Chapter 2
The Four Eras of Israeli Water Policies

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Israel is considered by many as a paragon of sound water management (e.g., Postal 1997). Due to the severe water scarcity Israel faces and the relatively high levels of human and social capital it can muster, Israel has successfully implemented policies that are at the forefront of the water policy field. These policies enabled Israel to develop an advanced postindustrial economy and to supply a burgeoning population with high-quality water at the tap on the basis of scarce and contested water resources. Moreover, Israel has succeeded in providing water to an advanced agricultural sector whose product per unit of water has risen rapidly in the past 30 years.

Yet, the seemingly successful water policies have been criticized within Israel as being outdated, inefficient, and environmentally detrimental. In the past 15 years, there have been increasing calls for an overhaul of Israel's water policies, as can be seen in the formation and recommendations of a series of governmental and parliamentary inquiry commissions.[1] These calls, coupled with the new options opened by large-scale desalination and the shifting intra-Israeli power structures, suggest that such a structural change may be underway (Feitelson and Rosenthal 2012).

Two of Israel's main water sources are shared (see Fig. 2.1). Consequently, Israel has been embroiled in some of the most widely discussed international water conflicts in the world. Actually, it is safe to suggest that the number of words written about water in the Israeli–Arab context, per unit of water, is significantly higher than for any other water conflict. Most of the studies on the Middle East water

[1] Invariably named after their chairs, these are the Arlosoroff committee (1997), the Magen committee (2002), the Gronau committee (2005), and the Bein committee (2010).

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Fig. 2.1 The Water resources of Israel and the NWC (*Source*: Author)

conflicts analyze Israel as a unitary player. Yet, as many studies of international affairs suggest, foreign policy is often driven by domestic concerns. Thus, most negotiations are conducted concurrently between countries and within countries (Putnam 1988). However, the internal mechanizations of Israeli water policies have remained largely opaque for the international audience. Hence, this chapter focuses on the shifts in Israeli water policies from an intra-Israeli perspective, though it does note the interplay between intra-Israeli policies and the international scene.

Israel lies between the Mediterranean and arid climatic zones. Rainfall ranges from 1,000 mm/year in a small part of the north to 100 mm/year and less in the southern half of the country, most of it within 5 months (November–March). As a result water has historically been a critical aspect of human habitat. However, until the technological innovations that were introduced in the late nineteenth century, most of the human habitation was based on springs, wells, and cisterns. At the time Israel gained independence, in 1948, water resource development was still largely limited to local and regional systems (Feitelson and Fischhendler 2009; Seltzer 2011). At that time only 20,000 ha were irrigated, and municipal systems barely supplied the domestic demand, which was low by today's standards (Weiner 1993).

The history of Israel's water policies since independence can be divided into four eras, differentiated by the issues, goals, discourse, means, and actors that framed the policies. A systemic shift in all these parameters occurred between each period and the subsequent one. Hence, the history of the Israeli water sector can be told as a story of eras and the transformations between them. The purpose of this chapter is to outline these four eras and the factors that led to the restructuring of the water policies from one era to the next.

Each era is described according to the main concerns that drove policies, the main actors that affected those policies, and the main issues that arose, and ultimately led to the next transformation. Clearly, transformations take time and cannot be seen as clean breaks from the past. Hence, while the periods can be delineated time-wise, there are overlaps between them.

2.1 The First Era: The Hydraulic Mission Period (1948–1964)

Immediately after independence, Israel was faced with three critical concerns: One, to accommodate the large immigration wave over one million new immigrants within 3 years; two, to provide food for the burgeoning population, as much of the previous production potential was damaged in the war and imports from neighboring countries were cut off; and three, to establish control over all the area of the state and prevent a return to the 1947 UN partition lines. Agricultural settlement was seen as the primary mean to address all three concerns, as it allowed immigrants to move quickly into the labor force, thereby increasing domestic food production at a time the country faced food and capital shortages, while establishing a stable presence in the contested areas (Bein 1982; Reichman 1990).

The three practical reasons for giving priority to the agricultural sector were augmented by a fourth, ideological, factor. The Zionist movement, and particularly the labor party dominating it at the time, was strongly committed to a rural ideal. An agrarian-based rural existence was viewed as an element for increasing the productivity and changing the employment base of the Jewish people and contributing to nation building by creating closer links between the recently arrived new immigrants and their ancient homeland (Willner 1969).

As most of the irrigable land is in the water-scarce south, and the settlement program, driven in part by geopolitical considerations, targeted areas where local resources were deemed insufficient, the settlement and agricultural development plans were contingent upon national water resource development and conveyance. To this end, a national water master plan was prepared by 1950. This plan was a continuation of earlier plans prepared by the Zionist movement for settlement purposes (Schwartz 2010) and in response to British attempts to limit Jewish immigration according to the "absorptive capacity" of the country, which was largely based on its food production capacity.[2]

The hydraulic mission of the early state period was to develop all available water resources and convey them to where they were needed for agricultural and settlement purposes (Blass 1973). This mission was driven by a nation-building agenda, and hence, the projects which were advanced to carry it out were not subject to strict economic criteria (Galnoor 1978). Based on the earlier plans (most notably Hay's 1948 plan, entitled TVA on the Jordan), the 1950 national water plan prescribed that water will be conveyed from Lake Kinneret in the north to the northern part of the arid Negev in the south, thereby combining all the main aquifers and streams into one comprehensive national water system (see Fig. 2.1). This was achieved with the completion of the National Water Carrier (NWC) in 1964. In the interim period, until the completion of the NWC, regional systems were gradually consolidated, and water from the Yarkon River was conveyed to the south through the Yarkon–Negev pipeline (Fig. 2.1). This pipeline was later incorporated in the NWC.

