FINAL REPORT

An Environmental and Socioeconomic Cost Benefit Analysis and Pre-design Evaluation of the Proposed Red Sea / Dead Sea Conduit

“Socio-Economic Condition”

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EXECUTIVE SUMMARY

The Dead Sea is a unique location to the world. Its unique water composition attracts medicinal tourism, and the areas around the Dead Sea are of outstanding historical and environmental importance. The Dead Sea and its surroundings are facing a great challenge as the sea level has been dropping by nearly one meter per year due to water diversions upstream and to mineral extraction industries. Studies made so far reveal that one third of the Dead Sea natural surface area and much coastline have been lost.

In order to stop the Dead Sea water level from dropping and bring it back to the earlier level, a study is being carried out to investigate the possibility of conducting a conduit from the Red Sea to the Dead Sea. The project is anticipated to include an intake canal at the northern tip of Gulf of Aqaba, where water would then be pumped through either an open canal or a pipeline to the southern part of the Dead Sea. In addition to building a desalination plant with annual capacity of 850 million cubic meter (MCM) or more, and a hydropower generator depending on the head difference between the Red Sea and the Dead Sea. The estimated water to be conveyed to the Dead Sea is about 2.6 MCM per day.

An agreement was signed between the Royal Scientific Society (RSS) and Friends of Earth Middle East (FoEME) to research and evaluate the long-term socio-economic issues related to the proposed Red Sea - Dead Sea Conduit (RDC), and to examine the impact of water flow disruption on the marine environment in the Gulf of Aqaba. The study is funded by USAID – MERC program.

In order to achieve the socio-economic study objectives, the study team surveyed the target area which extends from southern part of the Dead Sea to the northern part of Gulf of Aqaba. This area combines large important industries for Jordan, hotels, protected areas, archaeological sites, residential areas and agricultural lands.

RSS developed questionnaires for the different concerned sectors in the target area (local community sector, tourism sector, industrial sector, and hotel sector). Questionnaires were filled by a representative sample from each of the sector. The questionnaires aimed at collecting the views, perceptions, and issues of concern related to the project.

Results showed that the majority of the surveyed sectors supported the project idea, they have stressed however on several issues and concerns that must be considered before the establishment of the project and during the design phase.
such as: acquisition of private land, change of the Dead Sea water characteristics, medical value and negative effect of project activity on the protected areas and archeological sites along the proposed route of the conduit.
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1. INTRODUCTION

1.1 Existing situation of the Dead Sea and its surroundings

The Dead Sea is the lowest place on earth about, 417 meters below sea level. It was created as a result of a major earthquake that took place a million years ago in Jordan Rift Valley. The Dead Sea is the world's saltiest large water body and it is a unique global treasure. Its uniqueness lies in its peculiar characteristics, its water is valued for their medicinal and therapeutic effect which makes it appealing for tourists, and its mineral composition is responsible for a potential billion dollar industry in chemical production of potash, bromine and other important substances. It is also a unique environment for rare wild life and hundreds of bird species. The Dead Sea basin is the origin of some of the world's oldest human settlements and is an area with sites sacred to Christianity, Judaism and Islam. That is why regional countries and the international communities view the Dead Sea as a site of substantial environmental, ecological, economic and touristic importance, as well as a site of international natural and cultural heritage.

The Dead Sea originally consists of two basins; a larger deep northern basin and a shallow southern one separated by a peninsula called El-Lisan. The southern basin is essentially dry, and this is due to enhanced evaporation of its water by mineral extraction industries that have undermined the sustainability of the Dead Sea as a stable ecosystem, see Figure (1.1)

![Fig. (1.1): Southern Basin in 1989 and 2001](image-url)
Today the Dead Sea basin and its surroundings are facing a major challenge. Over the last 50 years, the Dead Sea level has fallen by about 25 m in depth, and it is currently declining at a rate of about 1 meter per year. This decline is mostly caused by large scale diversion -about 90% - of the Jordan River (which is the main supplier of Dead Sea water) for agricultural and municipal services in Israel and Jordan, leaving only 10% of the natural flow to reach the Dead Sea. In addition to the increased mining and extraction activities carried out by mineral industry as previously mentioned.

1.2 Suggested solutions for saving the Dead Sea

Since the main reason of the Dead Sea decline is diversion of the Jordan River and other springs that naturally flow into the Dead Sea for agricultural, industrial and municipal services in Israel and Jordan. Then a simple and direct idea to save the Dead Sea would be to implement an integrated, cooperative plan between the three parties (Jordan, Israel and Palestine) to efficiently manage the Dead Sea basin and distribute the surrounding water resources equally assuring that considerable amount of fresh water flows back to the Dead Sea. This plan represents a cure of crises from its original cause. If this plan is well studied analyzed and skillfully managed then it will be much easier, more feasible and with very low impact on the environment compared with other solutions.

Another solution is the idea of connecting the Dead Sea to the Mediterranean. This project is based on an annual inflow of 2000 million cubic meters (MCM) of water into the Dead Sea for 20 years during its filling up period, and afterwards on a reduced inflow of 1000 million cubic meters per year to compensate for losses due to evaporation. This project would also save the Dead Sea from drying up and will stabilize its shoreline which will boost the industrial activities, tourist trade and hotel business in the region.

The third solution is represented in the Red Sea-Dead Sea Conduit (RDC) project. This solution has been the result of long discussion between the parties involved and reached consensus among the parties. The RDC project will be discussed in details in the following sections.
2. RED SEA – DEAD SEA CONDUIT (RDC) PROJECT BASIC FEATURES

2.1 RDC Project Description

The concept of bringing water via a pipeline or a canal has been studied in many forms since the 1800s and more seriously since the mid twentieth century.

The Red Sea-Dead Sea water conveyance project represents one of the most important plans that have been drawn up to save the Dead Sea and to desalinate sea water as well as to generate electricity to Jordan, Palestine and Israel.

The project is anticipated to include an intake canal at the northern tip of the Gulf of Aqaba. The water would then be pumped through either an open canal or a pipeline (about 200 kilometers long) passing through Wadi Araba, Dana Natural Reserve, Ghor Al Safi, Ghor Fifa and ending at the southern part of the Dead Sea.

A desalination plant will be built near the Dead Sea shores with annual capacity of 850 MCM of fresh water; the reject brine will be conveyed to the Dead Sea at a rate of 2.6 MCM per day. A hydropower generator will be used to utilize the natural elevation (about 400 m) between Red Sea and Dead Sea to provide energy for hydrostatic desalination of the Red Sea water.

The cost of this project is expected to be very high about $0.8 billion for the conduit connecting Red Sea with Dead Sea, and $3.0 billion for the Desalination project and conveyance system to demand centers (Protecting the Dead Sea, Ancient Treasure 21st Century Opportunity). Figure (2.1) below shows the schematic view of the RDC project.
2.2 Importance of the RDC project

Due to the previously mentioned deterioration of the Dead Sea and the surrounding environment, it was found that the Red Sea-Dead Sea conduit project is one of the best practical solutions to save the Dead Sea, since some of its major objectives are to:

- Counter the accelerating degradation of the Dead Sea and the surrounding environment and restore it to a previous historical level.
Supply with a sustainable source of potable water for Jordan, Palestine and Israel.
Take advantage of the head difference between the Red Sea and the Dead Sea (about 400 m) to produce hydropower energy for operating the desalination plant using the process of Reverse Osmosis (RO) and to derive additional energy benefits.

2.3 Project sub-grant agreement

According to the grant agreement signed on February 11, 2004 between US Agency for International Development (USAID) with the American Near East Refugee Aid (ANERA) and Friends of Earth Middle East (FoEME) a project titled “An environmental and socioeconomic cost benefit analysis and pre-design evaluation of the proposed Red Sea-Dead Sea conduit” was to be undertaken. The Royal Scientific Society (RSS) was assigned by FoEME to research and evaluate the long-term socio-economic issues related to the proposed Red Sea-Dead Sea conduit, and the marine environment component study. This report presents the socio-economic component study.

2.4 Research objectives

This study aims at analyzing and predicting the long term impacts of the RDC project on the social and economical activities focusing on the industrial projects, tourism facilities and the different communities distributed in Wadi Araba, Dead Sea and Gulf of Aqaba (northern part).

The following are the study objectives of the socio-economic conditions component study:
- To establish baseline data with regard to socio-economic conditions.
- To examine the potential socio-economic impacts of the RDC on the societies and economical performance through developing questionnaires to different sectors (industrial sector, tourism sector and local communities sector).
3. METHODOLOGY AND RESULTS

3.1 Existing conditions

Information regarding the project had been collected from different relevant organizations. Several visits were conducted to different organizations such as:
- Royal Society for Conservation of Nature (RSCN) to get data and maps of the protected areas,
- Aqaba Agricultural Directorate to obtain data regarding the agricultural units in Aqaba and Wadi Araba areas,
- Ministry of Archaeology and Tourism to get information about archaeological sites on the eastern shore of the Dead Sea and Wadi Araba areas, and
- Department of Statistics to acquire some statistical data (population distribution, age distribution, educational levels, unemployment percentage, and average income) in the target areas.

Additionally, relevant literatures were collected and reviewed.

The following sections summarize the collected data and describes the existing conditions.

3-1-a Social Demographic Characteristics for Wadi Araba, Aqaba and Southern Ghor

Wadi Araba extends from the south end of the Dead Sea to the Gulf of Aqaba, both Wadi Araba and Southern Ghor (Safi Sub-District and Ghor Mazra'a Sub-District) are considered as part of Jordan Rift Valley (JRV).

Jordan Rift Valley is an element of a great rift which extends from Syria to the Red Sea and continues through large portion of Eastern Africa. Population group in JRV includes Palestinian, Israelis and Jordanian. The JRV has traditionally been north south transport corridor and crossed by important land routes in the east-west direction.

Aqaba is very important to Jordan, Aqaba is the only seaport in Jordan and it is considered as a center for tourism, industry and trade activity.

