigenous Peoples Development Framework and Indigenous Peoples Development Plan (if required)* to manage potential impacts to Bedouin populations and their herds during the construction and operational phases.
- *Construction Spoils Management Mitigation Plan* to manage the disposal in an environmentally friendly manner of the generated construction spoils.
- *Erosion and Sediment Control Mitigation Plan* to describe the measures during construction to minimize sediment carried by runoff from entering downstream surface water drainage systems (particularly for urbanized areas).
- *Fugitive Dust Control Mitigation Plan* to control fugitive dust control emissions during construction activities.
- *Noise Control Mitigation Plan* to control noise impacts on the surrounding communities during blasting and construction activities.
- *Wadi Crossing Mitigation Plan* to minimize the pollution and disruption associated with the construction crossings.
- *Tree Planting and Restoration of Natural Habitats Mitigation Plan* to ensure proper revegetation of areas disturbed by construction activities.
- *Traffic Control Mitigation and Public Communications Plan* to minimize the disruption of daytime traffic flows along important access roads.
- *Occupational Health and Safety Plan* to minimize health and safety risks to permanent and temporary employees of contractors during the construction phase, to staff during the operational phase, and to the public during both phases.
- *Health and HIV/AIDS Management Plan* to provide a framework to protect the health of, and prevent the transmission of HIV/AIDS to, both employees and the public during the construction phase.
- *Updated Public Consultation and Community Communications Plan for Construction Activities* to take into account all the impacts and mitigation measures identified during preparation of the Final Environmental and Social Assessment.

- Operations Phase Mitigation and Monitoring
 - Monitoring plan for operational phase performance of the *Marine Environment and the Coastal Zone Monitoring Plan* for the Upper Gulf of Aqaba.
 - Monitoring plan for operational phase performance of the *Wadi Araba Ecological Monitoring Plan*.
 - Monitoring plan for operational phase performance of the *Wadi (Seasonal River) Crossing Mitigation Plan* and the *Vegetation Planting and Restoration of Natural Habitat Mitigation Plan*.
 - Monitoring plan for operational phase performance of the *Dead Sea Environmental and Social Monitoring Plan*.
 - Updated *Public Consultation and Community Communications Plan for Operations Activities* that takes into account all the impacts and mitigation measures identified during preparation of the Final Environmental and Social Assessment.

Sub-Task 2 – Identification of Institutional Needs to Supervise Mitigation and Monitoring

The Consultant shall review the authority and capability of institutions at local, regional, and national levels and recommend steps to strengthen or expand them so that these institutions can provide oversight of environmental and social management and monitoring of the construction and operation phases of the Project. For the purposes of the Final Environmental and Social Assessment, draft terms of reference for each training activity should be prepared, and similar terms of reference should be included for any equipment or services required for institutional strengthening. The Consultant shall also prepare: (a) an implementation schedule for achieving the institutional strengthening that must be carried out as part of the Project, showing phasing and coordination with overall Project implementation plans, from construction to commissioning (start-up/turnover) to operations; and (b) the capital and recurrent cost estimates and sources of funds for implementing the institutional strengthening measures.

The level of monitoring should include at least weekly, and at some sites daily, inspections during construction activities to ensure compliance with the recommendations in the Environmental and Social Management Plan, and should clearly indicate roles and responsibilities. Monitoring should be detailed for choice of parameters, quantitative performance standards and frequencies (e.g., noise levels, dust levels, sediment management, restoration of disturbed land areas, special provisions for wadi crossings, etc.).

Post-construction frequency and performance indicators should also be developed, as well as the longer term environmental monitoring of operations. A reporting format that is simple and cost-effective should be developed to document monthly and annual progress in monitoring.

Sub-Task 3 – Resettlement and Land Acquisition Policy Framework and Plan(s)

Although the vast majority of the land required for the Project is owned by the Government of Jordan, measures will be taken by the Consultant to prepare a project specific Resettlement and Land Acquisition Policy Framework. The Policy Framework will be available for use in case it is required during the course of Project implementation. This Policy Framework will provide a detailed review of the potential need for involuntary resettlement and land acquisition and the general approach, procedures and principles of compensation for residents, compensation for relocations of businesses, compensation for the involuntary acquisition of land, compensation for temporary disruption of businesses, and compensation for damage to crops, trees or other types of property.