Development of water in the upper Jordan River, and particularly Israel's plan to divert water out of the Jordan River basin, was contested, mainly by Syria. Though the skirmishes that occurred around the Huleh drainage project in 1951 and the tensions surrounding the beginning of diversion works for the NWC around the Bnot Yaacov bridge in 1953 (as well as the skirmishes around the Syrian diversion plans in 1965–1966) were driven by geopolitical concerns, they were presented as confrontations over water.[3] Thus, water came to be viewed as the bone of

[2]Essentially, the Zionist movement claimed that with irrigation, food production can increase, and hence, the absorptive capacity is higher than in the British calculations. Reichman et al. (1997) provide a detailed account of this argument.

[3]The drainage of the Huleh lake and swamp were viewed at the time as a direct continuation of earlier Zionist drainage projects that were intended to eliminate malaria and create new farmlands. In reality, however, malaria was already eliminated at the time. The skirmishes in both this case and the Bnot Yaacov bridge area 2 years later, however, were largely over the control of the demilitarized zones between Syria and Israel, and particularly whether Israel could conduct works

contention, with important national security dimensions, thereby contributing to the symbolic importance of water in the national ethos of the time. To diffuse the upper Jordan River issue, President Eisenhower sent Ambassador Eric Johnston to the region. After four shuttle trips in 2 years, Ambassador Johnston drafted in 1955 an agreement, whereby the Arab states will receive all the water they could demonstrate a need for, while Israel got the "residual flows" without specifying any limitations on the location of use (Phillips et al. 2007a). While this agreement was never ratified due to the Arab States' refusal to recognize Israel at the time, it served as a basis for legitimizing the construction of the NWC and the conveyance out of the basin.

The extensive and rapid development of water resources in this formative era was carried out by a small cohesive highly capable policy community, largely composed of water engineers affiliated with the labor movement and the agricultural sector. Their success can be partly attributed to the direct access they had to centers of power, not least because several of the leaders of the labor movement previously held positions in the water sector.[4] The leadership of the policy community was largely associated with the national water planning company, Tahal, primarily due to the emphasis placed on planning and the professional leadership of the engineers in Tahal. However, as Alatout (2008) notes within the technical elite, there were fierce struggles, during which the dominant view shifted from viewing water as an abundant resource that has to be explored and utilized to a limited resource that has to be judiciously managed due to its scarcity. This latter view came to dominate the Israeli water scene and became the main theme of the second era.

2.2 The Second Era: Wise Management? (1959–1990)

Once all the main freshwater sources were tapped, by the mid-1960s, attention shifted toward the untapped potential of the Mediterranean Sea. However, a proposal to advance large-scale seawater desalination in the mid-1960s was scrapped due to the expected cost, thereby effectively ending the hydraulic mission era. From this point, and for the subsequent 40 years, the policy emphasis shifted to the management of the existing resources. While the occupation of the West Bank and Golan Heights in 1967 allowed Israel to control an additional headwater of the Jordan River (the Banias spring),[5] to access the eastern aquifer (see Fig. 2.1),

from the eastern bank of the Jordan River, which was contested. The 1965–1966 skirmishes, in contrast, were largely an outcome of the growing rivalry between Egypt and Syria over the leadership of the Arab world. For a more comprehensive overview and discussion, see Feitelson (2000).

[4]The most notable of these were Levi Eshkol, the founding director of Mekorot, the future national water company, who went on to become minister of the treasury and prime minister, and Pinhas Sapir who replaced Eshkol in Mekorot and later in the treasury (Seltzer 2011).

[5]The Jordan River has four sources in the north. The largest, the Dan springs, is within pre-1967 Israel, while the Ajoun and Hasbani streams originate in Lebanon and the Banias spring in the Golan Heights.

and to somewhat increase its intake from the Jordan River, the total amount of additional water made available by the results of the war was limited and did not change the overall picture. This can be seen in the water use patterns that did not change markedly as a result of the war (Grinwald 1989). Hence, since the late 1960s, the emphasis has shifted to the management of the existing resources.

The institutional structure for managing water was set already in the 1959 Water Law. This law nationalized all the country's water and established the post of water commissioner to manage it. Thereby any abstraction of water and any use of water require a permit. This command and control structure was used to determine how much water will be abstracted in each time period from each source and how much water each user will get in this time period. To do so, all water abstractions and uses have to be monitored, and indeed a comprehensive metering system was put in place.[6] The centralized institutional structure, the comprehensive monitoring of all abstractions and uses, and the existence of a national conveyance system allowed Israel to establish and operate a highly centralized and sophisticated water management system. This system is a natural monopoly. Mekorot, the water company established by the Zionist organizations, was designated in the 1959 Water Law as the National Water Company to operate this system.[7]

As noted above, once the possibility to embark on new large-scale projects was curtailed, the emphasis increasingly shifted to the optimal management of the water system. As water conveyance requires considerable energy, water is conveyed during off-peak energy use hours to higher altitudes and supplied by gravity during the rest of the day. Based on extensive monitoring of the water resources and weather patterns, water abstractions are determined after extensive deliberations within the water agencies (Feitelson et al. 2005). However, this decision-making process is largely opaque from the public's point of view, as no record of it is made public. A factor that received increasing attention in this era is water quality. Following the introduction of improved treatment processes, water quality at the tap improved over time.[8]

The institutional structure that was established in Israel was extended to the occupied territories through military orders. Hence, all the water resources of the upper Jordan,[9] Mountain aquifers, and coastal aquifer have been managed since 1967 by Israel as one system.

