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SUSTAINABLE MANAGEMENT OF THE DEAD SEA WATER RESOURCES

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OBJECTIVES AND GOALS

The main objective of the paper is to promote Sustainable Management of the Dead Sea's water resources under trilateral management, which is most significant and relevant to promoting sustainable development and protecting shared ecosystems.

The key purposes of the paper are to:

- Undertake a cost benefit analysis concerning the exploitation of Dead Sea water by various sectors at various rates of co-operation as a sensitivity analysis.
- Look at joint management options to enable maintaining minimum level of the water (redline).
- Design and possibly to initiate a multi-stakeholder process as a means to advance the project objectives.
- To determine the optimal level of economic activity, by sector, in the Dead Sea region, so as to maximise the combined value function at various rates of co-operation. The value function will be a function of economic, social and environmental costs and benefits.

These are the specific aims to reach the goals above:

- 1) Research the added value of the agricultural industry from the waters diverted from the Jordan River Basin. Look at all the costs involved from the production process together with a calculation of the environmental costs. In addition, perceived externalities attributed to agricultural activity will be evaluated based on government subsidies to this sector.
- 2) Research the added value of the mineral extraction industry-taking place at the Dead Sea. Look at all the costs involved in the production process together with a calculation of the environmental costs.
- 3) Research the added value of the tourism industry at the Dead Sea. Look at all the costs involved together with a calculation of the environmental costs.
- 4) Research the relationship between the various economic activities and the indirect cost effects they have on each other at varying time periods of forecasted development.
- 5) Research on the non-use value of the Dead Sea. What monetary value are people willing to place on unique natural phenomena that would disappear with the continuous drying up of the Dead Sea?
- 6) Evaluate results under two scenarios: on the basis of competitive national management and on the basis of co-operative trilateral management. Establish the conditions under which a co-operative outcome might emerge and the policy mechanisms required to ensure its credibility.

BACKGROUND

Fresh water availability is one of the main problems in the region. Water demand is on the rise among the general population, industry and agriculture. The Dead Sea area is dry; it enjoys but scarce rainfall and a high evaporation rate. But the water budget influencing the Dead Sea is far greater than that limited to the Basin itself. The Dead Sea level is dropping as water fail to reach it via the Jordan River, because it is pumped and diverted upstream. The main source of water for the Dead Sea is the Jordan River and its tributaries, mainly the Yarmouk River. Other smaller rivers flow into the Dead Sea and there are various springs fed by local aquifers.

In order to reach an understanding and a correct analysis of the economic value of the use of water sources, the amounts of water used must be assessed. Some of the data has already been collected regarding water exploitation both upstream – for agricultural and domestic uses in Jordan and Israel, and from the basin's groundwater and the lake itself by local stakeholders. The Palestinian use of the water resources in the Dead Sea Basin is negligible compared to the Israelis and Jordanians. Their contribution to the decline of the water level of the Dead Sea is limited to the usage of springs and water canals in the area. The information collected is to be compiled together as a comprehensive study including contributions from all three neighbouring entities.

The Dead Sea is managed with a high degree of inefficiency. Stakeholders along the lake, as well as upstream users, do not take into account environmental values associated with it. Therefore we must map the different stakeholders (agricultural, industrial and tourism), and demonstrate that the environmental value of the Dead Sea does not fall below the existing uses.

Data has been collected in Jordan, Israel and the Palestinian Authority as described below. The collection of all necessary must still be completed and presented coherently allowing the evaluation of the added value of different stakeholders in different countries.

Jordan

Added value from **agriculture**: considers plant types in the Jordan Valley, cost of production, water consumed for these crops, and the revenue of production.

A meeting was held at the Ministry of agriculture in October. Details were given regarding the changes to irrigation water, expansion of irrigated areas and increased production.

Added value from the **mineral extraction** industry: a visit was conducted to the Arab Potash company at the Dead Sea, and some of the data has been collected. Data related to prices is considered to be confidential. The site is basically a solar evaporation pond system, with an area of 131 km² for the manufacturing of ores and processing plants for the ores.

