I. Executive Summary

I.i The Risks

Lying at the lowest spot on earth, the waters of the Dead Sea are prized for their therapeutic value and for their minerals. The basin's cultural heritage includes the ancient city of Jericho, the archeological sites Masada and the Qumran caves, and locations claimed to be Jesus' baptism site. Its natural assets include the exquisite natural beauty of stark, pristine desert landscapes and flowing springs and oases that provide habitat to nearly 600 species of plants and animals.

The Dead Sea and its surrounding environment have been extremely compromised, however, and, barring a change in current policies, their future looks grim. Sea level has been dropping by nearly one meter per year due to water diversions upstream and due to mineral extraction industries. Consequences thus far include loss of one-third of the Sea's natural surface area and much coastline, the drying up of nearby natural springs that support wildlife, and the development of hundreds of sinkholes - areas of severe land subsidence resulting from drops in the groundwater table - which have damaged infrastructure, limited economic development opportunities, and destroyed natural habitat. Moreover, unsustainable development plans in areas such as the tourism industry threaten to further degrade the basin's environmental quality.

I.ii The Problem Setting

The management of the Dead Sea and its natural resources so as to preserve the area for future generations is, therefore, both imperative and urgent. Policymakers in the region have recognized the legitimacy of ethical, cultural and ecological rationales for conservation. They have failed, however, to develop, let alone implement, any type of comprehensive management plan. Policymakers have generally either viewed the degradation of the Dead Sea basin as an inevitable sacrifice at the alter of economic productivity or have promoted plans to remedy the damage by means of mega-infrastructure projects such as water importation via a Med-Dead or Red-Dead canal. Amazingly, they have adopted these positions without any clear sense of the economic benefits of conservation, the direct and indirect costs of continued destruction, or the potential indirect economic costs and adverse environmental consequences inherent in massive water transportation schemes. Furthermore, they continue to ignore the most fundamental cause of degradation: poor governance structures, including a lack of communication and cooperation both within and between governments and a lack of a common forum for bringing together multiple stakeholder groups.

In order to fill in the gaps in knowledge and understanding regarding the future of

the Dead Sea, Friends of the Earth Middle East (FoEME) conducted studies to assess the economic benefits of conservation, including the possible restoration of natural flows into the Dead Sea, and to examine lessons to be learned from other international governance institutions, with particular reference to the International Joint Commission, a body responsible for transboundary water management between Canada and the United States. By doing so, FoEME hopes to enable more informed policy that best promotes the overall long-term welfare of the region and its residents.

I.iii The Stakeholders

A wide array of different stakeholder groups in different countries have an interest in the management of the Dead Sea. Stakeholders reside both within and outside the basin. Agriculture, for instance, is a major consumer of water diverted upstream and sent out of the basin, while mineral extraction accelerates natural rates of evaporation from the Dead Sea itself. Tourism as a whole depends on the maintenance of the region's environmental quality and historical landmarks, however, incentives to individual tourism operators can diverge from the social optimum, as is common with many common pool resources. The preservation of the integrity of the region's ecological and cultural legacy is also of concern not only to environmentalists, but to the general public, both local and international, who may cherish the region as a vacation destination and/or simply as a site of historical and environmental import. Local populations are interested in quality of life which is a function of both economic opportunities and local environmental conditions.

The management of the Dead Sea cannot be properly understood outside of its political context. The basin is shared by three peoples - Jordanians, Israelis, and Palestinians - and administrative management is split not only among three governments, which often have strained relations between them, but also among dozens of governmental agencies with competing interests. Thus, effective management needs not only to overcome differences between sectors, but both between and within governments as well.

I.iv Governance Structures

Many possible models exist for management of transboundary commons. FoEME has promoted the concept of registration of the entire basin as a UNESCO Biosphere Reserve and/or World Heritage Site. Such a framework would require

all governments to work jointly to develop and implement a sustainable development plan with designated areas for conservation. It could also help reassure each party that its efforts would be reciprocated by its neighbors. To date, all countries have responded positively in principle to this idea, however, none have yet committed to its adoption and implementation.

The International Joint Commission (IJC) between Canada and the US has served as a body for transboundary management of water and environmental issues for nearly a century. Though the issues the IJC addresses and political context in which it operates are much different than that of the Dead Sea region, nevertheless, several aspects of the IJC can serve as a model for an institutional governance structure. It is a standing body with a mandate to undertake the research and activities necessary to "promote common good of both countries as an independent and objective advisor to the two governments." Scientists and policy experts are appointed to work in the best interests of the environment as a whole rather than as agents of their particular governments. They jointly review and approve projects affecting boundary waters, regulate the operation of such projects, work on dispute resolution, and alert the governments to potential areas of concern. Although the IJC has limited authority and is not responsible for project implementation, it has served as a focal point and clearinghouse for information and has helped to promote a sense of shared goals and impartiality necessary for effective transboundary management.

I.v Economic Analysis of Conservation

Because economic benefits such as satisfaction from hiking, from preservation of natural areas and ecosystem services, and from avoided damages to infrastructure, are not traded in a market, and are therefore difficult to quantify, they have largely been left out of policy analyses. These benefits, however, are no less real than the more obvious economic benefits of sectors such as agriculture and mineral extraction, and they should be included into policy decision-making if overall social welfare is at interest. Economic benefits to conservation include use values (e.g. provision of habitat that attracts tourism or welfare gained from visiting an area), non-use values (e.g. the sense of satisfaction one gets from knowing that something exists and will be available for future generations), and option or quasi-option values (e.g. the value of preserving the option of future utilization of a resource or region).

Two non-market valuation methods were used to assess consumer welfare from

conservation: the contingent valuation (stated preference survey) method, in which population samples from all three countries were asked their willingness to contribute to a fund for the preservation of the Dead Sea basin, and the travel cost method, which assessed benefits derived by those visiting the Dead Sea based on market expenditures and opportunity costs sacrificed in order to make such visits. All three peoples had a positive willingness to pay (WTP) for conservation, despite low incomes, as is shown in Table 1, with total WTP topping US$ 59 million yearly. Of this, over US$ 32 million per year is thought to be for non-use values only. Given the incentive people face to under-provide pubic goods, these figures are probably underestimates of true WTP, and should be thought of as lower-bound estimates. Moreover, this represents the WTP of the local population only and does not include that of the international community.

Country	Avg. Adjusted WTP (per household)	Estimated No. of Households	Estimated National WTP (Total)
Palestine	41.22 NIS = US$ 9.48	575,736	US$ 5,458,000
Jordan (mid-range estimate)	9.37 JD = US$ 13.12	893,500	US$ 11,724,000
Israel	100.25 NIS = US$ 23.06	1,819,700	US$ 41,966,000
TOTAL			US$ 59,148,000

Table 1 Average Adjusted Annual WTP for Dead Sea Fund

From the travel cost study, the best estimate of consumer welfare of domestic tourists from visiting the Dead Sea is US$ 193 million per year (Table 2).

Country	National Annual Consumer Surplus
Israel	US$ 154 million
Jordan	US$ 24 million
Palestine (mid-range estimate)	US$ 15 million
TOTAL	US$ 193 million

Table 2 National Annual Consumer Surplus based on Travel Cost

Doubling this figure to account for the benefits derived by international tourists would produce a value of US$ 386 million per year. There are reasons to think that this is an overly conservative estimate, given the tendency for international tourists to stay longer and invest more in travel, and given their higher opportunity costs. The rate of decline of consumer welfare because of the decline in the sea level was estimated at 0.67% per year. This means that over the past 60 years several billion dollars in benefits have been lost due to sea level decline. Projected losses over the

next 60 years are an additional US$24 million annually, using a 3% discount rate. The travel cost analysis also revealed that the average income of the domestic tourist at the Dead Sea is below that of the national average, indicating that their may be equity reasons for conservation, as the Dead Sea may serve as an tourist destination for those of limited economic means.

In addition to the use and non-use benefits of the general population, there are direct costs to local businesses, infrastructure, and development opportunities associated with environmental deterioration, especially as a result of sinkhole formation. While too little is known to accurately predict the future scale and location of sinkholes, damage to roads, agricultural lands, tourism development and evaporation ponds already causes hundreds of thousands of dollars in recurrent costs and has prevented development projects worth millions of dollars. The rate of sinkhole formation is thought to be increasing rapidly. If a restoration plan could prevent further sinkhole formation, avoidance of these costs would represent additional benefits of conservation.

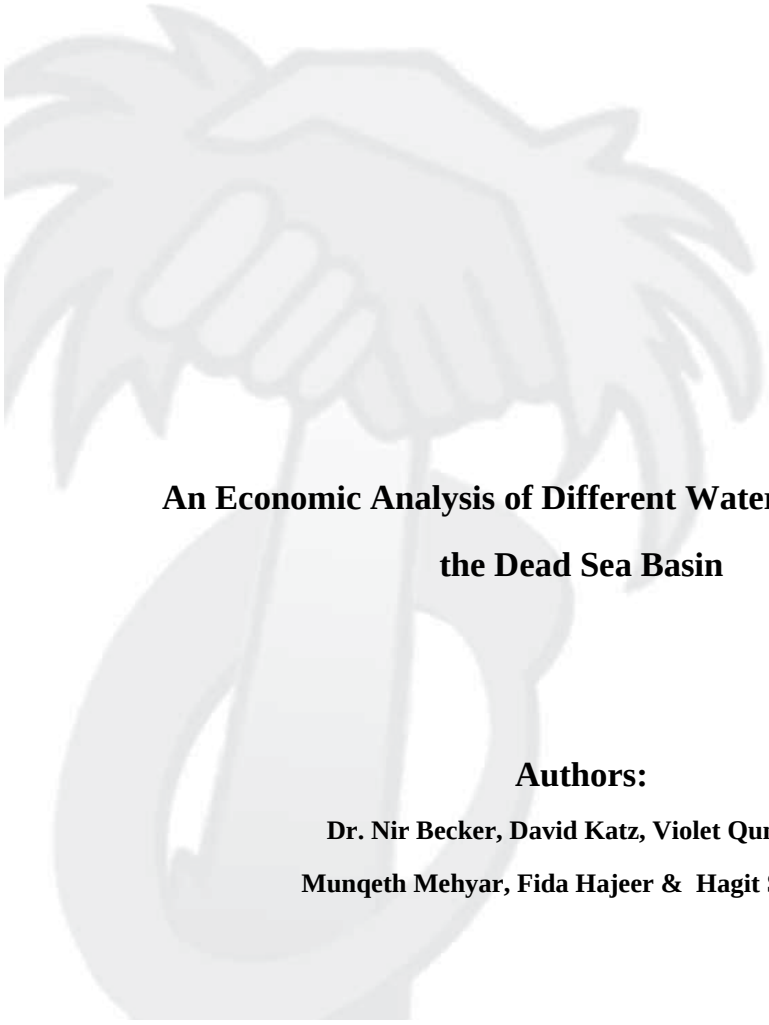
In sum, the economic benefits to conservation are clearly substantial: at least in the hundreds of millions of dollars per year. The value of the current uses of water diverted from the Dead Sea, i.e. the producers' surplus from current resource exploitation in agriculture and mineral extraction, were examined to provide context. The annual return on water in agriculture was estimated to be close to US$ 377 million for the region as a whole, but there are reasons to believe this may be a high-end estimate. The profitability of the Dead Sea mineral extraction was estimated at US$ 143 million per year.

A formal benefit-cost analysis of conservation vs. continued exploitation and degradation would be inappropriate given the imprecision of the values estimated, the omission of several key costs and benefits, gaps in scientific knowledge about physical trends, and lack of knowledge regarding the degree to which conservation and development goals really are mutually exclusive. What is clear, however, is that all three peoples place a high economic value on the conservation of the Dead Sea basin. Moreover, these benefits are distributed widely across the general public, rather than accruing to private interests, as is the case for current resource exploitation.

I.vi Conclusions

The significant economic benefits from conservation of the Dead Sea basin, when added to the already strong ethical, environmental, and cultural arguments, make a strong case for the implementation of a sustainable regional management plan. Registration of the basin as a Biosphere Reserve or World Heritage Site could provide as useful framework for regional cooperation and problem solving. In addition, the IJC may provide a model for an effective transboundary intergovernmental institution. While a comprehensive management plan is the ultimate goal, action should not be deferred until such a plan is in place. Immediate next steps may include identification of critically at risk areas within the basin, and securing of the resources necessary for their conservation, possible candidates include Ein Feshkha, an important bird area and registered nature reserve, The River Jordan, El-Auga Spring Wadi Mujib, and Ein Gedi. Also a possible priority would be identification of cost-effective options for maximizing protection given current resource and budgetary constraints.

P A R T O N E



An Economic Analysis of Different Water Uses Affecting the Dead Sea Basin

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II. AN ECONOMIC ANALYSIS OF DIFFERENT WATER USES AFFECTING THE DEAD SEA BASIN

II.i Introduction

Lying at the lowest point on earth and housing a diverse array of natural and historical treasures, the Dead Sea basin is a unique global treasure. Currently the Dead Sea itself and its surrounding basin are facing severe threats from intensive use of its resources, shortsighted development and weak and poorly coordinated governance structures. Barring a change in current policies, their future looks grim. The management of the Dead Sea and its natural resources in a manner that preserves the area for future generations is, therefore, both imperative and urgent.

Policymakers in the region have recognized the legitimacy of ethical, ecological and cultural rationales for conservation. They have failed, however, to develop, let alone implement, any type of comprehensive management plan. Policymakers have generally either viewed the degradation of the Dead Sea basin as an inevitable sacrifice necessary to achieve economic productivity or have promoted plans to remedy the damage by means of mega-infrastructure projects such as water importation via a Med-Dead or Red-Dead canal. Amazingly, they have adopted these positions without any clear sense of the economic benefits of conservation, the direct and indirect costs of continued destruction, or the potential indirect economic costs and adverse environmental consequences inherent in massive water transportation schemes. Furthermore, they continue to ignore the most fundamental cause of degradation: poor governance structures, including a lack of communication and cooperation both within and between governments and a lack of a common forum for bringing together multiple stakeholder groups.

In order to fill in the gaps in knowledge and understanding regarding the future of the Dead Sea, Friends of the Earth Middle East (FoEME) commissioned studies to assess the economic benefits of conservation, including the possible restoration of natural flows into the Dead Sea, and to examine lessons to be learned from other international governance institutions, with particular reference to the International Joint Commission, a body responsible for transboundary water management between Canada and the United States. By doing so, FoEME hopes to enable more informed policy that best promotes the overall long-term welfare of the region and its residents.