The change in emphasis had important fiscal ramifications. Capital expenditures on the water infrastructure were reduced from 3 to 5% of the total national capital

[6]The requirement to measure and monitor was made already in the 1955 Water Measurement Law.

[7]See Seltzer (2011) for a detailed history of Mekorot.

[8]See Seltzer (2011) for discussion of the different facets of water quality concerns addressed by Mekorot.

[9]An exception is the Ajoun stream, the westernmost source of the Jordan River, whose water is used primarily in Lebanon, and is not seen thus as part of the Israeli system. In contrast, most of the Hasbani water, which also originates in Lebanon, flows into Israel and is seen as part of the Israeli water potential.

outlays (which made water development one of the major development priorities during the 1950s and early 1960s) to less than 1% by the late 1960s, and the role of planning declined (Galnoor 1978). Despite ongoing planning activity, no new master plan was prepared for the water sector until 1988 (Schwartz 2010). Moreover, the 1988 plan was rejected by the acting water commissioner, without any public disclosure, as it contradicted his ongoing policies. This contributed to the decline in the share of Tahal's income from public sources in Israel. Until the completion of the NWC, national water projects in Israel accounted for over 75% of Tahal's activities, while after 1964 they fell to less than 30%. At the same time the share of Tahal's activities abroad increased. As Tahal increasingly became an international planning and consulting firm, its role in the Israeli national water policy making declined, leading to its eventual privatization in 1996.

The lack of a long-term plan after the termination of the desalination project in the mid-1960s could not mask, however, the increasing stress on the water system. Already in 1966 the State Comptroller issued a report that forewarned of excessive groundwater abstraction. Similar warnings were issued by various expert panels and planning teams in subsequent years. However, these warnings did not have an impact on policies (Kartin 2000). This can be partially attributed to the water commissioners that were appointed in the late-1970s and the l980s, which were closely associated with the agricultural sector (Feitelson et al. 2007). Hence, they strived to maintain the supply of subsidized freshwater to the agricultural sector, despite the growing demand from the burgeoning domestic sector. This resulted in an overdraft from the natural resources, both the Sea of Galilee and the aquifers (Gvirtzsman 2002).

Regardless of the political impasse, which precluded any major policy change, several innovations and actions helped alleviate the water stress. Perhaps the most important is the widespread introduction of drip irrigation. As a result of this technological innovation, the agricultural product per unit of water increased dramatically. Essentially, agricultural production was decoupled from water use or irrigated acreage. As can be seen in Fig. 2.2, agricultural production was highly correlated with water use and irrigated area until the early 1970s. Since then, however, agricultural product increased almost irrespective of the changes in water used in irrigation or the amount of irrigated land. A second factor that contributed to this decoupling was crop substitution in agriculture. Essentially, crops with a higher value per unit of water gradually replaced crops with lower water productivity.

A third factor that helped to decouple the trends is the increasing reliance on recycled water (Shelef 1991). Following a cholera outbreak in Jerusalem in 1970, wastewater treatment and water quality issues came to the public attention. In the subsequent years, a major advanced secondary treatment plant, the Shafdan, was built to treat most of the Tel Aviv metropolitan area's sewage, as part of the World Bank-financed National Sewage Project. The recycled wastewater is then conveyed to the northern Negev in the so-called third line (the first two being the two branches of the NWC below Rosh Haayin – see Fig. 2.1). A second advanced treatment plant was built in the Haifa metropolitan region. With the improvement in treatment levels, the range of crops that can be safely irrigated with recycled

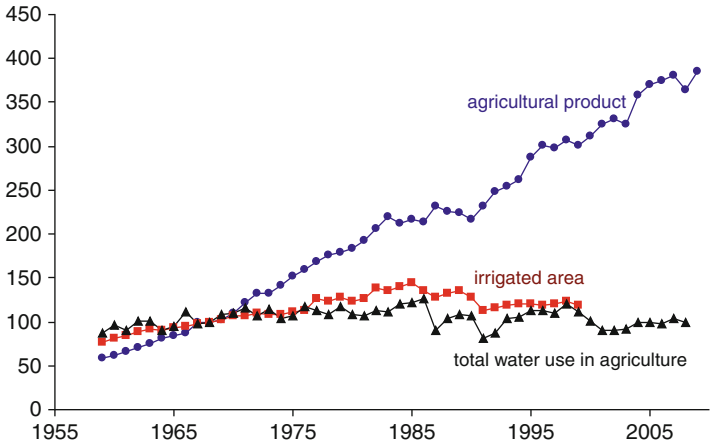

Fig. 2.2 Agricultural product, irrigated area,* and total water use in agriculture** in Israel 1959–2008 (index: 1968 = 100) [*Data on irrigated area was collected only until 1999. **Total water in agriculture includes freshwater, brackish water, and recycled wastewater] (*Source*: Central Bureau of Statistics, Annual Yearbooks)

water increased, thereby increasing the attractiveness of recycled water for farmers. Additional factors that increased the attractiveness of recycled water for farmers were the improvements in drip irrigation technology, which allowed recycled water to be used in drip irrigation, and the high nitrate levels in recycled water, which allowed farmers to save on fertilizers.

