

DISCUSSION PAPER

INTEGRATED WATER RESOURCES MANAGEMENT IN ISRAEL

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In April 2005, the Commission on Sustainable Development adopted a decision which recognized that ecosystem services are essential for human beings, especially in the framework of integrated water resources management (IWRM). This decision found the State of Israel in the midst of a severe water management crisis which has been on the national agenda since 2000. During 2000, the Israel government took a decision to act according to the principles of IWRM in order to face and overcome the water crisis. This discussion paper will focus on three of these principles within the framework of Israel's effort to implement a sustainable approach to the management of its scarce water sources.

Israel is located in a semi-arid climatic zone and its natural water sources are severely limited. Nevertheless, in the first decades following its establishment in 1948, Israel succeeded in establishing a reliable and technologically advanced water supply system which serves a variety of uses and is based on the integrated utilization of the country's water sources. The gradual increase in water consumption in Israel due to accelerated development and the rise in standard of living virtually forced the country to provide a dynamic response to the quantity and quality of water supply. During this period, the country sought to implement a water source management approach which incorporates long-term sustainability and economic considerations in relation to ecosystem services that are essential for human well-being. Apparently, however, these considerations were insufficient.

The Water Crisis of 2000: A Catalyst for Action

Despite Israel's relative success in the water sector in the face of limiting natural conditions, a water crisis occurred in the year 2000, which has not yet been resolved. The difficult drought of the winter of 1999/2000 and the lowered water level of Lake Kinneret (the Sea of Galilee) during this period awakened the concern and awareness of both citizens and government decision makers about the interlinked issues of water quantity and quality. As groundwater levels declined drastically, water quality deteriorated as a

result of both salination and pollution. As the country began to confront the crisis, it became apparent, once more, that the crisis actually began several years prior to 2000. It was realized that the management and preservation of ecosystems is a long-term and cumulative process. This combination of hard facts led to a sense of emergency and catalyzed the cabinet to issue directives based on IWRM principles in order to tackle the current crisis and prevent the emergence of yet another crisis in the future.

IWRM Principles in Israel

The following principles relate to IWRM in Israel:

1. Imposition of water extraction levies on the extraction of water from natural sources
2. Seawater desalination
3. Efficient use of wastewater and effluents
4. Brackish water desalination
5. Demand management (conservation and pricing)
6. Impoundment of floodwater along the coastal area.

As stated above, treatment of the water crisis in Israel encompassed several integrated activities, three of which will be highlighted in this discussion paper. This paper focuses on the long-term management of water resources based on an economic-environmental vision, whose aim is to assure the supply of ecosystem services for the well-being of the population in the region.

While at first, the link between these activities may not be apparent, this discussion paper will demonstrate how the creation of an economic incentive in one of the activities can benefit the second and together support and preserve the water system in its entirety.

Water Extraction Levies

Israel decided to impose a levy on the extraction of water from natural sources when the scope of the current water crisis first became apparent. This was first done for the coastal aquifer in the year 2000 and was followed by across-the-board water extraction levies in 2001 which related to all of the country's natural water sources. The imposition of the levy reflects a pricing approach, which aims to bring about payment for ecosystem services (PES).

In principle, use of the levy was meant to highlight the fact that water supply services carry a price and that they cannot be regarded as unlimited services with a price tag of zero (0). Of course, according to supply and demand principles, imposition of a levy is expected to immediately raise the price of water, thereby minimizing demand for water, especially by farmers.¹ The levy level steadily increases, although not necessarily in accordance with a multi-annual plan. The revenue from the levy enters the national treasury, where another arm is required to preserve and rehabilitate the country's natural water systems. In the first phase and until today, the levy was set as a fiscal levy - a type of tax which does not consider the characteristic of the services supplied by the ecosystem. Today, Israel is first beginning to establish the true price of using water sources by implementing an approach whereby the external costs of using the ecosystems are internalized. This water pricing approach should be based on such considerations as geographic area, water quantity and water quality in order to assure realistic and representative payment to the ecosystem. The implementation of this approach will prevent a situation whereby ecosystems – and future generations – will subsidize the present use of water sources and, of course, will prevent cross-subsidies of ecosystems among themselves within the Israeli water economy due to differences in quality, quantity and location. It goes without saying that the calculation of such environmental pricing-mechanism is not a simple task and is a major challenge in Israel's efforts to achieve the integrated management of its water resources.

¹ An assessment of water demand in Israel shows that the impact of price on urban demand is not significant.

Wastewater and Effluents

Another practical decision of the government was to put wastewater treatment and reuse high on its list of national priorities. In fact, national policy called for the gradual replacement of freshwater allocations to agriculture by reclaimed effluents. Currently about 65% (nearly 290 million cubic meters) of the wastewater produced in Israel is reclaimed for agricultural reuse.

A new standard for unlimited use of effluents is currently being formulated. The standard, which relates to 38 parameters, takes account of public health, soil, hydrological and flora considerations. As a result, Israel will be able to exchange nearly 50% of the fresh water (about 500 million cubic meters) which was detracted from agriculture to serve the municipal and industrial sectors. The objective is to treat 100% of the country's wastewater to a level enabling unrestricted irrigation by the year 2010 in accordance with soil sensitivity and without risk to soil and water sources.