This paper will evaluate the implications of various policy approaches for management of the Dead Sea basin. The paper is structured into two sections. The first covers the policy setting for management of the Dead Sea basin, highlighting the benefits provided by the Sea, the stakeholder groups involved, and governance needs and models. The second section discusses the economic setting of policy and management decisions, with an emphasis placed on results of the study on the economic value of conservation of the Dead Sea basin and on comments of an independent peer review of that study. [1] The studies find that substantial economic gains from conservation exist. However, to capitalize on these gains a coordinated management plan supervised by a cooperative transboundary governance structures is needed.

1 A draft of the study was reviewed by independent Israeli, Jordanian, and Palestinian economists, and discussed by economists, environmentalists, geologists and hydrologists at meetings in Umm Qays, Jordan and Jerusalem in July, 2003. Peer reviewers included the economists: Prof. Mahmoud K. El-Jafari (Al-Quds University), Prof Yoav Kislev (Hebrew University), and Dr. Sohail Magableh (Hashemite University) Helpful comments were also made by Dr. David Brooks, (FoE, Canada). FoEME would like to thank all of these people for their constructive input.

III. THE POLICY SETTING

III.i General Background And Presentation Of Paper's Relevance

The attractions of the Dead Sea are many. Its waters are prized for their medicinal value and for their minerals. The basin contains such cultural heritage as the ancient city of Jericho, the archeological sites Masada and the Qumran caves, and locations claimed to be Jesus' baptism site. Its exquisite natural beauty includes stark desert landscapes and flowing springs and oases that provide habitat to nearly 600 species of plants and animals.

The wide interest in the Dead Sea has also meant a broad range of often competing uses for the basin and its resources, from industry to agriculture to tourism to habitat and nature conservation. The waters of the Jordan River that sustain the Dead Sea and its surrounding basin, are highly prized in a region facing chronic water scarcity. [2] In addition to the riparians of the Dead Sea: Israel, Jordan and Palestine, both Syria and, to a lesser degree Lebanon, consumer water from the headwaters of the Jordan River. Thus, the sustainable management of the basin involves not only the coordination of actors in the basin and immediate surroundings, but throughout the region.

Competition between various economic sectors and between government agencies has, thus far, resulted in haphazard use of the land and water resources that sustain the basin. As a result the Dead Sea has lost one-third of its previous surface area, the surrounding coastal springs have begun to dry up desiccating wildlife habitat, and sinkholes have begun to appear, threatening development, transportation and habitats. In addition, the quiet beauty of the Dead Sea, the very feature that attracts so many tourists, is currently threatened by proposals for increasing the already substantial current hotel capacity in the basin by a factor of ten-fold. The need for a comprehensive and integrated management plan for the Dead Sea region is urgent.

Options being considered to address the situation range from passive acquiescence to the Sea's loss to large-scale engineering schemes to channel water to the Dead Sea by pipeline from the Mediterranean or the Red Seas. Another option, that of concentrating development away from natural areas, reinstating something approaching the flows of the Jordan River and limiting the water use by the mineral

2 All Dead Sea riparians consume at or beyond the renewable supply of water.

extraction industries, has not been seriously considered. Policy-makers have presumably overlooked such a plan or dismissed it as being economically or politically infeasible and involving too many costly sacrifices. Such a conclusion, however, has not been backed up with economic studies. As will become clear during the course of this policy paper, this third option should not be dismissed off-hand as impractical or even uneconomical.

III.ii Benefits Provided By The Dead Sea

The Dead Sea waters, the saltiest of any large body of water in the world, are valued for reputed therapeutic effects. Many visitors come to float in its waters and receive cosmetic and medicinal treatments in local spas and clinics. Some of the many historical and cultural attractions of the Dead Sea include the city of Jericho (purported to be the oldest continually inhabited city in the world), the Qumran caves where the Dead Sea Scrolls (the oldest copy of biblical texts) were found, the fortress of Masada, the baptism site of Jesus, Deir Ain Abata (Lot's Cave), and many others.

Natural benefits provided by the Dead Sea basin include serving as home and habitat to diverse desert wildlife, including over 400-450 species of plants, 90 species of birds, 25 species of amphibians and reptiles, 24 species of mammals, and 6 fish species. Many of these species are rare or endangered, including several endemic species and several migratory species for which the Dead Sea represents an important resting and feeding stop. It is also home to several nature reserves, such as Ein Shehka, Wadi Mujib, Ein Gedi, and Ein Feshkha, as well as other areas prized for their natural beauty.

These many and varied attractions make the Dead Sea a popular tourist attraction for both local and international visitors. Currently over 5,500 hotel rooms are located in the Dead Sea basin, and rates of occupancy are among the highest of any destination in the region. Tourism in the region provides up to 11,000 jobs.

The chemicals in the Dead Sea support both large mineral extraction industries, which supply fertilizer, agricultural and industrial processes, and a cosmetic and health aids industry. The Dead Sea Works and the Arab Potash Company, both location in the southern basin, are each the single largest factories in their host countries of Israel and Jordan respectively. Together they employ over 4,000 people and bring in annual revenues of US$ 650 million.

III.iii Threats Facing the Dead Sea

Drop in Sea Level and Loss of Sea Due to Water Abstraction

The primary threat is to the Dead Sea results from upstream diversions of waters that feed the Dead Sea. The national water carriers of Israel and Jordan divert 90% of the natural flow of the Jordan River, leaving only 10% of the natural flow to reach the Dead Sea. The primary user of these waters is agriculture, however, domestic and industrial uses are also served. Also, diversions of water from coastal springs such as Ein Gedi and Wadi Mujib, which flow directly into the Dead Sea have also reduced their contribution to the Dead Sea to a fraction of natural flow.

Enhanced evaporation of the Dead Sea's waters by mineral extraction industries along the southern shores of the Dead Sea has also undermined the sustainability of the Sea as a stable ecosystem. As a result of the diversions and evaporation ponds, the water level of the Dead Sea has declined over 21 meters between 1930 and 1997, and continues to drop at a rate of nearly a meter per year. One third of the original surface area of the Dead Sea has already disappeared. Water now needs to be pumped from the northern basin to the southern in order to supply the mineral factories with water.

III.iv Loss of Ecosystem Habitat Due to Drop in Sea Level

The drop in the Sea's level has caused drop in the water table along the coasts. This has resulted in the drying up of springs and associated habitats, threatening rare species. Also, as the shore of the Dead Sea recedes, estuarine ecosystems (areas where the freshwater from springs meets the saline waters of the Dead Sea) have also begun to disappear and change in composition. Reports of birds and other wildlife getting stuck in coastal mudflats that have replaced receding shorelines have also emerged.

While it was long believed that the "Dead Sea" contained no life at all in its waters, it was discovered to support endemic species of hypersaline-tolerant bacteria. However, with the loss of volume, the Dead Sea's salinity concentration has increased to such a point that even these salt-tolerant species are at risk (indeed, specimens have not been identified in the Dead Sea since the mid-1990s, although there may be colonies surviving in estuaries). Thus, the Dead Sea is at risk of living up to its name, and truly being a dead sea.

Loss of Infrastructure and Productive Land due to Drop in Sea Level

Sinkholes, areas of severe and concentrated land 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 damage to infrastructure, such as roads and agricultural plots, and could possibly be a risk to human safety. Over 1000 such sinkholes have developed on the western shore of the Dead Sea alone.

Land-based Environmental Degradation due to Unsustainable Development

The land-based threats are primarily in the form of tourism development, which, in addition to demanding pristine land for construction of facilities, also entail disturbance of much larger areas for placement of infrastructure and waste disposal. Plans exist for development of up to 50,000 hotel rooms along the Dead Sea, nearly a ten-fold increase over current numbers. Despite widespread agreement that demand is insufficient to support such extensive development, lack of coordinated planning could result in construction of significant overcapacity, resulting both in unnecessary economic inefficiencies and degradation of the natural resources of the area.

III.v Identification of Primary Stakeholders in the Management of the Dead Sea

Given the abovementioned benefits and threats, several groups of stakeholders in the management of the Dead Sea region can be identified. The most significant of these stakeholder groups and their primary interests are listed in Table 3.

As is shown in Table 3, a wide array of different stakeholder groups in different countries have an interest in the management of the Dead Sea. Stakeholders reside both within and outside the basin. Agriculture, for instance, is a major consumer of water diverted upstream and sent out of the basin, while mineral extraction accelerates natural rates of evaporation from the Dead Sea itself.

Stakeholder	Primary Interest in Dead Sea
Mineral Extraction Industry	The Dead Sea Works and the Arab Potash Company are the single largest factories in Israel and Jordan respectively. Together they directly employ nearly 4000 people and earn combined annual revenue of US$ 650 million. Their primary interest in the Dead Sea is recovery of minerals from the Dead Sea's waters. The companies benefit from the current loss of Dead Sea volume as the mineral concentrations become higher, which accelerates the extraction process. They have voiced concern that plans to bring in water from other sources (e.g. the Red Sea) will negatively alter the mineral composition of the Dead Sea's waters.
Tourism Industry Operators	The Dead Sea is a popular tourist attraction. Currently over 5500 hotel rooms exist in the area. Tourism provides roughly 11,000 jobs directly and more indirectly. The industry in interested in regulating capacity, zoning regulations, regional infrastructure development and maintenance of the shoreline and coastal areas. Interests of individual tourism operators, however, may diverge from that of the industry as a whole, in what is something of a typical common pool resource problem. Currently the majority of hotel capacity lies on the artificial, managed coasts of the evaporation ponds rather than on the receding shoreline of the natural sea.
Tourists	Thousands of tourists, both local and international, visit the Dead Sea basin each year. Primary attractions include the historical sites, the reputed therapeutic value of the Dead Sea's water, the basin's unique flora and fauna and desert landscape, and the year-round warm climate.
Farmers and the Farming Industry	Out of basin diversions of water for agriculture in Jordan and Israel are the primary competitive use of water that would otherwise flow to the Dead Sea. Agriculture as a whole accounts for a relatively minor proportion of the gross domestic product of these two countries, but accounts for the majority of their water use. Limited agriculture also occurs within the Dead Sea basin itself, which, despite its small scale, has significant impact on the local ecology. Though agriculture is relatively more significant in Palestinian society, the Jordan River system has never served as a primary source of water for Palestinian farming.
Residential and small-scale Industrial Users in the Basin	The Governate and city of Jericho represent the largest in-basin sources of domestic consumption of water, supporting a population of roughly 35,000. Smaller residential areas such as Fifa, Safi Sweimah and Kibbutz Ein Gedi, also consume water and local industries such as Ein Gedi bottle water production consume a substantial portion of waters that support desert oases critical to local ecosystems. Residents of the basin are primarily interested in being able to have secure access to the resources of the region in order to earn a decent standard of living.
Wildlife and Environmental Enthusiasts	Those concerned with the survival of unique species of flora and fauna whose fate will be determined by basin management decisions. While the wildlife itself is the primary stakeholder, environmental enthusiasts partially represent this larger stakeholder grouping in policy processes. Their interests focus on maintaining wildlife populations and stable and natural habitats and ecosystems.
All Residents of the Region	Given the cultural, historical and natural significance of the Dead Sea basin, many people from around the region, even those who infrequently visit the basin, derive pride, inspiration and comfort in knowing that the basin exists and will be available for future generations to enjoy. In addition, much of the region's water supply competes directly with water that formerly flowed to the Dead Sea.
International Community	The Dead Sea's status as the lowest place on earth and the world's saltiest large body of water, together with its unique cultural and natural features, ensures that its management and survival are of global interest.

Table 3 Significant Stakeholders in Dead Sea Management and their Interests

The interests in the Dead Sea are similarly diverse. Tourism as a whole depends on the maintenance of the region's environmental quality and historical landmarks, however, incentives to individual tourism operators can diverge from the social optimum, as is common with many common pool resources. The preservation of the integrity of the region's ecological and cultural legacy is also of concern not only to environmentalists, but to the general public, both local and international, who may cherish the region as a vacation destination and/or simply as a site of historical and environmental import. Local populations are interested in quality of life which is a function of both economic opportunities and local environmental conditions.

The management of the Dead Sea cannot be properly understood outside of its political context. The basin is shared by three peoples - Jordanians, Israelis, and Palestinians - and administrative management is split not only among three governments, which often have strained relations between them, but also among dozens of governmental agencies with competing interests. Thus, effective management needs not only to overcome differences between sectors, but both between and within governments as well.

Indicator	Israel	Jordan	Palestinian Authority
Population (2001)	6,400,000	5,000,000	3,100,000
Annual Population Growth (%)	2.1	3.0	4.0
(1997-2001)	108.3		
GNP (2001) (billions of US$)	16,750	8.8	4.2
GNI per capita (2001) (US$)		1,750	1,350

Major Socio-Economic Indicators
Source: World Bank, *World Development Indicators 2003*, *http://devdata.worldbank.org/*

III.vi Governance Structures for Balancing Interests and Managing the Commons

III.vii Current Governance Needs & Institutional Models

Over and above the standard problems of governing commons and public goods, several additional factors complicate the establishment of a functioning governance structure for the Dead Sea basin that would be capable of balancing the diverse interests of the wide range of stakeholder groups. These include:

Multiple national-level governments, with very limited cooperation/coordination due to political tensions
Large gap in income and cultural/political values between parties
Multiple local-level governments

Competing interests for water from outside the Dead Sea basin
Economic dominance of mineral extraction factories, and established rights of these semi-autonomous "states within states."

The details of some of these obstacles to governance have been addressed elsewhere [3], and therefore, will not be discussed in detail here. Of relevance to the discussion at hand is the fact that a single coordinating structure does not exist to coordinate and balance competing interests. Few frameworks have been suggested for accomplishing such a task. One such framework, promoted by Friends of the Earth-Middle East, is the establishment of the Dead Sea as a UNESCO Biosphere Reserve and/or World Heritage Site, both of which would entail establishing and implementing an integrated regional management plan with designated areas for conservation.[4] It could also help reassure each party that its efforts would be reciprocated by its neighbors. To date, all countries have responded positively in principle to this idea, however, none have yet committed to its adoption and implementation.

Within any governance framework there is need for functioning institutions. Clearly, piecemeal and national-based approaches have failed to secure the

3 See for example, '*One Basin One Strategy*' - Symposium on Promoting an Integrated Sustainable Regional Development Plan for the Dead Sea Basin," produced by EcoPeace (Friends of the Earth-Middle East), 1998.
4 See for example, '*Let the Dead Sea Live*' Concept Document : Moving Towards a Dead Sea Basin Biosphere Reserve and World Heritage Listings, produced by Friends of the Earth-Middle East,1999.

sustainability of the Dead Sea. A transboundary coordinating and supervisory body is necessary. The International Joint Commission (IJC) between Canada and the US has served as a body for transboundary management of water and environmental issues for nearly a century. Though the issues the IJC addresses and political context in which it operates are much different than that of the Dead Sea region, nevertheless, several aspects of the IJC can serve as a model for an institutional governance structure. It is a standing body with a mandate to undertake the research and activities necessary to "promote common good of both countries as an independent and objective advisor to the two governments." Scientists and policy experts are appointed to work in the best interests of the environment as a whole rather than as agents of their particular governments. They jointly review and approve projects affecting boundary waters, regulate the operation of such projects, work on dispute resolution, and alert the governments to potential areas of concern. Although the IJC has limited authority and is not responsible for project implementation, it has served as a focal point and clearinghouse for information and has helped to promote a sense of shared goals and impartiality necessary for effective transboundary management.