In addition, the Consultant will review the potential need for involuntary resettlement and land acquisition under all parts of the Project. If it is confirmed that private property will need to be acquired in specific Project areas, then a Resettlement and Land Acquisition Plan or Plans will be developed. The Resettlement and Land Acquisition Plan will provide detailed involuntary resettlement and land acquisition cost estimates (including entitlements of different categories of affected people) to be included in the Project and incorporated into the overall Project budget. Any required land acquisition should be included in the Resettlement and Land Acquisition Plan by the Consultant.

The Resettlement and Land Acquisition Plan should be based on up-to-date and reliable information regarding the scale of the proposed resettlement and land acquisition, its impact on the affected people, including legal issues involved. At a minimum, the Plan should cover the following elements: (a) an inventory of lands to be acquired and the numbers of affected persons and assets; (b) description of compensation and other resettlement entitlements to be provided; (c) consultations with affected people about acceptable alternatives; (d) institutional responsibility for implementation; (e) a timetable and budget; (f) participation of affected people in the design and implementation of the resettlement program; (g) grievance redress system; and (h) monitoring and evaluation of resettlement implementation.

Sub-Task 4 – Indigenous Peoples Development Framework and Plan(s)

An Indigenous Peoples Development Framework and, when appropriate, Indigenous Peoples Development Plans (IPDPs) should be prepared to address direct and indirect impacts of the Project on Bedouin populations and their herds. This may be especially important during the construction phase when their access to selected areas may be restricted. The Framework will provide a detailed review of the potential need to provide culturally appropriate assistance for Bedouin populations that may be affected by the Project. In cases where impacts are anticipated, project specific plans will be prepared in consultation with the concerned Bedouin groups to provide assistance to address potential impacts on these populations and their livestock. At a minimum, the Plan should cover the following elements: (a) an evaluation of impacts and the numbers of affected persons and assets; (b) description of compensation and other entitlements to be provided; (c) consultations with affected people about acceptable alternatives; (d) institutional responsibility for implementation; (e) a timetable and budget; (f) participation of affected people in the design and implementation of the

resettlement program; (g) grievance redress system; and (h) monitoring and evaluation of resettlement implementation.

Sub-Task 5 – Environmental and Social Management Plan: Schedule, Responsibilities and Costs

The Consultant shall provide: (a) an activities description and time-line schedule for implementing the: (i) Environmental and Social Management Plan; (ii) Resettlement and Land Acquisition Plan (iii) Indigenous Peoples Development Plan; (iv) Occupational Health and Safety Plan; and Health and HIV/AIDS Management Plan, with a breakdown of the sub-activities of mitigation measures, institutional strengthening and monitoring activities that are recommended for the Project, showing phasing and coordination with overall Project plans from construction to operations; (b) the entity responsible for each activity, and to whom they report functionally and legally, and (c) the capital and recurrent cost estimates and sources of funds for implementing the Environmental and Social Management Plan.

An Environmental and Social Management Plan Monitoring Consultant will be appointed to provide independent third party assurance and technical advice on effective implementation of the Plan. The scope of work and proposed budget level to appoint and remunerate an Environmental and Social Management Plan Monitoring Consultant for the construction and implementation phases of the proposed Project shall be prepared. The Environmental and Social Management Plan Monitoring Consultant will report directly to the Technical Steering Committee and coordinate closely with their designated specialists.

Part F – Process Steps

14 PUBLIC CONSULTATION AND DISCLOSURE

14.1 Introduction

Public consultation and disclosure of Project documents are internationally accepted practices for large-scale infrastructure projects and have proven to be valuable mechanisms to support cost effective and timely preparation and implementation of projects. Public consultations were an element of the earlier study prepared for the Jordan Rift Valley, undertaken by the Harza JRV Group in the mid-1990s, which included formal consultations in Aqaba, Amman, Eilat, Jerusalem, and Tel Aviv. It is a process that is formally required by many governments, most international financial institutions and bilateral donors, and increasingly by export credit agencies and commercial banks.