One of the effects of the increasing use of recycled water and of the conveyance of water from the relatively saline Lake Kinneret southward was the increasing salinity of water used for irrigation. Irrigation with recycled wastewater and Kinneret water resulted in increasing salinity levels in the unsaturated zone. The salinity in the unsaturated zone has over this period become an increasing source of concern, not only from an agricultural production perspective but also for the unconfined coastal aquifer (Kass et al. 2005). To reduce the salinity of Kinneret water, a bypass canal was built to divert water from saline springs in its vicinity to the lower Jordan River, thereby circumventing the intake to the NWC.

The increasing concern over water quality led to a change in the water law in 1971, expanding the water commissioner's jurisdiction to include water quality. However, the institutional authority over quality issues remained highly fragmented (National Water Commission 2010).

An additional noteworthy factor that allowed Israel to thrive, despite the decreasing amount of water available per capita, is the shift in agricultural policies. During the first era, the main goal of agricultural policies was to assure food self-sufficiency for Israel. By the mid-1960s, however, it became increasingly apparent that this was an infeasible goal. Hence, the agricultural policy shifted to a market-based agriculture, thereby signaling the general shift from a statist centrally planned to a more liberal market-oriented sector. The main ramification of this shift, from a water

perspective, is that the main water-intensive staples, most notably wheat, are largely imported, while the domestic production shifted toward crops which produce a high marginal value per unit of water (Fig. 2.2). This increasing reliance on "virtual water"[10] is one of the least acknowledged factors that allowed Israel to develop an industrial, and later postindustrial economy, without suffering from food shortages, despite the rising number of people dependent on the meager water resources.

2.3 The Third Era: Reflexive Deliberations (1990–2005)

The early 1980s were marked by a steady increase in freshwater consumption in irrigation, resulting in a steady increase in abstraction rates. Consequently, when droughts occurred in the late 1980s, most notably 1989–1990, water levels dropped to the "red lines" prescribed for Lake Kinneret and the Mountain Aquifer. Amidst the public outcry, a highly critical State Comptroller report was published (State Comptroller 1990). This report led, for the first time, to the dismissal of a water commissioner due to his perceived failure to manage the water resources judiciously. The State Comptroller report and subsequent dismissal of the water commissioner received wide public attention. As a result the debate over the direction that Israel's water policies should take, which previously was limited to a small technocratic elite, became public. This episode marks, thus, the beginning of the third era in the Israeli water policies, an era marked by increasing fragmentation within the policy community, and the rise of a series of new issues to the fore.

The first issue to arise was the deterioration in water quality in the aquifers and the validity of the brinkmanship policies pursued by the water commissioners. As Dery and Salomon (1997) point out, it became increasingly apparent that the overdrawing of the water resources in the mid-1980s was not an aberration, but rather the governing policy. Following Mosenzon's (1986) work, an increasing number of economists called for full-cost pricing in order to manage demand and hence prevent excess water drafts (Kislev 1991; Yaron 1991).

The increasing prominence of pricing issues in the water policy discourse was, however, only one of the changes in the sanctioned water discourse, the discourse seen as politically acceptable, that occurred since the early 1990s. In his review of the Israeli newspaper articles in three selected years between 1995 and 2000, Feitelson (2002) identified several story lines in addition to the scarcity and conservation themes, which predominated in the earlier periods, and the somewhat more recent water quality and pricing themes. These include water for nature, privatization, and desalination. These new themes reflected the widening and diversifying set of issues that became part of the water policy discussions since the early 1990s.

[10]"Virtual water" is the water embedded in food. As Allan (2001) shows, it has become the main de facto source of water in the Middle East since the early 1970s.

While water quality concerns were recognized for more than 20 years, their prominence rose since 1990, as part of the growing interest and attention paid to environmental issues in Israel in general over this period (not least due to the establishment of a Ministry of Environment in 1988) and within the professional elites in particular. During this period, several new environmental concerns gained prominence, as the widespread externalities of water development and use were increasingly recognized. The issue that perhaps gained the most attention was the implications of water policies for natural systems. This issue became prominent after several well-known highly visited nature reserves were almost desiccated in the 1999–2000 drought. Thus, while in-stream flows were seen largely as "wasted water" in previous eras, as manifest in the absence of nature from the list of uses to which water can be allocated under the 1959 Water Law, they increasingly were recognized as important for aquatic ecosystems and stream rejuvenation. Consequently, in 2004 the water law was modified, and nature was recognized for the first time as a legitimate use to which water should be allocated.

Other, closely related, environmental issues that gained prominence since 1990 were stream rehabilitation and wastewater treatment. The situation whereby wastewater flow untreated in streams was no longer seen as tenable, especially as streams became a mainstay for open space corridors in the coastal plain region. Such corridors were incorporated into all the national and regional master plans prepared during the 1990s. Moreover, following the statutory national plan for development and immigration absorption, ratified in January 1993, secondary level wastewater treatment became a requisite for housing development. As a result, a large number of new secondary and advanced secondary level wastewater treatment plants were built since 1993. Within a decade, almost all towns and cities were connected to an advanced secondary level treatment plant, driven by environmental concerns rather than recycling goals. The increase in quantities of treated wastewater allowed for a gradual substitution of freshwater in agriculture by recycled wastewater as well as use of recycled water for stream rehabilitation (Friedler 2001). By the end of this era, most of the irrigation in central and southern Israel was supplied by recycled wastewater.

These new "story lines" in the policy discourse did not lead, however, to policy change until 2000. During this period, the policy impasse that emerged in the 1980s remained (Feitelson 2005). In essence, the treasury demanded that water subsidies for agriculture be eliminated, as a condition for funding desalination. However, the agricultural lobby in the Knesset blocked any attempt to raise agricultural water tariffs. Hence, water tariffs remained too low for them to become effective demand management tools, while desalination, the main potential for augmenting water supply, was blocked by the treasury. Consequently, the water commissioner was forced to lower the water levels in the reservoirs, infringing previous "red lines" (Feitelson et al. 2005).