Some values are so widely shared and/or highly held by the public that they should not be up for negotiation. For the Dead Sea, these might include protection of endangered species, ecological "hotspots," and other rare habitat, e.g. natural springs such as Wadi Mujib, Ein Feshkha or Ein Gedi. They might also include sites of particular cultural or historical significance, such as the Qumran Caves or the location of Jesus' Baptism, or of particular importance for local communities, e.g. al-Auja as a water supply for the Jericho region.

These policy red-lines help both to highlight the relative importance of the issues at hand and constrain the set of policy options considered, eliminating consideration of options that would cause undue harm and/or controversy. Establishing what these core values and red-lines are should involve an iterative exchange of ideas between governments and other interested stakeholder groups. Furthermore, the participation of technical experts, especially in fields such as hydrology and ecology, would be necessary to identify the types and quantities of resources needed to maintain these highly valued areas. Such a process will also help elucidate tradeoffs between policy options that have not yet been recognized. Moreover, any management plan will have to seriously address economic issues, if it is to be viable. It is to this subject matter that this paper now turns.

IV THE ECONOMIC VALUATION

Friends of the Earth-Middle East, while not conducting a full Benefit Cost Analysis, (BCA), undertook an economic analysis of different uses of water affecting the Dead Sea basin. [5] The emphasis of the study was on valuation of non-market goods such as recreation and environmental quality, issues that are often left out of policy analysis, due to the difficulty in quantifying them. Omitting such genuine benefits from analysis implicitly assigns these goods a zero value, and thus gives a biased and flawed assessment of true economic welfare.

IV.i Methodology

Economists often distinguish between use and non-use values. Use values pertain to direct exploitation of resources, whereas non-use values can consist of existence value (the benefit one can get merely from knowing that a resource exists) and bequest or altruistic value (the benefit one gets from knowing that others, including future generations will have access to a resource). Option value, or the value of preserving a resource so that the option of future utilization is preserved, could be classified as either a use or non-use benefit, depending on the time frame.

Within the category of use value, a distinction can be made between direct and indirect use. Direct use refers to active appropriation or utilization of resources and includes both market and non-market goods. Market goods and services are those which are traded in markets, such as minerals, agricultural goods, and hotel stays, while non-market goods and services are those which are not themselves traded in a market but entail market expenditures that can be measured or estimated, such as outdoor recreation and photography. Indirect use generally refers to non-consumptive, non-market goods and services that the ecosystem itself provides, such as provision of habitat and groundwater recharge.

A schematic representation of these benefit categories is provided in Figure 1.

5 For the full economic study please see www.foeme.org /Dead Sea.

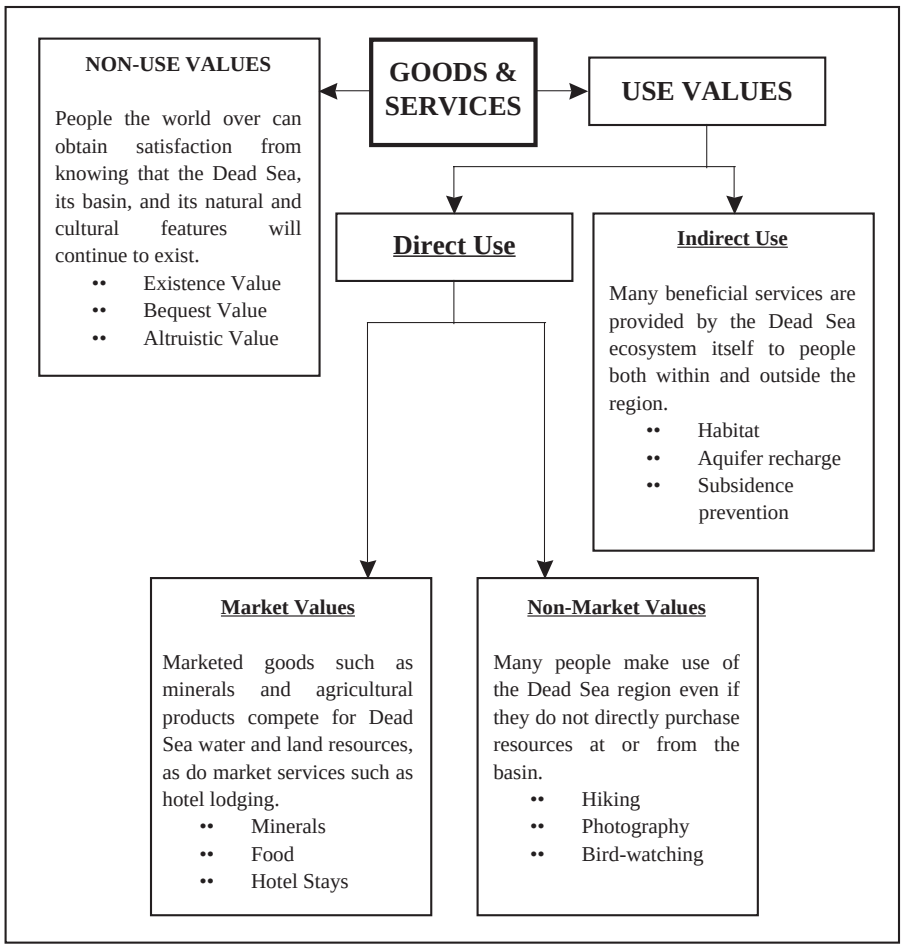


Figure 1 Categories of Values for Goods and Services from the Dead Sea

Economic valuation studies attempt to measure people's subjective estimation of the benefit they receive from a good by looking at their willingness to pay (WTP) for it. The presumption is that people's purchases reflect their priorities, at least to a degree. The welfare of producers, often referred to as "producer surplus" is measured by taking the revenue of a transaction minus the costs of production. Several methods attempt to measure the extent of change in welfare due to externalities, benefits or costs to parties other than producers and consumers. Most concentrate on estimating the value of damages caused by the transaction, e.g. lost

economic opportunities, or on estimating how much the injured party would have been willing to pay to avoid the negative impacts.[6]

Two of the most prominent methods to estimate WTP for non-market goods and services, Travel Cost and Contingent Valuation, were undertaken to assess the public benefit from the preservation of the Dead Sea. The contingent valuation method relies on surveys of consumers in which they are directly asked their WTP for maintenance of a resource at a particular level of quality (e.g. preservation of a species or a waterfall, or establishment of a hiking trail). The underlying concept for the travel cost method is that the amount of money (and time) that people spend to visit attractions, such as natural areas, gives an indication of (at least the lower bound of) the demand they have for the area. In both methods, responses from those surveyed can be aggregated and adjusted to form a population-wide demand curve for the resource. From this point, consumer surplus can be measured as for a normal market good. For the case at hand, the non-market value of protecting and maintaining the Dead Sea was evaluated and contrasted with the gains from the current unsustainable use of Dead Sea resources, primarily water resources.

IV.ii Valuation of the Conservation of the Dead Sea Basin

Contingent Valuation Method (Non-Market)

The contingent valuation method (CVM) was developed as a way of measuring both use and non-use values (and is widely seen as the only recognized method for ascertaining non-use values). It consists of asking a sample population about their WTP for preservation of an area or a species or some other non-market good that is thought to have a significant existence value or bequest value. Three contingent valuation studies were conducted among Palestinian, Jordanian and Israeli communities. Large random samples of local residents[7] were surveyed regarding how much they would pay annually to a fund to preserve the Dead Sea. Before asked about their WTP, respondents were informed about the importance of the Dead Sea as a natural habitat and center of cultural heritage, were informed both about the current environmental degradation process occurring in the Dead Sea basin and were reminded of their budget constraints.

6 Alternative methods look at the third party's "willingness to accept" (WTA) a negative impact. Many scholars have noted that WTA may differ significantly from WTP to avoid an impact, especially in cases where the scale of the damage is large.

7 Sample sizes were: 627 Palestinians, 545 Jordanians and 450 Israelis.

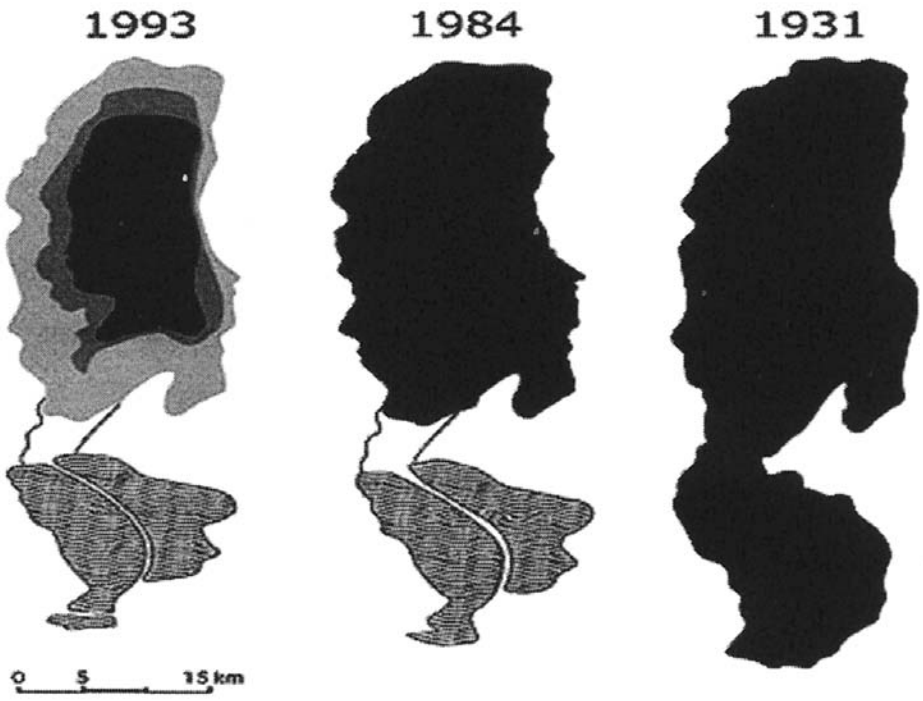


Figure 2 Schematic of Progressive Loss of Dead Sea Surface Area Shown to Survey Participants

Using socio-demographic information from the surveys, the responses were adjusted to reflect the total population. All three peoples surveyed had a positive response for willingness to pay indicating that the preservation of the Dead Sea is indeed viewed as an important asset by all. These values are summarized in Table 4. The importance of conservation is especially obvious in the case of the Palestinians who are under extreme economic pressures, yet still state their willingness to contribute to an annual fund.[8]

8 In fact, relative to Israelis both the Palestinians and Jordanians pledged more per capita, indicating perhaps more limited options for travel to a sea or to vacation spots in general.

Country	Avg. Adjusted WTP (per household)	Estimated No. of Households	Estimated National WTP (Total)
Palestine	41.22 NIS = US$ 9.48[9]	575,736	US$ 5,458,000
Jordan (low) [10]	5.96 JD = US$ 8.39		US$ 7,500,000
(midrange)	9.37 JD = US$ 13.12	893,500	US$ 11,724,000
(high)	12.67 JD = US$ 17.85		US$ 15,945,000
Israel	100.25 NIS = US$ 23.06	1,819,700	US$ 41,966,000
TOTAL			US$ 54,924,000 (low) US$ 59,148,000 (med) US$ 63,369,000 (high)

Table 4 Average Adjusted Annual WTP for Dead Sea Fund - Overall Population

It is widely acknowledged that consumers will tend to under-provide public goods (i.e. contribute less than their true valuation), either because they do not believe that others will contribute to this common good or because they intend to "free-ride," gaining the benefits of the contributions of others. Because of this public goods problem, the amount indicated in the Dead Sea CVM study can be considered a lower-bound estimate only.

In theory, CVM studies should capture both use and non-use values. As can be seen from comparing the results of the CVM study and the travel cost studies, the stated WTP is actually much lower than actual expenditures on tourism alone. Possible explanations include the possibility that many people may doubt that the Dead Sea conservation fund would in fact be successful and therefore did not reveal their true WTP. In addition, many may have perceived any contribution as above and beyond use values, since they would continue to pay travel cost expenditures to access the site, for instance. Furthermore, many people may value the Dead Sea, but feel that they should not have to pay for its conservation since they did little to cause its degradation. An analysis of the Israeli questionnaires estimated that roughly 55% of the stated value of the WTP could be attributed to

9 Palestinian surveyed came exclusively from the West Bank, and thus, their WTP may exhibit some bias if significant differences exist between the WTP of West Bank residents and Gazans, however, this should not make a substantial difference in the overall WTP for the region.

10 Because of the large percentage of zero responses from individuals who stated that they did value the Dead Sea but could or would not contribute to a fund, several values were estimated for Jordan. The low estimate includes all zero responses as zero valuation, while the high estimate calculates the average value omitting the zero responses. The medium range estimate is simply an average of the low and high household estimates.

non-use values. If this ratio is applied to the region as a whole, the mid-range estimate of the total WTP for non-use values only would amount to US$ 32,378,000.

The figures listed above are for local residents only, and do not take into consideration the value the international community might contribute to such a fund. Given the large number of international tourists and the cultural and ecological heritage of global import, the international community's willingness to contribute to a conservation fund may be significant.

IV.ii.a Travel Cost Method (Non-Market Valuation)

The fact that people spend money to visit the Dead Sea indicates that it has a tangible economic benefit. For local tourists in Jordan, the Dead Sea represents the only beach accessible in a day trip for the majority of the population, and for Palestinians in the West Bank it represents the only beach accessible without traveling through Israel. The level of tourism depends on the quality of the natural and physical environment of the destination. By quantifying the economic returns to tourism in the Dead Sea, and determining how these returns might be negatively affected over time by the deterioration of environmental quality in the basin, one can estimate some of the use-values of preservation of the Dead Sea basin.

For many attractions the cost of travel can represent a relatively large share of the overall cost of access. All costs incurred in the visit, including both direct costs such as the cost of travel and lodging, and indirect costs such as the opportunity cost of time (e.g. lost wages), need to be factored in when calculating demand for recreation. For the Dead Sea, travel cost studies were conducted by surveying samples of visitors at both Israeli and Jordanian tourist centers within the basin. Data was collected on their travel expenditures and calculations estimated for opportunity costs, as is detailed below. A Palestinian travel cost study was not undertaken since the Palestinians do not have control over tourist facilities along the Dead Sea itself, nor do they have freedom of movement to travel to the Dead Sea region. An expected range for benefits for Palestinians was estimated, however, using a benefits transfer approach, utilising the response data from Jordan.