14.2 Tasks

14.2.1 Task 1 – Develop a Proposed Consultation and Communications Program, including Public Participation and Consultation

The objective of this task is to develop a consultation and communications program for the Project design and implementation process:

The Consultants shall:

- In close cooperation with the Technical Steering Committee, jointly prepare a proposed Consultation and Communications Program that will provide for involvement and inputs from public consultation and participation to both the Feasibility Study and the Environmental and Social Assessment. The Consultation and Communications Program will describe how the substantive issues will be discussed in a two-way manner with stakeholders from multiple levels of government, residents of the Project area of influence, academic and applied research institutes, civil society organizations, nongovernmental organizations and interested individual citizens.

Instructions:

The meetings and focus groups should involve representatives of the beneficiary Parties, as appointed by their respective representatives on the Technical Steering Committee. For each meeting or focus group a formal record should be made including the agenda, a list of participants and a summary of the issues discussed; copies of materials should be provided to the participants.

It is proposed that consultation and participation meetings be conducted at the locations identified by the Steering Committee.

Special measures will need to be taken to ensure that the views of women are properly obtained and taken into account. In addition,

special procedures will also be required to contact Bedouin populations that make seasonal use of the greater Project area and who move their livestock across areas that will be disrupted by construction activities.

Special measures will be taken to meet with the Aqaba Regional Authority and players in Eilat responsible for environmental management in the upper Gulf of Aqaba, as well as with representatives of organizations responsible for protected areas in the greater Project area such as the Dana Wildlands in Jordan.

The Consultation and Communications Program will continue during the Project implementation process, especially in conjunction with major construction activities. Although the Consultant will no longer be involved at that stage, the Consultant will need to train appropriate staff from the beneficiary Parties to continue the consultation process during Project implementation.

14.2.2 Task 2 – Assist Beneficiary Parties in Implementation of the Consultation and Communications Program, Including Disclosure of Project-Related Documents to the Public

The objective of this task is to support the beneficiary Parties in the implementation of a Consultation and Communications Program that includes provisions for the disclosure of Project related documents to the public:

The Consultant shall:

- Assist the beneficiary Parties in implementing the Consultation and Communications Program, including the development of an official Project website to post information for public access and receive comments and requests for information.
- Support the beneficiary Parties in dissemination of printed copies of the draft and final versions of the Feasibility Study and Environmental and Social Assessment in key locations within the greater Project area. Specific provisions would be made for the disclosure of information to local communities before the appraisal and construction phases of the Project.
- The draft and final reports will be disclosed as follows: the Executive Summaries of the Feasibility Study and Environmental and Social Assessment will be made available in Arabic, English and Hebrew. The Main Reports of the Feasibility Study and Environmental and Social Assessment; the Social Assessment; the Resettlement and Land Acquisition Framework; the Resettlement and Land Acquisition Action Plan(s); and the Indigenous Peoples Development Plan will be provided in English.

15 TECHNICAL STEERING COMMITTEE

A Technical Steering Committee representing the beneficiary Parties and World Bank will be established to oversee the preparation of the Feasibility Study and the Environmental and Social Assessment. The members of the Steering Committee should be equally representative of the beneficiary Parties. The Technical Steering Committee will make its decisions on a consensus basis. The composition of the Steering Committee is as follows:

- Four (4) representatives from Jordan.
- Four (4) representatives from Israel.
- Four (4) representatives from Palestinian Authority.
- Two (2) representatives from the World Bank.

Detailed terms of reference for the committee will be prepared after finalization of this TOR and before initiation of the Feasibility Study and the Environmental and Social Study.

16 PROJECT MANAGEMENT UNIT

A Project Management Unit will be established for the supervision of the Feasibility Study and Environmental and Social Assessment and will be directed by and report to the Technical Steering Committee. The Project Management Unit will oversee the activities of the consultants on a day to day basis and will provide reports on progress of the studies to the Technical Steering Committee.

