

# Physical Development in an Ecologically Sensitive Area: The Planning of the Dead Sea Region

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Vanessa Sztankeler\* Isaac A. Meir\*\* Moshe Schwartz\*\*\*

Ben-Gurion University of the Negev

*Both basins of the Dead Sea (DS) have been deeply damaged in the last 50 years by anthropogenic intrusion in its water balance. The northern basin is receding, together with the fresh water aquifers along its shores. This has led to the formation of sinkholes, subsidence areas and landslides, affecting wide coastal segments, and bringing development to a halt along the western DS shore. In the southern basin, the water level is rising, threatening the tourist-hotel area lying on its shores. This overview of planning and decision making in the last four decades shows that environmental degradation, conflict between industry and tourism, conservation versus development, water scarcity, unsustainable water and wastewater management have remained persistent problems. Coordination among agents of management and planning, missing for decades, is essential to cope with the problems of the DS region, which are expected to grow increasingly severe on both DS shores, in the absence of sustainable solutions. Critical decisions made recently have to be effectively implemented to avoid a catastrophe.*

**Keywords:** *Dead Sea; planning process; decision making; environmental degradation; master plans; Ein Bokek hotels defense project.*

Situated 423 m below mean sea level (Esakov, 2010), the Dead Sea (DS)<sup>1</sup>, is the earth's lowest and saltiest lake. The DS supplies raw materials to the minerals industry, and is a key tourist attraction. Both industries are involved in a four decades conflict: industrial development versus tourism, and both versus the environment.

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\* Zuckerberg Institute for Water Research, J.Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus 84990 Israel.

\*\* Corresponding author: Desert Architecture and Urban Planning, Dept. Man in the Desert, Institute for Dryland Environmental Research, J.Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus 84990 Israel. Email: [sakis@bgu.ac.il](mailto:sakis@bgu.ac.il)

\*\*\* Social Studies Unit, Dept. Man in the Desert, Institute for Dryland Environmental Research, J.Blaustein Institutes for Desert Research, Ben-Gurion University of the Negev, Sede Boqer Campus 84990 Israel.

Over the last five decades, the DS has already lost over one third of its surface area and its shoreline has fallen by 25m. It is expected to drop to -430m by the year 2020 (FoEME, 2006). This decline is due to two factors. The first is pumping and damming of the Jordan and Yarmouk rivers by the riparian countries - Israel, Jordan, Syria and Lebanon. In their pursuit of agricultural, tourist and industrial purposes, they have diverted 95% of the water that flowed through the Jordan River until the 1950s, and carried an average of 1.3 billion cubic meters (BCM) (FoEME, 2007) of fresh water per year into the DS. In recent years (2007-2008), this figure has declined to about 100 million cubic meters (MCM) per year (FoEME, 2007), most of it sewage.

The second factor is related to The Concession Law (1961). This law granted by the State of Israel, allows the major Israeli mineral industry, the Dead Sea Works (DSW) company, to pump water from the northern DS basin, for mineral extraction and production until 2030. A similar law established analogous rights for the APC (Arab Potash Company) in Jordan, for similar industrial processes, until 2056. These laws led to 80% of the DS water level decline, while industrial activities on both sides of the southern basin are responsible for the remaining 20%. The water deficit of the basin is estimated at 1100MCM by natural evaporation and 300MCM by industrial evaporation, caused jointly by the Israeli and Jordanian Potash Companies (PRFDSR 2005) (Gabrieli in Israeli Parliament Protocol 155, 2011).

There has been little historical research on planning and policy for the DS region. The Policy Report for the Future of the Dead Sea (PRFDSR, 2004), the only multi-disciplinary document examining trends in the DS region, has focused on the northern basin, leaving out the southern one.

This paper attempts to remedy part of this lacuna, by assessing decision making at several administrative and governmental levels, dealing with the implications of the DS water retreat process, as well as with alternatives for protecting the tourist-hotel area, located on the shore of Salt Evaporation Pond number 5 (SEP 5), the largest in the southern DSW basin. The specific issues are briefly considered within the broader context of other environmental disasters caused by willful neglect of the environmental and human context, as well as within the contexts of Israel's political economy and environmental policy.

## **POLICY, PLANNING AND LARGE-SCALE ENVIRONMENTAL DISASTERS**

Large man-made environmental disasters are seldom due to lack of information or scientific knowledge. Rather, they are often caused by willful neglect of heavy risks to the environment or to the population, in the unrestrained pursuit of finan-

cial gain or political goals. To substantiate this claim, we refer to three instances of huge man-made environmental disasters.

Among the best known ones is the shrinking and severe pollution of the Aral Sea, defined by researchers as "an ecological nightmare and a socioeconomic tragedy" (Glantz et al., 1993). Bordering five central Asian countries – Uzbekistan, Turkmenistan, Tajikistan, Kazakhstan and Kyrgyzstan – the Aral Sea was used by the Soviets to demonstrate the power of man over nature. Party and government officials, backed by a politicized scientific community, preached the socialist transformation of nature. One such scientist was Viktor Konda, who captured the spirit of socialist transformation writing in 1953 that "the Party [...] and the Soviet government are doing everything possible to transform nature, do away with deserts, to attain a further big rise in agricultural productivity [...] The grand projects outlined by Stalin's genius [...] will make possible to master the forces of nature in the USSR." (Hollis, 1978) Aimed at transforming the arid surroundings into fertile fields, the waters of Syrdarya and Amudarya, two major perennial rivers feeding the Aral Sea, were diverted since the 1950s to massively irrigate cotton fields as part of Moscow's "cotton independence policy".

Hundreds of thousands of people living in the Aral Sea basin, especially Karakalpakstan, were drastically affected by policies aimed at boosting cotton production quotas. As production stopped increasing, more fertilizers and pesticides were used, exacerbating the environmental disaster, causing an exponential rise in health problems, morbidity and mortality (Kasperson et al., 1995; Monin, 1988). The water level of the Aral Sea dropped at an increasing rate (0.21m/year, 1961-1970; 0.6 m/year, 1971-1980; 0.8 m/year, 1981-86. Glantz et al. 1993), bringing the overall area of the sea from 68,000 sq.km in the 1960s to less than 10% of this size in 2009, exposing ever larger dry areas covered with salts, and chemicals washed into the sea (Micklin, 2007). Today, projects are implemented to re-flood parts of the basin, but no one has been held accountable, nor have the livelihoods of the region's residents been restored.