Variable	Relationship (Pearson correlation)	Significance of relationship
Age	-0.813	0.095
Education	-0.389	0.518
Income	-0.306	0.617
No. of adults accompanying the respondent	-0.207	0.738
Cost of trip*	-0.928	0.023

Equation 1: $C_i = (W/4) * (T_i) + (KM_i*1.92*2) + N,$
Where the subscript *i* represents a visitor from the *i*-th region, and
C = travel cost
W = forgone wages (opportunity cost) per hour
T = average trip length from any home region (in hours)
KM = the distance of the home region from the Dead Sea (in NIS/kilometers)
N = average price of lodging

Figure 3 Variables Influencing Number Of Per Capita Annual Visits To Dead Sea

Over 150 Israeli and 200 Jordanian visitors to the Dead Sea in 2002 were surveyed as to the frequency and duration of their visits, as well as the distance traveled to arrive at the Dead Sea. Socio-demographic data was also collected in order to detail any differences between respondents coming from different regions and in order to enable extrapolation of the study results to the general public. Actual travel cost per visitor was determined by taking distance traveled and multiplying by a factor to reflect the cost of fuel.[11] To this was added a fraction of forgone wages to reflect the opportunity cost of time spent at the Dead Sea. Regression analyses were used to derive demand curves, i.e. the quantity of trips desired for a given price. From this, consumer benefit from visitation to the Dead Sea was calculated. The results are presented in Table 5.

Country	National Annual Consumer Surplus
Israel	US$ 154 million
Jordan	US$ 24 million
Palestine (low)	US$ 11.2 million
(mid-range)	US$ 14.9 million
(high)	US$ 18.5 million
TOTAL(low)	US$ 189 million
(mid-range)	US$ 193 million
(high)	US$ 197 million

Table 5 National Annual Consumer Surplus based on Travel Cost

11 In the case of the Israeli visitors, a value of the average cost of one night's lodging was also included since it was found that the average stay was over 24 hours. Average duration of trip was 33 hours for Israelis and 17.8 hours for Jordanians.

The study did not attempt to assess a travel cost value for international tourists even though they constitute a large share of the tourism in the area.[12] However, it is clear that such a value would be substantial since it would likely include rental of a car or a share of the purchase of a tour package, hotel accommodations, as well as opportunity costs. In fact, the economic value of international tourists would nearly certainly be even larger than that of the local communities. Thus, a doubling the local consumer surplus from US $189-197 million to US $378-394 million would provide a conservative estimate of total annual benefits.

The entire consumer surplus from tourism cannot be considered as a benefit of conservation of the Dead Sea region, as many tourists will continue to come even as the sea recedes and springs dry up. But there is a loss of consumer surplus as these phenomena occur. Estimates based on survey data from the travel cost and contingent valuation studies, indicated that a drop in visitation rates by local tourists of 0.67% per year can be attributed to drop in the sea level and the associated damages caused by this drop. If this trend is true also for international tourists and consumer surplus is presumed to have dropped at the same rate, then the undiscounted loss in consumer surplus due to the drop in sea level over the last 60 years was US $6 billion in current dollars, or an average of US$ 99.2 million yearly. Under the same assumptions, the resulting undiscounted loss over the next 60 years would be over US $4.2 billion, or US $83.3 million per year on average. Using a 3% discount rate would reduce this annual figure to US$ 23.7 per year. These latter figures reflect the calculated economic loss to visitors of the Dead Sea only from the further degradation of the Dead Sea from its current status, and does not include the losses already incurred.

Analysis of the survey results highlighted some important equity concerns as well. For instance, the income of both the average Israeli and Jordanian tourist to the Dead Sea was lower than the respective national average incomes. A possible explanation of this is that richer people may be able to afford vacation trips to more distant locations, while others are restricted to locations closer to home. If this is indeed the case, preservation of the Dead Sea as a tourist site provides benefits in terms of social equity to, above and beyond the economic benefits.

12 This is, in fact, an important source of foreign currency for all three countries. For instance, recently in Jordan 46.6% of the visitors who come for one-day visits were non-Jordanians, while the percentage climbed to 68.3% of those who stay more than one day. The average stay of the international tourist in the basin is not only longer, but also involves more expenditures per time period, likely indicating a higher consumer surplus.

IV.ii.b Environmental Damage from Overuse of Dead Sea Resources (Market)

In addition to the value of the loss of natural, cultural and aesthetic features due to the drop in the Dead Sea level and misuse of surrounding lands, there is direct economic impact on residents, transportation, investment and industry in the region. A complete assessment of future damages would be highly speculative, since we are only now learning of the scale of damages. A survey of some of these damages and their economic impacts, however, while not comprehensive, gives a sense of the type and scale of economic damages being incurred.

In Israel, nearly US $3 million dollars of lost income (including discounted future income) due to destruction of agricultural land from sinkholes has been documented, and predictions of costs to reconstruct roads and bridges over the next decades are also in the millions of dollars. In addition, plans for a large hotel complex at Mazor were indefinitely shelved due to sinkhole damage.

Agricultural land and road infrastructure has also been lost in Jordan. Also, Jordanian hotels along the Dead Sea have already spent hundreds of thousands of dollars for shore stabilization embankments to counteract possible damage from the receding shoreline. The Jordanian mineral industry has also incurred damage to at least one of its evaporation ponds and certain areas are now unavailable for use as ponds, costing it tens of thousands of dollars. Furthermore, the need for the mineral companies to periodically relocate pumping station locations as the sea level drops could cost several million dollars per readjustment.[13]

In short, sinkhole damage already causes hundreds of thousands of dollars in recurrent costs and has prevented development projects worth millions of dollars. The rate of sinkhole formation is thought to be increasing rapidly. If a restoration plan could prevent further sinkhole formation, avoidance of these costs would represent additional benefits of conservation.

IV.ii.c. An Estimate Of The Impact Of The Drop In The Water Level On Infrastructures, Structures, And Livelihoods In Jordan

- **Agriculture**

Agriculture has suffered directly from the sinkholes phenomenon in Ghor Haditha.

13 At least some of the losses to the mineral industries are offset by the Dead Sea's increased salinity concentration as its level drops, which, in turn, decreases the cost of mineral extraction.

Agricultural lots impacted by the sinkholes are left empty. Some of these lots included date-palm plantations, while others included different kinds of field crops. The average area that was impacted exceeds 50 dunums. To date, the Jordan Valley Authority (JVA), the government agency responsible for the area, has tried to fill the sinkholes, however most sinkhole sizes increased and general subsidence is happening on a large scale.

• Tourism

The hotel industry in Jordan is located at the northern shore of the Dead Sea. The impacts of the deterioration of the Dead Sea can only be seen as an increase in expenditure in order to maintain the beaches in a healthy shape. So far the deterioration of the water level did not result in any reduction of the number of visitors locally or internationally. The primary economic impacts related to the deterioration of the Dead Sea water level are as follows:

Beach erosion, which results in the change of the northern beach morphology where all the Jordanian hotels are located, especially in the form of beach erosion due to exposed shores. The hotels are investing money to stabilize the shape of the beach. These investments reached tens of thousands of JDs per hotel.

The reduction of the Dead Sea's water level has resulted in destruction of concrete built passages leading to the waterfront. The hotels relate these destructions to the unstable soils of the area. The hotels were not able to quantify these damages monetarily.

Sinkholes have not appeared in the northern beach area and therefore are not assumed to have an impact on the hotel industry.

• Mineral Extraction

The Arab Potash Company was designed on the bases that the Dead Sea surface area is shrinking. The company planned to change the location of the pumping station from the upper basin of the Dead Sea every 10 years to cope with the decline in the sea level. The deterioration of the Dead Sea basin has had the following impacts on the Mineral Extraction Group (MEG):

• Negative impacts

Every 10 years the company is required to change the location of the pumping station. The cost of this action reaches around JD 15 millions. The reconstruction of the pumping station is related to the speed of drop of the Dead Sea level.

Besides the change of the location, the pumping power is increasing as the difference of head increases and the length from Dead Sea water to the evaporation ponds increases. The company did not provide us for the amount of extra energy

required for these operational activities.
A sinkhole appeared in the newly established evaporation pond. The company refilled the sinkhole at a cost of around JD 10,000. The sinkhole did not affect any other infrastructures nor did it injure any of the workers in the area. The company did not conduct any risk assessment of the sinkhole phenomenon.
The size of the new pond was reduced form 20 to 18 km, 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.

- **Positive impacts**

The reduction of the Dead Sea level had a positive effect on the (Mineral Extaetion Group the company (MEG) was able to increase and expand the total area of the evaporation ponds. The evaporation surface was expanded northward by 18 km^2.
The reduction in the total fresh water input from the River Jordan and the other sources has lead to an increase in the Dead Sea water density from 1.22 (designed density in 1979) to 1.34. The increase in the Dead Sea density has meant an increase of the mineral content of the pumped water and has resulted in a direct reduction of the duration required to precipitate the mineral in the evaporation ponds. This consequentially has increased the rate of harvesting of the raw material from the Dead Sea. After the heavy rain of the 1992 the company indicted that their total pumping from the Dead Sea water was reduced due to the dilution effect; Dead Sea water had to stay for a longer period in the pond to reduce its water content and therefore harvest the required amount of minerals.

Sector	Type of Impact	Result	Positive/ Negative	Scale of Impact	Value
Agriculture	Sinkholes	Abandoning Land and loss of production	Negative	50 dunums	2500 JD per year
Industry	Sinkholes	Loss of opportunity	Negative	10% of the production speed	10,000 JD to fix sink holes within the dyke
					Loss of 2 km2 of the surface area of evaporation pond
	Lowering the Sea level	Changing the location of the pumping station	Negative		15,000,000 JD every 10 years
	Increased Density	Increased production	Positive	10-15 better production speed	Na
Tourism	Beach erosion	Mitigation measure Beach restoration	Negative	50-60,000JD per year per hotel	200,000 JD per year

Table 6 Summary of Economic Impacts Due to Environmental Damage in Jordan

IV.ii.d An Estimate Of The Impact Of The Drop In The Water Level On Infrastructures, Structures, And Livelihoods In Israel

Agriculture - Kibbutz Ein Gedi

Kibbutz Ein Gedi has been hit hard by the phenomenon of the sinkholes. Its date plantations lie in the most active area of sinkholes, forcing the members to abandon the plantations. The kibbutz drafted an estimate of lost income as a result of its inability to work the plantations and the cost of planting a new plantation. The estimate of damage as calculated by the kibbutz is enclosed. The majority of the damage results from the loss of income of the land dedicated to growing dates, which totals 6.38 square kilometers. The present value of damages (using a discount rate of 6.5%) is estimated at nearly US$ 2.8 million.

Cause	Value	Area	Loss per sq. km.
Loss of income due to the closing of the dates	10,250,000 NIS	6.38 sq km	160,658 NIS
Cost of planting a new plantation	750,000 NIS		
Loss due to land processed for planned plantation	830,000 NIS		
Damage to mangoes	247,000 NIS		
Total			

Table 7 Damage from the Loss of Agricultural Land in Ein Gedi Due to Sinkholes

- **Tourism**

Plans to build 5,000 new hotel rooms in Mazor south of Ein Gedi were frozen as a result of sinkhole formation. This would have been nearly a doubling of the number of hotel rooms available in Israel and could have provided roughly 10,000 new jobs.

- **Transportation**

The life expectancy of a bridge is 120 years, with the economic life expectancy being 50 years. The changes in the flow regime of the seasonal streams and the widening of their beds shortens both the economic and physical life expectancy of the bridges and their rebuilding, taking into account new geomorphological and geological processes. The collapse of the bridge spanning Nachal Arugot, its redesign, and its rebuilding enable the estimate of potential damage resulting from the drop in the water level. The planned cost of the new Nachal Arugot bridge is 15

million NIS, based on the following assumptions:
All of the bridges will be rebuilt an average of two times in a period of 30 years, the first time after five years, and the second time after 30 years.
Based on this estimate, the present value (discounted at a rate of 6.5% the cost of borrowing the money for construction) of the total cost of building the bridge is 16 million NIS.
The cost of building a paved ford (Irish bridge), is 4 million NIS. Based on the same forecasted rebuilding schedule, the total discounted cost (at a discount rate of 8%) of rebuilding the bridge in 30 years is 5 million NIS.
Stretches of Route 90 are in danger of collapsing, and the road will need to be repaved at a higher topographical level. The cost of repaving per kilometer is 4.5 million NIS at a discount rate of 6.5%. A risk map has still not been created on which a repaving estimate and reshouldering estimate could be based. Assuming that the stretch in question is 20 kilometers long, the cost will be 100 million NIS. Assuming that the paving will be executed within a timetable of 15 years, the estimated discounted cost of repaving the roads is 41 million NIS.

- **Prevention of planned use**

According to the outline plan of the Tamar- Dead Sea Regional Council, a new tourism and urban area at Mazor in the southern part of the Dead Sea to the north of Masada is planned, which now lies in the sinkhole zone. Based on the findings of a risk survey, it will be determined whether or not residential and hotel zoning can be granted there. If it should be determined that it is not reasonable to build in the area, an alternative site must be found for this activity. Meanwhile, in the absence of findings, the main parameters for estimation of the economic significance of the drop in the water level are:

* Tentative planning only.
* The demand for land use, and particularly for building a new town, is not proven.
* The potential for damage upon postponing the approval of the plans in the proposed locale, and with the process of locating an alternative site and its approval with the planning agencies, is low.
* There is no shortage of land in the Dead Sea area, and it appears, subject to the risk map, that land can be found for any future use.
* The potential damage to operations of the resorts as a result of the drop in the water level and the distancing of the beach from the hotels will be more costly than finding an alternative site for Mazor.

• **Mineral Extraction**

The lowering of the Dead Sea level led to the separation of the sea's northern and southern sections in the 1970s. As a result, the Dead Sea Works was forced to build a canal through which it now must pump water in order to bring them to the evaporation ponds for mining. The decline in the surface area of the Dead Sea has also led to an increase in salinity, i.e. in mineral concentration. Water density has increased by over 10% since the separation of the sea into two distinct sections. This has actually been economically beneficial for the company as the more highly concentrated brine reduces the time and energy necessary for mineral extraction. Overall production and revenue has increased substantially as the sea level has dropped, however, the extent to which any of this increase is related the sea level change is unclear. Therefore, despite the real impacts of the loss of surface area and drop in sea level, we are unable to present any figures regarding the economic value of these effects.

IV.iii Market Valuation of the Status Quo vis-à-vis the Dead Sea

In order to place the economic values of conservation of the Dead Sea in context, it is necessary to compare them to the status quo, which conceivably would be upset by the conservation measures. The primary factor affecting the sustainability of the Dead Sea basin is water supply, therefore this study now turns to a valuation of the two largest users of the natural water inputs into the Dead Sea: agriculture and mineral extraction.

