

# Red Sea – Dead Sea Water Conveyance Concept Feasibility Study and Environmental and Social Assessment

## Information Note - July 2007

This note provides information on the Red Sea – Dead Sea Water Conveyance Concept Feasibility Study and Environmental and Social Assessment. In 2005, Israel, Jordan and the Palestinian Authority agreed on the terms of reference of a Study Program as a way to investigate whether and how transfer of water from the Red Sea to the Dead Sea can stop the decline of the Dead Sea water level and restore the unique natural and cultural environment of the Dead Sea.

This note consists of five parts:

- Background
- The conveyance concept
- The Feasibility Study and the Environmental and Social Assessment
- The Study Program process and the role of the World Bank
- Present status

As the Feasibility Study and the Environmental and Social Assessment are work in progress, some of the information in this note will change over time. You are encouraged to check for updates on the website of the Study Program: [www.worldbank.org/rds](http://www.worldbank.org/rds).

### Background

The Dead Sea (see Figure 1) has been a centerpiece in the history of many cultures and religions for centuries. The region around the Dead Sea is considered by some as the cradle of human culture and civilization. It features numerous archeological and historic sites. The Dead Sea is considered the lowest spot on earth – about 400 meters below sea level. Its water is ten times more saline than ocean water, making it one of the saltiest water bodies in the world. The Dead Sea's distinctive chemical composition and fresh/salt water interface have created a unique ecology of international importance.

*Figure 1: Satellite image of the Dead Sea and surrounding areas*



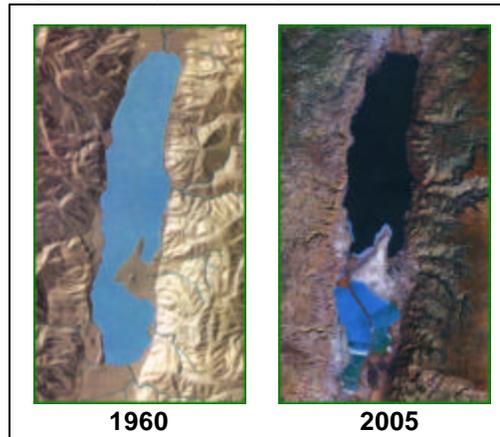
Until recently, tourism and recreation made a major contribution to the economy of the region. The Dead Sea and its shoreline support a significant health industry. Additionally, potash mining and processing (and related chemicals) are major industries on both sides of the Sea.

The Dead Sea and its unique environment are changing, as the water level is dropping due to a sharp decrease in inflow. The water level has fallen from 394 meters below sea level in the 1960s to 418 meters below sea level as of 2006. As a result, the Sea's water surface area has been reduced by one third: from roughly 950 square kilometers to 637 square kilometers today (see Figure 2). The water level continues to drop at an alarming pace of 0.8 to 1 meter per year, and the Sea's surface area is shrinking accordingly.

The significant decline of the water level over the past 30 years is due to diversion of water from the Jordan River and from the Dead Sea itself. The Jordan River is the main water body feeding the Dead Sea. Water extracted from the river is of vital importance for the population and economy in the region.

Environmental damage has already been incurred in the Dead Sea area. Current damage includes loss of freshwater springs, river bed erosion, and occurrence of over one thousand sinkholes. If no action is taken to remedy the situation, the further decline of the Sea is likely to cause more severe environmental, cultural, and economic damage. It is estimated that, if left unattended, the Dead Sea will reach a new equilibrium at an elevation that is about 100 meters below the current level. The soil matrix around the Sea will collapse further as the water level falls, causing additional sinkholes and intensive erosion of river beds. Exposure of wet mudflats will make large stretches of the shoreline inaccessible. Increasingly higher loss of groundwater resources will also occur as the fresh/salt water interface recedes.

*Figure 2: Surface area of the Dead Sea*



The region and the international community view the Dead Sea as a site of cardinal international cultural, environmental, and touristic importance. There is much – local, regional, and international - interest to “save the Dead Sea”. This includes a grass roots movement, launched by Nongovernmental Organizations. The NGO community is proposing designation of the Dead Sea within UNESCO's Man and the Biosphere Program to focus attention on this resource. The program would place the Dead Sea among the world's important landmarks, provide protection from future degradation, and allow for additional international assistance. The Friends of the Earth – Middle East is leading the initiative and UNESCO has undertaken initial reviews. A formal request to UNESCO must come from the Governments involved.