Western countries have not traditionally paid more attention to the environment than the Soviet Union. Suffice to mention environmental disasters such as the Exxon Valdez oil spill (1989). Caused by an oil tanker which hit the Bligh Reef, Alaska, and spilling 260,000 to 750,000 barrels (41,000 to 119,000 m<sup>3</sup>) of crude oil, it caused an extensive oil spill, eventually impacting over 1,100 miles of non-continuous coastline. It is considered one of the most devastating human-caused environmental disasters, and was the largest in US waters until the 2010 Deepwater Horizon oil spill, in the Gulf of Mexico. The subsequent investigation, carried out by the National Transportation Safety Board, identified five probable causes, among them the human factor (crew fatigue, possible use of alcohol on duty), managerial negligence (inadequate supervision of the crew by the company, resulting in poor practices), and negligence on the part of the authorities (lack of effective vessel traffic system by the US Coast Guard, and lack of pilot and escort services). To quote an of-

ficial report: "The Exxon *Valdez* incident therefore dramatizes the difficult decisions that must be made in balancing environmental protection and economic growth in Alaska [...]. The truth brought to bear by the *Exxon Valdez* incident is that accidents can occur that threaten the coexistence of conservation and energy interests." (Skinner and Reilly, 1989:1). This may be understood to imply that environmental damage, when it is in the service of economic development, may be considered acceptable.

Later assessments blamed the environmental impact on poor contingency planning, which neglected the lessons of previous similar accidents: "The initial response was too slow, the environmental aspects were forgotten, and the wrong methods were selected for the cleanup. However, it is also clear that major errors were made long before the tanker hit the rock. Why, for example, was Exxon allowed in the years prior to the spill, to disband its emergency response team in Valdez? Why was more attention not directed to the technical development with the aim of building safer tankers? [...] The underlying problem is that, for too many years, environmental issues such as the threat of oil spills have been neglected. As a result, dearly won experience has been lost. When a new spill occurs, old mistakes are repeated. This is the lesson of Exxon Valdez." (Linden, 1990).

This remark applies to the recent and bigger oil spill, that of the Gulf of Mexico, in 2010. According to the National Oil Spill Commission Report (2011), the specific accident, known as the Deepwater Horizon Oil Spill, resulted in a three month long oil flow. It is the largest accidental marine oil spill in the history of the petroleum industry, and resulted from an underwater explosion, which killed 11 men and injured 17 others. Eventually stopped by capping the wellhead, the leak released appr. 4.9 million barrels (780,000 m<sup>3</sup>) of crude oil. It caused extensive damage to marine and wildlife habitats, as well as to the fishing and tourism industries in the Gulf of Mexico.

In January 2011 the White House Oil Spill Commission released its final report on the causes of the accident. It blamed the British Petroleum company and its partners for making a series of cost-cutting decisions, and for the lack of a system to ensure well safety. The Commission also concluded that the spill was not an isolated incident, caused by "rogue industry or government officials", but that "The root causes are systemic and, absent significant reform in both industry practices and government policies, might well recur".<sup>2</sup> This is corroborated by additional independent research into the accident and into the effectiveness of managerial supervision of facilities and practices (Hopkins, 2011).

These brief paragraphs indicate that regardless of the political and economic system, the environment has often been disregarded or considered of secondary importance to the economy. Both the US and the Soviet Union were confident that bigger is always better, and partial to the oversized (the biggest farm, the largest factory, the highest skyscraper, the largest industrial company, the biggest irrigation project (TVA) etc). This predilection for gigantism, strongly visible as early as the

late nineteenth century, and the hubris it implied, led to severe problems, analyzed by Scott (1999).

Within this framework, it is interesting to consider the Dead Sea case, since Israel complies with both of the previous constraints: the earlier Zionist-socialist ethos of conquering the desert and making it bloom, and the later capitalist shift, leading to the oligarchic domination of the Israeli market, defined by Ben-Bassat (2002) as a pyramidal system of wealth accumulation, giving the oligarchs unprecedented power over government decision makers.

## POLITICAL ECONOMY AND ENVIRONMENTAL POLITICS IN ISRAEL

The operation of an effective environmental movement started much later in Israel than that in Europe or America. The few environmentalists operating in Israel from the mid-fifties on, were politically weak (Tal, 2002). Moreover, Zionist ideology was mostly about changing nature, not conserving it. In his 1932 poem, national poet Nathan Alterman wrote: "we shall beautify you Homeland, build you gardens, dress you in concrete and cement, dry up the swamps". Actually, the State of Israel, soon after its establishment in 1948, started implementing that program, and a few years later "making the desert bloom" as well, without renouncing the old Labor Zionist aspiration to plant any uncultivated space, maximizing Jewish agricultural settlement, even though by 1958 Israeli agriculture was already suffering from over-production (Schwartz and Giladi, 1993).

Moreover, the new State of Israel was concerned about economic and military survival, at least until the 1967 Six Days war, and economic development, as perceived in Israel, included little worrying about environmental sustainability. Israel's first environmental bureaucracy (12 persons) was established five years later, in 1972 and played a minor advisory and educational role in the country (Tal, 2002).

"An [Israeli] Ministry of the Environment was not established before 1988, decades after most developed countries had established theirs. It was weak, in terms of manpower and budget allocation, though it did have some clout thanks to the Business Licensing Law, which gives it some control over polluting industries and real estate developers (Lawhon, 2006). All in all, the ministry has seen 11 Directors General and 13 ministers (2011), most of whom failed to display enthusiasm when receiving the position and were seldom successful in their efforts, which seems to indicate that the Ministry has hardly become powerful.

The much smaller state of Israel demonstrated macrophilia (preference for oversized economic enterprises or conglomerates, notwithstanding the country's small size) similar to that of bigger countries, such as those described in the three cases described above. In the 1950s-60s, as well as in the 1970s, almost all mammoth enterprises, including those which had started as private enterprises in the pre-State era, before 1948, were owned by the State or by the Union Federation, the Histadrut,

whose enterprises included a very large bank, the country's largest industrial conglomerate, its largest road and housing construction enterprise and some of Israel's largest commercial enterprises as well (Greenberg, 2004). As a matter of fact, one of the largest private successful companies, the Palestine Potash Ltd., established in 1930, had given up its concession for Dead Sea exploitation in 1951, perhaps due to the government's refusal to help it obtain credit to repair war damages, and was replaced in 1952 by the government owned Dead Sea Works (Plessner, 1994).

The publicly owned economic giants were used by the State to fulfill national goals, with little regard for profit considerations. Thus, Histadrut enterprises helped bring employment to the north and especially to the south periphery of the country, while the banks were told by the government to whom and how much credit to allocate. In exchange for using these industries, conglomerates and banks, in the pursuit of its development purposes, the government would bail them out whenever they were in trouble.