IV.iii.a Assessment of the Economic Value of Water in Agriculture

The largest consumer of water in the region is agriculture. It is also the lowest valued use of water per volume. Thus, during periodic water shortages in the region, it is often agriculture that is the first to feel the brunt of restrictions in water use. Any increase in instream flow rights that necessitated a reduction in offstream consumption would also come at the expense of agriculture. Therefore, rough estimates were made of the economic return to water as an input in agriculture.

According to World Bank figures, agriculture represents only 2% of the value added of Jordan's Gross Domestic Product (World Bank, 2003), yet it consumes 75% of the nation's water.[14] The amount of freshwater allocated for irrigation in

14 Water sold to farmers is highly subsidized (farmers pay just a few cents per cubic meter), and this does not reflect the true value of water's scarcity. This encourages high consumption rates, wasteful irrigation practices and low production efficiency.

the Jordan Valley is roughly 200 million cubic meters (mcm), of which nearly 150 mcm was from surface waters (primarily from the Yarmuk, a tributary of the Jordan River). Data for in depth calculations of the value of water as an input in agriculture in Jordan is unavailable. However, 2% of GDP is roughly US$ 175 million. Such a figure describes the return on agriculture as a whole, including rain-fed agriculture, and is not restricted to the Jordan Valley. Therefore, it most likely overestimates the value of water in agriculture in Jordan, but can serve as an upperbound estimate.

Agriculture accounts for roughly 60% of the total consumption of water in Israel, but less than 2% of the nation's GNP and of total employment. Unlike its neighbors, Israel has the logistical, technical and financial resources to desalinate water in amounts equal to that supplied by the Jordan River system. One method to estimate the value of water for agriculture would be to estimate the cost of replacement of water taken from farming. The cost of production of desalinated water of sufficient quality for agriculture has been estimated at US$ 0.60 per cubic meter. Given that the Jordan River system supplies Israel with 500 mcm annually on average, replacement of this entire amount with desalinated water would come to a cost of US$ 300 million. This figure, however, should only be seen as an upper-bound estimate and most likely grossly over-estimates the actual value of water as an input in agriculture. The fact that agriculture has not fully exploited it allocation of freshwater over the past decade, even at subsidized prices, can be seen as evidence that water at least on the margin, is worth less than its cost of US$ 0.21/m^3. If the marginal benefits from water are near constant, then there would be zero producer surplus to water as an input. Given that 500 mcm is not a marginal change in the water budget of the agricultural sector, use of the marginal value of water is unlikely to provide an accurate estimate of the true gross value of water to the farmers, but it can serve as a lowerbound estimate of total WTP for water. Thus, the range of values for the economic value of Jordan River water in agriculture in Israel is between zero and US$ 300 million. Given this, an intermediate figure of US$ 150 million is likely a reasonable estimate.

Palestinian agriculture affecting the water balance in the Dead Sea basin takes place primarily in the Jericho and Tubas Districts.[15] Approximately 56 MCM of

15 The amount of Palestinian agriculture is restricted because access to water is restricted. Thus, the estimates of the value of water in agriculture represent current uses, rather than efficient uses or uses that would occur if Palestinians had unrestricted access to the Eastern aquifer, which drains into the Dead Sea basin.

water is used for agricultural purposes in the Jordan Valley of which 44 MCM is used in the Jericho District and 12 MCM in the Tubas District. Palestinian water use in agriculture, while important to local economies and livelihood, has a relatively minor impact on the overall water balance of the Dead Sea.

Based on information from the Palestinian Central Bureau of Statistics regarding the extent of irrigated land, and returns for individual crops, the value added from irrigated crops is US$ 32 million per year in Jericho and roughly US$ 20 million. Because almost all of the value added comes from the irrigated crops, most of this return can be attributed to water as an input.

Summing the values of the return to Jordan River system water in agriculture across all three countries, gives an overall return of roughly US$ 377 million. This however is only a very rough estimate and probably should be seen as an upper-bound estimate.

IV.iii.b Market Valuation of the Dead Sea Mineral Extraction Industry

As noted above, the Dead Sea Works and the Arab Potash Company, are the single largest factories in Israel and Jordan respectively, collectively employing nearly 4000 people directly and earning a combined annual revenue of over US$ 650 million. For Jordan, mining represents one of the nation's leading sources of foreign currency. By intentionally accelerating the natural evaporation of the Dead Sea's waters through construction of shallow evaporation ponds, the companies are able to collect, process and refine the sea's minerals. Primary mineral products include potash and potash fertilizers, bromides, and magnesium.

In the case of Dead Sea mineral works, the producer surplus (i.e. revenues minus costs) of the industry as a whole was examined as a measure of economic gain. According to the annual reports of the Arab Potash Company (APC), the firm's annual revenue from 1999-2002 averaged 148 million JD, or roughly US$ 208 million. Its annual pre-tax profits averaged 32 million JD, or US$ 45 million over the same period. According to its website, the annual revenue of the Dead Sea Works (DSW) is US$ 450 million. Data was not available as to the company's profitability,[16] but assuming that its profit/revenue ratio is similar to its Jordanian counterpart (i.e. 21.6% between 1997-2002), annual profits for DSW would be in the range of US$ 97 million. Thus, total producer surplus from the Dead Sea

16 Because the Dead Sea Works is privately owned, data as to pre-tax profits is proprietary information and so could only be estimated.

mineral extraction industry was estimated at US$ 143 million annually.

Company	Avg. Annual Revenue	Avg. Annual Profits
Arab Potash Company	US$ 208 million *	US$ 45 million *
Dead Sea Works	US$ 450 million**	US$ 97 million ***
TOTAL	US$ 658 million	US$ 143 million

Table 8 Average Annual Revenue and Profits of Dead Sea Mineral Extraction

* based on figures from company annual reports from 1999-2002

** based on figure reported on company website (www.dsw.co.il)

*** based on APC's average profit ratio of 21.6%

IV.iv Conservation vs. Continued Exploitation - A Look at the Numbers

The ultimate goal of this research is to inform policy decisions regarding possible management and/or development plans for the Dead Sea Basin. As stated earlier, the economic value of the preservation of the natural resources of the Dead Sea in a sustainable manner has generally not been considered in regional development planning. After having collecting and analyzing data regarding public perceptions of the value of preservation, it is possible to make at least preliminary assessments of and comparisons between different development options.

A formal benefit-cost analysis is not appropriate for several reasons. Firstly, a conservation approach and the continued existence of some agriculture and possibly some mineral extraction need not be mutually exclusive. From a more practical rational, the total elimination of agriculture and/or the mineral industries is highly unlikely. An "all or nothing" approach is primarily instructive rather than a realistic or even desirable policy suggestion.

Secondly, many of the estimates are too broad to be used with any precision and many costs and benefits associated with conservation were not assessed in this study. Thirdly, there still exist many gaps in scientific knowledge regarding the processes underway in the Dead Sea, and the possibilities for mitigating and/or reversing them. Some experts have noted, for instance, that even restoration of most of the natural flow of the Jordan River might still be insufficient for stabilization of the Dead Sea level.[17]

17 For instance, Professor Amos Bein, Director of Israel Geological and Hydrological Survey, personal communication, 2003.

Finally, environmental awareness in the region is only just beginning to develop. It is very plausible that the values expressed by those surveyed, and the public at large, could develop much more in favor of environmental/conservationist goals. Unfortunately, administering a survey at one particular point in time gives only a snapshot of social preferences and does not provide any indication of trends or changes in these preferences. Such sensitivity to rapidly changing parameters such as environmental awareness and preferences should give decision-makers pause, especially when considering policies with long term implications.

It is possible, however, to make some conclusions given the data presented in this study. Benefits to preserving the Dead Sea Basin include:
* Conservation of rare and endangered flora and fauna
* Conservation of unique ecosystems
* Preservation of historical and cultural sites
* Preservation of undeveloped areas for hiking and aesthetic enjoyment
* Avoided damages to industry, transportation, agriculture and public safety due to sinkholes
* Avoided expenditures to accommodate receding shoreline, especially by tourism industry
* Considerations of social equity may be merited when evaluating conservation of the Dead Sea as a policy option, given that it may serve as a tourist destination for local tourists of below average income who lack other travel destination possibilities.
* The costs of securing such a vision may involve:
* Limiting the upstream abstraction of water which naturally flowed to the Dead Sea
* Limiting the mineral extraction activities of industry in the basin.

According to the contingent valuation study the local willingness to contribute to a Dead Sea fund was between US$ 55-63 million per year. Of this, an estimated US$ 32 million per year is believed to represent non-use values. These figures do not include the non-use values people outside the region have for preservation of the region. According to the travel cost study, the economic value to local tourists of visitation to the Dead Sea is US$ 193 million per year. This figure can safely be at least doubled to include international tourists. An estimate of the loss of tourism due to drop in the sea level was 0.67% per year. Using a discount rate of 3% would give an average annual expected loss of roughly US$ 24 million in consumer surplus from the loss of the Dead Sea over the next 60 years if no

conservation action is taken. Annual damages from sinkholes to infrastructure, industry, tourism, and public safety are difficult to estimate, but total accumulated damages so far are already several million dollars and are likely to grow in the future.

Clearly, the benefits to conservation of the Dead Sea are substantial. Rough estimates of the value of water in agriculture and mineral extraction at the expense of the Dead Sea are US$ 377 million and US$143 million per year respectively. A direct comparison of the value of conservation and the value of water in agriculture and mineral industry may not be appropriate, however, for the reasons noted above, especially the fact that a conservation approach and the continued existence of some agriculture and possibly even some mineral extraction need not be mutually exclusive.

What is important to notice is that conservation of the Dead Sea is highly valued by all the peoples of the region and by international tourists, and may be of the same order of magnitude as the economic value of the current status quo. In addition, the economic benefits of conservation are distributed widely across the general public, rather than accruing in the hands of private interests, as is the case with current development practices.

Combining the heretofore ignored economic benefits with ethical and ecological rationales, conservation deserves to be taken seriously as a policy option. Furthermore, assuming an "all or nothing" approach is not adopted, further studies may enable identification of critical and/or highly valued areas for conservation within the Dead Sea basin that can be attained at much lower opportunity costs than would complete restoration.

Differences between Countries

Economic notions of welfare are based on metrics such as willingness to pay and profits, which are themselves limited to a very large degree by ability to pay and ability to invest. Thus, economic analyses inherently give more weight to those with money. Because the Israeli economy dwarfs that of its neighbors the value Israelis place on the Dead Sea skews the overall results. In situations in which the difference between countries' economies is so large, the results of economic studies often tend to reflect only the economy of the dominant nation. This study indicates, however, that benefits from conservation of the Dead Sea Basin are not exclusive

to any one country. Both the contingent valuation and the travel cost studies indicate that all three populations value the natural and cultural assets of the Dead Sea basin and have a strong desire to manage the area in a sustainable manner.

Disaggregating the results, it becomes evident that, while all three countries have potential gains and losses from both conservation and continued exploitation, these gains and losses are not distributed equally across countries. The Palestinians, for instance, contribute relatively little to the current degradation of the Dead Sea, but highly value its conservation.[18] In relative terms, the Jordanians have much more at stake if resources were denied to agriculture and mineral extraction in favor of conservation. Israel has both productive agriculture and industry as well as a big Dead Sea tourism industry and a public that is willing to and can afford to contribute large sums towards conservation. Israel, with both productive agriculture and industry as well as a big tourism industry has much at stake with either option.

18 The opportunity costs to the Palestinians of conservation would likely change significantly should they gain full access to the Eastern Aquifer and The River Jordan.

V. Putting the Analysis to Use: Policy Implications and Recommended Next Steps

V.i Identification of Relative Gainers and Losers from Competing Policy Options

Economic benefit-cost analyses are infrequently good tools on which to decide policy. Ethical, cultural, ecological and practical political concerns may be more important than achieving an efficient outcome; all the more so when evaluating decisions that are irreversible (or difficult to reverse) and/or that have implications across generations. The Dead Sea apparently provides a vacation spot that is accessible to those of modest financial means. In addition, the preferences of future generations are not taken into consideration in benefit-cost analyses, and while there is no guarantee that profits made from exploitation will stay in the region, its environmental legacy will. Thus, conservation makes sense for reasons of both intra- and inter-generational equity, which may be more important than maximizing net present benefits.

An analysis of benefits and costs can, however, inform policy-makers, indicating what the current generation is willing to pay for, and therefore perhaps highlighting values that may not otherwise be apparent. The conservation of the Dead Sea basin clearly offers a host of significant economic benefits to all three populations, which should not be dismissed when considering the future management of the area.

The economic analyses also help identify winners and losers from any specific policy. Economic notions of welfare are based on metrics such as willingness to pay and profits, which are limited to a large degree by ability to pay and ability to invest. Thus, economic analyses inherently give more weight to those with more money. In absolute terms the Israeli economy dwarfs that of its neighbors and therefore would tend to dominate in any benefit-cost analysis, blurring potential differences between countries. Disaggregating the results, it becomes evident that, while all three countries have potential gains and losses from both conservation and continued exploitation, these gains and losses are not distributed equally across countries.

V.ii Prioritizing Conservation Goals and Identification of Opportunity Costs

Given the impracticality of an "all or nothing: conservation vs. development" approach to water use affecting the Dead Sea, the next step in prudent

policy-making may be to identify priority areas for conservation. It may be, for instance, that certain important levels of preservation can be achieved with relatively little economic sacrifice. Establishing the minimum resource needs, or 'red-lines', necessary to maintain ecologically rich spring-fed ecosystems, such as Wadi Mujib, Ein Feshkha and Ein Gedi, for instance, are primary candidates on which to concentrate efforts.

Examination of the local ecological and hydrological needs can then be combined with a more localized economic analyses to determine least cost methods of securing such objectives. This may help clarify what the levels of risk to the ecosystems are, what the minimum red-lines for extraction should be, if they can be addressed locally or need a basin-wide approach, and what logical and cost-effective places are to make initial reductions in current resource consumption patterns.