The Project Management Unit would support the Steering Committee by undertaking the following activities:

- Support the Technical Steering Committee in the contracting of consultants.
- Coordination of the work of the consultants for the Feasibility Study and Environmental and Social Assessment.
- Coordination of financial management of the contracts, including processing of invoices and payments.
- Preparation of regular reports to the Technical Steering Committee concerning progress of the study program including the status of expenditures.
- Management of the planning the public consultation process.
- Undertaking other duties as assigned by the Technical Steering Committee.

Detailed terms of reference for the Project Management Unit will be prepared after finalization of this TOR.

17 INDEPENDENT PANEL OF EXPERTS

17.1 Introduction

International practice for large-scale projects that are highly complex and present major irreversible decisions often involves the use of independent advisory panels of internationally recognized experts to provide advice during the design, implementation, and operational phases. It is planned therefore that an independent panel will be appointed for the proposed Feasibility Study and Environmental and Social Assessment.

The Panel of Experts will serve as independent reviewer of the Feasibility Study and the Environmental and Social Assessment. The Panel of Experts will be appointed by the Technical Steering Committee. The Project Management Unit will arrange the meetings between the Panel of Experts and the Consultants.

18 DELIVERABLES AND SCHEDULE

18.1 Introduction

The TOR will be implemented on two parallel tracks. The first track will carry out studies related to the feasibility of the concept from the technical, economic, financial, legal, and institutional point of view. The second track will carry out a full Environmental and Social Assessment that will allow discussions and decisions on the environmental and social impacts of the proposed Project. The reason for the separate tracks and use of separate consultancy firms to implement the two elements of the TOR is to allow an unbiased, independent Environmental and Social Assessment of the Project. Products from these two separate activities will constitute the basis for decision making related to the overall feasibility of the Project. The preparation of these documents will be supported by the specialized sub-studies.

18.2 Deliverables

Consistent with this approach, the deliverables for this TOR will include two separate reports: the Feasibility Study Report and the Environmental and Social Assessment Report. Both documents will fully rely on the Sub-Studies Report that would be integrated within the above mentioned two documents.

18.2.1 Feasibility Study Report

All reports listed below should be submitted in English. Unless otherwise stated, 10 copies are submitted to each of the beneficiary Parties and 10 copies to World Bank through the Technical Steering Committee and according to the schedule given below.

Inception Report. The inception report should be submitted in English to the Technical Steering Committee 60 days after Date of Letter Award.

Progress Reports. Progress reports should be submitted in English to the Technical Steering Committee monthly, following contract signature. The progress report should present a very brief overview of progress in completing the tasks, difficulties in achieving the work as described in the contract, proposed alternate means to achieve the Project objectives, status of budget and major scheduled milestones, and

any proposed modifications to the contract mandate. It is anticipated that progress reports would be 1-3 pages maximum in length.

Consultation and Communications Program. The Consultation and Communications Program should be submitted to Technical Steering Committee according to the time schedule set out below.

Annotated Outline of Feasibility Study. The Annotated Outline of the Feasibility Study should be submitted to Technical Steering Committee according to the time schedule set out below. The Annotated Outline should consist of the full table of contents to be used for the Feasibility Study, complete with chapter titles, annex titles, numbering format, main author responsible for each section, main issues to be addressed in each section, issues that require clarification or cooperation for each section, type of input to each section, and approximate page length for each section. An initial outline for the table of contents has been presented above.

Preliminary Draft Feasibility Study (25 copies to each of the beneficiary Parties, 10 copies to World Bank). The Preliminary Draft Feasibility Study shall be submitted to the Technical Steering Committee according to the time schedule set out below. This report should provide the first draft text on the details of the compiled available data report and of all new surveys, interviews, consultations, sampling, analyses, and other data collected. The preliminary draft information should be compiled in formats that can easily become part of the draft reports or draft technical annexes. These preliminary draft texts are to be updated as the study progresses and based upon review comments.