The Arab Potash Company has had to make provision for exceptional losses due to sinkholes: During the year 2001 several sinkholes have appeared in Dike 18. As a result the company stopped pumping water into the pan and reduced the water level to prevent the dike from collapsing. Currently, the company is conducting technical studies to rehabilitate the dike and to increase its safety factor in order to put the dike back into operations. An impairment loss of JD

4,000 has been recognised in the income statement, which represents the estimated cost of the rehabilitation of the dike.

Israel

Added value of the **tourism** industry: the data collected reviews the number of employees in Dead Sea hotels, turnover rates at these hotels, and numbers of visitors – local and foreign – to nature reserves and tourist sites in recent years.

The **mineral extraction** industry is one of the most profitable industries in the country. Some of the required data was available from the company's financial report for the year 2001.

Agriculture is a major employment provider for the local population in the Dead Sea Basin. Data was collected on revenues from different types of grown vegetation, as well as animal farming, considering expenses made on water consumption.

Information on the cost of dealing with the problem presented to the region's infrastructure by the sinkholes, and the influence that this phenomenon has on the local economy is still to be studied. It should be noted that sinkholes are very numerous on the western shore of the Dead Sea, and pose a serious issue to be addressed.

Palestinian Authority

The Palestinian Authority has no direct access to the Dead Sea shore. Therefore it has no development projects (industrial or tourism) in the studied area, or a Dead Sea mineral extraction industry. All tourism activities are concentrated in the city of Jericho and the adjacent archaeological and historical sites. In 1996, investors found Jericho to be a suitable place to invest in. New investments in the tourism sector since 1997 exceeded US\$ 180 million. New hotels were founded to cope with the ever-increasing numbers of tourists coming to Jericho. The growth in this sector came to a complete halt with the revived Intifada and growing tension in the area.

Data on the number of **tourists** visiting the tourist and religious sites in Jericho area and the added value from this sector was collected from the Ministry of Tourism.

Data on water resources especially springs and water flowing in the open canals in the Jordan Valley area as well as the economic data for **agricultural** products were collected.

The environmental values of the Dead Sea will be estimated through both use value and non-use value. The first is done by the well established "Travel Cost Method". This method tries to find the value of an environmental resource through information about visitors that are actually going to the Dead Sea, taking into consideration their place of origin and other socio-economic characteristics.

For that purpose some 400 survey-questionnaires (200 in Israel and 200 in Jordan) are to be answered by visitors to the Dead Sea shores.

In Jordan

The questionnaire was translated to Arabic, and two hundred copies were distributed among the visitors of the Dead Sea over the weekend. Their answers were then compiled to an Excel file, to enable extrapolation of the use value.

In Israel

The use value questionnaire was translated to Hebrew, and distributed among visitors to the Dead Sea. Approximately 120 use value questionnaires have been filled in on the Israeli side, and an additional 80 are expected to be completed shortly. The data collected from these questionnaires is being compiled to a computer file, to allow for a comparative analysis with results collected in Jordan.

In the Palestinian Authority

This type of questionnaire should be conducted at the Dead Sea shore to evaluate the amount of money people are willing to pay and the cost of their visit to the shore. It is found that we could not conduct this questionnaire at the Palestinian Authority area as Palestinians could not reach to the Dead Sea, nor even Jericho, the closest Palestinian city to the Dead Sea, because of the prevalent political atmosphere and restrictions on movement of Palestinians. This questionnaire could possibly be conducted in the future, should the political situation improve.

In addition to the use value evaluation, the "Contingent Valuation Method" will also be used in order to reveal other types of uses. The non-use value attempts to give an economic value from public that does not necessarily visit the site, and yet value it as important simply because it exists.

Non-use value questionnaires are at the core of the debate in economic studies. As nature and sites like the Dead Sea are not marketable commodities, such questionnaires aim to determine the value of the environment and its natural resources. Non-use values are often based on contingent market systems, not based on the genuine behaviour of people.

As the phrasing of such a questionnaire is quite sensitive, it was decided to hold focus groups to test and discuss the proposed wording. In the focus group the question regarding the potential contribution is an open question. The compiled results of the answers to the questionnaires in the focus groups will also determine an initial sum of money people will be asked if they are willing to commit to saving the Dead Sea. In the final questionnaire, the question will be dichotomised (yes/no), then followed by a higher/lower figure depending on the first answer.