V.iii Conclusions

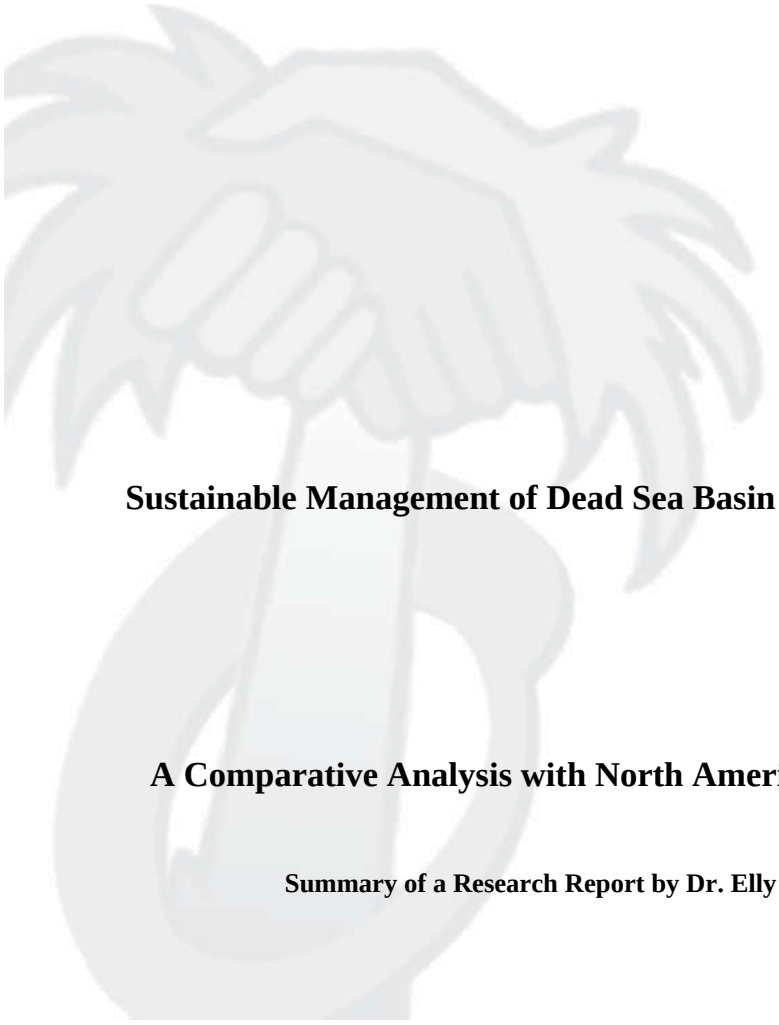
Strong ethical and ecological cases have long been made for the importance of preserving the natural beauty and the environmental and cultural integrity of the Dead Sea basin for future generations. This study demonstrates that there are also clear economic benefits to doing so, and therefore, the net economic costs of conservation are not nearly as great as generally perceived. While the data and results from this study are only enough to give a general impression of the scale of benefits, rather than a precise value, they do imply that environmental and economic objectives need not be mutually exclusive.

As in almost any policy process, there will be those that gain from conservation, and those that lose out. In this case, "winners" include the general public in all three countries, and indeed from around the world, future generations who will be able to experience the beauty of the Dead Sea and its natural surroundings, the tourist industry and the local wildlife. Those who's livelihoods and actions might be restricted could include farmers and the mineral industry. A policy which calls for complete cessation of farming and mineral extraction in the basin in order to restore natural flows is not acceptable for reasons of both equity and practicality. However, so too, continuation of the status quo is also unacceptable.

Given the cultural, environmental and economic issues at stake, a sensible course of action is to identify the "red-lines" of minimum resources necessary to maintain

core areas of natural and social value, and to identify least cost methods of securing these resources. A multi-stakeholder process involving representatives of each of the interested parties is the logical next step both to help identify what these 'core areas' to be preserved are, and to develop an agreed upon procedure for the realignment of control over the resources necessary to achieve the desired conservation goals.

P A R T T W O



Sustainable Management of Dead Sea Basin Water Resources

A Comparative Analysis with North American Experience

Summary of a Research Report by Dr. Elly Hermon

VI SUSTAINABLE MANAGEMENT OF THE DEAD SEA'S WATER RESOURCES: A COMPARATIVE ANALYSIS WITH NORTH AMERICAN EXPERIENCE

VI.i Introduction

This report focuses on three North American models of joint management of transboundary water resources examined for the purpose of drawing lessons applicable for developing an institutional framework for joint management of the Dead Sea water resources. The three models considered represent different categories of inter-jurisdictional co-operation in managing shared water resources involving different levels of government:

a) The Canada-U.S. International Joint Commission (IJC) at the international level;
b) The Prairie Provinces Water Board (PPWB) at the sub-national (interprovincial) level;
c) The Great Lakes Commission (GLC) combining characteristics of joint water management at both the international and sub-national (inter-state/province) levels.

A special emphasis is placed on examination of joint water management patterns in the Great Lakes region. The selection of this case study for an in-depth analysis was determined by a number of considerations discussed in more detail below, one of which is related to the fact that it involves examination of joint water management at both the international and inter-state/province levels. Such an examination is considered useful given the interactions between the two levels of government - state/province and federal - with regards management of transboundary water resources in both Canada and the U.S. where the provinces and the states exercise very significant powers over water resources located within their respective boundaries, though in the U.S. the federal government powers in this area are more extended..

The PPWB management model examined in this report is particularly interesting in this regard as a case study centred on joint management of relatively scarce water resources in a Canadian region affected periodically by droughts and competition over limited water resources. From the perspective of lessons applicable in the Dead Sea context, this case study offers a model of successful implementation of a remarkably well-conceived inter-jurisdictional apportionment agreement on transboundary water resources based on a flexible sharing formula taking into account variations in water flows. The relevance to the Jordan River system deserves serious consideration.

Each of the joint management models considered has its own characteristics intended to meet specific needs, often determined by a well-defined regional context as is the case with the GLC and the PPWB, yet all of them have some common orientations and basic principles reflecting the approaches guiding joint management of shared water resources in North America. These approaches are based on such concepts as sustainable use of resources, protection of the ecosystem, integrated water management, equity and search for a common interest in managing shared resources. These concepts have been gradually integrated into the conceptual frameworks orienting joint management practices in North America. The report highlights this conceptual evolution which may provide some valuable lessons for other parts of the world that are searching for a successful model of joint management of water and related resources. The examined joint management practices include proven procedures for conflict-resolution, participatory decision-making and consensus-building considered as being of particular interest for developing joint management in the Dead Sea area. The more technical aspects of joint management regarding water quantity and water quality issues and the inter-relationships between these two categories of issues are also considered as they may provide some relevant lessons as well.

The issue of the general relevance of the Canada-U.S. experience in joint management of shared water resources for the Dead Sea deserves some preliminary consideration. The differences between the two regions from many perspectives-environmental, political, economic - are obvious. Yet, at a closer examination these differences appear to be much less significant than they do at first glance and even some analogies between the two regional contexts can be identified.

The geopolitical context of the Dead Sea area is heavily influenced by the asymmetrical type of relations among the riparian nations. Conflict is still a significant feature of these relations, notably as regards the still unsettled Palestinian claims in the area. Although considerably less conflict-ridden, a similar pattern of asymmetry characterises the Canada-U.S. relations given the much larger political and economic weight of the latter. Furthermore, the current pattern of friendly relations between the two North American nations is the result of a lengthy historical process marked by periods of tension and conflict. The two countries share one of the longest borders in the world, a considerable part of which consists of shared watercourses the management of which has involved, and to some extent still involves, dealing with significant conflicts of interests. There is thus much to

be learned from their experience and largely successful efforts to overcome these difficulties.

From a political perspective, the feasibility of developing a joint management framework for the Dead Sea is questionable over the short term due to the current tense political climate in the region. However, such an endeavour deserves serious attention when considered in a broader time perspective that takes into account advances in the peace process in the region respecting management of transboundary water resources and notably future projects related to cooperative management of the Dead Sea's water resources.

Another consideration which may, at least at first glance, shed doubts as to the relevance of the Canada-U.S. experience in joint management for the Dead Sea area, is related to the differences between the environmental characteristics of the two regions, notably with regards the availability of water resources. Or at closer examination, it appears that whereas large portions of the Canada-U.S. border region are rich in water resources, this abundance does not preclude competition between different water uses. The Great Lakes are a significant case in point. The analysis provided by this case study highlights the extent of this competition, regardless the abundance of water in the region, and the need for mediation and conflict resolution which has actually led to developing appropriate procedures to meet these needs. This experience is relevant for the Dead Sea case where competition between different water uses is significant.

In order to provide an appropriate basis for evaluation of the relevance for the Dead Sea of the North American experience in joint management of shared water resources examined in this report, a field survey in the region was conducted. This survey included interviews with Israeli, Jordanian and Palestinian experts and officials dealing with relevant water and Dead Sea issues at the governmental and non-governmental levels. These interviews, based on detailed questionnaires, provide valuable insights as to the vision and expectations in the region regarding future patterns of joint management for the Dead Sea. The possible implications in this regard of the Red Sea-Dead Sea conduit project are also briefly examined in the light of the results of this survey.

VI.ii The IJC Model With Lessons For The Dead Sea

The Canada-U.S. International Joint Commission (hereinafter IJC) is a unique

binational organization with an impressive record of achievements in joint management of shared transboundary water resources and often described as a most relevant model for other parts of the world. This success is highlighted by the complexity of the IJC role in managing boundary and transboundary waters along and across one of the longest borders between two nations, a significant part of which being constituted of shared water resources often subject to competing regional and sectoral demands and conflicting national interests.

It is precisely this complexity of the IJC tasks which renders its management model all the more relevant for the Dead Sea where problems related to shared water resources are complex as well. However, the contrast existing from many perspectives - geographical, environmental, economic, political - between the North American setting and that of the arid Dead Sea basin shared by three nations afflicted by acute water shortages, may at first glance raise some scepticism as to the relevance of the IJC experience for this region. Nevertheless, at closer examination it becomes apparent that there are some potentially useful lessons to be drawn from the IJC cooperative water management model. This does not necessarily imply that it would be possible or desirable to transfer the IJC model be to the Dead Sea region indiscriminately. It only suggests that some lessons drawn from the IJC experience and some features of its management model can be transferable for the purpose of promoting cooperative management of shared water resources in this region;

VI.ii.a Significance of the BWT

The success of the IJC is largely related to the Boundary Water Treaty of 1909 (hereinafter BWT) which provides the legal framework for the IJC activities.

There is a most important lesson to be learned from the IJC experience in this respect which is applicable to the Dead Sea and the efforts aimed at creating a joint management structure for the shared water resources in this region. A necessary condition for the successful operation of such a structure is prior agreement on the guiding principles which are to orient its decision-making process. In the case of the IJC, this condition is satisfied in the first place by the definition provided by the BWT as to the categories of cases - such as the use, diversion, obstruction and pollution of boundary and transboundary waters to the detriment of interests on the other side of the border - where the Commission is authorized to exercise its jurisdiction.

Criteria or principles - including, most importantly, the order of precedence of competing water uses - which are to govern the settlement of differences arising between the parties, are yet another key element in such an agreement. It has greatly facilitated the IJC work under art. VIII of the BWT and seems to be all the more relevant for the Dead Sea region where competition between various sectors - such as tourism, agriculture (notably as regards water supplies to the Dead Sea diverted for irrigation out of the region) and mineral extraction - is particularly intense. On the other hand, such an agreement should allow, as it is the case with the BWT, also for a certain degree of flexibility for adjustments required in special situations or unforeseen developments in the natural and human related environment. It was precisely this degree of flexibility provided by the formulation of the BWT which enabled the IJC to adjust to changing circumstances and revise its own positions in the light of new data or scientific evidence, as it was the case, for example, with its re-evaluation of the causes of fluctuating Great Lakes water levels and the measures intended to alleviate their adverse effects, which led to the adoption of a more comprehensive approach to these issues and to new conclusions (see section VIiii below). This adaptability of the Commission highlights its relevance, from the perspective of its legal framework, for water management in the Jordan River basin where such a feature is considered as necessary (Kay and Mitchell, 2000:186-8).

VI.ii.b The IJC Management Patterns with Lessons for the Dead Sea

- ***A politically low- key profile***

Though the IJC has some quasi-judicial powers regarding the approval of new development projects affecting transboundary waters which may harm interests located on the other side of the international border, it has essentially advisory and monitoring functions. These functions are conducted to a large extent through study boards the recommendations of which are not binding.

Many observers are inclined to think that it is precisely the relatively low profile kept by the IJC which enables it to discharge its responsibilities effectively in the political context of jurisdictions jealously defending their prerogatives. Indeed, the governments have clearly indicated their reluctance to let the Commission deal with issues which they deemed to be able to deal with more effectively through diplomatic channels. While keeping a low profile deprived the IJC from gaining an increased influence in its sphere of activity, it shielded it from criticism and

opposition associated with a politically high profile role which would have proven detrimental to fundamental prerequisites for its successful functioning such as impartiality and credibility. A more politicised role not only could encounter stiff opposition from jurisdictions jealous of their respective prerogatives but would also make considerably more difficult avoiding divisions on national lines within the Commission.

There are potentially useful lessons to be drawn from this orientation of the IJC model, lessons applicable for the purposes of creating in the Dead Sea region a joint management structure.These lessons all the more relevant in the light of the political sensitivities existing in this region regarding national sovereignty. Any future joint management structure in the Dead Sea region would have to strike a delicate balance between the need, on the one hand, to gain such a degree of influence on matters related to its sphere of activities as required to render its role effective, and on the other hand, the need to keep a politically low profile avoiding its exposure to politically motivated opposition likely to prove an enormous impediment for its successful functioning. The modesty shown by the IJC throughout most of its long history appears thus as the best recipe for the Dead Sea case. However, this does not mean that the modesty shown by the Commission is synonymous with conservatism. The readiness of the Commission to embrace new and innovative conceptual approaches to the issues in its sphere of activity, approaches characterised notably by a holistic vision of the problems associated with these issues, should not be underestimated. No doubt, advocating such approaches and such a vision, as the ecosystem management approach adopted by the IJC, may require a certain degree of political courage where implementation of such approaches encounters resistance of certain interests. The example set up by the IJC in this respect deserves close attention.

- ***Promotion of Technical Cooperation***

One of the most important functions of the IJC is to provide a forum and an instrument for binational technical cooperation on issues pertaining to transboundary water resources management. This includes joint fact-finding and monitoring, joint definition of objectives for water management and strategies for achieving them. A most significant lesson from the IJC experience in this respect which might be applicable for the purposes of developing joint management of shared water resources in the Dead Sea area is related to the value of technical cooperation and the strategies for developing it. It highlights notably the

significance of developing direct contacts between experts from the relevant governmental agencies of the concerned nations discharging responsibilities regarding the issues considered, and provides some indication as to the practices to be employed by a joint management structure for this purpose. In the political context of the Dead Sea, such IJC proven practices as inserting officials from various government agencies of both countries in an organizational environment stimulating joint endeavours, like impartial fact-finding and formulation of objective recommendations, are of a particularly high educational value for developing a culture of international cooperation, much needed in a region where conflict and adversity have prevailed for so long.