Draft Feasibility Study – Executive Summary, Main Report (25 copies to each of the beneficiary Parties, 10 copies to World Bank)

The Draft Feasibility Study Report should be submitted within the time schedule set out below. The objective of the Draft Feasibility Study is to present key findings and the most relevant information and data rather than general and non-specific information.

The Executive Summary should provide a clear presentation concerning the scope and objectives of the proposed Project, assess its technical, environmental and social feasibility under current conditions, indicate community/agency consultations undertaken and their outcome, and include an evaluation of costs and potential sources and mechanisms for funding the Project. In addition to text, the Executive Summary should contain tables, figures and/or maps as needed.

The Main Report should focus on findings, conclusions, and recommended actions supported by summaries of the data collected and citations for any references used in interpreting those data. Liberal use of tables, maps, and graphics to present summaries of data and analyses is strongly encouraged. Unpublished documents that are not readily available should also be assembled into an annex.

The Draft Feasibility Study should be delivered to the Technical Steering Committee and disclosed to the public by posting it on the Project website and making it available at appropriate locations in printed form.

The Technical Steering Committee will organize review meetings and maintain written minutes of meetings to record the major comments. Main sections of the Feasibility Study that require extensive re-writing and editing should be re-submitted for verification to the Technical Steering Committee. Once the Technical Steering Committee has issued a letter approving the revisions to the Draft Feasibility Study that incorporate its comments, the Consultant shall submit the Final Feasibility Study.

Final Feasibility Study (50 copies of Executive Summary and of the Regional Assessment, Project Specific Assessment to each of the beneficiary Parties, 10 copies to World Bank). The Final Feasibility Study should be submitted within the time schedule set out below. The Final Feasibility Study should provide complete details of all work performed, analyses made, and justification of options and recommendations proposed. This report will build upon the reports completed previously and integrate comments received from the Technical Steering Committee, including issues raised and discussed at review meetings, as well as written comments.

The Final Feasibility Study should be delivered to Technical Steering Committee and disclosed to the public by posting it on the Project website and making it available at appropriate locations in printed form.

In addition, a master hard copy and master soft electronic copy suitable for reproduction purposes should be provided to the Technical Steering Committee to meet any future needs for reprinting.

18.2.2 Environmental and Social Assessment Report

All reports listed below should be submitted in English. Unless otherwise stated, 10 copies are submitted to each of the beneficiary Parties and 10 copies to World Bank through the Technical Steering Committee and according to the schedule given below.

Inception Report. The inception report should be submitted in English to the Technical Steering Committee 60 days after Date of Letter Award.

Progress Reports. Progress reports should be submitted in English to the Technical Steering Committee every six weeks following contract signature. The progress report should present a very brief overview of progress in completing the tasks, difficulties in achieving the work as described in the contract, proposed alternate means to achieve the Project objectives, status of budget and major scheduled milestones, and any proposed modifications to the contract mandate. It is anticipated that progress reports will be 1-3 pages maximum in length.

Consultation and Communications Program. The Consultation and Communications Program should be submitted to the Technical Steering Committee according to the time schedule set out below.

Annotated Outline of the Environmental and Social Assessment Report. The Annotated Outline of the Environmental and Social Assessment Report should be submitted to the Technical Steering Committee according to the time schedule set out below. The Annotated Outline should consist of the full table of contents to be used for the Environmental and Social Assessment, complete with chapter titles, annex titles, numbering format, main author responsible for each section, main technical issues to be addressed in each section, issues that require Technical Steering

Committee clarification or cooperation for each section, type of input to each section, and approximate page length for each section.

Preliminary Draft Environmental and Social Assessment - Regional Assessment, Project Specific Assessment (20 copies, including 10 copies to the World Bank). The Preliminary Draft Environmental and Social Assessment shall be submitted to the Technical Steering Committee according to the time schedule set out below. This report should provide the first draft text on the details of all surveys, interviews, consultations, sampling, analyses, and other data collected. The preliminary draft information should be compiled in formats that can easily become part of the draft reports or draft technical annexes. These preliminary draft texts are to be updated as the study progresses and based upon the received comments.