Relevant social and demographic characteristic for Wadi Araba, Aqaba and Southern Ghor will be presented in the following parts.
• **Population:**
In the project area, the population is estimated at 128,900 capita (2003), the population distribution is shown in Table (3.1).

**Table (3.1): Population distribution for year 2003 in the project area**

<table>
<thead>
<tr>
<th>Area</th>
<th>Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>Safi Sub-District</td>
<td>20,420</td>
</tr>
<tr>
<td>Ghor Al Mazra'a Sub-District</td>
<td>15,955</td>
</tr>
<tr>
<td>Wadi Araba Sub-District</td>
<td>4,545</td>
</tr>
<tr>
<td>Aqaba District</td>
<td>87,980</td>
</tr>
</tbody>
</table>

Most of the people in the southern Dead Sea area are concentrated in Al Safi and around the Arab Potash Company. In Wadi Araba, the sparse population is spread through ten districts with the major group residing in Risha, Rahma and Quorggira. In Aqaba, the concentration of population is due to opportunities for employment in port facilities and its associated development and tourism.

• **Age Distribution**
The Jordanian society is characterized by domination of the youth. More than 40% of the population of Jordan is under 15 years, see Table (3.2).

**Table (3.2): Age distribution of the population for year 2003 (%)**

<table>
<thead>
<tr>
<th>Age group</th>
<th>Ghor Al Mazra'a Sub-District</th>
<th>Safi Sub-District</th>
<th>Wadi Araba</th>
<th>Aqaba Governorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 – 14</td>
<td>45</td>
<td>45</td>
<td>44.9</td>
<td>43.4</td>
</tr>
<tr>
<td>15 – 24</td>
<td>22</td>
<td>22</td>
<td>19.7</td>
<td>20.2</td>
</tr>
<tr>
<td>25– 64</td>
<td>31.4</td>
<td>31.4</td>
<td>33.2</td>
<td>34.6</td>
</tr>
<tr>
<td>+65</td>
<td>1.6</td>
<td>1.6</td>
<td>2.3</td>
<td>1.9</td>
</tr>
</tbody>
</table>

• **Gender distribution**
Gender distribution of population in the project area where the water conduit will pass is shown in Table (3.3).

**Table (3.3): Gender distribution for year 2003**

<table>
<thead>
<tr>
<th>Sex</th>
<th>Ghor Al Mazra'a Sub-District</th>
<th>Safi Sub-District</th>
<th>Wadi Araba</th>
<th>Aqaba Governorate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>15,955</td>
<td>20,420</td>
<td>4,545</td>
<td>101,900</td>
</tr>
<tr>
<td>Male</td>
<td>8,610</td>
<td>11,020</td>
<td>2,550</td>
<td>52,200</td>
</tr>
<tr>
<td>Female</td>
<td>7,345</td>
<td>9,400</td>
<td>1,995</td>
<td>49,700</td>
</tr>
</tbody>
</table>
• Education
Jordanian people are relatively well educated. Illiteracy rate is 8.9% for those above 15 years old (2.4% for male and 6.5% for females). In Jordan there are 531 secondary schools, 43 community colleges, 8 public and 12 private universities.

• Employment and unemployment
Table (3.4) shows the cumulative numbers of applicants that applied to Civil Service Bureau up to year 2002 and the numbers of those who were employed during the year 2001. The data is distributed according to their gender and their educational qualification in Aqaba and Karak governorate.

Table (3.4): Cumulative number of applicants up to the date of 20/1/2002 and number of those who were employed during 2001 in Aqaba and Karak

<table>
<thead>
<tr>
<th>Educational Qualification</th>
<th>Number of Applicant</th>
<th>Number of Employed Persons</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
</tr>
<tr>
<td>University</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karak</td>
<td>326</td>
<td>474</td>
</tr>
<tr>
<td>Aqaba</td>
<td>263</td>
<td>318</td>
</tr>
<tr>
<td>Community College</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karak</td>
<td>424</td>
<td>2203</td>
</tr>
<tr>
<td>Aqaba</td>
<td>139</td>
<td>628</td>
</tr>
<tr>
<td>Secondary School</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Karak</td>
<td>244</td>
<td>415</td>
</tr>
<tr>
<td>Aqaba</td>
<td>123</td>
<td>121</td>
</tr>
<tr>
<td>Total</td>
<td>994</td>
<td>3092</td>
</tr>
<tr>
<td>Aqaba</td>
<td>525</td>
<td>1067</td>
</tr>
</tbody>
</table>

• Economic Characteristics
With referring to our survey in Mazra'a sub district, Safi Sub-District and Wadi Araba the native residents depend on farming, while non native resident depend on industry especially in the Arab Potash Company and in tourism sector. While in Aqaba, people usually depend on commerce and government jobs.

The average annual income for most households in Ghor Mazra'a, Safi District, Wadi Araba and Aqaba are shown in the following Table.

Table (3.5): Average annual income for year 2003

<table>
<thead>
<tr>
<th>Governorate Name</th>
<th>Average Annual Income (JD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghor Al Mazra'a Sub-District</td>
<td>7,798</td>
</tr>
<tr>
<td>Safi Sub-District</td>
<td>4,866</td>
</tr>
<tr>
<td>Wadi Araba</td>
<td>3,116</td>
</tr>
<tr>
<td>Aqaba</td>
<td>6,090</td>
</tr>
</tbody>
</table>
3.1-b Water Demand in Jordan

Jordan lies among the dry and semi dry climatic zones, which are characterized by their minimal rainfall and high percentage of evaporation. Its climate is a mix of Mediterranean and dry desert climate. The temperature varies from a few degrees below zero in the winter to around 46°C in the summer season. Annual precipitation ranges from 50 mm in the desert to 600 mm in the Northwest highlands. About 94% of the total area of Jordan receives an average annual rainfall of 200 mm or less, where the volume of the annual precipitation is about 8,500 MCM. However, high rate of evaporation combined with plant transpiration return most of the precipitation directly to the atmosphere before it can infiltrate into aquifers, or flow directly to wadis, streams and to the Dead Sea. In addition, less than 10 percent of the total precipitation is available for human use.

Water resources in Jordan are very limited and are among the lowest in the world. The available water resources per capita are decreasing because of the population growth from more than 160 m$^3$ per capita per year for all uses at 2005 to only 91 m$^3$ per capita per year by 2025, putting Jordan in the category of having an absolute water shortage.

Jordan's water resources consist primarily of surface and ground water. Renewable water resources are estimated at about 780 MCM per annum, including ground water (275 MCM/year distributed among 11 basins) and usable surface water (505 MCM/year distributed among 15 catchments basins). An additional of 143 MCM/year of groundwater is estimated to be available from fossil aquifers. Brackish aquifers are not yet explored, but at least 50 MCM/year is expected to be available for urban uses after desalination. Treated wastewater is being used on an increasing scale for irrigation, primarily in the Jordan River Valley, and can provide at least an additional 80 MCM/year until the year 2010 as shown in Figure (3.1).

![Fig. (3.1): Current and projected water supply from various water resources (1998-2020).](image-url)
Based on projections of available water amounts, the gap between supply and demand from all sources is increasing annually, as shown in Figure (3.3). Despite the huge investment in the water sector for the coming years, water deficit for all uses is projected to be 437 million m$^3$ by the year 2020, comparing with 320 million m$^3$ in 2000. These figures show the necessity for adopting a long term water plan and future scenarios of water management that consider both demand management and non-conventional water resources, in order to decrease the gap between supply and demand.
3.1-c  **Infrastructure and Basic Service in Karak and Aqaba Governorate**

This part will focus on the two governorates (which cover the target areas); Aqaba and Karak Governorate. Aqaba governorate includes; Aqaba district and Wadi Araba sub-district. Karak Governorate includes; Ghor Al-Mazra'a sub-district and Safi sub-district.

- **Electricity**
  99% and 98% of cities and villages in the Aqaba and Karak governorate are connected to the national electrical grid respectively.

- **Health Care**
  Health care in Aqaba and Karak Governorate is provided by the Ministry of Health, the Armed Force and the private sector.

Medical services include hospitals (where there are two private and one armed hospital at Aqaba and there are two private and one armed hospital in Karak), dental clinics, pharmacies, maternity centers and childhood centers.

- **Communication**
  Communication in Karak and Aqaba includes telecommunication system and mail services provided by public and private sector.

3.1-d  **Land Use**

**Residential Area**

The project target area extends from the Dead Sea basin to southern Ghors (Ghor Al Mazra'a sub-district, Ghor Al Safi sub-district), Dana Village, Wadi Araba (Bir Madkur, Risha, Gharandal, Rahma, Qatar) and ending at the northern tip of Gulf of Aqaba.

Figure (3.4) shows the project target areas.
Agriculture
Agricultural lands with high production rate are concentrated in Ghor Al-Mazra'a and at Al-Safi sub-district.

Following are the distribution of Agricultural lands according to land use in Ghor Al-Mazra'a and Al-Safi sub-district:

- Area planted with field crops (dunums): in winter 229,262 and in summer 9,871.
- Area planted with vegetables (dunums) in winter 29,175 and in summer 14,704.
- Area for temporary meadows (dunums) in winter 11.5, and in summer 1,191.
- Area planted with fruit trees (dunums) is 34,895.
- Not use productive land (dunums) is 11,146.
- Not classified land (dunums) is 3,236.

While in Aqaba district the distribution of area according to land use for the year 2000 are as follow:

- Area planted with sylvan tree (dunums) is 205,700.
- Area planted with fruit trees (dunums) is 42,042.
- Area planted with field crops (dunums) is 216,007.
- Area planted with vegetables (dunums) is 54,058.

Industrial projects
The Dead Sea is known to be one of the world's richest sources in minerals. It contains more than 35 different types of minerals, mainly magnesium, sodium, potassium, calcium, selenium, chloride, sulfur, bromide and manganese. Consequently large industrial company has been developed at the Dead Sea basin to benefit from these minerals in producing several types of important products and cosmetics.