As a result of the severe drought of 1999–2000, which forced the water commissioner to lower the "red lines" in Lake Kinneret to the level of the intake for the NWC, and a change in the stance of the agricultural lobby, desalination was raised again as a realistic option. In the summer of 2000, the minister of

finance reversed the position of the treasury by issuing the first tender for large-scale desalination (in Ashkelon), thereby breaking the impasse and setting in motion a plan for large-scale seawater desalination.[11] This breakthrough was allowed for by the technological innovations that led to a dramatic drop in desalination cost.

This era in water policies within Israel coincided with the peace process initiated in Oslo. Water was one of the issues that were raised as part of this peace process, which lasted throughout the 1990s. As a result transboundary water issues gained once again a high public profile during this period. These issues were dealt with extensively in the two main agreements reached during this period: the Israeli–Jordanian peace accord in 1994 and the 1995 Israeli–Palestinian interim agreement (the so-called Oslo B agreement). The Israeli–Jordanian agreement is a multifaceted agreement, whereby Israel provides additional water to Jordan in the north, as well as storage services for 20 MCM from the Yarmouk River, and can continue utilizing the Arava aquifer on the Jordanian side in the south. The interim Israeli–Palestinian agreement requires that Palestinians in the West Bank receive additional water from the northeastern and eastern Mountain Aquifers and establishes a Joint Water Committee to manage water resources in the West Bank. This committee has been subject, however, to increasing criticism by Palestinians (i.e., Nassereding 2001). Following this agreement, Israeli and Palestinian water supply systems in the West Bank were gradually separated.

However, the most significant difference between this era and the previous one is the widespread dissatisfaction with the institutional structure of the water sector. This dissatisfaction is manifested in a number of committees that were asked to review Israel's sector since the mid-1980s and their recommendations. The first among these was the Arlosoroff committee, which submitted its report in 1997. This committee suggested that major policy shifts were needed – real cost pricing of both end use and abstractions and a reduction in government involvement. This reduction was to be achieved by a breakup of the national water supply company (Mekorot), through privatization and the establishment of a public service authority for water. The Arlosoroff commission also proposed to strengthen the water commissioner's office by increasing his independence and improving his planning capacities. In 2001 a parliamentary inquiry commission (the Magen committee) was formed, which reached similar conclusions.

Some of the recommendations made by the Arlosoroff and Magen committees, such as increasing the planning capacity of the water commissioner and increasing private sector participation in water supply and wastewater treatment, have been adopted. However, these modifications were deemed insufficient, resulting in the

[11]The decision to issue the tender is considered here as the turning point. However, it was one of several governmental decisions that moved desalination forward. Earlier government decisions to plan for desalination were made in January 1997 and March 1999. Decisions to widen the scope of desalination were made after the tender was issued in 2001 and 2002. But these were only partially implemented (National Water Commission 2010).

establishment of a national inquiry commission, the Bein committee. But this committee convened against a different background than previous committees, as by 2010 large-scale desalination was already underway.

2.4 The Fourth Era? Desalination and Privatization

The inauguration of the first large-scale desalination plant in Ashkelon, in 2005, arguably marks the beginning of a new era. While the discussions and disagreements that marked the previous era continue, the advent of large-scale desalination marks several fundamental shifts from previous eras.

The advent of large-scale desalination allows for the first time since the mid-1960s to substantially augment the quantity of available freshwater. Hence, it allows for an increase in the total amount of freshwater for all sectors. Desalinated water also reduces the salinity of wastewater, thereby allowing for wider wastewater recycling (Tal 2006). Since higher wastewater treatment standards were promulgated, a wider array of crops can be irrigated by such recycled water. As wastewater is generated from the urban sector, it is not affected by weather or climate change. Hence, the combination of desalination and higher-quality wastewater reduces the vulnerability of Israel to weather vagrancies and climate change. Yet, desalination increases energy use in the water sector, and hence its carbon footprint, and may have some detrimental effects on coastal seawater.

Desalination also alters the basic water geography, as it is generated along the seashore and conveyed inland (Feitelson and Rosenthal 2012). Hence, north to south flows along the NWC are expected to decline, as additional water desalinated along the Mediterranean shore reduces the need to convey water from the Kinneret basin (IWA 2011). This shift in flow patterns has wide ramifications (Feitelson and Rosenthal 2012). It allows additional water to be retained in the natural systems, hence potentially allowing for rejuvenation of natural resources (IWA 2011). As desalination has been advanced through public–private partnerships, and Mekorot was barred from these tenders (with the exception of the Ashdod plant), it advances the treasury's intent to reduce Mekorot's monopoly power. However, most of the tenders have been won by consortiums that included a single leading firm (IDE), thereby raising the prospects of substituting a state company monopoly for a duopoly (Feitelson and Rosenthal 2012).

The emphasis on incorporating private capital is part of a wider neoliberal agenda that came to predominate the Israeli policy scene since the 1980s (Ben Porat 2008). A second facet of the neoliberal agenda in the water sector has been the reform of municipal water. Following a government decision in 1997, the Water and Sewage Corporation Law was passed in 2001, whereby these services were to be corporatized, rather than being supplied directly by the municipalities. By 2009 the majority of the population is supplied through such corporations, though there are increasing critiques of these corporations (Ben-Elia 2009). These critiques largely focus on the rise in water rates to consumers. These have become a focal

point for public unrest for the first time in Israel in 2010 and were one of the issues raised in the widespread public protests on costs of living in the summer of 2011.