Draft Environmental and Social Assessment Report – Executive Summary, Regional Assessment, Project Specific Assessment (100 copies, including 10 copies to the World Bank)

The Draft Environmental and Social Assessment Report should be submitted within the time schedule set out below. The objective of the *Environmental and Social Assessment Report* is to present key findings and the most relevant information and data rather than general and non-specific information. The Environmental and Social Assessment Report should be concise and limited to significant social and environmental issues.

The Executive Summary should indicate community/agency consultations undertaken and the budget levels and source(s) of financial support for implementation of the recommended actions. In addition to text, the Executive Summary should contain tables, figures and/or maps as needed.

The Main Report should focus on findings, conclusions, and recommended actions supported by summaries of the data collected, and citations for any references used in interpreting those data. Liberal use of tables, maps, and graphics to present summaries of data and analyses are strongly encouraged. Detailed or un-interpreted data are not appropriate in the main text and should be presented in annexes or a separate volume. Unpublished documents that are not readily available should also be assembled in an annex.

The Draft Environmental and Social Assessment Report should be delivered to the Technical Steering Committee and will be disclosed to the public by posting it on the Project website and making it available at appropriate locations in printed form.

The Technical Steering Committee will organize review meetings and maintain written minutes of meetings to record the major comments. Main sections of the Environmental and Social Assessment Report that require extensive re-writing and editing should be re-submitted for verification to the Ministry of Water and Irrigation - Jordan. Once the Technical Steering Committee has issued a letter approving the revisions to the Draft Environmental and Social Assessment Report that incorporate its comments, the Consultant shall submit the Final Environmental and Social Assessment Report.

Final ESA Report – Executive Summary, Regional Assessment, Project Specific Assessment (200 copies of Executive Summary and 100 copies of the Regional Assessment, Project Specific Assessment, including 10 copies to the World Bank). The Final Environmental and Social Assessment Report should be submitted within the time schedule set out below. The Final Environmental and Social Assessment Report should provide complete details of all work performed, analyses made, and justification of options and recommendations proposed. This report will build upon the reports completed previously and integrate comments received from the Technical Steering Committee, including issues raised and discussed at review meetings, as well as written comments.

The Final Environmental and Social Assessment Report will be delivered to the Technical Steering Committee and disclosed to the public by posting it on the Project website and making it available at appropriate locations in printed form.

In addition, a master hard copy and master soft electronic copy suitable for reproduction purposes should be provided to the Technical Steering Committee to meet any future needs for reprinting.

18.2.3 Sub-Studies Report

All reports listed below should be submitted in English. Unless otherwise stated, 10 copies are to be submitted to each of the beneficiary Parties and 10 copies to the World Bank through the Technical Steering Committee and according to the schedule given below.

Proposed Work Program. The proposed work program should be submitted in English to the Technical Steering Committee 30 days after Date of Letter Award.

Progress Report. Progress reports should be submitted in English to the Technical Steering Committee monthly following contract signature. The progress report should present a very brief overview of progress in completing the tasks, difficulties in achieving the work as described in the contract, proposed alternate means to achieve the Project objectives, status of budget and major scheduled milestones, and any proposed modifications to the contract mandate. It is anticipated that progress reports will be 1-3 pages maximum in length.

Consultation and Communications Program. The Consultation and Communications Program should be submitted to the Technical Steering Committee according to the time schedule set out below.

Interim Report. An Interim Report will be submitted that will include: a review of the existing and ongoing studies and an analysis of gaps in information; a proposal for studies to be undertaken in Phase 2; and an annotated outline of the Sub-Studies Report.

The Annotated Outline should consist of the full table of contents to be used for the Sub-Studies Report, complete with chapter titles, annex titles, numbering format, main author responsible for each section, main issues to be addressed in each section, issues that require clarification or cooperation for each section, type of input to each section, and approximate page length for each section. An initial outline for the table of contents has been presented above.

Preliminary Draft of Sub-Studies Report. The Preliminary Draft of Sub-Studies Report shall be submitted to the Technical Steering Committee according to the time schedule set out below. This report should provide the first draft text on the details of all data collected. The preliminary draft information should be compiled in formats that can easily become part of the draft reports or draft technical annexes. These preliminary draft texts are to be updated as the study progresses and based upon the Technical Steering Committee comments.