Recurrent bailing out insulated these enterprises from the constraints of the market, leading them to perceive themselves as "too big to fail", and allowing them to give in with impunity to the political pressures of the Government or of the Histadrut secretary general. Thus they avoided firing workers and overpaid them, even when economic circumstances required more conservative policies. Moreover, in the late 1970s and early 1980s, three digit inflation and fickle government policies (Schwartz, 1995) generated a turbulent economic environment, to which the economic giants adapted too late and too little. Even when their managers were fully aware of the economic imperatives inherent in the situation, they failed to resist political pressures and accumulated very high debts. The stringent anti-inflationary measures undertaken by the State and the Bank of Israel created a situation in which they could not be bailed out. The Labor Owned Enterprises collapsed in the eighties, and were privatized to pay their debts (Greenberg, 2004).

In the late 1980s and 1990s Israel's economy underwent globalization and liberalization, accompanied by deregulation (Shalev, 1999; Gabai and Rob, 2002), followed in 2005 by financial reform (Gabai, 2009). These processes did not reduce the excessive concentration which had characterized the Israeli economy, in the socialist era. To the contrary, the State and Histadrut enterprises and conglomerates which underwent privatization, were acquired by some twenty politically well connected business groups (Maman, 2004). Moreover, deregulation facilitated processes of economic concentration, including privatized giants and some additional large conglomerates on top of the above mentioned groups. According to the 2010 Report of the Bank of Israel (2011), "some twenty business groups, nearly all of family nature, and structured in a pronounced pyramidal form, continue to control a large proportion of public firms [some 25% of the firms traded on the stock exchange]". Israel's being a small country makes it easier for these groups to attain monopolistic or oligopolistic standing, at the expense of consumers, who pay monopoly rents or less fortunate entrepreneurs who suffer from a permanent credit crunch, since

the above vertically integrated groups have cross holdings in industrial, service and financial companies (banks).

One of those politically well connected business groups is the billionaire Ofer Brothers, involved in aviation, media, private equity and high tech. They also control The Israel Company, self advertised as Israel's largest holding company which includes oil refineries, green energy, the Zim shipping company, and an automobile manufacturing enterprise in China. The Israel Company also includes Israel Chemical Ltd (ICL), a company specializing in producing chemicals, especially fertilizers. The company includes the Dead Sea Works.

These are the circumstances which have led to the overexploitation of the Dead Sea, to the desiccation of its southern basin, and to environmental outcomes and hazards, whose implications are described below.

## THE DEAD SEA NORTHERN BASIN

The DS area (Figure 1) has declined from 922 km<sup>2</sup> in 1973 to 641.3 km<sup>2</sup> in 2004 (Al-Hanbali *et. al.*, 2005). In 1978 the two basins of the DS disconnected, the southern one dried up and, later on, was used for DSW evaporation ponds, becoming an artificial basin. At present (2011), along the retreating western shore of the northern (natural) basin, exposed mudflats, landslides, gully incision, and erosion, threaten infrastructures and buildings. However, the severest impact is that of the sinkholes, formed along the shoreline by fluctuations in the groundwater table accompanying shore retreat and dissolution of the salt layers, and threatening people and infrastructures. About 500 sinkholes (Litvinoff and Raz, 2007) have been monitored along the western DS shore and more than 200 (Yeichieli *et al.*, 2002) new ones appeared every year. Their systematic monitoring launched in 2006 and financed by the Ministry of National Infrastructures (MNI), has been discontinued (Rotem, 2005; Aharonov in Israeli Parliament Protocol 155, 2011).

Thus far, sinkhole formation has caused the closing of tourist and agricultural sites. Current policy aims at restoring affected areas and preventing infrastructure collapse, to preserve settlements and tourist areas. The bodies in charge, such as regional municipal councils, cannot reach an agreement with the Ministry of Finance (MF) on the budgets required to continue research and implement projects coping with the sinkhole problem.

### *The Sinkhole Phenomenon*

A sinkhole is a geomorphological term, denoting a localized depression on ground surface, that develops when underlying earth material, such as rock or soil, dissolves and is washed out from underneath. In the DS area sinkhole incidence is propelled by the percolation of freshwater from the region's springs into the ground, due to the decreased pressure, caused by the retreating seawater. Gradually, the salt ceiling of

the caverns subsides, followed by the collapse of the overlying unconsolidated sediments into the empty spaces and the formation of sinkholes on the surface (Yechieli *et al.*, 2002). Their development endangers people, settlements and infrastructures along the western DS shore.

**Figure 1: Dead Sea area map**



Note: The continuous white line delineates the DS banks pre-1948. The light gray area at the south-western side of DS is SEP5, the evaporation pond affecting directly the hotels to its west. White dots and white areas along the west coast of DS delineate sinkhole concentrations.

### *Coping with DS shrinking*

The Red Sea-Dead Sea Conduit (RSDSC) project, or "Peace Conduit", is the alternative considered most plausible. Planned to be developed on the Jordanian side, the 400 km conduit is meant to transfer 2BCM of water per year, from the Red Sea to the Dead Sea. Half of that water would be desalinated and supplied to Israel, Jordan and the Palestinian Authority (PA), and the rest would be diverted to the Dead Sea. The project would also produce hydroelectric power, and dump the salt-heavy remains in the Dead Sea, raising its level. Its cost was estimated between US\$1.5-5 billion. While environmentalists and scientists oppose it, it is the only alternative being assessed. The feasibility study titled Terms of Reference (ToR) is directed by the World Bank.

By 2005, the feasibility study was expected to take two years and to cost US\$15.5 million, while the project itself could amount to US \$5 billion, taking up to 20 years to complete (BIC, 2010). World Bank's interim initial assessment report (World Bank, March 2010) was presented at public hearings by June 2010. However, it provides little new information relevant to the project's environmental and social effects. Study completion is due by mid 2011, leaving little time to plan further alternatives (FoEME, 2010).

Critics of the Red-Dead scheme claim that instead of building the canal, the Dead Sea could be saved by ending the over-exploitation of Jordan River water by farmers in Israel and Jordan. Besides, its location in the Syrian-African Rift Valley is extremely dangerous in terms of seismic activity. The Sea of Galilee, Jordan River and Dead Sea "should be regarded as one system; stabilizing the Dead Sea level by recovering the Jordan River, is the alternative closest to the original situation and hence the most proper (Raz, 2007).

An important problem of the "Peace Conduit" ToR is its lack of assessment of alternatives and the neglect of the vital issues of water and energy supply, solutions for DSW SEP 5 raising level, sinkhole management, and restoring the Jordan River (Zaslavsky, 2007).