Large-scale desalination also raises several issues in the wider Israeli–Palestinian scene. Essentially, Palestinians claim additional water due to Israel's ability to substitute desalinated water for water from the contested Mountain Aquifer (Phillips et al. 2007b). Israel counters that the desalination does not substitute for the need for storage capacity, as desalinated seawater serves as a base supply, while the natural reservoirs are necessary to address fluctuations in natural replenishment (IWA 2009).

Several additional features differentiate this era from the previous one. The first is the establishment of a water authority in place of the previous position of the water commissioner. The establishment of this authority, with wider purview than the water commissioner, was an outcome of pressures by the empowered treasury. However, the treasury had to make significant compromises in this process (Zinger 2011), thereby arguably not making the difference it sought to make (Fischhendler and Heikkila 2010).

A second feature that, arguably, differentiates this era from the previous one is the return of long-term planning. Following an interim emergency plan that was formulated in 2002 (IWA 2002), a long-term plan has been prepared, which is in an advanced draft form as this lines are written (IWA 2011). Both of these plans advance desalination as the major long-term prospect, seeking add capacity in the short run above the rise in demand in order to replenish the aquifers (IWA 2011). This plan is a partial response to the findings of the Bein committee, which was established to examine the factors behind the continuing crisis, resulting from the multiyear drought. Other recommendations of this committee pertained to the need to use pricing for demand management and for a more open decision-making process in the water sector (National Inquiry Commission 2010).

2.5 Overview and Conclusions

Sixty-four years after independence, Israel's water policies are now in their fourth phase, or era. This reflects the extraordinary dynamism of Israel's water policies. Such dynamism is indicative of the high level of adaptive capacity exhibited by the Israeli water sector, allowing Allan (2001) to suggest that Israel is the only country in North Africa and the Middle East (MENA region) to adapt to impeding water scarcity without the benefit of vast oil resources. However, this adaptation is fraught with internal struggles, as each transformation from one era to the next is an outcome of a crisis in previous policies.

Table 2.1 summarizes the four eras according to the main factors that were used to define them: the concerns or goals that the policies sought to address or advance; the main actors that affected and implemented the water policies (by their weight in making these policies); the main policies advanced; and the main issues with which these policies had to contend.

Table 2.1 Overview of the four eras

Era	Hydraulic mission	Wise management	Reflexive deliberations	Desalination and privatization
Main concerns/goals	Supply to rural settlements	Optimize water management	Whether to manage demand or augment supply	Supply to urban sector
	Integrate system	Increase water productivity in agriculture		Reduce dependency on weather
Main actors (by order of importance)	Tahal	Mekorot	Treasury	Treasury
	Mekorot	Water commissioner	Water commissioner	Private capital
	Settlement bodies	Tahal	Mekorot	Water authority
			Agricultural lobby	
Main issues	What is the water potential	Water quality	Political impasse	Pricing
	Ability to convey Jordan River water out of basin		Negotiations over water with neighbors	Water for nature
				Funding desalination
				Monopolies
Main policies	Augmentation by accessing all possible resources	Water saving in agriculture	Brinkmanship in water abstractions; Extensive wastewater treatment and recycling	Desalination
	Large-scale water conveyance	Algorithms to manage water resources		Privatization
		"Red lines" for Kinneret and westerns Mtn Aquifer		
		Extension of management rules to West Bank		

So far I have described each era. In this section, I present an overview focusing on the actors, as the actors are those that determine policies, and thus, the shifts between eras should be seen as an outcome of shifting power relations between the actors.

The hydraulic mission era was dominated by engineers. Two engineers in particular stand out. The first is Simcha Blass, who was the main figure behind the initiation of the NWC and who sought to develop all possible water resources as rapidly as possible (Blass 1973). The second is Aharon Weiner, who often clashed with Blass, arguing that water has to be managed judiciously, as it is a scarce resource. Between the two of them, and despite the clashes among them, they established Tahal as the lead agency in water resource planning, as it was the agency which planned the Israeli water system according to the settlement needs.[12] These needs were defined by the settlement bodies. Hence, the settlement bodies were central in defining the emerging water geography. In essence this was a geography whereby water was extracted from the natural water bodies into a pipe-determined geography, increasingly conveyed from north to south, out of the natural basins (Feitelson and Fischhendler 2009), thereby creating a national integrated system (Fischhendler and Heikkila 2010). The two main issues that had to be addressed in order to establish this system were to determine the water potential, that is, how much water can be extracted and conveyed, and whether water can be conveyed out of the Jordan basin. Both of these issues were settled in the mid-1950s, as the water potential was realized to be lower than Blass suggested, and the Johnston accords provided the legitimization necessary to convey water out of the Jordan basin.

As all the basins were essentially closed by the mid-1960s and desalination was blocked due its cost, the emphasis shifted to the management of the existing system (Weiner 1993). As a result decision-making power shifted and Mekorot increasingly became the lead agency, as it managed the integrated water system. While the position of the water commissioner was formed, expertise remained during this second era largely in Mekorot and Tahal. But as the funds for planning were cut, Tahal increasingly oriented itself to the international market.

The main focus of water management shifted during this era toward quality issues. A bottom red line was established in the Kinneret in 1968 to protect the quality of the lake's water. The red line has since been the focal point in public discussions of water in Israel (Feitelson et al. 2005). The red lines, however, are only one of the quality issues. Other issues pertained to the level of wastewater treatment and the extent to which wastewater can be recycled. The main concern with regard to this issue was the danger of salinization of groundwater and soils.