Draft of Sub-Studies Report (25 copies to each of the beneficiary Parties, 5 copies to World Bank – Executive Summary, Main Report). The objective of the Sub-Studies Report is to present key findings and the most relevant information and data rather than general and non-specific information. The Executive Summary should provide a clear presentation concerning the scope and objectives of the proposed Project and assess available technical, environmental and social feasibility information. In addition to text, the Executive Summary should contain tables, figures and/or maps as needed.

The Main Report should focus on findings, conclusions and recommended actions, supported by summaries of the data collected, and citations for any references used in interpreting those data. Liberal use of tables, maps, and graphics to present summaries of data and analyses is strongly encouraged. Unpublished documents that are not readily available should also be assembled in an annex.

The Draft Compiled Available Data report should be delivered to the Technical Steering Committee and disclosed to the public by posting it on the Project website and making it available at appropriate locations in printed form.

The Technical Steering Committee will organize review meetings and maintain written minutes of meetings to record the major comments. Main sections of the Draft Sub-Studies Report that require extensive re-writing and editing should be re-submitted for verification to the Technical Steering Committee. Once the Technical Steering Committee has issued a letter approving the revisions to the Draft Available Information Report that incorporate its comments, the Consultant shall submit the Final Sub-Studies Report.

Final copy of Compiled Available Data Report (50 copies of summary and 25 of full report to each beneficiary Party, 10 copies to World Bank). The Final Compiled Available Data Report should be submitted within the time schedule set out below. The Compiled Information Report should provide complete details of all work performed. This report will build upon the reports completed previously and integrate comments received from the Technical Steering Committee, including issues raised and discussed at review meetings, as well as written comments. The Final Sub-Studies Report should be delivered to the Technical Steering Committee and disclosed to the public by posting it on the Project website and making it available at appropriate locations in printed form.

In addition, a master hard copy and master soft electronic copy suitable for reproduction purposes should be provided to the Technical Steering Committee to meet any future needs for reprinting.

18.3 Consultant Supervision and Time Schedule

The work of the Consultant will be supervised by the Technical Steering Committee, which will be the focal point for coordination with all other ministries, agencies and any other international institutions. The Technical Steering Committee will facilitate access by the Consultants to the data available from the beneficiary Parties and support field visits. It will also provide liaison and contacts with the government, academic and applied research institutions, Civil Society Organizations and Nongovernmental Organizations, and will work cooperatively with the Consultant for all public participation and public consultation activities.

The following is the time schedule for the production of the reports described above. The Consultant should begin work upon contract signature. The Consultant should propose a clear schedule with critical milestones and make all possible efforts to meet the proposed time schedule.

18.3.1 Indicative Schedule for the Feasibility Study

MILESTONE	MONTH
1. Contract signature	0
2. Participate in Study Launch Workshop	1
3. Submit Inception Report	3
4. Submit Consultation and Communication Program Jointly with ESA Consultant	3
5. Submit Annotated Outline of Feasibility Study	4
6. Comments issued by Technical Steering Committee	5
7. Initiate Desk and Field Studies	5
8. Submit Preliminary Draft Feasibility Study, including the Economic and Financial Study	19
9. Comments issued by Technical Steering Committee	20
10. Submit Draft Final Feasibility Study – Executive Summary, Main Report, including the Economic and Financial Study	21
11. Comments and Approval Letter Issued by Technical Steering Committee	23
12. Issue Final Feasibility Study Report	24

18.3.2 Indicative Schedule for the Sub-Studies

MILESTONE	MONTH
1. Contract Signature and Mobilization	0
2. Submit Work Program for four Sub-Studies	1
3. Compile, review, and evaluate existing/ongoing studies	3
4. Submit Interim Report, including Study Proposal for Phase 2 and Annotated Outline	3
5. Comments issued by Technical Steering Committee	4
6. Submit Preliminary Draft Sub-Studies Report	10
7. Comments issued by Technical Steering Committee	11
8. Submit Draft Final Sub-Studies Report	16
9. Comments and Approval Letter Issued by Technical Steering Committee	17
11. Issue Final Sub-Studies Report	18