The regional stakeholders, as DSW, Tamar Regional Council (TRC) as well as scientists and environmental organizations, claim that additional alternatives should be assessed by the World Bank, given the unpredictable environmental implications of the RSDSC.

In the 1990s, the Red-Dead became relevant due to the peace process between Israel and Jordan. This time the project included as main targets desalination and electricity production for the three riparian countries. Research findings (Esakov, 2010) indicate that both options, freshwater and seawater reflow to the DS, may cause serious alterations in water quality, such as stratification of the DS water column, gypsum precipitation that could whiten the surface water, dilution of the latter and microbial blooming.

The RS-DS Water Conveyance Study Program is currently researching the physical, biological and chemical implications of mixing the water from both sources.

Carried out by the GSI (Geological Survey Israel) with other engineering and academic bodies, the study assesses three scenarios: 1) *the current status*, 2) *no action* and 3) *addition of Red Sea water and rejection of the brine from the desalination process*. The time frame of this research is until 2050 or even 2075 for an inflow start in 2020 (Esakov, 2010).

Given the degradation of the DS basin, the Israeli Government set up The Policy Report for the Dead Sea Future (Government Decision no. 2863, 5 January 2003). The document's formulation was directed by the Ministries of the Environment (ME) and MNI, and carried out by specialized teams on geology, hydrology, environment, economics, law and planning. The "business as usual" scenario was submitted in 2005, but two scenarios remain to be assessed: RSDSC and restoring freshwater supply from the Jordan River to the DS.

The first Policy report was to provide recommendations, and supply the Tamar Regional Council (TRC) with a development planning tool for a coast affected by severe geological deterioration. However, the report recommended developing tourism in areas separated from the coast, partly diverting it into authorized nature reserves, which was rejected. On the whole, however, the report's recommendations may well be the basis for a first National Master Plan for the Dead Sea Shore. In 2006, a public tender was opened by the Planning Administration of the Ministry of the Interior, to submit proposals for the first National Master Plan for the DS, TAMA 13 (Ministry of the Interior-MI, 2006). The selected team was to submit its Master Plan in two years (Ministry of National Infrastructures-MNI, 2008), but it remains to be submitted (2011). A Policy Report on the TAMA 13 is ready, but according to the MI, will not be published until the coordinating body on the DS decides what alternative it recommends to protect the southern basin (Israeli Parliament Protocol 155, 2011).

## THE SINKHOLE ISSUE AT THE NATIONAL SCALE

The Knesset (Israeli Parliament) protocols in this section help review decisions and examine funding issues related to sinkhole formation. Major topics include insurance, compensation to damaged sectors and budgets for research and projects.

### *Insurance*

Both Kibbutz Ein Gedi and the Tamar Regional Council (TRC) expect the State to assume full responsibility for accidents and financial damage caused by sinkholes, and to defray insurance costs, as the sinkholes are not an *unexpected ecological disaster*, but an outcome of State decisions. Thus, the main damaged bodies, Kibbutz Ein Gedi and TRC, should not have to meet insurance costs, and the issue cannot be addressed by legislation on natural catastrophes. The committee in charge, the damaged parties and the MF, all agree that the insurance should cover the entire DS

region, while economic compensation is mainly for Kibbutz Ein Gedi. The insurance issue, raised in meetings in the last years, revolves around two basic questions: (1) Who will meet insurance costs? (2) Is the Ministry of Finance (MF, Capital Markets and Insurance Division) (Israeli Parliament Protocol 7861, 2004) correct in claiming that personal insurance is superfluous, as sinkhole risks are wholly covered by vehicle insurance, National Insurance and work accident legislation, or, alternately, are the legal representatives of Kibbutz Ein Gedi and TRC correct in claiming that people's safety within the DS area is not covered by any insurance policies or mechanisms?

While private insurance companies would not take the risk of insuring against events which might cost hundreds of millions of dollars, the Capital Market Division of the MF announced to the committee in 2005 that the State has no room for insurance costs in its budget. In subsequent meetings the MF still stated that life insurance, vehicle insurance and the National Insurance do not exclude sinkholes; therefore pedestrians, cars and buses would be covered. The committee requested from the MF a formal document confirming that such insurance does exist. Until then, the State should take responsibility for the issue, or close the DS area, including tourism and settlements. There is no certainty, even at the national level, which insurance would legally cover a sinkhole accident if it occurred, causing loss of life or physical disability. TRC and the damaged parties still ask for a definite resolution regarding human safety in the DS area (Israeli Parliament Protocol 78, 2007). As of 2011 the issue remains unresolved.

### *Compensation to Damaged Sectors*

Representatives of Kibbutz Ein Gedi argue that even if the government has, for decades, been unaware of the sinkholes, the last few years have widely publicized them. Nevertheless, the State did not stop water pumping from DS, nor did it refrain from extending the DSW's Concession until 2030. This strengthens the argument that the State is responsible for the sinkholes. The main stakeholder damaged by them is Kibbutz Ein Gedi. The compensation it requires would help it rebuild damaged infrastructures and facilities, compensate it for tourism and agricultural losses in the last decade, and generate new income sources. Since early 2004, several Knesset meetings had agreed to legislate on the sinkhole issue, given that the State (MF) had failed to provide satisfactory answers. The law would not only cover Kibbutz Ein Gedi and TRC, but also the hotels, infrastructures and all involved local parties.

The TRC Engineering Department (TRCED) argues that the MF had discharged its responsibility for research on sinkhole formation and on ways of coping with it. The only subject still discussed is compensation. TRCED also agreed to comprehensive legislation on the matter. By the end of 2004, the parliament committee discussed a 4-year plan (2003-2007), outlined by the MF and Kibbutz Ein Gedi, to support the latter's economic recovery (Israeli Parliament Protocol 7861, 2004). The

government (Feb.5, 2006, Government Decision 4692) authorized the compensation promised to Kibbutz Ein Gedi for infrastructure damages, and allocated an alternative agricultural area in Nahal Ze'elim for the lost date groves (Rinat, 2006; PMO, 2006). This was not implemented. In February 2011, a new Government Decision (2816) confirmed the previous one, but was not implemented either.

### *Budget for Sinkhole-related Projects*

Most of the research on sinkholes was carried out under the MNI by two teams: the Research and Development (R&D) team, including the IGS and the Geophysics Institute, and the engineering team, supervised by TRCED.

The first stage of the government-commissioned research – aimed at understanding the phenomenon, and dealing with topsoil and infrastructure collapse - has provided fairly extensive knowledge on sinkhole generation, while mapping risk areas. The next stage was formulating the policy report. This required additional research, further mapping of risk areas, at the local rather than regional scale, controlling individual holes, and providing constant update on their dynamics.