The following are the industrial companies at the southern shore of the Dead Sea:

1- Arab Potash Company (APC)
APC is formed in 1956 and was given a concession from the Government to exploit, manufacture and market the resources of the Dead Sea for 100 years. APC is producing potassium chloride, fertilizer grade and industrial grade potash. APC is employing 2,200 persons directly. It also owns shares in several companies which rely on the mineral of the Dead Sea as raw materials.

2- Numira Mixed Salts and Mud Company
This project started in 1997 with a capital of 1.5 million USD. The plant produce mixed salts and Dead Sea Mud. These natural Dead Sea products are consumed in cosmetics and skin care applications. The company is the sole provider of Dead Sea raw materials for the cosmetics industry in Jordan which comprises
more than 60 plants. Nurmira also provides APC with bagging, handling and screening services.

3- **Jordan Bromine Company (JBC)**
JBC is a private limited liability company established in 1999, with total investment of 143 million USD. The plant is considered the largest US investment in Jordan. Around 80 Jordanians are currently employed in JBC.

4- **Jordan Safi Salt Company (JOSSCO)**
JOSSCO is a public shareholding company established in 1996. The company operates a salt plant located in the southern end of the Dead Sea together with loading and storage capacity in Aqaba. The plant produces industrial salt and table salt. The total number of employees at the company is 251.

5- **Jordan Magnesia Company (JORMAG)**
JORMAG was established to produce high quality dead burned magnesium oxide and other secondary product by using magnesium rich brine from Dead Sea and limestone as raw materials.

6- **Al Janoub Filter Manufactures Company (JFMC)**
JFMC was established in April 1997. Total number of employees is 65 and the company main products are oil filter, purification filter and iron/steel plates filter.

**Protected Areas**
Protected areas make a vital contribution to the conservation of the world's nature and cultural resources. Protected areas can provide an opportunity for rural development and rational use of marginal lands for research and monitoring, for conservation education, and for recreation and tourism. There are several important protected areas in Jordan which contain many valleys, springs and important bird areas. The Red Sea-Dead Sea conduit is expected to pass through some of these protected areas.

Following are the protected area located within the project area:

1- **Safi-Fifa**
Safi-Fifa area is located south of the Dead Sea and north of Wadi Araba with coordinates of E: 732250 and N: 3425033, see Figure (3.5). The area features agricultural plains with sand and silt dunes covered with halophytic and subtropical vegetation south of the Dead Sea between the villages of Safi and Fifa and adjacent rocky hillsides. Several valleys run into the Dead Sea through this site. The area is threatened by industrial development.
2- **Dana Nature Reserve**

The Dana Nature Reserve is located in Tafila Governorate with coordinates of E: 734294 and N: 3396801, see Figure (3.5). It features a system of wadis and mountain extending from the Sharrah Mountains in the east to the desert lowlands of Wadi Araba in the west. Rocks are predominantly limestone and sandstone and are covered with weathered material.

The area of the reserve is currently 2287 km$^2$. The area is designated as a Nature Reserve in 1989 by the Royal Society for the Conservation of Nature in collaboration with the Department of Forestry.

3- **Wadi Araba**

Wadi Araba is located in Aqaba Governorate with coordinates of E: 706671 and N: 3320542, see Figure (3.5). The site extends from Fifa south of Dead Sea to Aqaba and comprises of desert sand dunes, gravel outwash plains and mudflats.

![Fig (3.5): Natural Reserves in the Project target area](image)

**Tourism Projects**

Jordan Government started to develop the tourism situation of the Eastern shore of the Dead Sea since 1995. Through Jordan Valley Authority, Jordan Government has prepared a master plan that focuses mainly on two areas; Sweimeh and Zara area. The total area available for investment in Sweimeh is 2,275 dunum and 860 dunum in Zara.
The development master plan for the year 2010 include 12,500 bed units in Sweimeh and 12,500 bed units in Zara including various project such as:

- Hotels
- Boat stations
- Commercial center
- Project for tourist service

The following projects have been established by international and local investment company including five stars hotels and resort:

- The National Company for Hotels and Tourism, Mövenpic Hotel with a capacity of 340 room and total number of 500 employees.
- Tourism Business Company, Marriot Hotel with a capacity of 293 room and total number of 320 employees.
- SPA resort with a capacity of 126 and total number of 170 employees.

Archaeological Sites

The major archaeological site belong to the Chalcolititure period (4200 – 3200 BC) and located on the northeast of the Dead Sea was discovered and named Swiemah, while the other major Bronze Age sites such as Babed-dhira, Numeira, Tell Shek Issc and Feifa were registered during field operations conducted by travelers. Recent archaeological surveys and excavation conducted on the eastern shore by Jordanian and foreign mission revealed the presence of more archaeological sites in Zara, and Ghor AlSafi.

The excavation works at Ghor Al Safi has revealed a presence of the largest historical grave yards which belongs to the Bronze age around 2500 B.C. Statistical studies indicate that there are about half million graves in the area and the eastern shore of the Dead Sea starting from Ghor Al Mazra'a and ending at Ghor Khenseerah, which is a city that is full of ten thousands of burial sites in different sizes and shapes.

The archeological activity is also concentrated in Wadi Arab area which is considered a continuation of the Great Rift Valley. This section has been known from ancient Biblical times as the Arabah. An exploration has revealed the presence of a number of ruined villages and many copper and silver mines in Wadi Khaled, Feinan and other small sites.

The occupational sequences in Wadi Araba began with the Neolithic period 3500 B.C. Hence, remains of settlement are noticed in many places.

The archeological remains found on the eastern shore of the Dead Sea and in Wadi Araba dated back to 6500 B.C. – 1800 A.D. which means the Neolithic, Chalcolithic, Bronze Age, Iron Age Hellenistic, Roman, Byzantine era and Islamic periods.
3.2 Results and analysis

According to the second objective of this research a questionnaire was developed through conducting several meetings with Friends of Earth Middle East (FoEME), where the final layout and numbers of the questionnaires that should be distributed for each sector has been agreed upon.

The aim of this survey is to investigate and get the opinion of different sectors (residential, industrial and tourism) toward the proposed Red Sea-Dead Sea conduit project and to explore how differences in livelihood, culture and socioeconomic conditions influence the attitudes and perceptions of people in the community.

The following table shows the numbers of questionnaires distributed to different sectors.

<table>
<thead>
<tr>
<th>Type of Sector</th>
<th>Actual number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential /Southern Ghors and Wadi Araba</td>
<td>303</td>
</tr>
<tr>
<td>Tourism</td>
<td>319</td>
</tr>
<tr>
<td>Industrial</td>
<td>12</td>
</tr>
<tr>
<td>Residential /Aqaba</td>
<td>118</td>
</tr>
<tr>
<td>Dead Sea hotels</td>
<td>3</td>
</tr>
<tr>
<td>Aqaba hotels (on shore only)</td>
<td>2</td>
</tr>
</tbody>
</table>

For both the residential and tourism sectors, the questionnaires were analyzed according to gender and educational level (university, high school, elementary school). And also according to nationality (Jordanian, non Jordanian) for the tourism sector.

The following sections discuss the important issues that were investigated in each sector as well as the results and major concerns.

3.2-a Residential Sector (Southern Ghors, Wadi Araba and Northern tip of Gulf of Aqaba)

The investigation was started by enquiring about living status of inhabitants in the project area. This was done by asking people if they own any land(s) in the project area and type of their land (residential, commercial and agricultural), if any one of the family is working in the plants or hotels near to the Dead Sea, and if they suffer from water shortage.

Afterwards, people's perceptions was investigated towards the continuous lowering of the Dead Sea level, the project activities (excavation, construction and operation), the
impact of mixing Dead Sea water with Red Sea, the passage of conduit through (near) their lands (or homes), and the establishment of a desalination plant and finally towards the whole project idea.

Major findings of the residential sector living in Southern Ghors and Wadi Araba were as follows:

![Graph showing support for the project idea]

<table>
<thead>
<tr>
<th></th>
<th>Female opinion (%)</th>
<th>Male opinion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes I am with this project</td>
<td>78.7</td>
<td>82.87</td>
</tr>
<tr>
<td>No I am not</td>
<td>11.11</td>
<td>9.39</td>
</tr>
<tr>
<td>I don't know</td>
<td>10.19</td>
<td>7.74</td>
</tr>
</tbody>
</table>

- 81% of the residents met support the project idea.
- 42% of the residents met anticipate that mixing Red Sea water with Dead Sea may negatively affect Dead Sea characteristics.
- 77% of residents met believe that a closed pipeline is the best way to convey water from Red Sea to Dead Sea.
- 45.5% of the residents met do not mind if the conduit passes near their homes or through their lands provided that proper compensation is given, 29% do not mind at all and 25.5% oppose the idea.
- 74% of the residents met think that building a desalination plant will contribute in covering water deficiency in Jordan.

Major findings of the residential sector living in Aqaba were as follows:

- 77% of the residents met support the project idea.
- 71% of the residents met are concerned that the construction of the canal and the water conveyance process from the Red Sea may impact the marine life.
- 44.6% of the residents met are concerned that the construction of the canal and the water conveyance process from the Red Sea may impact tourist attraction.
- 74% of residents met are worried about the noise that may be generated from the pumping station.
61.3% of residents met believe that a closed pipeline is the best way to convey water from Red Sea to Dead Sea.

During distribution of questionnaire the people were asked to write their notes and concerns toward the project. Following are the major concerns of the people living in southern Ghors and Wadi Araba:

- Acquisition of their land without fair compensation.
- Fears from the occurrence of earthquakes due to the continuous digging and earthworks.
- Flooding of Dead Sea water to agricultural lands surrounding the area during or after restoring the Dead Sea level.
- Change of the Dead Sea water characterization and therapeutic value.
- Fears from polluting water wells within project area.