18.3.3 Indicative Schedule for the Environmental and Social Assessment

MILESTONE	MONTH
1. Contract signature	0
2. Participate in Study Launch Workshop Jointly	1
3. Submit Inception Report	3
4. Submit Consultation and Communication Program Jointly with Feasibility Study Consultant	3
5. Submit Annotated Outline of ESA Report	4
6. Comments issued by Technical Steering Committee	5
7. Initiate Desk and Field Studies	5
8. Submit Preliminary Draft ESA Report	19
9. Comments issued by Technical Steering Committee	20
10. Submit Draft Final ESA Report	21
11. Comments and Approval Letter Issued by Technical Steering Committee	23
12. Issue Final Environmental and Social Assessment Report	24

18.4 Staffing and Experience of the Consulting Firms

It is anticipated that the Consultants will establish a strong core team of specialists. It is envisaged that highly experienced specialists will serve as the Feasibility Study and Environmental and Social Assessment Team Leaders and Deputy Team Leaders. The Consultants should complement the skills of the core team with other specialists with experience in the Middle East and around the world, relying whenever possible on local skilled expertise and professional knowledge represented by beneficiary Parties. In some cases Government affiliated organizations and academic institutions may provide unique an exceptional expertise on specialized topics and their participation may be important to the successful preparation of the Study Program.

The Consultants should propose and justify the range of disciplines to be included in the core Project teams and the complementary skills of other short-term specialists. The inputs of all specialists should be clearly indicated as it is anticipated that the majority of the work program will be carried out by individuals highly experienced in their professional fields and whose experience and knowledge will be aligned with the tasks assigned.

Study Team Leaders should have at minimum 10 years professional experience managing interdisciplinary infrastructure projects in the case of the Feasibility Study, and Environmental and Social Assessment of projects in the case of the Environmental and Social Assessment. The Study Team Leaders should have familiarity with studies of equivalent size projects; and a demonstrated ability to work with government officials, civil society organizations, Non Government Organizations, and the public at large. They should have a proven track record on managing and coordinating a diverse group of professionals.

The Consultant should name individuals to participate in specified roles within the Project team and provide full curricula vitae and any other information considered relevant by the Consultant. The Consultant should name the Study Team Leader, the Deputy Study Team Leader, the other core team members, and key short-term specialists, and provide an assurance that all members of the proposed team will be made available as specified in the proposal.

18.5 Indicative Schedule of Payments to the Consultants

For the performance of the duties enumerated under the Terms of Reference, the Consultant will be paid a lump sum fee.

The lump sum fee would be paid in the following manner:

- Fifteen percent (15%) of the said fee as an advance payment against the submission of a bank guarantee for the amount.
- Five percent (5%) of the said fee upon acceptance of the Inception Report / Work Program and the Consultation and Communications Program.
- Five percent (5%) of the said fee upon acceptance of the Annotated Outline of Feasibility Study or Environmental and Social Assessment Report or the Sub-Studies Reports.
- Thirty percent (30%) of the said fee upon acceptance of Preliminary Draft Feasibility Study or Environmental and Social Assessment Reports or the Sub-Studies Report.
- Twenty five percent (25%) of the said fee upon acceptance of the Draft Feasibility Study or Environmental and Social Assessment Reports or the Sub-Studies Report.
- Twenty percent (20%) of the said fee after approval letter of the Client and upon acceptance of the Final Feasibility Study or Environmental and Social Assessment Report or the Sub-Studies Report.

18.6 Ownership and Control of Information, Data and Documents

Provision of information and data to the Consultants shall not constitute transfer of any and all intellectual property rights, ownership, licensing or the right to use these for any other purpose than the Study.

Documents and information/data provided to and/or generated by the Consultants shall be not be disclosed without the expressed written consent of the Technical Steering Committee.

The Consultants are advised that with respect to commercially generated information/data, there might be a need to conclude specific agreement with the owners of such information/data.