Until 2004, the sinkhole teams spent NIS 11 million to produce an interim report about sinkholes. In 2003, the TRCED submitted a budget of NIS 13 million to the MF for the period 2004-5, to continue research. The MF argued that one should define the national and regional council's responsibilities regarding research levels: advanced projects, such as mapping and controlling isolated holes, as well as modeling and experimental projects on sinkhole areas, should be funded by the council. To this day, TRC met much of the costs for the "national projects" (Rotem, 2005).

Between 2003-2005 an engineering team has worked in risk areas, to assess which ones can be developed. TRC was expected to fund the research, estimated at NIS 15 million. The council claims that it cannot allocate such a sum, and that the sinkhole issue is the State's responsibility. In a meeting at the MI in 2005, and again in 2006 (Rinat, 2006), TRC's engineer stated that research on sinkholes has stopped, while current policy is to close new sinkhole areas, due to lack of funds and guidelines to cope with the problem. The budget for sinkholes research in the Geological Survey was over in 2006, and so was the TRC geologist's budget in May 2007 (Israeli Parliament Protocol 78, 2007).

In 2007 the Ministry of Tourism (MT) allocated NIS 8 million to keep monitoring sinkholes, but the main difficulty remained the lack of a clear national policy. At present, the recommendations concerning high risk areas threaten to end the coast regional development. A budget of 4.5 million NIS was provided to the GSI by the MF, for the years 2008-2010, for empirical research (State Comptroller, 2009).

Government Decision 783 (2009) put the DSPGC in charge of the sinkhole issues in the framework of the MT. However, a few months later (January 2011), Government Decision 2722 put the GSI in charge of research and monitoring the sinkholes issue and the infrastructure's instability on the DS shores. The planning

staff of TAMA 13 was appointed to serve as Steering Committee of the GSI research. The allocated budget was 1.5 million NIS per year until 2012 (Government Decision 2722, 2011).

## THE DEAD SEA SOUTHERN BASIN – TOURISM VERSUS INDUSTRY

The resort area of Ein Bokek-Hammei Zohar is located on the shore of Salt Evaporation Pond (SEP) 5, the main DSW's industrial pool and the only bathing area for hotel guests. Water evaporation is very high; thus, a layer of salt and other minerals has accumulated at the bottom of the ponds, raising the level by 20cm per year at SEP 5. DSW has to maintain a constant water volume in the ponds to carry out industrial processes. Therefore, dykes separating the ponds must be raised constantly to contain the rising water. This is hazardous to all structures and infrastructures in the shore area due to possible floods from SEP 5. Besides the rise of the SEP level, the groundwater layer under the shore also rises, threatening building foundations on the beach area (State Comptroller, 2002). The level of SEP 5 has risen by about 8.5m since the ponds have started operating, in the late 1960s. By the DSW concession expiry (2030) the pond level is expected to rise by 13m (PRFDSR, 2004), i.e. 5m above present levels.

Since the early 1970s, all official bodies in charge of tourism development in the DS region, have been aware of the risk of damage to the foundations of buildings located on the shores of SEP 5. Those bodies have included MT, Israel Land Administration (ILA), Dead Sea Region Development Co. Ltd (DSRDCo), TRC and Tamar Local Planning Committee. In 1971 the first hotel was built in Hammei Zohar, when the MT started encouraging the expansion of hotels, thermal baths, and therapeutic facilities on the shores of SEP 5 at Ein Bokek - Hammei Zohar. However, no local master plan supported hotel development, nor were any building permits required. Thus, DSW asked the Ministers of Finance and Tourism, in charge of implementing the Concession Law, to make tourism decision-makers and planners aware of the rising water in the salt ponds. DSW demanded that development be confined to the 150m strip from the SEP 5 shoreline (PRFDSR, 2004). Buildings were to be built on high points, to ensure that the lowest construction level, including foundations, be above the highest possible SEP level, making it technically possible to raise dykes, if necessary. Government and development bodies failed to heed the warnings.

DSW holds documents signed by the hotel developers. The stakeholders accepted the yearly level rising of SEP 5, besides committing to refrain from suing the mineral industry and to implement protective measures. However, at the time of this agreement, the Concession Law expiry date was set at 2000 and the lowest level of the hotels was determined according to the SEP's level that year.

### *Planning for Risk to the Hotels Area: 1970-1990*

In 1975, a statutory master plan for Hammei Zohar area, promoted by the DSRDCo, determined the altitude of hotel entrance levels, without stipulating that their lowest level be above sea level, nor requiring protection measures for building foundations. In the early 1980s, a detailed plan for the two tourism areas considered for the first time the lowest permitted concrete base level for hotels, fixing it at the expected SEP 5 level for 2012 (EIAR, 2003). In 1983 the development of tourism facilities in the area was suspended, until a solution was found to the issue of the rising SEP 5 level.

However, the MT, ILA and DSRDCo repeatedly requested that the council abolish this complete moratorium on development. A year later the plan was modified, proposing a protection dyke limiting SEP 5, to allow tourist activities at the new salt-water pool. This time the guidelines required protecting building foundations, to ensure structure safety (with no need for earth dykes, until 2020). The plan was approved in 1987.

In the years 1980-1988, eight hotels, with a total of 1,350 rooms, and other tourist facilities, were built on the SEP 5 shores. The official bodies were aware of the risk of foundation flooding, from 1995 on, and first levels flooding from 2012 on. In the Ein Bokek-Hammei Zohar area, four hotels were built according to an earlier plan, including no measures to cope with rising SEP water levels. In 1995, the first temporary solution was carried out, based on a protecting dam along Ein Bokek and three underground pumping stations, to divert water to SEP 5.

### *Planning Concerning Risk to the Hotels Area:1990-present*

In 1990 the Negev Tourist Development Authority (NTDA) NTDA requested an engineering and economic assessment, to devise temporary solutions for the threatened hotels area. A Dutch engineering company proposed a lagoon, separating the tourist area from SEP 5 by a dam, ensuring direct protection of Hammei Zohar beach by an earth dyke separating the built-up area from SEP 5. A further alternative was abandoning the Ein Bokek - Hammei Zohar area and developing tourism on new sites. The NTDA recommended the lagoon option, as the most suitable long-term solution, subject to geotechnical assessment, and protection by earth dykes. Until the plan's completion, direct protection was recommended for five years.