While the major concerns for people living in Aqaba were:

- The negative effect of pumping water on the marine life and wild life in the Red Sea and surrounding areas.
- Noise impact from water pumping.
- Fears from groundwater pollution.
- Fears from demolishing houses near the pumping area without compensating their owners.

The detailed results and analysis of the residential sector questionnaire are shown in Annex (1).
3.2-b Tourism Sector

The investigation was started by enquiring about the motive for people visit to the Dead Sea area, where they stay during their visit to the Dead Sea and how frequent they visit the Dead Sea.

After that people's opinion was investigated towards the decline of Dead Sea level, the possibility of changing the color of Dead Sea water as a result of executing the project, the change of the concentration and chemical composition of the Dead Sea water if it will affect therapeutic value of the Dead Sea and finally towards the whole project idea.

The major findings of the tourism sector were as follow:

- 71.6% of the tourists met support the project idea.

<table>
<thead>
<tr>
<th></th>
<th>Jordanians Opinion (%)</th>
<th>Non Jordanians opinion (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes I am with this project</td>
<td>73.37</td>
<td>69.5</td>
</tr>
<tr>
<td>No I am not</td>
<td>13.61</td>
<td>11.35</td>
</tr>
<tr>
<td>I don’t know</td>
<td>13.02</td>
<td>19.15</td>
</tr>
</tbody>
</table>

- It was found that 83% of tourists met think that tourism sector in the area may be highly affected by the continuous decline of the Dead Sea level.
- 54% of tourists met are concerned from the effect of mixing Red Sea with Dead Sea on the medical value of the Dead Sea.
- 46% of the tourists met will still be attracted to visit Dead Sea even if slight changes occur in Dead Sea water such as color change.

During the distribution of questionnaires, people were asked to write their notes and concerns toward the project. Following are people’s major concerns:

- Negative impact on Dead Sea unique environment, and as result on the tourism.
- Fears from the pollution in the area due to the existence of the desalination and power generation plants, in addition to the negative impact of the construction of the pipeline.
- Fears from chemical reactions affecting the therapeutic value of the Dead Sea when mixed with Red Sea water.
- Raising the level of the Dead Sea may cause flooding and thus affect hotels and resorts on shore.

The detailed results and analysis of the tourism sector questionnaire are shown in Annex (2).

**3.2-c Industrial Sector**

All industries on the East Dead Sea shore have been visited (Arab Potash Co., Magnesia Co., Bromine Co., Numaira for Mineral Salts Co., South for Oil Filters Co. and Safi Salt Co.). Several interviews with the management of each industry were carried out in order to record their comments and concerns for this important project. Several companies in Amman that sell Dead Sea products were visited as well.

During the meetings, managements opinion were investigated towards the dependency of the industrial factories on Dead Sea water, the consequences of continuous lowering of the Dead Sea on industrial activities, the effect of change in concentration and chemical composition of the Dead Sea water on the production process and on product quality, the establishment of a desalination plant and finally towards the whole project idea.

The major findings of the industrial sector survey:

- 92% of the industries support the project idea.
- 63.6% of the industries on the Dead Sea shore may be closed completely if the Dead Sea level continues to decline.
- 73% of the industries think that possible change in the composition and concentration of Dead Sea water will impact the quality of their production.
- 73% of the industries prefer a closed pipeline to transport the water to the Dead Sea.
During the meetings with management they had several concerns such as:

- The effect of mixing Red Sea water with Dead Sea water on the concentration and chemical characteristics of mineral salts.
- Impact on the earthen dams at the salt pans if there is no control on the Dead Sea level.
- Changing in salt concentration of the Dead Sea water may affect the final product thus negatively impact all companies depending on Dead Sea minerals.
- The pipeline must be pulled 1 to 3 km inside Dead Sea basin so that a good mixing could take place.

The detailed results and analysis of the industrial sector questionnaire are shown in Annex (3).

3.2-d Hotel Sector

Questionnaires had been distributed to be filled by the hotels management in the Dead Sea area (Marriott, Mövenpick and Dead Sea Spa), and in the northern shore of Gulf of Aqaba where two from three (target) were surveyed.

The management opinion was investigated towards the continuous decline of the Dead Sea and whether it affects tourist attraction and occupancy rate, the effect of this project on the therapeutic value of Dead Sea water, the establishment of a desalination plant, and the effect of project activities (excavation, construction and operation) on tourist attraction, and finally towards the whole project idea.

Major findings of the Dead Sea hotel sector survey:

- All the hotels support the project idea
- 100% of the hotels surveyed believed that tourists will still be attracted to visit Dead Sea even if slight changes occur in Dead Sea water such as color change.
- 75% of the hotels surveyed believed that building a desalination plant at the Dead Sea will contribute in covering the deficiency of water shortage in the country.
- 50% of the hotels surveyed believed that the existence of major activities related to the project such as hydropower, desalination plant at the industrial area of the Dead Sea will impact the tourist attraction to the Dead Sea and the occupancy rate at their hotel.

Major findings of Aqaba hotel sector survey:

- The surveyed hotels support the project idea.
- Managers of the hotels surveyed believe that the project will not impact tourism sector and occupancy rate at their hotels.
- The surveyed hotels prefer an open canal to transport the water to the Dead Sea.
The detailed results and analysis of the hotels sector questionnaire are shown in Annex (4).

### 3.3 Major Socio-Economic Issues and Proposed Mitigation Measure

This section discusses the relevant issues and concerns generated from the above survey study and the proposed mitigation measures:

- **Acquisition of lands**
  The water conduit will pass through many private lands in Ghors, Wadi Araba and Aqaba areas. Therefore, fair compensation to the land owner should be done according to articles and procedures stated in Land Acquisition Law No. 12, 1987. The fair compensation should be based on the market value of the land taking into consideration the value of properties which exist on the land.

  According to article 4A of the Land Acquisition Law, an advertisement should be written in local newspapers. This advertisement should include names of land owners, identification number, location, total area and area to be acquired of each land lot. After 15 days of the advertisement date, the Ministers Cabinet will approve immediate acquisition of land lots as per the advertisement.

  The water conduit will also cross some agricultural lands, important soil areas and range lands. According to Land Acquisition Law any destroyed trees, crops or vegetables farms, either inside or outside the acquired land should be compensated for.

- **Visual Impacts**
  Some of the project activities will cause negative visual impact such as the following:

  - The construction works will cause temporary negative change of the area scenery due to equipments, machinery and piles of excavated and backfill soil, particularly in agricultural and inhabited areas.
  - The existences of an intake pump at the northern tip of the Gulf of Aqaba.
  - Building of desalination plant near the Dead Sea shores.
  - Mixing Dead Sea water with the Red Sea water which may cause changing of the Dead Sea water color and this will have negative visual impact for tourist

  Following are the proposed mitigation measures to be implemented in order to reduce the negative visual impact as a result of project activities:
The lands should be returned to their original nature as they were before excavation, especially in agricultural and residential areas. This includes returning the topsoil, removal of unused soil, debris and any other types of wastes resulted during the construction phase.

The intake pump should be installed inside an isolated room to reduce the noise level.

The desalination plant should have green buffer zone around it.

The research team in Israel will quantify the expected precipitation of gypsum due to the mixing between the calcium-rich Dead Sea brine and sulfate-rich seawater and they will modify a model to quantify the ratio of the Red Sea water that should be mixed with the Dead Sea water.

**Protected Areas and Archeological Sites**

As mentioned above the area extending from the northern tip of Gulf of Aqaba until the southern shore of the Dead Sea is full of protected areas and Archeological Sites, thus the water conduit path and structure should be carefully planned and designed to avoid any disturbance of this natural ecosystem. In addition, the historical sites should be marked and identified before starting any project activity.

**Business Prosperity**

The construction phase includes many activities, which requires both skilled and non-skilled labors. This will increase the opportunity for local labors to work, improve their skills and living standards.

It is also expected that the project may include desalination plants or power generation and this is another opportunity for labors and professionals to work.

During construction phase, there will be a need for purchasing new equipment, opening new markets to serve labors and using vehicles to transport the equipment and instruments, this may cause business prosperities in the project area.

**Industrial Sector**

As it was mentioned before, there are large industries located in the southern basin of the Dead Sea shore. These industries mainly depend on the Dead Sea mineral salts in their production. In addition there are other companies in Amman which depend on Dead Sea mud to produce cosmetics and skin care products. Thus, any changes on the Dead Sea water concentration or characteristics will have negative impact on those companies.

The research team in Israel will study the physical and chemical properties of both the Dead Sea and the Red Sea in order to examine if the chemical characteristics of the Dead Sea will change after mixing both seas. They will modify a model to quantify the ratio of the Red Sea water that should be mixed with the Dead Sea water in order to prevent the occurrence of any possible characteristics change.
The continuous decline in the Dead Sea level has different impacts on the Arab Potash Company. Following are those impacts:

1. **Negative impact**
   Every 10 years the company is required to change the location of the pumping station. The cost of this action reaches around 15 million JD. Changing in the location also implies an increase in pumping power.

2. **Positive impact**
   The reduction in the total fresh water input from Jordan River and the other sources has lead to an increase in the Dead Sea density, which means an increase of the mineral concentration of the pumped water and will result in a direct reduction of the duration required to precipitate the mineral in the evaporation ponds. This consequentially has increased the rate of harvesting the raw material from the evaporation ponds of Arab Potash Company and similar activities.

- **Sinkholes**
  Sinkholes, areas of rapid and sudden manifestations of subsidence, have begun to appear along the shores of the Dead Sea due to shifts in the groundwater dynamics resulting from the drop in the coastal water table. This has already caused environmental damage.

  Sinkholes have caused Environmental damages to the following:

  1. **Agricultural**
     Agriculture has suffered directly from sinkholes phenomenon in Ghor Haditha. Agricultural lots impacted by sinkholes are left empty. Some of these lots include different kinds of field crops.