• Independence and conflict resolution

A relatively high degree of independence vis-à-vis governments and limited executive powers count among the most prominent features of the IJC management. Although the IJC depends financially for its functioning on the governments and the commissioners are appointed by their respective governments, they are serving on the Commission in a personal capacity and not as representatives of governments. On the other hand, the latter generally refrained from interfering in the Commission's decision-making process, nor did they reverse its decisions. The Commission could thus develop a tradition of collegial approach to problem solving and conflict resolution, the commissioners orienting their positions in the light of their search for the common good, avoiding divisions on national lines that would paralyse the Commission's work, which did not occur but in very few cases. This has been achieved through a consensus building procedure requiring reaching decisions by a majority vote (four of the six commissioners, three for each country) including at least one commissioner from each country, while in practice the decisions are reached through consensus, a procedure applied also as regards the Commission's boards.

Another element which contributed to the IJC success was the principle of equality between the two parties enunciated in the BWT and which oriented the Commission's procedures. Accordingly, in spite of the obvious asymmetrical relationship between the two countries, they were to enjoy equal representation on the Commission and its organs, the stronger partner refraining from imposing its own views by the mere weight of its advantage. Yet another factor contributing to the IJC success is its pragmatic approach to problem solving. The Commission tends to base its decisions on the merits of each case dealt with, privileging

examination of the facts and specific context of the issue considered rather than strict legal considerations and precedence. The Commissioners strive thus to reach decisions based on factual examination and impartial expert opinion rather than on advocacy of national interests. Such an approach would prove most valuable for conflict resolution in the Dead Sea case.

A significant lesson drawn from the IJC management patterns indicates that a certain degree of independence is not only desirable for such a body but also necessary for its adjustment to progress in scientific understanding of the issues and to evolution in social values. Without such adjustments the effectiveness of any joint water management body is greatly hampered in the long run. This lesson is applicable for the purposes of creating a joint management structure in the Dead Sea region, all the more that the complexity of the problems there does require adoption of innovative approaches which may encounter stiff resistance in some quarters.

• ***Participatory management approach***

The IJC has developed a participatory process of decision-making through various forums in which stakeholders and the public at large are given the opportunity to express their views on the various water management issues dealt with by the IJC. Accordingly, the IJC has developed a two-way communication process improving the quality of the information provided to the public about the issues at stake and encouraging informed, science-based inputs of the stakeholders and the public at large in his decision-making process. The IJC experience illustrates the significance of such a participatory, multi-stakeholder management approach for consensus building and would prove useful for the Dead Sea where mediation between conflicting interests of different stakeholders is required as well.

• ***Integrated, basin/watershed-wide management approach***

In recent years the IJC has adopted an integrated watershed management approach by encouraging the establishment of international watershed boards for transboundary watersheds extending across the Canada-U.S. border. Such boards deal in an integrated manner with water quality and water quantity issues on a basin-wide basis. This IJC experience provides some valuable lessons for the Dead Sea by illustrating that the advantages of an integrated, basin-wide management approach.

VI.iii The Great Lakes Case Study with Lessons for the Dead Sea

VI.iii.a The Relevance Of The Great Lakes Case For The Dead Sea: Introductory Considerations

The selection of the Great Lakes as a case study for the purpose of drawing lessons relevant for the Dead Sea area has been determined to a large extent by the complexity of the problems related to managing the water and related resources in both regions and of the ensuing challenges aimed at dealing with them on a basin-wide basis. This complexity stems from the characteristics of both the physical and human environments of these two regions. The Great Lakes system is composed of five interconnected vast lakes with the St. Lawrence River as their major outlet to the Atlantic Ocean. The interconnectiveness between the major components of this system renders ineffective the search for partial solutions that disregard their interactions. The human environment of this region is also characterized by a high degree of complexity due to a number of factors. On the political and administrative level, the coexistence of various jurisdictions and levels of government, the responsibilities of which tend to overlap. On the economic level, the region is characterized by the presence of various interests with competing water demands. Water management is rendered even more complex by the distribution of these interests on both sides of the international frontier and different sides of inter-state/provincial boundaries. This increases the need for coordinated international and inter-jurisdictional cooperation in the search for solutions and in their implementation.

The complexity of water management in this region is further heightened by water demands outside the region resulting in such projects as inter-basin water transfers which may have potential adverse consequences for Great Lakes interests. The remarkable complexity of the physical and human setting of the Great Lakes - St. Lawrence River system and its reflection on the management level have contributed to its reputation as the "world's greatest laboratory for institutional experimentation and management innovation" (Donahue, 2002:81).

This basic characteristic - high level of complexity of the issues and challenges connected with managing water and related resources - is also present in the Dead Sea context, though on a different scale. The physical environment of the latter, though much different in many regards compared to that of the Great Lakes, is basically similar in one important respect - being part of a larger water system, the Jordan River system. The human environment, or that related to human activities,

is also complex due to the distribution of various interests with competing water demands on both sides of the international border and the other interjurisdictional boundaries in the region. As in the case of the Great Lakes, the situation is rendered even more complex by water demands originating outside the region and affecting its own water resources, notably by diverting waters of the Jordan-Yarmouk River system.

It appears therefore that the two regions, the Great Lakes and the Dead Sea, in spite of marked differences, present some basic common features as far as the complexity of joint water management is concerned. This highlights the relevance of lessons drawn from the rich joint management experience developed in the Great Lakes region for dealing with similar problems existing in the Dead Sea area, problems that require transboundary and intersectoral solutions.

Two institutions representing different levels of government and distinct variants of a joint water management model stand out in the region: the Canada-U.S. International Joint Commission (IJC) and the Great Lakes Commission (GLC). While the latter represents a regional inter-state/province perspective dedicated to Great Lakes issues, the IJC has far more significant responsibilities extending to the entire Canada-U.S. border but which over the years has increasingly focused on Great Lakes issues to the point of being often perceived as an institution devoted mainly to this region.

VI.iii.b Competing Water Uses

There are five major Great Lakes waters user categories: Riparian or shoreline property owners; shipping; hydroelectric power generation; fisheries and wildlife; tourism and recreation. Understanding the nature of the specific water demands of the various main user categories present in the Great Lakes region is indispensable for comprehending the challenges facing any management body dealing with Great Lakes water resources. Such an understanding is also relevant in the Dead Sea where decisions for a future joint management body would be similarly confronted with the complex task of mediating between competing demands of various categories of water users distributed on sectoral rather than national lines. This applies particularly to demands regarding lake water levels. Examination of the respective demands of the various Great Lakes user categories indicates that each one defines optimum lake levels differently (Carroll, 1983:122-3).

In the area of water quality, management decisions are similarly complex given conflicting interests of various sectors such as industry and agriculture, the activities of which are a main cause of water pollution. On the one hand, residents and the tourism, recreation and fishery sectors have a strong interest in preventing pollution and improving the lakes water quality.

It should be noted that the distribution on both sides of the border of sectoral interests having different water demands respecting lake levels is not symmetrical due to differences in level of development in some sectors. However, these differences are largely counterbalanced by the common interests existing in various sectors on the two sides of the border, which stimulates formation of transborder coalitions and alliances strongly affecting joint water management decisions in a manner transcending political boundaries.

The situation as regards competing water demands of different user categories in the Dead Sea region is similar in some important respects, notably given that the two main economic sectors there - the mineral extraction industry and the tourism and health industry sector - are differently affected by declining Dead Sea water level. There are therefore some useful lessons to be drawn from the solutions worked out in the Great Lakes region.

VI.iii.c The IJC Experience With Great Lakes Water Levels And Flows Issues: Lessons For The Dead Sea

The IJC experience with regulating Great Lakes water levels and alleviating the adverse effects of their fluctuations provides some lessons highly relevant for the Dead Sea major problems resulting from the continuing decline in its water level. Some of the conclusions reached by the IJC studies as to the measures considered most appropriate for alleviating the adverse effects of Great Lakes fluctuating levels, seem to be relevant for the Dead Sea situation. These studies recommend shifting the focus of the measures aimed at alleviating the adverse effects of fluctuating water levels from physical regulation of lake levels through regulatory works to measures related to land use or shoreline development planning. It is thus recommended to identify the shoreline areas which are vulnerable to fluctuations in lake water levels and to reorient their development patterns accordingly.

This conclusion has some significant implications relevant for the Dead Sea region. Any joint management structure intended to deal with the shared water resources in

the region is not likely to discharge this responsibility effectively without assuming more comprehensive responsibilities including some influence, at least in an advisory capacity, on regional development planning. The basic orientations of the IJC management model appear thus to be all the more relevant for the Dead Sea region.

As to reorientation of shoreline development planning with a view to alleviating the adverse effects of changes in lake water levels by limiting development in vulnerable areas, the overall result of such a policy may obviously bring to a noticeable reduction in the development of such areas. However, from an economic perspective, it still may be preferable to exposing development to the adverse effects of changes in water levels. Does the same rationale apply to the Dead Sea situation? This remains an open question which deserves serious scrutiny. The IJC experience related to problems raised by this question is surely valuable as it highlights the need for shoreline development planning as a necessary element in any strategy of response to adverse effects of changes in lake water levels. Yet, in the Dead Sea case this element does not necessarily appear as decisive as it is considered by the IJC to be in the Great Lakes region. Other important factors should be taken into account as well. Regional development in the Dead Sea area is confronted to a real dilemma regarding maintaining a more stable lake water level. On the one hand, it is heavily dependent on development of the tourist, recreation and health industries, the facilities of which are concentrated on the Dead Sea shores. These industries are consequently most negatively affected by declining lake levels. However, constraining the development of such vital sectors is likely to have bleak consequences for the regional development, involving considerable loss of revenues and rare sources of employment.

Another factor inducing the decline in Dead Sea level is the mineral extraction industry. Its extensive use of evaporation ponds increases significantly the considerable loss of Dead Sea waters due to evaporation (Biger, 1995:114). The resulting management dilemma is similar in this regard to that confronting the IJC in the Great Lakes region where it has to deal with conflicting interests resulting from competing uses of Great Lakes waters. The IJC management decisions are however considerably facilitated by the order of precedence established in the BWT regarding competing uses of shared transboundary water resources. In the Dead Sea case the task of establishing such an order of precedence is all the more complicated that the economic value of water used by competing sectors appears to

be even more difficult to determine than in some other cases. Tourism, agriculture (as regards diversion of water supplies to the Dead Sea for irrigation purposes) and mineral extraction are all economically and socially important sectors with competing water demands affecting Dead Sea water level. Determination of the economic value of competing uses of water by sector appears thus to be potentially useful for facilitating defining an optimal Dead Sea water level on the basis of water demand management involving a costs/benefits analysis of competing water uses.

The IJC experience in dealing with competing interests related to water levels issues is enlightening by showing that such an approach should take into account also non-monetary factors (and hence hardly quantifiable in economic terms) such as social and environmental considerations related to adverse affects of reduction in water supplies to the Dead Sea and the resulting decline in its water level. Maintaining a relatively stable, optimal Dead Sea water level involves striking an adequate balance between competing water uses. This task seems thus to require managing the whole Jordan-Yarmouk River system which ensures the Dead Sea water supplies and on which largely depend significant segments of the economy and society in the region far beyond the Dead Sea. Consequently, any joint management structure intended to deal with the Dead Sea problems has to have a say on managing all water resources affecting Dead Sea level or affected by it - as it is the case with the IJC in the context of the Great Lakes-St. Lawrence River system. There, by its jurisdiction pertaining to regulating water levels and flows, the Commission can orient water management from a national perspective as well as sustainable development from a regional perspective (for example, by opposing inter-basin water transfers which might adversely affect Great Lakes interests).

VI.iii.d The IJC Experience With Great Lakes Basin-Wide Management With Lessons For The Dead Sea

The Commission's leading role in the area of water level regulation was an important factor in inducing it to embrace the concept of basin-wide management when the impossibility to affect water level of one of the five lakes in the Great Lakes system without affecting (with possible negative impacts) the level of some other one, became obvious. Similarly, the linkage between water quantity and water quality issues became obvious as well. Accordingly, the IJC has developed an integrated watershed management approach by beginning to combine its specialized advisory and control boards dealing respectively with water quality and

water quantity issues within the same transboundary watershed. For this purpose integrated international watershed boards have been already established in a number of rivers basins with a view to providing a comprehensive basin-wide management approach taking into account the various issues related to shared boundary waters and their interrelationships. It is not the only example of the IJC contribution to promoting a basin-wide management approach.

The integrated basin-wide and watershed management approach adopted by the IJC is all the more relevant for the Dead Sea basin where the scarcity of water resources is a major constraint making integrated regional development planning all the more necessary. Such a solution involving joint management of water resources co-ordinated by a common commission for the entire Jordan-Yarmouk basin has been advocated by some analysts in the region (Kliot, 1995:198sq.; Shuval, 1993:8; Zgheib and Fullerton, 1993), which highlights still further the relevance of the IJC model for the region. As far as the Dead Sea region is concerned, such a basin-wide approach seems to be promising for dealing with root causes of its particular problems, to the extent of course that its feasibility is to be facilitated by favourable political developments in the region. This expectation does not however preclude projects with a more modest scope such as developing a regional co-operation framework entailing the creation of a joint management body adapted to specific needs of the Dead Sea region. Such a body would be able to coordinate joint endeavours in such areas of regional common interest as tourism, mineral extraction, protection of the environment and notably to ensure a more stable Dead Sea water level. It would also be able to fulfill investigative and advisory functions, similar to those discharged by the IJC, respecting transboundary resources in the Dead Sea region. Creating such a transboundary cooperation framework with limited regional objectives could be more feasible than reaching a more ambitious agreement in a broader geopolitical context, as it does not necessarily entail agreement about such thorny issues as apportionment of water resources. Absence of such a regional, transboundary coordination would compromise the considerable development potential of the Dead Sea region and the effective protection of its unique natural environment. On the other hand, as indicated by the IJC experience, successful transboundary cooperation in managing shared water and related resources in this region may provide a useful leverage for improving relations between neighbouring nations.

VI.iii.e Great Lakes Water Quality Issues And Their Relevance For The Dead Sea Region

Water quality issues are of utmost importance for any large fresh waterbody in a densely populated area. No wonder that these issues figure high on the water management agenda in the Great Lakes region. In the case of a saline waterbody like the Dead Sea, water quality issues are considered from a different perspective - that of a highly saline lake - and the relevance of any comparison between water quality management challenges in the two regions is hardly obvious at first glance. However, closer examination of the IJC experience with water quality management in the Great Lakes area reveals some significant aspects which provide the rationale for such a comparison and hence, allows for drawing from the IJC experience in this area some lessons applicable to the Dead Sea region. These aspects are related to the adoption by the IJC of a comprehensive, ecosystem approach in dealing with water quality management issues in the Great Lakes area. Such an approach is of great interest for sustainable development in the Dead Sea region.