There is a general consensus on the need to restore the Dead Sea, but opinions on how to achieve this objective vary. While all agree on the need for demand management as part of the solution, a question is to what extent demand management measures can restore the natural flow of the Jordan River. Given the fact that the flow of the Jordan River is largely appropriated for what are viewed as key economic and social uses, good water management within the basin may have to be combined with a water transfer from outside the Jordan Basin to restore the Dead Sea level to a reasonable level.

### **The Red Sea – Dead Sea Water Conveyance Concept**

The need to save the unique values of the Dead Sea, the desire to avoid an environmental calamity, and the need to develop additional water resources have led Jordan and Israel to promote the rehabilitation of the Dead Sea. As part of peace negotiations, they conceived the concept of water conveyance from the Red Sea to the Dead Sea as a means to arrest the declining water level and to allow gradual refilling over time to a feasible level. The concept was also agreed to by the Palestinian Authority.

The three Beneficiary Parties (Jordan, Israel, and the Palestinian Authority) have articulated a shared vision of the Red Sea–Dead Sea Water Conveyance Concept, centered on:

- Saving the Dead Sea from environmental degradation;

- Desalinating water and generating energy at affordable prices for Jordan, Israel, and the Palestinian Authority; and
- Building a symbol of peace and cooperation in the Middle East.

Connecting the two seas is not a new idea. A possible interbasin transfer has been studied in many forms since the mid-1800s. The 400-meter difference in elevation between the Dead Sea and the Red Sea (or the Mediterranean Sea) has long been enticing because of the gravity flow advantage and the considerable potential for hydropower generation. As unit prices for desalination have dropped in recent years, combining the transfer with desalination for domestic or agricultural uses has become more appealing.

The presently considered concept places rehabilitation of the Dead Sea as its top priority. It proposes a 180 kilometer long alignment from the Red Sea at Aqaba/Eilat to the Dead Sea that generally follows the border between Jordan and Israel and lies entirely in Jordanian territory. A 1998 pre-feasibility study considered fourteen alternatives for alignments and conveyance elevation. The study defined one preferred alignment along Wadi Arava to be further investigated. The concept considers an eventual annual water transfer of 1,900 million cubic meters from the Red Sea to the Dead Sea. Initially, this entire amount would flow into the Dead Sea to raise the water level and thereby compensate for the inflow reduction due to lower Jordan River diversion and industrial and natural evaporation losses. This could be combined with hydropower generation for potential sale in the region and/or energizing a potential desalination plant. Over time, part of the conveyed water could be desalinated for potable water distribution to municipalities in the region.

The conveyance concept offers potential environmental, economic, and other benefits. The principal potential benefit is the saving of the Dead Sea from ecological degradation and its partial restoration. Arresting the decline of the water level and its eventual rise will be conducive to economic development of the region. The hydropower and water desalination component, if viable, will help to address the chronic water shortage in the region by providing a stable new water source. Closely related to these direct benefits would be “peace dividend” from increased cooperation among the Beneficiary Parties. Additional benefits would include employment during construction and in operating and maintaining the system and in the potash industry.

However, there are also potential critical environmental and social challenges. The mixing of Red Sea and Dead Sea waters will require careful study to determine the way they would interact. Other potential environmental impacts of a conveyance system could include changes in the Upper Gulf of Aqaba/Eilat, changes in the ecological connectivity in the Wadi Arava, and a potential impact on groundwater. Potential social impacts could be both direct during the construction phase including effects on local communities, employment issues, and health risks and indirect during the operation phase related to changes in land use and economic development. Potential impacts to archaeological and historical sites could be an issue during the construction and operation of the conveyance system.

The magnitude of the conveyance concept is not unprecedented. In order to put it in perspective, it is helpful to mention some major inter-basin water transfer projects elsewhere in the world. Examples of similar projects include: the Lesotho Highland Project in Lesotho and South Africa; the San Francisco River Water Transfer in Brazil; The Central Arizona Project in the USA; the Wanjiashai Water Transfer Project in China; and the proposed Ebro River Water Transfer in Spain. These projects transfer similar volumes of water from one basin to another as the Red Sea – Dead Sea conveyance concept, and cost in the same range.