     Accordingly, Jordan Valley Authority together with the government agency responsible for the area has tried to fill sinkholes, however most sinkhole sizes increased and general subsidence is happening on a large scale.

  2. **Mineral Extraction**
     A sinkhole appeared in APC newly established evaporation pond. The company refilled the sinkhole at a cost of around 10,000 JD. The sinkhole did not affect any other infrastructure nor did it injure any of the workers in the area. The company did not conduct any risk assessment of sinkhole phenomenon.

     The size of the new pond was reduced from 20 to 18 km\(^2\), (a 10% reduction of the total surface area), this measure was taken to avoid border and shoreline area where sinkholes are very active and dangerous.
• **Flooding**
Regarding the hydrological study that was conducted by the Israeli party on Araba Valley Basin, the intersection points of the proposed canal route with the relevant watersheds in Araba Valley Basin were identified. The flow rate of these watersheds was also calculated and categorized into high, medium and low risk to the canal.

To reduce the impact of flood on the canal (where it passes through large drainage of the catchments areas), the canal should be protected against flash floods by suitable method of protection. This matter has to be dealt with carefully during the design of the project.

• **Earthquake**
The geomorphologic study that was conducted by the Israeli party on Araba Valley delineates the crossing points of the proposed canal with various faults types (exposed and inferred). It revealed that all faults within the valley can be suspected of being active. It is also found that Dana area is located in high magnitude earthquake (M>4.2), which means high risk to the canal.

The contractor shall take an appropriate protection measures for the canal during its design and construction especially at intersection point's location with the fault in Arab Valley and Dana area. This issue would be of importance in the design of the project. Certainly, in an incident of an earthquake affecting the line, the impacts would be high in terms of socio-economic conditions.
4. PROJECT ACTIVITIES

The coordination and cooperation in this research study was important for the successful execution of the work. Therefore several meetings were held throughout the whole project period and our team has relied on the inputs, comments and decisions taken during the meetings. The table below lists these meetings specifying the date, participants and issues discussed during these meetings.

Table (4.1): Meetings took place during the project period

<table>
<thead>
<tr>
<th>Date of Meeting</th>
<th>Participants</th>
<th>Discussed Issues</th>
</tr>
</thead>
</table>
| 1st July, 2004        | Royal Scientific Society represented by Dr. Bassam Hayek, Mr. Mohamad Mosa and Dr. Nidal Al-Oran with Geological Survey of Israel group and Friends of Earth Middle East (FoEME) | ➢ The work plan of the socio-economic conditions and marine studies.  
➢ The ways of coordination related to the socio-economic issues.  
➢ The questionnaires distribution and data collection from Palestine and Israel. |
| 5th July, 2004        | Royal Scientific Society represented by Mr. Mohamad Mosa with Mr Nader Al Khatib from Water & Environmental Development Organization (WEDO) and Mr Abdul Rahman Sultan (FoEME) | ➢ The cooperation and role of WEDO was discussed.                                  |
| 17th October, 2004    | Royal Scientific Society represented by Dr. Bassam Hayek, Mr. Mohamad Mosa and Dr. Nidal Al-Oran with Geological Survey of Israel and (FoEME) | ➢ The data collection criteria for the socio-economic conditions and marine components were discussed.  
➢ Certain limitations of work progress were discussed especially the sampling of marine near Israeli border and the data related to the socio-economic conditions for Israeli and Palestinian partners. |
<table>
<thead>
<tr>
<th>Date Of Meeting</th>
<th>Participants</th>
<th>Discussed Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st December, 2004</td>
<td>Royal Scientific Society represented by Mr. Mohamad Mosa with Mr. Abdul Rahman Sultan (FoEME) and Mr. Nader Al Khateeb (WEDO).</td>
<td>➢ The type of information that should be collected for the socio-economic conditions in Palestinian and Israeli areas close to the Dead Sea shore.</td>
</tr>
<tr>
<td>28th February, 2005</td>
<td>Royal Scientific Society represented by Dr. Bassam Hayek and Mr. Mohamad Mosa with Geological Survey of Israel and (FoEME)</td>
<td>➢ The progress in work was presented, feedbacks regarding the different component studies of the project have been brought up as well.</td>
</tr>
<tr>
<td>23rd January, 2006</td>
<td>Royal Scientific Society represented by Dr. Bassam Hayek and Mr. Mohamad Mosa with Geological Survey of Israel and (FoEME).</td>
<td>➢ The achieved work regarding the socio-economic conditions.</td>
</tr>
</tbody>
</table>
5. CONCLUSIONS AND RECOMMENDATIONS

It was found that the Red Sea-Dead Sea conduit project represents a proper solution for saving the Dead Sea from vanishing, and the establishment of a desalination plant will contribute in solving the water deficiency problem in Jordan, Israel and Palestine.

As a result of this socio-economic study and investigation, it was found that the project has negative and positive environmental impacts. Key positive impacts include:

- At the macro level: the impacts are largely positive; by preserving the Dead Sea as a historical and valuable site, providing water to augment the supply in Jordan, and providing electricity.
- Improving the quality of life in the project area through creating new job opportunities for the local people and thus giving rise to business prosperity in the region.
- Tourism industry will greatly benefit, since this project will prevent sinkholes formation thus allowing for additional tourism projects expansion.
- Agricultural activities will also benefit as a result of solving the problem of sinkholes, which represent a life and economic risk.

The negative aspects can be summarized in

- Effect on farmers since the canal is expected to pass through agricultural lands, some farmers may lose their farms.
- Effect on mineral industries whereas mixing Red Sea water with Dead Sea may change the Dead Sea water characteristics. However, the industries also realized that in long terms, the industries can be affected greatly there if the Dead Sea continues to decline, noting that the industries are also suffering from the sinkholes problem.

By surveying the three concerned sectors in the area (residential, industrial and tourism) it was found that most of the people are supporting the project idea, although several issues and concerns were raised up such as:

- Acquisition of private land without fair compensation.
- Negative visual impact of project activities during construction.
- Affecting the protected areas and archeological sites.
- Negative effect of earthquakes on the water canal.

Following are some suggested recommendations for the above mentioned concerns and issues:

- The design shall take an appropriate protection measures for the conduit during its design and construction especially at intersection point's location with the fault in Arab valley and Dana area.
• Quantify the ratio of the Red Sea water that should be mixed with the Dead Sea water in order to prevent the occurrence of chemical characteristics change of the Dead Sea utilizing the model that Israel partner has.

• The water conduit path and structure should be carefully planned and designed to avoid any disturbance for protected areas.

• To give fair compensation for land owners and to compensate them for any destroyed trees, crops or vegetables farms inside there land.

• To return lands to its original nature as they were before excavation, especially in agricultural and residential areas. This includes the returning of the topsoil, removal of unused soil, debris and any other types of wastes resulted during the construction phase.
REFERENCES

6. Personal communication during August - December 2004 with the following organizations:
   - Amman Chamber of Industry
   - Department of statistics
   - Jordan Valley Authority
   - Ministry of Agriculture
   - Ministry of Tourism
Annex 1: Questionnaire Results for Residential Sector
# Southern Ghors and Wadi Araba Residential Sector

**All**

Total Number of respondents = 303

<table>
<thead>
<tr>
<th>Question</th>
<th>Response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- Do you own a property in the Dead Sea or in the Araba Valley area?</td>
<td>Yes</td>
<td>58.94%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>41.06%</td>
</tr>
<tr>
<td>2- If the answer to the previous question is &quot;yes&quot; then what is the usage?</td>
<td>Agricultural</td>
<td>46.90%</td>
</tr>
<tr>
<td></td>
<td>Residential</td>
<td>49.56%</td>
</tr>
<tr>
<td></td>
<td>Commercial</td>
<td>3.54%</td>
</tr>
<tr>
<td>3- If the answer to the previous question is &quot;Agricultural land &quot;, then what is the main produce?</td>
<td>Fruit and vegetables</td>
<td>80.99%</td>
</tr>
<tr>
<td></td>
<td>Forest trees</td>
<td>7.44%</td>
</tr>
<tr>
<td></td>
<td>Ornamental plants</td>
<td>1.65%</td>
</tr>
<tr>
<td></td>
<td>Not planted</td>
<td>9.92%</td>
</tr>
<tr>
<td></td>
<td>Other (specify)</td>
<td>------------</td>
</tr>
<tr>
<td>4- Do you or any of your family members work at one of the plants that extract minerals from the Dead Sea (i.e. Potash plant)</td>
<td>Yes</td>
<td>26.28%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>73.72%</td>
</tr>
<tr>
<td>5- Do you or any of your family members work at one of the hotels or resorts located on the shores of the Dead Sea?</td>
<td>Yes</td>
<td>5.52%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>94.48%</td>
</tr>
<tr>
<td>6- Do you or any of your family members own a small business that depends on the tourists and visitors coming to the Dead Sea area?</td>
<td>Yes</td>
<td>9.33%</td>
</tr>
<tr>
<td></td>
<td>No</td>
<td>90.67%</td>
</tr>
</tbody>
</table>
7- If the answer for any of the previous questions (4, 5, 6) is "yes", then what is your monthly income?

- 70-150 JD 78.89%
- 150-300 JD 20.55%
- 300-800 JD 0%
- 800 JD and above 0.56%

8- Do you think that the decline or dryness of the Dead Sea will affect your living standards?

- Yes, completely 39.64%
- Yes, partially 25.45%
- No 34.91%

9- Have you heard about the water conveyance project from the Red Sea to the Dead Sea?

- Yes, and I have read about it 22.57%
- Yes, but I did not read about it 47.57%
- No 29.86%

10- What is the source of water for your home / farm:

- Private well 2.55%
- Network 96%
- Water tankers 1.45%

11- Do you suffer from water shortage / unavailability at your home/ farm?

- Yes, always 29.58%
- Yes, sometimes 55.28%
- No 15.14%

12- Do you believe that the building of a desalination plant at the Dead Sea will contribute in covering the deficiency of water shortage in the Country?