Yet, water issues were largely absent from the public debate during this era. This can perhaps be explained by relatively high levels of rainfall during the late 1960s

[12]In its first 4 years, between 1952 and 1956, Tahal was also in charge of operating the water system. In 1956 following the resignation of Blass, the operation elements were transferred to Mekorot, which subsequently became the National Water Company.

and 1970s and the evident success of the Israeli agriculture to raise the marginal value product of water through conservation and crop substitution, thereby allowing also to accommodate the rising domestic demand.

Following the series of droughts since the late 1980s, water issues rose again in the public eye. The third era, however, was largely marked by a political impasse, whereby the treasury prevented large-scale augmentation (mainly desalination), while the agricultural lobby precluded any significant cut in subsidies for water in agriculture (hence preventing further demand management). Thus, the water commissioner (whose role became gradually more central) was forced to draw down the water levels in Lake Kinneret and the aquifers (Feitelson 2005; Feitelson et al. 2005). However, the extent to which the water commissioner agreed to extract from the water reservoirs was a function of the identity of the water commissioner. Essentially, water commissioners who came from the agricultural sector and were aligned with it tended to take a brinkmanship approach, whereby they allowed for a greater drawdown from the aquifers and lake, while water commissioners who were part of the professional elite took a more precautionary approach (Feitelson et al. 2007). The flexibility of the water commissioner to determine water policies was, however, increasingly constrained by the international obligations of Israel in the peace agreement with the Kingdom of Jordan, and the interim agreement with the Palestinians, as well as by the increasing share of the domestic sector of water consumption. As domestic consumption is inelastic relative to the agricultural use, the buffer that could be drawn upon in multiyear droughts has shrunk.

Since successful 1985 stabilization plan, the power of treasury officials increased with widespread effects on water policies. Initially, the treasury mainly pushed for higher water rates in agriculture. The pressures to raise water rates for farmers were followed in the past 15 years by a series of additional policy initiatives that were successfully advanced by the treasury. However, these policies cannot be discussed in separation from the general ideological shift toward neoliberal policies. This shift is perhaps best seen in the calls to break up the Mekorot monopoly.

The drought of 1999–2001 opened the policy window for desalination. Feitelson and Rosenthal (2012) suggest that this was allowed to move forward, albeit in fits and starts, due to a change of view within the treasury. Increasingly the treasury has come to see desalination as a way to break the Mekorot monopoly, by advancing desalination through tenders, from which Mekorot was barred. In the past 10 years, the treasury advanced and implemented two additional reforms. The first forced municipalities to corporatize their water and sewage services. The second restructured the water commissioner's office, which became now the water authority, with a somewhat wider regulatory scope.

The long-term master plan, currently being prepared by the water authority, calls for the rapid expansion of desalination. However, the tender issues so far have allowed for the emergence of a duopoly, as a single leading firm (IDE) is involved in most of the desalination plants. Hence, new issues arise regarding the institutional structure of the water sector, which question whether it will be able to adapt as flexibly and effectively as it has in the past. These issues cannot be disassociated from the wide ranging calls to decentralize the tycoon-dominated economy, the

increasing opposition to higher water tariffs in the urban sector, which led also to calls to de-corporatize the municipal water sector, coupled with the realization that the Palestinians in the West Bank need additional freshwater and calls, echoed by the Bein commission, for greater transparency in water decision making. The question how will these new emerging issues be addressed is at the forefront of the Israeli water discourse today.

References

Alatout, S. (2008). 'States' of scarcity: Water, space, and identity politics in Israel, 1948–1959. *Environment and Planning D, 26*, 959–982.

Allan, T. (2001). *The Middle East water question: Hydropolitics and the global economy*. London: I.B Tauris.

Bein, A. (1982). *Immigration and settlement in the state of Israel*. Tel Aviv: Am Oved (in Hebrew).

Ben Porat, G. (2008). Political economy: Liberalization and globalization. In G. Ben Porat, Y. Levy, S. Mizrahi, A. Naor, & E. Tzfadia (Eds.), *Israel since 1980* (pp. 91–116). Cambridge: Cambridge University Press.

Ben-Elia, N. (2009). *Israel's Corporatization of water supply and sewerage services: An unresolved reform, Florsheim studies*. Jerusalem: The Hebrew University of Jerusalem (Hebrew).

Blass, S. (1973). *Water in strife and action*. Ramat Gan: Massada (Hebrew).

Dery, D., & Salomon, I. (1997). "After me the deluge": Uncertainty and water policy in Israel. *Water Resources Development, 13*, 93–110.

Feitelson, E. (2000). The ebb and flow of Arab-Israeli water conflicts: Are past confrontations likely to resurface? *Water Policy, 2*, 343–363.

Feitelson, E. (2002). Implications of the shifts in the Israeli water discourse for Israeli-Palestinian water negotiations. *Political Geography, 21*, 293–318.

Feitelson, E. (2005). The political economy of groundwater exploitation: The Israeli case. *Water Resources Development, 21*, 413–423.

Feitelson, E., & Fischhendler, I. (2009). Spaces of water governance: The case of Israel and its neighbors. *Annals of the Association of American Geographers, 99*, 728–745.

Feitelson, E., & Rosenthal, G. (2012). Desalination space and power: The ramifications of Israel's changing water geography. *Geoforum, 43*, 272–284.