## **The Feasibility Study and the Environmental and Social Assessment**

Over a period of roughly three years, the Beneficiary Parties, with technical assistance from the World Bank, prepared the terms of reference for the Feasibility Study and the Environmental and Social Assessment of the Red Sea – Dead Sea Water Conveyance concept (“the Study Program”). The Study Program’s objective is to investigate the feasibility of the concept as a solution to the decline of the Dead Sea water level. The outcome of the Study Program will serve as a tool for stakeholders to determine whether transfer of water from the Red Sea to the Dead Sea is feasible. It is important to note that the Study Program seriously considers the option of no action.

The terms of reference stipulate that the Feasibility Study and the Environmental and Social Assessment will be comprehensive and transparent, and will involve extensive stakeholder participation and disclosure. The Study Program consists of the preparation by independent consultants of a Feasibility Study and an Environmental and Social Assessment. It is estimated that the Feasibility Study and the Environmental and Social Assessment will take approximately 24 months. The total costs of the Study Program - including study management, the Panel of Experts, stakeholder consultation meetings, and the World Bank Trust Fund audits and related expenses - is estimated at US\$15.5 million.

The Feasibility Study will review and assess the technical, economic, financial, environmental, and social dimensions of the proposed water conveyance concept in an integrated manner. The study calls for identification and evaluation of relevant technical aspects of the concept, 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 Feasibility Study will only consider technical and financial aspects of the proposed conveyance concept and shall not in any way prejudice the riparian rights of any of the Beneficiary Parties.

The Environmental and Social Assessment will review and assess the potential environmental and social impacts of the proposed conveyance concept at the regional and project specific level. The Environmental and Social Assessment will be carried out independently of the Feasibility Study by a separate consultancy company. It seeks to undertake an analysis of alternatives including the no-action alternative, to assess the short-term and long-term impacts of the concept, if implemented. The terms of reference also calls for identification of mitigation measures and requires a monitoring, evaluation, and reporting system.

The terms of reference for the Study Program include extensive public comment and consultation, as well as stakeholder meetings and disclosure at every stage of the process. This process will be sponsored and primarily conducted by Jordan, Israel, and Palestinian Authority officials. The public consultation and disclosure are a valuable mechanism to support transparency and provide input from stakeholders and other affected parties.

The Study Program will carry out the analysis of a wide range of technical, economic, financial, environmental, social and institutional issues to the highest professional standards. It will attach value to each of these issues to ensure that each receives its appropriate consideration. The Study Program will undertake these tasks and studies in a way that reflects and respects the unique political context of the Middle East.

## The Study Program Process and the Role of the World Bank

In a jointly signed letter to the World Bank dated May 9, 2005, the Beneficiary Parties requested the World Bank to coordinate donor financing and manage the implementation of the Study Program. The

*Figure 3: May 2005 World Economic Forum – Dead Sea*



Beneficiary Parties jointly and publicly announced their agreement at the World Economic Forum – Dead Sea in May 2005 (see Figure 3).

In response to the request, the World Bank agreed to coordinate donor financing and manage the Study Program. The concept is relevant to development objectives of the World Bank, which has a comparative advantage as an independent, trusted facilitator and brings the knowledge and credibility of a global organization, together with on-the-ground experience.

This will be a complex study. The Study Program requires a major effort from all parties to carry out an effective investigation in order to inform the decision process. But it also constitutes a major opportunity for those who live in the lower Jordan Valley to work together and strengthen relationships with neighbors in the region while addressing an environmental challenge of global interest and significance.

Activities of the Study Program will be directed by a Technical Steering Committee, consisting of four representatives of each of the Beneficiary Parties and two World Bank representatives. Given the complexity of the Study Program and the proposed conveyance concept, an independent panel of experts of international stature will be appointed to monitor, review, and provide advice during preparation of the Feasibility Study and Environmental and Social Assessment.

## Present Status

The World Bank has set up a multi-donor trust fund as a vehicle to finance the Study Program. A donor meeting was held in Paris in July 2005 to raise financing. Since then, four bilateral donors have made firm commitments to financing the Study Program: France, Greece, Japan, The Netherlands and the United States of America.

With the funding in place from these five donors, the Beneficiary Parties and donors met at the Dead Sea in December 2006 to launch the Study Program. An Expression of Interest for Consultancy Firms was released in April 2007. Firms were shortlisted in June 2007. The work on the Study Program is expected to begin in September 2007.

For the latest on the Red Sea – Dead Sea Water Conveyance Concept Feasibility Study and Environmental and Social Assessment, visit the Study Program’s website: [www.worldbank/rds](http://www.worldbank/rds).