- Yes, completely 37.85%
- Yes, partially 35.76%
- No 9.38%
- I do not know 17.01%

13- Will you use desalinated water for drinking purposes?

- Yes 69.47%
14- How much are you willing to pay for desalinated water?
- Less than 0.35 JD/ m³ **52.53%**
- Between 0.35 - 0.5 JD/ m³ **24.24%**
- More than 0.5 JD/ m³ **23.23%**

15- Are you concerned that the discharge of brine water (by-product of desalination plant) will change the composition of present Dead Sea water and impact negatively tourism to the Dead Sea or the extraction of Dead Sea minerals?
- Yes **41.85%**
- No **22.22%**
- I do not know **35.93%**

16- What is your opinion if the conduit passes near your land/home/farm?
- I don’t mind without any condition **28.97%**
- I don’t mind with good compensations **45.52%**
- I Oppose/ protest **25.51%**

17- The study of the protection of the Dead Sea should include:
- Study of the project as the only solution **11.72%**
- Study of the project included in a broader study to include other options of water management in the region. **66.40%**
- I do not know **21.88%**

18- Do you prefer that the project be managed by:
- Government **62.14%**
- Corporate (Public) **16.07%**
- Private **9.29%**
- I do not know **12.5%**

19- In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?
- Building an intake in the Gulf of Aqaba then transferring water in a closed pipeline to the Dead Sea **26.83%**
- Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline **50.17%**
Transferring water from the Red Sea to the Dead Sea through an open canal 23.00%

20- If the project will not be implemented what are you going to do to solve your water problem?

☐ Call for better water management 74.05%
☐ Adapt with the existing situation 25.95%

21- Are you concerned that if the project is not carried out, the Dead Sea level will continue to decline and negatively impact tourism in the area?

☐ Yes 79.20%
☐ No 6.20%
☐ I do not know 14.60%

22- What is your overall position of the project idea?

☐ I support 81.32%
☐ I don’t support 10.03%
☐ No position 8.65%
Southern Ghors and Wadi Araba Residential Sector

All Male

Total Number of Male respondents = 186
Number of males with University degree = 49
Number of males with high school education = 82
Number of males with Elementry education = 55

1- Do you own a property in the Dead Sea or in the Araba Valley area?

- Yes 63.39%
- No 36.61%

2- If the answer to the previous question is "yes" then what is the usage?

- Agricultural 46.79%
- Residential 48.076%
- Commercial 5.134%

Total Number of Male respondents = 186
Number of males with University degree = 49
Number of males with high school education = 82
Number of males with Elementry education = 55
3- If the answer to the previous question is "Agricultural land", then what is the main produce?

- Fruit and vegetables: 79.54%
- Forest trees: 6.02%
- Ornamental plants: 2.4%
- Not planted: 12.04%
- Other (specify) --------------

4- Do you or any of your family members work at one of the plants that extract minerals from the Dead Sea (i.e. Potash plant)?

- Yes: 25.86%
- No: 74.137%

5- Do you or any of your family members work at one of the hotels or resorts located on the shores of the Dead Sea?

- Yes: 4.65%
- No: 95.34%
6- Do you or any of your family members own a small business that depends on the tourists and visitors coming to the Dead Sea area?

- Yes 11.57%
- No 88.43%

7- If the answer for any of the previous questions (4, 5, 6) is "yes", then what is your monthly income?

- 70-150 JD 81.37%
- 150-300 JD 18.63%
8- Do you think that the decline or dryness of the Dead Sea will affect your living standards?

- Yes, completely: 36.02%
- Yes, partially: 24.84%
- No: 39.14%

9- Have you heard about the water conveyance project from the Red Sea to the Dead Sea?

- Yes, and I have read about it: 30.29%
- Yes, but I did not read about it: 53.71%
- No: 16%

10- What is the source of water for your home/farm:

- Private well: 1.83%
- Network: 96.95%
- Water tankers: 1.22%
11- Do you suffer from water shortage / unavailability at your home/ farm?

- Yes, always 25.44%
- Yes, sometimes 61.54%
- No 13.02%

12- Do you believe that the building of a desalination plant at the Dead Sea will contribute in covering the deficiency of water shortage in the Country?

- Yes, completely 38.37%
- Yes, partially 39.54%
- No 9.88%
- I do not know 12.21%
13- Will you use desalinated water for drinking purposes?

- Yes: **71.10%**
- No: **28.9%**

14- How much are you willing to pay for desalinated water?

- Less than 0.35 JD/ m³: **55.92%**
- Between 0.35 - 0.5 JD/ m³: **22.04%**
- More than 0.5 JD/ m³: **22.04%**
15- Are you concerned that the discharge of brine water (by-product of desalination plant) will change the composition of present Dead Sea water and impact negatively tourism to the Dead Sea or the extraction of Dead Sea minerals?

- Yes: 37.97%
- No: 27.22%
- I do not know: 34.81%

16- What is your opinion if the conduit passes near your land/home/farm?

- I don’t mind without any condition: 29.14%
- I don’t mind with good compensations: 49.72%
- I Oppose/protest: 21.14%
17- The study of the protection of the Dead Sea should include:

- Study of the project as the only solution  **12.82%**
- Study of the project included in a broader study to include other options of water management in the region. **62.18%**
- I do not know **25%**

18- Do you prefer that the project be managed by:

- Government **61.40%**
- Corporate (Public) **15.79%**
- Private **12.28%**
- I do not know **10.53%**
- In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

- Building an intake in the Gulf of Aqaba then transferring water in a closed pipeline to the Dead Sea [20.34%]
- Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline [54.24%]
- Transferring water from the Red Sea to the Dead Sea through an open canal [25.42%]

- If the project will not be implemented what are you going to do to solve your water problem?

- Call for better water management [71.51%]
- Adapt with the existing situation [28.49%]
21- Are you concerned that if the project is not carried out, the Dead Sea level will continue to decline and negatively impact tourism in the area?

- Yes 80.81%
- No 7.56%
- I do not know 11.63%

22- What is your overall position of the project idea?

- I support 82.87%
- I don’t support 9.39%
- No position 7.74%
Southern Ghors and Wadi Aruba
Residential Sector

All Female

Total Number of Female respondents= 117
Number of females with University degree = 15
Number of females with high school education = 52
Number of females with Elementary education = 50

1- Do you own a property in the Dead Sea or in the Araba Valley area?

- Yes 52.10%
- No 47.90%

2- If the answer to the previous question is "yes" then what is the usage?

- Agricultural 47.14%
- Residential 52.86%
3- If the answer to the previous question is "Agricultural land ", then what is the main produce?

- Fruit and vegetables 84.21%
- Forest trees 10.53%
- Ornamental plants 5.26%
- Not planted 5.26%
- Other (specify) 0%

![Bar chart showing percentages of main produce in agriculture.]

4- Do you or any of your family members work at one of the plants that extract minerals from the Dead Sea (i.e. Potash plant)?

- Yes 26.89%
- No 73.11%

![Bar chart showing percentages of females' opinion on working at Potash plants.]

5- Do you or any of your family members work at one of the hotels or resorts located on the shores of the Dead Sea?

- Yes 6.78%
- No 93.22%

![Bar chart showing percentages of females' opinion on working at hotels and resorts on the Dead Sea.]

6- Do you or any of your family members own a small business that depends on the tourists and visitors coming to the Dead Sea area?

- Yes 5.26%
- No 94.74%

7- If the answer for any of the previous questions (4, 5, 6) is "yes", then what is your monthly income?

- 70-150 JD 75.64%
- 150-300 JD 23.07%
- 300-800 JD
- 800 JD and above 1.28%
8- Do you think that the decline or dryness of the Dead Sea will affect your living standards?

- Yes, completely: 44.74%
- Yes, partially: 26.32%
- No: 28.95%

9- Have you heard about the water conveyance project from the Red Sea to the Dead Sea?

- Yes, and I have read about it: 10.62%
- Yes, but I did not read about it: 38.05%
- No: 51.33%
10- What is the source of water for your home / farm:

- Private well: 3.60%
- Network: 94.59%
- Water tankers: 1.80%

11- Do you suffer from water shortage / unavailability at your home/ farm?

- Yes, always: 35.65%
- Yes, sometimes: 46.09%
- No: 18.26%
12-Do you believe that the building of a desalination plant at the Dead Sea will contribute in covering the deficiency of water shortage in the Country?

- Yes, completely 37.07%
- Yes, partially 30.17%
- No 8.62%
- I do not know 24.14%

13-Will you use desalinated water for drinking purposes?

- Yes 66.96%
- No 33.04%
14- How much are you willing to pay for desalinated water?

- Less than 0.35 JD/m³ 46.48%
- Between 0.35 - 0.5 JD/m³ 28.17%
- More than 0.5 JD/m³ 25.35%

15- Are you concerned that the discharge of brine water (by-product of desalination plant) will change the composition of present Dead Sea water and impact negatively tourism to the Dead Sea or the extraction of Dead Sea minerals?

- Yes 47.32%
- No 15.18%
- I do not know 37.5%
16- What is your opinion if the conduit passes near your land/home/farm?

- I don’t mind without any condition: 28.7%
- I don’t mind with good compensations: 39.13%
- I Oppose/protest: 32.17%

17- The study of the protection of the Dead Sea should include:

- Study of the project as the only solution: 10%
- Study of the project included in a broader study to include other options of water management in the region: 73%
- I do not know: 17%
18- Do you prefer that the project be managed by:

- Government 63.3%
- Corporate (Public) 16.51%
- Private 4.59%
- I do not know 15.60%

19- In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

- Building an intake in the Gulf of Aqaba then transferring water in a closed pipeline to the Dead Sea 37.27%
- Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline 43.64%
- Transferring water from the Red Sea to the Dead Sea through an open canal 19.09%
20- If the project will not be implemented what are you going to do to solve your water problem?