The IJC has played a significant role in promoting the conclusion and overseeing the implementation of the Canada-U.S. Great Lakes Water Quality Agreement (GLWQA) signed in 1972 and considered to be, with the exception of the BWT, the most comprehensive environmental agreement ever reached between Canada and the U.S. (Schwartz, 1992:64). The key elements in this agreement are the commitment not to pollute boundary waters and the definition of general and specific water quality objectives requiring specific remedial measures. However, a main characteristic of the agreement is its flexibility in allowing the various jurisdictions in the Great Lakes basin to operate their own pollution control programs intended to meet those objectives. The interjurisdictional coordination was thus limited to the definition of water quality objectives, leaving the choice of implementation measures to the discretion of each jurisdiction (federal, state/provincial, municipal) required to discharge pollution control responsibilities. This flexibility was a key factor in meeting the water quality objectives established in the Agreement given the differences in approaches to pollution control on both sides of the border. The non-binding character of the GLWQA, considered as just "a little more than an expression of intentions" (LeMarquand, 1986:231), facilitated this flexibility and favoured voluntary compliance that would have been hampered by a more rigid legal framework.

This flexibility of the 1972 GLWQA is a significant element from the perspective of lessons applicable in the Dead Sea region where the respective approaches to environmental management applied by the three nations sharing this region are also different. From this perspective, the North American experience in the Great Lakes points out the value of international environmental agreements even when they are not endowed with stringent binding provisions. A flexible international framework largely based on voluntary compliance thus appears as a possible solution in the Dead Sea context where differences in national approaches to environmental problem-solving and sensitivities regarding jurisdiction and sovereignty constitute a serious obstacle to adoption of more stringent international agreements.

The significance of the revised 1978 GLWQA is reflected in the new concepts introduced by the Agreement, a development to which IJC studies and recommendations contributed significantly. A precedent-setting ecosystem approach was thus adopted as the conceptual framework for managing Great Lakes waters. Accordingly, a comprehensive vision of human-nature interactions involving a "basin-wide, long term perspective was to guide the management approach in this area taking into account the impacts of all of man's activities on the natural and socio-economic systems of the Great Lakes Basin" (IJC, 1980). This approach has thus been described as instrumental in "anticipating and preventing boundary environmental disputes" (Environment Canada, 1999:22). The ecosystem management approach appears thus to have a significant potential not only for fostering the sustainable use of environmental resources but also for reducing and preventing international conflicts among user groups once they accept to abide to its principles and to orient their activities accordingly. From the perspective of lessons applicable to the Dead Sea, this aspect of the ecosystem approach is of great interest because it indicates a management model based on principles of conflict prevention and resolution. By highlighting the common interest of all actors to protect their shared environment and taking into account the interrelationships between its various components that transcend political boundaries, this approach has a significant potential for stimulating cooperation between the jurisdictions and user groups sharing the Dead Sea basin.

This management approach provides thus potentially useful lessons applicable to the Dead Sea area for the purposes of joint management and institution building and developing adequate procedures of consensus-building involving stakeholders, interested citizens and NGOs, scientists, environmentalists and government

agencies on the basis of a two-way communication process. The Great Lakes experience with binational management of transboundary water resources point out the merits of the ecosystem approach from a scientific perspective, while indicating the difficulties entailed in its implementation from the management perspective. This highlights the significance of educational efforts intended to raise the consciousness level of all players as to the complexity of environmental issues and the necessity of a comprehensive, innovative management approach. Such educational efforts appear to be all the more useful and necessary in the Dead Sea area given the absence of any tradition of international cooperation in the region and the urgency of mutual trust building measures which can be significantly enhanced by appropriate education focusing on the merits of an ecosystem, basin-wide management approach for shared water resources.

The IJC played a significant role in the promotion of the ecosystem management approach through numerous studies, publications and meetings as well as recommendations to the governments and "vision statements" (Christie, 1995:282-3).

VI.iv Joint Water Management In The Canadian Prairie Provinces With Lessons For The Dead Sea

Institutional arrangements for joint water management in the three Canadian prairie provinces- Alberta, Saskatchewan and Manitoba - represent a successful management model which may provide potentially valuable lessons for other parts of the world. These arrangements are based on a Master Agreement concluded between the federal and the three prairie provincial governments, as well as between neighboring provinces, which provides a formula for apportionment of interprovincial waters based on the principle of equitable sharing or equal percentages of the natural flow in the main watercourses flowing through the three provinces.

The Master Agreement provides also for the creation of the PPWB. The Board consists of two members appointed by the federal government, one of whom is to serve as its chairman and of one member appointed by each of the three provinces chosen from those engaged in the administration of water resources or related duties and serving as member of the Board in addition to their other duties (PPWB, 1992:21). The functions of the Board include overseeing and reporting on the Master Agreement as well as recommending investigating matters relevant to the

Agreement and submitting recommendations for their resolution to the parties. The responsibilities of the PPWB include also managing water quality and groundwater.

VI.v Relevance Of The Water Situation In The Prairie Provinces For The Dead Sea Case

The prairie provinces experience in joint water management compared to Dead Sea challenges in this area provides a good example of analogies that can be identified between different regions which at first glance may differ significantly from the perspective of their respective water situation. It shows that in a territory globally considered as rich in water resources, vast portions of it may be affected by water shortages due to the variation in topographical and climatic conditions - cyclical periods of drought and scarce quantities of precipitation, on the one hand, and the demographic and economic conditions on the other hand. These conditions result often in increased competition among various users over transboundary surface water and aquifers which are often affected by overpumping. In such regions, distance from abundant water resources is a major factor and may result in increased competition for limited water resources available within a reasonable distance range. Like the Middle East, significant portions of the Canadian prairie provinces are thus affected by water scarcity which may considerably aggravate in drought years. Furthermore, this region is confronted to water management problems similar in some important respects to those with which is confronted the Middle East. These problems are related to sharing transboundary water resources given that the major rivers in the prairie provinces cross international or inter-provincial boundaries.

VI.vi Conclusions

1. The analysis of the North American experience with joint management of shared water resources provided by this report tends to confirm its relevance, in some significant respects, to the Dead Sea case. This conclusion is supported by the following evidence:

a) The fact that this experience is considered to be globally successful, notably with regards mediation between competing water uses and water demands, is an achievement of special interest for the Dead Sea case where similar competition is present as well.

b) The complexity of the water management issues dealt with by the examined joint management bodies, which include water quantity and quality issues, water

allocations, mediation between competing water demands/uses and often conflicting interests of various jurisdictions and stakeholders. Dead Sea joint management issues are similarly complex, which facilitates drawing useful lessons from the North American experience.

c) The flexibility of the examined North American joint management institutional frameworks that has facilitated the adoption of an incremental approach to joint management and institution-building, which is particularly relevant to the Dead Sea case.

d) The effectiveness of data collection and information sharing as the basis of North American joint management patterns highlights the relevance of these measures for the Dead Sea case and their significance for mutual trust building.

f) The effectiveness of the conflict resolution procedures developed by the North American joint management bodies. This effectiveness is based on impartial fact-finding through joint investigations that take into account the views of all concerned stakeholders. The credibility of the recommendations produced by such a process is important in their acceptance by the parties despite their non binding character. Such conflict resolution procedures could contribute significantly to confidence-building in the Dead Sea area.

g) The non-binding character of important interjurisdictional agreements orienting joint management of transboundary water resources in North America seems to meet the needs of a future joint management framework for the Dead Sea. The voluntary compliance of the provisions of such agreements is likely to be better accepted by the parties of future agreements in the region and to facilitate adoption of joint management objectives.

h) The conceptual framework elaborated for developing indicators for measuring the state of the ecosystem and progress towards achieving environmental quality and sustainable development objectives in the Great Lakes area. Such an endeavour is relevant for the Dead Sea case given the need in the region for a similar cooperative effort to measure the environmental impacts of current patterns of regional development with a view to increasing their sustainability.

i) The results of the field survey conducted in the region among local experts and government officials indicate that many of the most significant features of joint management patterns examined in the North American context are perceived as desirable for the purposes of joint management and institution-building in the Dead Sea area. These features include:

- The advanced conceptual approaches orienting joint management practices based on such concepts as integrated water management, sustainable use of resources, and protection of the ecosystem.

It should be noted that this comprehensive management approach adopted by the North American joint management bodies has some significant advantages not only from the perspective of sustainable development but also from the negotiations leading to the political agreement on which any future institutional framework for joint management for the Dead Sea will be based. Actually, such an approach, focussing on the linkages between problem areas or packages of issues rather than on individual issues dealt with separately, may facilitate trade-offs in the negotiation of an agreement. Some interviewees acknowledged the potential advantage of such an approach.

- Recognition of the need for basing joint management on a prior political agreement (For example, the IJC is based on the BWT of 1909 and the PPWB is based on the Master Agreement on Apportionment of 1969).
- Recognition of the need for a staged approach to joint management and institution-building involving formulation of the political agreement in general terms will facilitate adaptation to changing conditions and emerging needs as was the case with the two above-mentioned agreements. The significant evolution of the management patterns of the examined joint management bodies since the adoption of the political agreements on which they are based is a reflection of this phased approach to joint management and institution-building.
- Avoiding attributing enforcement powers to the joint management body will render it more acceptable for governments that have a high degree of sensitivity with regards national sovereignty.
- The consensus-based management approach orienting the decision-making process.
- The participatory management approach involving consultation with stakeholders and the concerned public.
- Development of public-private partnerships intended to facilitate achievement of the joint management objectives.

2) Although the three North American joint management models examined in this report are based on the above-mentioned principles, they still differ in some significant respects. Consequently, there are relevant lessons to be drawn from their respective distinct features. Indeed, the results of the above-mentioned survey conducted in the region show that local experts and actors favour a combination of such relevant lessons drawn from different joint management models rather than

focusing on a single model deemed to be the most relevant compared to other existing models.

Accordingly, it is possible to identify some basic distinct features of the three examined models which might be relevant for orienting building a joint management and institutional framework for the Dead Sea:
With regards the IJC model, one of its most significant features that might be relevant for the Dead Sea case is the relatively high degree of independence and impartiality of this international management body. This body is dependent on financial resources allocated by the governments who also assign most of the experts needed for its various tasks. According to the analysis of this management model, this particular feature is one of the main reasons for its success attributed to a large extent to the fact that its decision-making is oriented by the search for common interest rather than what is perceived as the national interest. From this perspective, the IJC represents an effective model of alternative international dispute resolution. It is less formalized than that of a diplomatic framework, and therefore deserves serious consideration, particularly in a political context like that of the Middle East where conventional diplomacy encounters significant difficulties.

The PPWB management model is similar in many respects to that of the IJC, both models are based on political agreements that provide guidelines for managing shared water resources. However, one of its most significant distinct features which has contributed largely to its success is the water sharing formula provided by the Master Agreement of Water Apportionment of 1909. This sharing formula allocates to each of the three Prairie Provinces a predetermined percentage, rather than a predetermined quantity, of the transboundary water resources. Such a flexible principle is better adapted to the conditions of an environment affected by periodic droughts and acute water shortages as are the prairie provinces and the Middle East. It seems therefore particularly relevant for joint management of water resources in the Jordan River Basin.

The GLC management patterns can be distinguished from the other two examined management models as a less formalized management model lacking quasi-judicial powers similar to those attributed to the IJC, nor is it empowered to play a significant role in dispute resolution like the other two previously mentioned joint management bodies. However, it is precisely this less formalized character and

reduced powers that are limited to information gathering and sharing as well as policy promotion and coordination in an advisory capacity, that render it relevant for the purpose of joint management and institution-building in the Dead Sea area. The phased approach to joint management and institution-building favoured by the interviewees in the survey conducted in the region indicate that such joint management patterns may be appropriate, at least as a first stage, for joint management and institutional framework-building in the Dead Sea area.

3) An important conclusion resulting from the survey conducted in the region is that the issue of future management options for the Dead Sea is presently, and probably more than ever before, subject to debate and investigation. This is reflected by the ongoing studies recently launched by the concerned governments, the international community - notably the World Bank - and NGOs, following the renewed interest in the Red Sea-Dead Sea conduit project. The survey clearly showed that this project is currently given attention on the agenda of the concerned governments but that it has aroused serious doubts as to its environmental and economic impacts. Future political developments will also play a major role in the decision-making process regarding the fate of the Dead Sea. It remains however that valid suggestions of suitable joint management patterns for the region can hardly be formulated without further investigation of the ongoing efforts currently undertaken in both the political and scientific domains.

It should be noted however that the emphasis currently placed in the region on the Red Sea-Dead Sea conduit project as a possible solution to the Dead Sea declining water level and associated environmental problems should not make us overlook other potential solutions which should be considered as complementary rather than as alternative to the above-mentioned option. Such a potential solution, referred to by several interviewees with various degrees of scepticism, entails developing basin-wide joint management of the Jordan River-Yarmouk system which could potentially increase water supply to the Dead Sea. Although such a solution entails in the first place prior political agreements among all the riparian nations which is hard to foresee at present time, this option nevertheless deserves serious consideration and further investigation

4) Another important conclusion resulting both from the research on the North American experience in joint management of shared water resources and the survey conducted in the region points to the importance of public education. The

analysis of the North American experience highlights the emphasis placed in North America on developing two-way communication between stakeholders and the public at large and the relevant government departments and management bodies. Such communication is intended to provide reliable information that facilitates improving understanding of the issues and positions of those concerned, including the interests of stakeholders and government policy makers. Lack of such information has often proved to be a major impediment to developing the broad cooperation among all the concerned actors considered as indispensable for successful implementation of joint management objectives. Furthermore, such public education endeavours appear as highly desirable for preparing the groundwork for establishing an institutional framework for joint management for the Dead Sea. This suggestion is supported by the results of .the survey that show the rather limited extent of information about the relevance of the North American experience examined in this report.

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Advancing Conservation and Sustainable Development of the Dead Sea Basin- Broadening the Debate on Economic and Management issues

The management of the Dead Sea and its natural resources to preserve the area for future generations is imperative and urgent. In order to fill in the gaps in knowledge and understanding regarding the future of the Dead Sea, Friends of the Earth Middle East (FoEME) commissioned studies to assess the economic benefits of conservation, including the possible restoration of natural flows into the Dead Sea, and to examine lessons to be learned from other international governance institutions, with particular reference to the International Joint Commission, a body responsible for transboundary water management between Canada and the United States.

Only recently the legitimate ethical, cultural and ecological rationales for conservation have been recognized. The degradation of the Dead Sea basin has been viewed as an inevitable sacrifice at the alter of economic productivity or mega-infrastructure projects have been promoted to remedy the damage done. Positions were adopted in the absence of a comprehensive assessment of the economic benefits of conservation, the direct and indirect costs of continued destruction, or the potential indirect economic costs and adverse environmental consequences inherent in large project schemes.

This report intends to advance more informed discussion that would best promote the overall long-term welfare of the Dead Sea region and its residents.

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