The development of 2,100 new hotel rooms at Ein Bokek-Hammei Zohar was cancelled by investors in 1991, due to uncertainty about the selected alternative. In 1992, the official bodies involved in the area's development decided that the 3,000 new hotel rooms at Ein Bokek should be built 8m above the maximum height of SEP 5. That same year, the Government committed to execute the defense measures for Ein Bokek - Hammei Zohar - then called "protection stage A". Dyke construction was to be completed by the end of 1994, postponing a long-term solution for

seven years. Meanwhile, further tourist resorts were developed, raising the number of hotel rooms from 1,600 to 2,500 by 1997.

The MT and the DSRDCo did not modify the plans' guidelines to move the maximum level of 612 m to 614.5 m (local reference system eq. - 385.5m in the national reference system), which would have ensured that by 2030 (end of DSW Concession Law) the lowest floor of the structures built after the modification, would be above the SEP 5 level.

#### ***Dead Sea Shore Protection: Stage A***

In 1993 the MF, DSW and TRC decided to build steel paneled walls 14 m under the earth dykes, along Ein Bokek's beaches. Underground drainage was built to evacuate the groundwater close to building foundations, collect it by three pumping stations and divert it back to SEP 5. The steel panel was to cut the saline groundwater interface, keeping water from SEP 5, as well as groundwater, from reaching the beach area and building foundations. The project, completed in 1995, was considered a temporary solution. In 1997, an accident at one of the pumping stations caused the death of four people. Thus, the TRC stopped maintaining the facilities. By 2000, damage to building foundations was attributed to the stoppage of the operation of two pumping stations. An assessment funded by the MNI indicated that, over five years, the saline solutions of SEP 5 had damaged the buildings to an unspecified extent. The engine room of one hotel in the area was found to be less than 40cm above the SEP level, which in two years could cause the room's flooding.

#### ***Dead Sea Shore Protection: Stage B***

In 1998 TRC was charged by the Prime Minister's Board, MF and MI with *stage B*, to provide a temporary solution for 2001-2008, raising the height of the dyke by 1m and rebuilding the damaged pumping stations. *Stage B* started late 2002, when project costs (estimated in 2001) had almost doubled (State Comptroller, 2006).

A Steering Committee directed by the MT was established in 1999, to carry out an assessment on seismology, hydrology, geology and soil science and recommend a long-term solution by early 2000. In late 2001 there were still no recommendations. Thus, an additional Steering Committee was established, presided by the MNI, with the participation of the MT, MF, ILA, TRC and Ein Bokek-Hammei Zohar Hotels Association. That committee was to decide on the long term solution, transferring responsibility from the MT and MF to the MNI. In 2002, it was recommended to stop marketing land for tourism in the threatened SEP 5 area, until a solution was reached. In a subsequent MNI report, the following alternatives were proposed:

- Salt harvesting from SEP 5, over an area of 80km<sup>2</sup>. This option is considered by all - except the DSW - as the most expensive, but the most appropriate.
- Abandoning the risk area: this is considered unfeasible, as there are no proper sites for rebuilding the Ein Bokek-Zohar site.

- Direct protection by earth dykes.

Stage A, carried out in 1995, aimed at protecting the Ein Bokek area for 5 years. By 2030, SEP 5 will have risen to 18m, 5m above current levels, and the dykes will have to reach a two-storey building height to contain it. This is visually unacceptable to hotel guests.

However, the MNI supported direct protection through dykes, rather than the lagoon alternative, given that the critical engineering issues, including the sinkholes, had not been assessed. An additional option was submitted to the MNI committee: subdividing SEP 5 into two pans (yet unapproved Master Plan 55/100/02/10). A new pool, designed as a lagoon, with a width of 300m from the shore, would protect the area from the start of SEP 5 to Newe Zohar. This would allow adding water to SEP 5 while harvesting salt in the new pool, to keep its level constant. This long range alternative was recommended by the Steering and Engineering Committees.

In 2004, the geotechnical assessment with a cost of NIS 10 million (2004 value) was approved (State Comptroller, 2006), and by early 2005 the Government should have reached a decision suggested by the MT (in charge of the permanent solution). According to the TRCED it is unlikely that the tasks, which should have been over by 2007, will start in the next ten years (Rotem, 2005). In July 2004 the protection of the southern region of Israel project, moved from the authority of MNI to that of the MT, and in March 2005, from the MT to the Israel Government Tourist Corporation (Ministry of Tourism). A Supreme Court decision ordered the Minister of Tourism to provide solutions by May 24, 2011, while a recent experts report submitted to the MT, states that salt harvesting is the correct solution (NRG, 2011).

By late May 2011, in the absence of long-term solutions, electricity, water and sewage networks must be kept up in the protected area to ensure service. Immediate investments are needed for infrastructure and facilities protection, stage A-3 (2010-2015). The public funds involved in keeping the area functional, may reach NIS 330 million (appr. US\$100,000,000), if no long-term plan is carried out in the next ten years (Rotem, 2005).

In 2004 drilling tests at 80m depth indicated the ineffectiveness of the steel panel walls built in stage A. Besides, dykes were designed without considering critical issues, such as sinkholes and earthquakes (Rotem, 2005). At present most hotel sewage systems are flooded by brine that has invaded pipes, damaging wastewater treatment.

After *stage A* was identified as a technical failure, the committee in charge (MT) decided to assess a new pumping system, based on a Belgian plan, which proposed digging about 70 pump-containing wells 10m deep, to lower the ground water level and divert it back to SEP 5, thus protecting hotel foundations for 10 years. As of 2011, this temporary solution has been implemented and may hold until 2012-14, when the level of SEP 5 reaches +15m (current level is 13.6m). Besides, the dyke should be raised by 1m, to keep the Ein Bokek- Hammei Zohar tourist area func-

tioning, until a long-term system is implemented, which in any case cannot happen before 2015.

## THE NATIONAL SCALE

### *Protection for Neue Zohar*

In March 2005, the budget for the temporary protection project of Ein Bokek-Hammei Zohar was discussed in a parliamentary meeting (Parliament Protocol 374, 2005), within the framework of the Amendment Law<sup>3</sup>. According to the Budget Division of the MF, the Amendment was to implement protection measures for Ein Bokek. Conditions at Hammei Zohar were unknown, though it requires protection measures as well. The MF stated that Neue Zohar was a new issue, and that no budget was assigned for its protection. This generated disagreement in the Knesset Committee, as this settlement may be the only way to expand DS settlements, given environmental constraints.

The MT claimed that Neue Zohar is not a tourist site, like Ein Bokek-Hammei Zohar, but a settlement. In August 2005, the ILA began allocating lots there, repeating the mistake of the 1970s, despite its awareness of the future flooding of the area. Both the hotels and the DSW attribute the situation to the government's contradicting actions to grant the Concession to DSW, on the one hand, thus continuously raising the SEP 5, and to encourage tourism development at Ein Bokek-Hammei Zohar, on the other hand. Until now (2011) about NIS 500 million have been spent on temporary solutions. NIS 300 million could have been saved if a permanent solution had been applied from mid-2006 on (MT, 2006; TRC, 2007; Israeli Parliament Protocol, 2007).