- Call for better water management: 78.18%
- Adapt with the existing situation: 21.82%

21- Are you concerned that if the project is not carried out, the Dead Sea level will continue to decline and negatively impact tourism in the area?

- Yes: 76.47%
- No: 3.92%
- I do not know: 19.61%
22- What is your overall position of the project idea?

- I support: 78.70%
- I don’t support: 11.11%
- No position: 10.19%
## Aqaba Residential Sector

**All**

| Total Number of respondents= 118 |

1. Have you heard about the water conveyance project from the Red Sea to the Dead Sea?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, and I have read about it</td>
<td>27.97%</td>
</tr>
<tr>
<td>Yes, but I did not read about it</td>
<td>46.61%</td>
</tr>
<tr>
<td>No</td>
<td>25.42%</td>
</tr>
</tbody>
</table>

2. In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Building an intake in the Gulf of Aqaba then transferring water in a closed pipeline to the Dead Sea</td>
<td>28.83%</td>
</tr>
<tr>
<td>Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline</td>
<td>32.43%</td>
</tr>
<tr>
<td>Transferring water from the Red Sea to the Dead Sea through an open canal</td>
<td>38.74%</td>
</tr>
</tbody>
</table>

3. Are you concerned that the conveyance (pumping) of water from the northern tip of the Gulf of Aqaba will result in noise that would impact you or the tourism industry in Aqaba?

<table>
<thead>
<tr>
<th>Response</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>47.41%</td>
</tr>
<tr>
<td>No</td>
<td>27.59%</td>
</tr>
<tr>
<td>I do not know</td>
<td>25%</td>
</tr>
</tbody>
</table>

4. Are you concerned that the construction of the canal and the water conveyance process from the Red Sea will impact the following:

<table>
<thead>
<tr>
<th>Impact</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. The aestheticism value of the beach</td>
<td>44.23%</td>
<td>55.77%</td>
</tr>
<tr>
<td>b. The marine life</td>
<td>71.72%</td>
<td>28.28%</td>
</tr>
<tr>
<td>c. The tourist attraction</td>
<td>44.55%</td>
<td>55.45%</td>
</tr>
</tbody>
</table>
5. The study of the protection of the Dead Sea should include:

- Study of the project as the only solution 5%
- Study of the project included in a broader study to include other options of water management in the region. 69%
- I do not know 26%

6. What is your overall position of the project idea?

- I support 77.06%
- I don’t support 12.84%
- No position 10.10%
Aqaba Residential Sector

All Male

Total Number of Male respondents = 57

Number of males with University degree = 26
Number of males with high school education = 24
Number of males with Elementry education = 7

1. Have you heard about the water conveyance project from the Red Sea to the Dead Sea?

☐ Yes, and I have read about it 40.35%
☐ Yes, but I did not read about it 47.37%
☐ No 12.28%

2. In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

☐ Building an intake in the Gulf of Aqaba then transferring water in a closed pipeline to the Dead Sea 32.08%
☐ Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline 32.08%
☐ Transferring water from the Red Sea to the Dead Sea through an open canal 35.84%
3. Are you concerned that the conveyance (pumping) of water from the northern tip of the Gulf of Aqaba will result in noise that would impact you or the tourism industry in Aqaba?

- Yes it will affect [33.93%]
- No it will not [35.71%]
- I do not know [30.36%]

4. Are you concerned that the construction of the canal and the water conveyance process from the Red Sea will impact the following:

a. The aestheticism value of the beach [46%] [54%]
b. The marine life

66.67%  33.33%

---

c. The tourist attraction

42.55%  57.44%

---

5. The study of the protection of the Dead Sea should include:

- Study of the project as the only solution  8.33%
- Study of the project included in a broader study to include other options of water management in the region.  64.58%
- I do not know  27.087%
6. What is your overall position of the project idea?

- I support 76.78%
- I don’t support 17.86%
- No position 5.36%
1. Have you heard about the water conveyance project from the Red Sea to the Dead Sea?

- Yes, and I have read about it [16%]
- Yes, but I did not read about it [46%]
- No [38%]

2. In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

- Building an intake in the Gulf of Aqaba then transferring water in a closed pipeline to the Dead Sea [26%]
- Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline [33%]
- Transferring water from the Red Sea to the Dead Sea through an open canal [41%]
3. Are you concerned that the conveyance (pumping) of water from the northern tip of the Gulf of Aqaba will result in noise that would impact you or the tourism industry in Aqaba?

- Yes [60%]
- No [20%]
- I do not know [20%]

4. Are you concerned that the construction of the canal and the water conveyance process from the Red Sea will impact the following:

   a. The aestheticism value of the beach

      - Yes [43%]
      - No [57%]
b. The marine life

![Graph showing percentage of females' opinion on whether the marine life will be affected by the proposed conduit.]

- **Elementary**: 82.35%
- **High School**: 70.37%
- **University**: 55.56%

Females Opinion

- **Yes it will affect**: 76%
- **No it will not**: 23%

53%

---

b. The marine life

- **Elementary**: 82.35%
- **High School**: 70.37%
- **University**: 55.56%

Females Opinion

- **Yes it will affect**: 76%
- **No it will not**: 23%

---

c. The tourist attraction

![Graph showing percentage of females' opinion on whether the tourist attraction will be affected by the proposed conduit.]

- **Elementary**: 43.75%
- **High School**: 56.66%
- **University**: 77.77%

Females Opinion

- **Yes it will affect**: 46%
- **No it will not**: 53%

---

5. The study of the protection of the Dead Sea should include:

- Study of the project as the only solution: 19%
- Study of the project included in a broader study to include other options of water management in the region: 73%
6. What is your overall position of the project idea?

- I support 77%
- I don’t support 7.5%
- No position 15%
Annex 2: Questionnaire Results for Tourism
### Tourism Sector

**Total Number of Tourism respondents = 319**

1. What is the motive for your visit to the Dead Sea area?
   - Medical: 3.48%
   - Enjoyment of the Dead Sea and its landscape (Tourism): 68.04%
   - All above: 28.48%

2. Where do you stay during your visit to the Dead Sea?
   - Hotel: 40.81%
   - Private resort: 19.94%
   - The beach or the public resorts: 39.25%

3. What is the average number of your visits to the Dead Sea?
   - Once a week: 13.71%
   - Once every month: 15.05%
   - 1 - 4 every year: 71.24%

4. Are you concerned that the decline of the Dead Sea water level will impact your visit to the Dead Sea and will impact the tourism sector?
   - Yes, completely: 42.17%
   - Yes, partially: 40.58%
   - Will not impact: 17.25%

5. Have you heard about the water conveyance project from the Red sea to the Dead Sea?
   - Yes and I have read about it: 25%
   - Yes, but I did not read about it: 39.69%
   - No: 35.31%

6. If the transfer of the Red Sea water to the Dead Sea lead to a slight change in the color of the Dead Sea water (white), do you think this will impact the tourist attraction in general and your visit to the Dead Sea?
   - Yes, in a dramatic manner: 14.97%
   - Yes, in a partial manner: 38.85%
7. Are you concerned that the project will impact on the medical characteristics of the Dead Sea?

- Yes, in a dramatic manner 26.97%
- Yes, in a partial manner 54.28%
- Will not impact at all 18.75%

8. Have you suffered from water shortage during your visit or stay at private resorts at the Dead Sea?

- Yes in a dramatic manner 8.77%
- Yes in a partial manner 21.43%
- No 69.80%

9. Do you think that the existence of major activities related to the project such as hydropower, desalination plant in the industrial area of the Dead Sea will impact the tourist attraction to the Dead Sea and your future visits?

- Yes 49.03%
- No 50.97%

10. In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

- Building an intake in the Gulf of Aqaba then transferring water, in a closed pipeline to the Dead Sea 21.90%
- Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline 39.37%
- Transferring water from the Red Sea to the Dead Sea through an open canal 38.73%

11. The study of the protection of the Dead Sea should include:

- Study of the project as the only solution 12.41%
- Study of the project included in a broader study to include other options of water management in the region. 62.41%
- I do not know 25.18%

12. Do you support the overall project idea?

- Yes 71.61%
- No 12.58%
- No position 15.81%
Tourism Sector

Jordanian

Total number of Tourism (Jordanian Respondents) = 173

1. What is the motive for your visit to the Dead Sea area?
   - Medical 2.31%
   - Enjoyment of the Dead Sea and its landscape (Tourism) 65.9%
   - All above 31.79%

2. Where do you stay during your visit to the Dead Sea?
   - Hotel 33.89%
   - Private resort 20.9%
   - The beach or the public resorts 45.19%

3. What is the average number of your visits to the Dead Sea
   - Once a week 18.67%
   - Once every month 19.87%
   - 1 - 4 every year 61.44%

4. Are you concerned that the decline of the Dead Sea water level will impact your visit to the Dead Sea and will impact the tourism sector?
   - Yes, completely 40.46%
   - Yes, partially 44.5%
   - Will not impact 15.04%

5. Have you heard about the water conveyance project from the Red sea to the Dead Sea?
   - Yes and I have read about it 31.21%
   - Yes, but I did not read about it 44.5%
   - No 24.29%

6. If the transfer of the Red Sea water to the Dead Sea lead to a slight change in the color of the Dead Sea water (white), do you think this will impact the tourist attraction in general and your visit to the Dead Sea?
   - Yes, in a dramatic manner 17.96%
   - Yes, in a partial manner 36.52%
7. Are you concerned that the project will impact on the medical characteristics of the Dead Sea?
   - Yes, in a dramatic manner: 25.45%
   - Yes, in a partial manner: 56.36%
   - Will not impact at all: 45.5%

8. Have you suffered from water shortage during your visit or stay at private resorts at the Dead Sea?
   - Yes in a dramatic manner: 7.22%
   - Yes in a partial manner: 25.3%
   - No: 67.48%