Feitelson, E., Gazit, T., & Fischhendler, I. (2005). *The role of "Red Lines" in safeguarding the sea of Galilee (Lake Kinneret)*. Jerusalem: The Jerusalem Institute for Israel Studies (Hebrew).

Feitelson, E., Fischhendler, I., & Kay, P. (2007). The role of a central administrator in managing water resources: The case of the Israeli water commissioner. *Water Resources Research, 43*(11), 1–11.

Fischhendler, I., & Heikkila, T. (2010). Does integrated water resource management support institutional change: The case of water policy reform in Israel. *Ecology and Society, 15*(1), 4.

Friedler, E. (2001). Water reuse – An integral part of water resource management: Israel as a case study. *Water Policy, 3*, 29–39.

Galnoor, I. (1978). Water policymaking in Israel. *Policy Analysis, 4*, 339–367.

Grinwald, Z. (1989). *Water in Israel: Administrative and operational aspects consumption and extraction 1962–1989*. Tel Aviv: Ministry of Agriculture, Water Commission, Water Allocation Department (Hebrew and English).

Gvirtzsman, H. (2002). *Water resources in Israel*. Jerusalem: Yad Ben-Zvi (Hebrew).

Israel Water Authority (IWA). (2002). *Interim master plan for water development in the years 2002–2010*. Tel Aviv: IWA.

Israel Water Authority (IWA). (2009). *The issue of water between Israel and the Palestinians.* Tel Aviv: IWA. http://www.water.gov.il/NR/rdonlyres/A111EFEF-3857-41FO-B598-F4819AE9170/0/waterissuesbetweenIsraelandthePalestinians.pdf

Israel Water Authority (IWA). (2011). *Long-term national master plan for the water sector: Policy document*. Tel Aviv: Draft (Hebrew).

Kartin, A. (2000). Factors inhibiting structural changes in Israel's water policy. *Political Geography, 19*, 97–115.

Kass, A., Gavrieli, I., Yechieli, Y., Vengosh, A., & Starinsky, A. (2005). The impact of freshwater and wastewater irrigation on the chemistry of shallow groundwater: A case study from the Israeli Coastal Aquifer. *Journal of Hydrology, 300*, 314–331.

Kislev, Y. (1991). *The water economy of Israel* (Working paper 9006). Rehovot: The Center for Agricultural Economic Research (Hebrew).

Mosenzon, R. (1986). *The water budget – A comprehensive multi-year perspective, budget wing*. Jerusalem: Ministry of Finance (in Hebrew).

Nassereding, T. (2001). Legal and administrative responsibility of domestic water supply to the Palestinians. In E. Feitelson & M. Haddad (Eds.), *Management of shared groundwater resources: The Israeli-Palestinian case with an international perspective*. Boston: Kluwer.

National Inquiry Commission on the Management of the Water Sector in Israel. (2010). *Commission report*. Haifa (Hebrew). http://elyon1.court.gov.il/heb/mayim/Hodaot/00407510.pdf

Phillips, D. J. H., Attili, S., McCaffrey, S., & Murray, J. S. (2007a). The Jordan river basin: 1. Clarification of the allocations in the Johnston plan. *Water International, 32*, 16–38.

Phillips, D. J. H., Attili, S., McCaffrey, S., & Murray, J. S. (2007b). The Jordan river basin: 2. Potential future allocations to the co-riparians. *Water International, 32*, 39–62.

Postal, S. (1997). *Last oasis: Facing water scarcity*. New York: Norton.

Putnam, R. D. (1988). Diplomacy and domestic politics: The logic of two-level games. *International Organization, 42*, 427–460.

Reichman, S. (1990). Partition and transfer: Crystallization of the settlement map of Israel following the war of independence 1948–1950. In R. Kark (Ed.), *The land that became Israel*. New Haven/Jerusalem: Yale University Press/Magnes Press.

Reichman, S., Katz, Y., & Paz, Y. (1997). The absorptive capacity of Palestine 1882–1948: A geographical appraisal. *Middle Eastern Studies, 33*, 338–361.

Schwartz, Y. (2010). *Past water master plans and lessons derived*. Tel Aviv: Israel Water Authority (Hebrew). Available: http://www.water.gov.il/Hebrew/Planning-and-Development/Planning/MasterPlan/DocLib1/ReviewMasterPlans.pdf

Seltzer, A. (2011). *Mekorot: The story of the Israel national water company – the first 75 years*. Jerusalem: Yad Yitzhak Ben-Zvi (Hebrew).

Shelef, G. (1991). The role of wastewater in water resource management in Israel. *Water Science and Technology, 23*, 2081–2089.

State Comptroller. (1990). *A report on the management of the water market in Israel*. Jerusalem (in Hebrew). http://elyon1.court.gov.il/heb/mayim/Hodaot/00407510.pdf

Tal, A. (2006). Seeking sustainability: Israel's evolving water management strategy. *Science, 313*, 1081–1084.

Weiner, A. (1993). The water sector in Israel. In *Encyclopedia hebraica* (vol. VI(2)), Jerusalem: The State of Israel (in Hebrew).

Willner, D. (1969). *Nation-building and community in Israel*. Princeton: Princeton University Press.

Yaron, D. (1991). Rationing of water and water prices in Israel. *Riveon Lekalkala (The Economic Quarterly), 150*, 465–478.

Zinger, G. (2011). *Crossing stormy water: The establishment of the water authority as a case of implementation of Israeli Government Decisions*. Unpublished MA thesis, Federmann School of Public Policy, The Hebrew University of Jerusalem (Hebrew).