By early 2007, a meeting in the Regional Planning Council of the Southern District dealt with modifying the master plan 55/10/02/10 DSW Evaporation Ponds (MI, 2007), in view of the urgency of a solution. The plan included:

- Assessing the best long-term solution: salt harvest, pumping stations, or lagoon.
- A plan for "Evaporation Ponds," to protect threatened buildings and infrastructures from SEP 5 water rising. The plan's implementation should be as rapid as possible, until a long range plan is completed, allowing interested parties to prepare building plans and obtain building permits. The plan's review should have been over by June 2007, together with an Environmental Assessment Report (EAR) on selected measures and an EAR on the salt harvest alternative. This decision failed to meet the March 2008 deadline for submitting the permanent plan to the Government. In 2008 the Dead Sea Preservation Government Company Ltd (DSPGC) was charged with developing and carrying out definitive measures for the permanent protection of the Ein Bokek-Hammei Zohar hotel area. A tender was open until mid-May 2011 for proposals to design

protection measures along the shore of SEP 5 (DSPGC, 2011). Only in May 2011, the DSPGC submitted to MT the assessment report that recommends salt harvesting of SEP 5 as the most environmentally friendly option. The MT approved the proposed alternative, although the Government has not officially endorsed this yet.

The decision making process of the hotel area defense project since the 1970s was examined twice by the State Comptroller; the last report (B-56, 2006) included the year 2005 and the third is in process. A later State Comptroller report, B-59, published in 2009 examines the water withdrawing process of the Dead Sea as well as the sinkholes phenomenon, its implications and the decision making process in that matter. From 1970 to 2009, more than 10 committees sought solutions for the tourist area on SEP 5.

### *Defense Project of Ein Bokek-Hammei, Zohar Area*

In the period 2004-2008 Israel Government held extensive discussions and reached Decisions 2424, 8-2004; 928, 12-2006; 1311, 3-2007; 1666, 5-2007; 2193, 8-2007; 3262, 3-2008. None curbed the environmental deterioration threatening infrastructures as well as residential, tourist, and agricultural activities.

## SUSTAINING UNSUSTAINABILITY

This paper assessed decision making dealing with the DS water retreat process and with its implications, as well as with the protection of the tourist-hotel area, located on the shore of SEP 5, the largest in the southern DSW basin.

In the matter of the DS water retreat there has been little success coping with it and there is no actual prospect of such success in the foreseeable future. The only alternative seriously envisaged for preventing or counteracting the water retreat process has been the Red-Dead project. Its costs are high while its risks are difficult to assess. Thus the likelihood of its implementation is not high even though there have been feasibility studies about it and one of them is being done at present by the World Bank. Other alternatives (such as reducing irrigation in Jordan and Israel, adding one billion cubic meters to the Jordan River's annual contribution to the DS, reverting it to what it was until 1950) have not been studied. However, they appear politically and economically unfeasible.

In the matter of the sinkhole phenomenon, extensive government and locally funded research have provided a good understanding of their formation, and a mapping of most of them (until 2007, when funding for monitoring ceased). However, in the absence of a solution for DS retreat, sinkholes will continue to multiply, endangering people and infrastructures.

In the matter of protecting the tourist-hotel area on the shore of SEP 5, progress appears to have been made, during the last month of this paper's writing, May

2011. However, while a solution has been adopted by the Minister of Tourism, in conformity with the Israel Supreme Court order, and while that solution is environmentally appropriate, its funding remains unclear, as explained below.

Since 2004 the assessment and implementation of measures for the protection of the Ein Bokek-Hammei Zohar Area from flooding risks is managed by MT. From 2004 to 2009, the issue passed through seven Ministers of Tourism, every one of whom held office between 6 months to 1 year.

Since 2006, hotel area protection is discussed by Israel's Supreme Court, following a lawsuit by the Dead Sea Hotels Association against all actors involved in the process (the State of Israel, MF, MT, MNI, MI, ILA, DSW, TRC). June 2007 was the deadline to start working on the permanent solution, after adopting an alternative: salt harvest or lagoon. No progress was made, other than the Supreme Court order to the Minister of Tourism to reach operational decisions by late May 2011.

In Sept. 2007, the Knesset Committee of the Interior and Environmental Protection (Israeli Parliament Protocol 217, 2007) stated that the State performance was negligent in the DS crisis, and that one single body should be entrusted with implementing all protection measures for the DS coast. Thus, a non-governmental Supervision Committee headed by a Knesset member was established as part of the Commission of Interior and Environmental Protection, to periodically report on progress on the issue.

One of the main requirements of the Supreme Court was to ensure that a single statutory body be put in charge of the administration, geo-technical, engineering assessments and implementation of all protection measures for the DS coast. That body was DSPGC.

Due to lack of action, most hotels as well as the infrastructure, may be flooded within the next years. At present, two hotels are protected against partial floods. The Ein Bokek dam must be raised to protect the hotels from floods, even though it will spoil the landscape for their guests. All these tasks require statutory approval.

According to Gov. Decision 3262(3-2008) the Dead Sea Preservation Government Company Ltd (DSPGC) will manage the temporary tasks and select a long-term alternative for the protection of the Ein Bokek-Hammei Zohar area from flooding on the west coast of SEP 5 of DSW.

A budget of NIS 300 million was allocated for urgent tasks, and preparing feasibility assessments for the long term protective system. The interest of all regional stakeholders is to ensure the continuance of both industries in a symbiotic system. Without the industrial activity the DS southern basin would dry up, phasing out the tourist area.

In 2008 the protection project of the DS coast entered the framework of the Committee of National Infrastructures and the DSSPGC among all involved decision makers, to achieve a sustainable development approach. Currently, there are three alternative long-term solutions:

- Full salt harvest from SEP 5, the most expensive though the most environmentally friendly alternative.
- Digging a lagoon with constant level for tourist area with partial salt harvest.
- Abandoning the six hotels and rebuilding them on the shoreline on a higher area (6). This solution would only be partial, as the salt harvest would become necessary in twenty years, while the costs of new infrastructures would be huge.

The first solution is the preferred option by most involved actors (environmental protection bodies, TRC, the DS hotels association and the team of NMP 13), thus, a solution has to be found for the colossal amounts of harvested salt, probably returning it to the northern basin.