9. Do you think that the existence of major activities related to the project such as hydropower, desalination plant in the industrial area of the Dead Sea will impact the tourist attraction to the Dead Sea and your future visits?
   - Yes: 47.61%
   - No: 52.39%

10. In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?
    - Building an intake in the Gulf of Aqaba then transferring water, in a closed pipeline to the Dead Sea: 24.39%
    - Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline: 38.41%
    - Transferring water from the Red Sea to the Dead Sea through an open canal: 37.19%

11. The study of the protection of the Dead Sea should include:
    - Study of the project as the only solution: 11.72%
    - Study of the project included in a broader study to include other options of water management in the region: 60.68%
    - I do not know: 27.58%

12. Do you support the overall project idea?
    - Yes: 73.37%
    - No: 13.6%
    - No position: 13.03%
**Tourism Sector**

<table>
<thead>
<tr>
<th>Total number of Tourism (Non Jordanians) Respondents=146</th>
</tr>
</thead>
</table>

1. **What is the motive for your visit to the Dead Sea area?**
   - Medical **3.62%**
   - Enjoyment of the Dead Sea and its landscape (Tourism) **78.23%**
   - All above **18.15%**

2. **Where do you stay during your visit to the Dead Sea?**
   - Hotel **48.63%**
   - Private resort **18.5%**
   - The beach or the public resorts **32.87%**

3. **What is the average number of your visits to the Dead Sea**
   - Once a week **7.5%**
   - Once every month **90.022%**
   - 1 - 4 every year **83.45%**

4. **Are you concerned that the decline of the Dead Sea water level will impact your visit to the Dead Sea and will impact the tourism sector?**
   - Yes, completely **44.29%**
   - Yes, partially **35.71%**
   - Will not impact **20%**

5. **Have you heard about the water conveyance project from the Red sea to the Dead Sea?**
   - Yes and I have read about it **17.69%**
   - Yes, but I did not read about it **34%**
   - No **48.29%**

6. **If the transfer of the Red Sea water to the Dead Sea lead to a slight change in the color of the Dead Sea water (white), do you think this will impact the tourist attraction in general and your visit to the Dead Sea?**
   - Yes, in a dramatic manner **11.56%**
   - Yes, in a partial manner **41.49%**
   - Will not impact at all **46.95%**
7. Are you concerned that the project will impact on the medical characteristics of the Dead Sea?

- Yes, in a dramatic manner 28.77%
- Yes, in a partial manner 51.79%
- Will not impact at all 19.44%

8. Have you suffered from water shortage during your visit or stay at private resorts at the Dead Sea?

- Yes in a dramatic manner 10.56%
- Yes in a partial manner 16.9%
- No 72.54%

9. Do you think that the existence of major activities related to the project such as hydropower, desalination plant in the industrial area of the Dead Sea will impact the tourist attraction to the Dead Sea and your future visits?

- Yes 50.7%
- No 49.3%

10. In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

- Building an intake in the Gulf of Aqaba then transferring water, in a closed pipeline to the Dead Sea 19.2%
- Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline 40.39%
- Transferring water from the Red Sea to the Dead Sea through an open canal 40.39%

11. The study of the protection of the Dead Sea should include:

- Study of the project as the only solution 13.17%
- Study of the project included in a broader study to include other options of water management in the region. 64.34%
- I do not know 22.49%

12. Do you support the overall project idea?

- Yes 69.5%
- No 11.34%
- No position 19.16%
Annex 3: Questionnaire Results for Industrial Sector
Industrial Sector

Total Number of Industries surveyed = 12

1. To what extent does the decline of the Dead Sea water level impact your industry?

- Closure of the plant 63.64%
- Abandon parts of the plant 18.18%
- Does not impact 18.18%
- Positive impact on mineral extraction

2. Have you heard about the water conveyance project from the Red to the Dead Sea?

- Yes and I have read about it 41.67%
- Yes, but I did not read about it 58.33%
- No

3. In your opinion the implementation of the project is:

- Major and important to the Dead Sea region and to your industry 66.67%
- Will negatively impact your industry due to change of Dead Sea water composition 25%
- No importance of the project 8.33%

4. Are you concerned that a change in the composition and concentration of the Dead Sea water will impact the quality of production at your industry?

- Yes, and there is no way to modify the production lines (industry closure) 36.36%
- Yes, and there is a way to modify the production lines 36.36%
- Will not impact the industry 27.28%

5. Have you participated or conducted a scientific study on the impact of transferring water from the Red Sea to the Dead Sea?

- Yes 8.33%
- No 58.33%
- Our industry has no relation 33.34%
6. If the answer on previous question is "yes", what is the impact of this water transfer on your industry according to your study?

- Positive impact [100.00%]
- Negative impact [0%]
- No impact

7. What is the source of water to your industry?

- Private well [21.43%]
- Network [57.14%]
- Water tankers [21.43%]
- Our Industry does not need water

8. Does your industry suffer from water shortage?

- Yes, permanent
- Yes, sometimes [41.67%]
- No [58.33%]

9. Do you believe that the building of a desalination plant at the Dead Sea will contribute in covering the deficiency of water shortage in the industry?

- Yes, completely [16.67%]
- Yes, partially [50%]
- No [8.33%]
- I don’t know [25%]

10. In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?

- Building an intake in the Gulf of Aqaba then transferring water, In a closed pipeline to the Dead Sea [45.45%]
- Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline [27.27%]
- Transferring water from the Red Sea to the Dead Sea through an open canal [27.28%]

11. The study of the protection of the Dead Sea should include:

- Study of the project as the only solution [10%]
- Study of the project included in a broader study to include other options of water management in the region [80%]
- I do not know [10%]
12. What is your overall position of the project idea?

- [ ] I support 91.67%
- [ ] I don’t support 8.33%
- [ ] No position 0%
Annex 4: Questionnaire Results for Hotel Sectors
Dead Sea Hotel Sector

Total Number of respondents = 4

1. What was the yearly average rate of occupancy in the hotel in year 2000………% , year 2004 ………% 

2. Do you see the continuous drop in the Dead Sea level as having an impact on the tourism sector and the occupancy rate in the hotel?
   - Yes, in a dramatic way 25%
   - Yes, in a partial way 75%
   - Does not impact 0%

3. Have you heard about the water conveyance project from the Red Sea to the Dead Sea?
   - Yes, and I have read about it 50%
   - Yes, but I did not read about it 50%
   - No 0%

4. If the water conveyance project from the Red Sea to the Dead Sea will lead to changes in the Dead Sea water color (white or reddish brown), do you believe that this change will impact the tourist attraction in general?
   - Yes in a dramatic way 0%
   - Yes in a partial way 0%
   - Will not impact 100%

5. Do you believe that the project will impact the medical characteristics of the Dead Sea?
   - Yes, in a dramatic manner 0%
   - Yes, in a partial manner 75%
   - Will not impact 25%

6. What is the water source for your hotel?
   - Private well 0%
   - Network 50%
   - Water tanks 50%
7. What is the average water consumption in your hotel?

-------------- m³ / --------------
-------------- JD / --------------

8. Have you suffered from water shortage in your hotel?

☐ Yes, in a dramatic manner 50%
☐ Yes, in a partial manner 25%
☐ No 25%

9. Do you believe that the building of a desalination plant at the Dead Sea will contribute in covering the deficiency of water shortage in the Country?

☐ Yes, completely 75%
☐ Yes, partially 25%
☐ No 0%
☐ I do not know 0%

10. Will you use desalinated water for drinking purposes?

☐ Yes 50%
☐ No 50%

11. How much are you willing to pay for desalinated water?

☐ Less than 0.35 JD/ m³
☐ Between 0.35 - 0.5 JD/ m³
☐ More than 0.5 JD/ m³

12. If the project will not be implemented, what are you going to do to solve your water problem?

☐ Call for better water management 100%
☐ Adopt with the existing situation 0%

13. Do you prefer that the project be managed by:

☐ Government 0%
☐ Corporate (Public) 50%
☐ Private 50%
☐ I do not know 0%
14. Are you concerned that the existence of major activities related to the project such as hydropower, desalination plant at the industrial area of the Dead Sea will impact the tourist attraction to the Dead Sea and the occupancy rate at your hotel.

- Yes 50%
- No 50%

15. The study of the protection of the Dead Sea should include:

- Study of the project as the only solution 25%
- Study of the project included in a broader study to include other options of water management in the region. 50%
- I do not know 25%

16. What is your overall position of the project idea?

- I support 100%
- I don’t support 0%
- No position 0%
# Aqaba Hotel Sector

**Total Number of respondents = 2**

1. **What was the yearly average rate of occupancy in the hotel in year 2000………..%, year 2004 ………..%**

2. **Have you heard about the water conveyance project from the Red to the Dead Sea?**
   - Yes and I have read about it 100%
   - Yes, but I did not read about it
   - No

3. **Are you concerned that the project might impact on the tourism sector and occupancy rate at your hotel?**
   - Yes 100%
   - No
   - I do not know

4. **Are you concerned that the project will impact negatively on the marine environment in the Gulf of Aqaba that will lead to negative impact on the tourism attraction?**
   - Yes 100%
   - No
   - I have no idea

5. **Are you concerned that the conveyance of water from the northern tip of the gulf Aqaba will lead to noise that will impact on the tourist attractions?**
   - Yes 100%
   - No
   - I don’t know

6. **In your opinion, what is the best way to convey the Red Sea water from the Gulf of Aqaba?**
   - Building an intake in the Gulf of Aqaba then transferring water in a closed pipeline to the Dead Sea
   - Transferring water from the Red Sea to the Dead Sea directly through a closed pipeline
   - Transferring water from the Red Sea to the Dead Sea through an open canal 100%
7. In your opinion the implementation of the project is:

☐ Major and important to the Dead Sea region and to the country 100%
☐ Major and important to the Dead Sea region only
☐ No importance of the project to the Dead Sea region nor the country

8. What is your overall position of the project idea?

☐ I support 100%
☐ I don’t support
☐ No position