As stated, the 38 parameters which are meant to protect soil, flora, groundwater and public health were established based on these aspects. Similarly, the technology for upgrading Israel's wastewater treatment plants to allow them to comply with these standards was examined and found to be feasible for implementation. However, it was necessary to justify this process from an economic point of view and therefore an economic review of the standard was conducted to assess the feasibility of implementation in terms of the national economy. Cost-benefit analysis therefore took account of the entire water system – fresh water, wastewater, brackish water, desalinated water and floodwater as well as different geographic areas and ecosystems. At the center of this review was a cost-benefit analysis which included an assessment of both direct costs and externalities. An essential element in this review was the impact on groundwater quality in terms of nutrients and salts.

In addition, two additional economic-financial tasks were undertaken:

1. A decision on the distribution of the cost of compliance with the standards between the polluter – the municipal sector which receives clean and natural water and then releases wastewater into the system – and the user – the agricultural sector which demands large quantities of water and reliability of supply and is obligated to irrigate in a manner which minimizes damage to nature.
2. To create a financing-operating model for the establishment and proper operation of the wastewater and effluent infrastructure.

The results of these studies demonstrated the following in terms of Israel's economy:

1. There is a net economic benefit from the use of effluents which comply with an unrestricted irrigation standard.
2. In certain geographical areas, there is an economic benefit in implementing a more stringent standard for protection of groundwater while in other areas, a less stringent standard may be sufficient.
3. It would be worthwhile for the government to grant convenient loans for the implementation of the process and to give priority to the private sector for implementation and management.

The Israel government has recently taken a decision to implement all of the above.

Seawater Desalination

The combination of severe water shortage and highly intensive irrigated agriculture, combined with the salinity problem, convinced the government that it is imperative for Israel to enter the desalination field.

To date, desalination facilities, which are meant to supply some 300 million cubic meters of desalinated seawater with low salinity levels, have been established or are in different stages of establishment. The average cost to the national economy will be some 0.65 cents per cubic meter. All of the projects are being built with private sector financing and

management so that in addition to the relative efficiency which is associated with implementation by the private sector, the capital cost of water production will not be subsidized either directly or indirectly.

In addition to increasing Israel's water supply, seawater desalination is expected to make a real contribution to the economy in general. From a national point of view, implementation of this decision will lead to realistic pricing of natural water resources. In practice, this means that the marginal price of natural water will equal the price of desalination and therefore the marginal cost of desalination should be the price of each cubic meter of natural water. Even if in practice such pricing is only theoretical and is not currently expressed in the price of water, it determines the benchmark for the true water price which Israel seeks to achieve for ecosystem use.

Within the framework of the desalination project, the question of reducing salts to very low levels was examined (Israel is plagued by a difficult problem of salinity in groundwater, surface runoff, soils, etc.). After assessing the pollution that is generated by salts, it was decided to give an economic incentive to developers for the substantial reduction of salt levels. This economic incentive took account of the fact that the quality of desalinated water has an impact on the quality of Israel's water system.

Construction and operation of desalination facilities requires attention to the following environmental issues: damage to land uses resulting from the construction of coastal facilities which may harm natural assets and landscape, archaeological and historical sites; damage to marine activity and other marine facilities; damage to the coastal environment as a result of the disposal of concentrated brine to sea, with a brine concentration which is two to three times higher than sea water; enrichment with other chemicals and underground pipelines; damage to the hydrological system; creation of noise nuisances; intensified use of energy; use and storage of hazardous chemicals/materials, etc.

The goal of government is to achieve a win-win situation, which integrates economic and environmental considerations. Therefore, Israel has set a uniform and transparent policy, in addition to daily cooperation with all stakeholders in order to achieve sustainable development and to protect other ecosystems.

Summary and Conclusion

This discussion paper seeks to demonstrate the integration of three simultaneous activities used to help achieve IWRM in Israel. The importance of this integrated activity may be shown by the following example. A prerequisite for unrestricted irrigation by effluents is a salinity level which does not exceed a chloride concentration of 250 mg/l. In Israel some of the fresh water reaching household taps reaches a similar salinity level of 250 mg/l (the salinity of Lake Kinneret has even reached 270 mg/l). Without resorting to seawater desalination and reducing the general salinity levels, effluents cannot be used to achieve the target of substituting effluents for fresh water in agriculture, even in the case of other sanitary effluent high effluent quality standards. The use of high-chloride effluents salinates the groundwater which eventually reaches household taps. This water is then transformed into more saline wastewater and then into even more saline effluents. The cycle is perpetuated to the point where these water sources totally damage groundwater quality and adversely impact on the entire water system balance.

The case of salts reflects the impact cycle of different integrated uses of both natural and artificial systems. The example demonstrates the need for managing water systems in an integrated manner which includes means for the economic pricing of ecosystem use and incentives for activities which will only become economically beneficial in the long term.

The measures detailed in this discussion paper were designated, *inter alia*, to provide for Israel's agricultural needs while reducing the existing gap between water prices for agriculture and for other uses. While this gap has been reduced in recent years, it still exists. This leads to the question of whether a uniform product – water – should have a uniform price? The answer, from the point of view of PES is a resounding yes. Moreover,

it is necessary to set a price which expresses the long-term value of the use and preservation of water based on the precautionary principle. There are many reasons for supporting agriculture in Israel as is done in other countries. However, water pricing mechanisms should not be used for supporting agriculture, because they will distort the management of the water sector and the protection of its ecosystems.

Israel has created a number of integrated tools for the management of its water economy in recent years. The time has now come to upgrade its implementation of realistic water pricing approaches, effluent quality standards and seawater and brackish water desalination. Also high on the priority list for future years are additional tools such as floodwater impoundment and demand side management, the latter of which has been the subject of in-depth study in recent years. The implementation of current tools along with additional tools in future years should further advance Israel's efforts to attain the integrated management of its water resources for the benefit of present and future generations.