The second alternative would have harmful environmental implications due to the huge amounts of raw material required for the lagoon's dyke (about 42 MCM of earth) that would be extracted from the quarrying areas within the Concession Area of DSW.

The DSW production would be paralyzed if the level of SEP 5 could not be raised, as this is the outcome of their industrial activity. The dykes have to be continuously raised, which in a couple of years would have irreversible visual impact on hotel facilities on SEP 5. The salt harvest could only start in 2015, after assessment and planning. Harvest costs are roughly estimated at 6,000 million NIS (appr. US\$ 1800 million) (Daniel in Israeli Parliament Protocol 318, 2010). DSW considered this option as unreal and economically illogical (Israeli Parliament Protocol 217, 2007). The company wanted to establish an additional industrial evaporation pond, SEP 6, given the SEP 5 water level and imminent damages expected from 2010 on to additional tourist facilities. The Israel Union for Environmental Defense (Adam, Teva Ve'din) categorically rejects the SEP 6 option, which would raise the water deficit of the northern basin, and plans legal action to prevent it.

DSW states that the proposed SEP 6 would enhance safety in SEP 5 area, leave the tourist area visually unharmed and slow down the rise of the SEP 5 level. In January 2009, a specialist report for the Planning Board of the MI also recommended full salt harvest, from all SEP 5's 80km<sup>2</sup>, as the most feasible in economic, environmental and technical terms. Today, all the main regional and national stakeholders and green bodies, agree, for the first time on implementing the SEP 5 salt harvest alternative.

After more than three decades of awareness of critical hazards in the DS area, and a large number of project attempts, bodies and committees, little progress has been made. Between 2008 and 2011 several decisions were made, with little effect on the ground so far. In May 2011, professional assessment was submitted to the MT, and recommended salt harvest in SEP 5 as a long term solution. On May 23, 2011, the Minister of Tourism announced it on the evening news. On July 27, 2011, the government decided to adopt the salt harvest solution, even though it may cost NIS 5-7 billion (about US\$1.4-1.9 billion). However, the source of this funding is still being

discussed. The MF refused to allocate it, the Minister for Environmental Protection used the term "the polluter pays", and the DSW representative called that a travesty, since the Concession Law defines SEP 5 as an "evaporation and sedimentation pond", thus sediments cannot be defined as "pollution". It is obvious that the future holds more legal deliberations and actions. On Sept.9, 2011, the Minister for Environmental Protection announced that he would ask for the enactment of a law to make the DSW pay for 90% of the expenses (MEP, 2011).

## CONCLUSIONS

Through this work five major stakeholders were identified, unequal in their power to make or prevent system-level decisions. The weakest are the local residents (Kibbutz En Gedi) and the Tamar Regional Council. Furthermore, while the regional council does represent the residents, it also benefits from the municipal taxes paid by other stakeholders, not least the DSW, and is thus limited in its ability to fight them.

A slightly more powerful stakeholder are the "green" bodies, including the Ministry for Environmental Protection, and a long series of NGOs, e.g., Israeli Society for Protection of Nature, Friends of Earth-Middle East and other groups. They have been able to instigate discussions and make inquiries, promote legislation and resolutions, but have so far been unable to ensure implementation.

The third group is the hotel owners. They are directly affected by the rise of the SEP level, and are incurring operational and maintenance losses. However, their power appears limited, compared to that of the more powerful stakeholders.

The fourth stakeholder is the DSW. In addition to being one of the country's biggest employer and exporter, it is part of a huge family-owned conglomerate controlling a significant share of the Israeli economy. DSW and its holding company, ICL (Israel Chemicals Ltd.), have so far enjoyed total immunity, regardless of decisions by authorities, legislation, and damage to other stakeholders. Moreover, the DSW has won a renewal of the Concession Law, which grants it practically absolute power over the Dead Sea until 2030.

Finally, the MF, despite evincing some token interest in environmental issues, has been unwilling to enforce decisions and balance stakeholder interests, protect an important national asset, or pay for the damages wreaked by its policies. Its only consistent policy has been that of limiting its expenses.

Apparently, the economic power of the bigger stakeholders has won them the support of the authorities, at the expense of weaker stakeholders and of the region's environment. In the coming years tourism in the region is likely to decline as the environment keeps deteriorating, until the profitability of the DSW declines (not least due to international decisions phasing out by 2013-2015 one of their major products – methyl-bromide, except for "critical uses" - Montreal Protocol articles 2 and

5, UNEP, 2000), at which stage they may discontinue activities, leaving scorched earth behind them.

The recommended alternatives for restoring the northern basin and protecting the southern coast are still in early stages of discussion and assessment. We showed the critical issues of a controversial planning process, implemented in a rich, and threatened area, due to inefficient political and administrative decision-making. Is the situation about to change? As mentioned, critical steps are currently taken, which might transform, after decades of no-action, the threatened future of the DS.

It is difficult to be optimistic about the implementation of the new government decision, given the weakness of environmental interests, and the strength of Israel's dominant business groups. The Treasury is not likely to disburse willingly more than a billion dollars, nor to enter a total war against one of the country's most powerful groups. And the group owning DSW is not likely to disburse such a sum willingly.

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## NOTES

1. List of abbreviation: DS-Dead Sea; DSW-Dead Sea Works; DSRDCo-Arad and Dead Sea Region Development Co. Ltd; DSPGC-The Dead Sea Preservation Government Company Ltd; DSSPGC-The Dead Sea Sustainable Preservation Government Company Ltd; FoEME-Friends of the Earth - Middle East; IGS-Israel Geological Survey; IGTC-Israel Government Tourism Corporation; ILA-Israel Land Administration; MAB-Man and Biosphere; ME-Ministry of Environment; MI-Ministry of the Interior; MNI-Ministry of National Infrastructure; MT-Ministry of Tourism; NBPC-National Building and Planning Committee; NMP-National Master Plan; NTDA-Negev Tourist Development Authority; RSDSC-Red Sea Dead Sea Conduit; SEP-salt evaporation pond ; SCPRFDSR-Steering Committee of the Policy Report on the Future of the Dead Sea Region; ToR-Terms of Reference; TRC-Tamar Regional Council; TRCED-Tamar Regional Council Engineering Department.
2. We have been unable to retrieve the official report, which seems to have been removed from the relevant site of the US Government, so we are relying on the cross referencing of the specific wording in a number of secondary sources, including Greenpeace and Reuters.

3. The Israeli Amendment Law is a regulation started by the Government as of 1985. The law addresses critical issues of national priority which are generally long term matters. It works within the financial and budget national agenda. It is also named as law of economic policy <http://he.wikipedia.org/wiki>

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